METHODS OF COLLECTION OF CROP AREA STATISTICS

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Outline

- Introduction
- Basic Concepts of Area Statistics
- Techniques for Data Collection
- Data sources for Measuring Crop Area
- Methods used for Crop Area Estimation (UBOS experience)
- Challenges & photos
Introduction

- Uganda is an agricultural based country and its economy largely depends on agriculture.

- Agriculture contributes about 24.3% to GDP.

- About 80% of all households in the country are involved in agriculture.

- 90% of the rural households are involved in agriculture.
Introduction - Employment

- The sector provides employment to over 80% of the Uganda’s population.
- 43% of the predominant household based enterprise is in Agric (census.2014).
- 64% of the working population is engaged in subsistence agriculture.
Households by Type of activity

% Distribution of agric. households by type of activity

- Crop Growing: 75%
- Livestock Farming: 57.6%
- Mixed Farming: 66.9%

Source: NPHC 2014

- 75% of agricultural households are engaged in crop
Need for Agricultural Statistics

Agricultural statistics are essential for:-

- monitoring market trends
- estimating future prospects of agricultural commodity markets
- forecasting
- planning and allocating resources
Need for Agricultural Statistics

- They are vital tools for policy-making in the agricultural sector

- Precise estimate for area harvested and yield is paramount for accurate statistics on crop production – hence better GDP estimation
Basic Concepts

- **Area Planted**: Total Area sown with temporary and permanent crops

- **Area harvested**: Total Area from which the crop is gathered

- **Crop Yield**: average amount of produce obtained per unit of area harvested

  - Crop yield = Crop production/Area harvested
Sources of Crop Area Statistics

1. **Agricultural Censuses:** It's normally a large sample survey and not a complete census

<table>
<thead>
<tr>
<th>Advantages</th>
<th>Disadvantages</th>
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<tbody>
<tr>
<td>👍 No sampling error.</td>
<td>👍 Statistics become obsolete quickly</td>
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<tr>
<td>☝️ Provide the frames for sample surveys</td>
<td>☝️ Normally covers structural variables</td>
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<tr>
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<td>☝️ Validating data is time-consuming</td>
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### Sources of Crop Area Statistics

#### 2. Sample Surveys: Agricultural surveys, crop production surveys, household surveys integrated with a module on agriculture

<table>
<thead>
<tr>
<th>Advantages</th>
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<tr>
<td>✐ provides reliable estimates</td>
<td>✐ Presence of sampling error</td>
</tr>
<tr>
<td>✐ done more frequently</td>
<td>✐ cost increases with frequency</td>
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<td>✐ data can be promptly processed and analyzed</td>
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<td>✐ Has a wide scope, including questions on area planted, quantity produced, prices and agricultural practices</td>
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### Sources of Crop Area Statistics

**3. Administrative data sources:** Farm and land registers, administrative reporting systems, data from local government units

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<thead>
<tr>
<th>Advantages</th>
<th>Disadvantages</th>
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<tr>
<td>👍 Inexpensive because already available</td>
<td>👍 Potentially large measurement error</td>
</tr>
<tr>
<td>👍 Offer complete coverage timely</td>
<td>👍 Hard to assess data accuracy</td>
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### 4. Remote sensing: Aerial photographs, satellite imagery

<table>
<thead>
<tr>
<th>Advantages</th>
<th>Disadvantages</th>
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<tbody>
<tr>
<td>Offer quick and easy area estimation</td>
<td>Quite Expensive</td>
</tr>
<tr>
<td>Information is produced with a high level of disaggregation</td>
<td>high-resolution images decreases accuracy for small plots estimate</td>
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<td>Need for ground truth data</td>
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Remote sensing - Image
Remote sensing - Image
Remote sensing - Image
Techniques for Data collection

- PAPI (Paper Assisted Personal Interview)
- CAPI (Computer Assisted Personal Interview)
- CATI (Computer Assisted Telephone Interview)
- CAWI (Computer Assister Web Interview)
Area Measurement Methods

Area Measurement

- Rural households have irregular plot shapes
- Operators normally do not know the area operated
- Farmers estimates tend to depend on the nature of land ownership, distribution, weather
Area Measurement Methods

- Crop area plays an important role in estimating crop production.

- The most appropriate measurement technique to estimate crop area depends on various operational factors;-
  - land configuration, field shape, crop type, cropping pattern, available skills and resources.

- Both objective and subjective methods used.
Area Measurement Methods

1. Farmer Assessment of Crop Area
2. Rope-and-compass Method
3. Area measurement through Maps
4. Global Positioning System (GPS)
5. Remote Sensing and GIS
Method#1: Farmer’s Assessment

Here, the farmer is asked to declare/estimate the area of his/her fields/plots/parcels.

The enumerator and the farmer may visit all of the farmer’s fields and estimate the surface area by visual inspection.
Advantages

- It's relatively less time-consuming and inexpensive.

- Farmer assessments of crop area can serve as a baseline for imputation where objective measurements are missing.
Disadvantages

- Highly subjective, as it depends on farmers’ knowledge and experience
- Nonstandard units of measurement used by farmers may be difficult to standardize
- Farmers Underreport area for very large plots and overreport area for small plots – World Bank study
Method#2: Use of MAPS

- Requires preparation of orthophotographs and high-resolution satellite imagery.
- Enumerators draw the plot boundaries directly on the map (manually).
- The plot area calculated from digitalized maps with Geographic Information System (GIS) software.
Advantages

- Can provide complete coverage and accurate measurements if the satellite image is of high quality and up-to-date
Disadvantage

- Very expensive to acquire orthophotographs and digitized maps
- Plot boundaries are not static, hence need to update maps – high cost
- Not possible to acquire clear satellite images due to weather condition
Method#3: Rope- &- Compass Method

Compass

Rope

Tape

Measurement

Plot boundaries
Method#3: Rope- & - Compass Method

- It’s also known as the polygon method, traverse measurement, chain- &- compass, etc.
- Before GPS method, it was considered the gold standard for crop area estimation
- The length of each side and the angle of each corner are measured using a measuring tape and a compass
Method#3: Rope-&-Compass Method

- For regular plots, surface area is calculated using trigonometry

- For irregularly shaped plots, an approximate polygon with straight sides is obtained by demarcating its vertices on the ground
Method #3: Rope- &- Compass Method

During the give-and-take process and the measurement process, errors are introduced.
Advantages

- Provides accurate area measurements
- The closure error can be evaluated on the spot, and corrected if considered too big
Disadvantage

- Obtaining area measurements through this method is laborious, time consuming, and expensive

- More than one enumerator required for each plot measurement
Method #4: Remote Sensing & GIS

Satellite images
Method#4: Remote Sensing & GIS

- Widely adopted to estimate crop area statistics
- Classified satellite images and land cover maps are used
- Uses remote sensing data and a recognition technique to estimate the crop area
- Satisfactorily useful for determining area for very large plots
Advantages

- Provides quick crop area estimates covering a vast geographical area
- Useful in areas of hilly terrains and in areas that are inaccessible.
Disadvantages

- Very expensive technique
- Very difficult to obtain estimates for areas under cloud cover
- Area estimates for small plots, may not be very accurate
Method#4: GPS

The Global Positioning System (GPS) is a space-based satellite navigation system that provides location and time information anywhere on Earth.
Method #4: GPS

- The GPS hardware determines coordinates for the x, y and z axes, with x and y being the geographic coordinates that determine location and z being the coordinate that determines elevation.

- GPS are used to determine the location, elevation, and even the area covered.
Method#4: GPS

According to the World Bank, systematic use of GPS-measured land area may result in improved agricultural statistics and a more accurate analysis of agricultural relationships (Carletto et al., 2016a)
Advantage

- Area measurements with GPS are more rapid, time-efficient and feasible.
- Data are stored in digital format, and thus traceable and easy to incorporate into a database.
- It’s immune to the potential biases linked to respondent characteristics and the use of non-standard measurement units.
Disadvantage

- The accuracy of GPS measurements is influenced by:
  - tree canopy cover (High accuracy with no tree canopy cover and vice versa)
  - the weather conditions (accuracy is higher under sunny conditions than under cloudy conditions)
  - the plot size (the larger the size of the plots, the more accurate the results)
  - the land in hilly areas
Techniques used in Data collection

- PAPI (Paper Assisted Personal Interview)
- CAPI (Computer Assisted Personal Interview)
- CATI (Computer Assisted Telephone Interview)
- CAWI (Computer Assister Web Interview)
Area Measurement Using GPS

UBOS EXPERIENCE
Area Measurement Using GPS

- Enumerator should complete all other sections of the Questionnaire before area measurement.
- Walk around the plot with the respondent in order to determine the plot boundaries.
- Clear any obstructions that may block your path, so that you have a clear, unobstructed path around the boundary of the plot.
Area Measurement Using GPS

Enumerator taking measurement
Area Measurement Using GPS

- Mark your **starting point** with a stick so you can identify the point when you return.
- The starting point should be the northwest corner of the plot.
- Wait for the device to fix on **at least 4** satellites.
Procedure for Area Measurement Using GPS

- Note the time you are starting to use the Garmin GPS.
- Proceed to the starting corner of the plot where you have marked with a stick.
- At the starting corner, wait until at least 4 satellites have been acquired.
- Select the AREA CALCULATION page by highlighting and clicking the center of the Thumb Stick.
Procedure for Area Measurement Using GPS

- START will appear on the screen
- Walk slowly around the perimeter of the plot.
- Hold the GPS flat in your hand and stretch your hand slightly forward.
- A MUST to walk on the edge of the plot
- At every corner, you MUST stop for 5 seconds and then continue walking.
Procedure for Area Measurement Using GPS

- Walk all the way around and back to your starting point with the GPS facing the direction in which it started the area calculation.
- When you reach the starting point, Press CALCULATE and the area and the perimeter of the plot will be displayed on the screen.
Field Experiences
Enumerators climbing Hills to access crop plots and parcels to conduct area measurement

Field workers, driver and their respondent
Field worker undertakes area measurement using GPS device

Field worker participates in farm work to secure and interview
On a rainy day, enumerators always put on rain coats to protect equipment from getting destroyed.

A field worker supports a farmer by carrying a bunch of harvested banana.
THE END

UBOS APP
Find on google play store

THANK YOU FOR LISTENING