

# Technical Assessment: Data Analyst

## 1. Instruction

You have been shortlisted for the position of **Data Analyst**.

As part of the recruitment process, you are required to demonstrate your ability to design and develop a digital data collection system for an agricultural project using an **open-source mobile data collection platform**, alongside data analysis. You may use **CommCare** or **ArcGIS Survey123** if available, but you must justify your platform choice. If you use ArcGIS Survey123, explain how you would manage relational datasets despite the platform not being fully open source.

The exercise is divided into Section A (**Form Design**) and Section B (**Data Analytics**). Together, the questions assess your knowledge and practical application of relational data structures, digital form design, data quality controls, data analysis, and user experience best practices. The technical assessment carries more weight than the oral interview.

## SECTION A:

### 1.1 Assignment

Design and develop a digital data collection solution for registering **smallholder farming households** participating in an agricultural development project. The system should support **longitudinal monitoring**, allowing households and individual household members to be revisited across multiple agricultural seasons.

## 2. Project Scenario

An organization is implementing an agricultural livelihoods project across several Local Government Areas (LGAs) in Nigeria. The project requires registration and monitoring of:

- Households
- Household members
- Farms (demonstration plots)
- Farm plots (households' plots)
- Crops
- Livestock
- Agricultural trainings
- Field agent visits
- Input distribution
- Harvest assessments
- Each household may own multiple farms.
- Each plot may contain multiple crops.
- Each household contains multiple household members.
- Households receive multiple interventions during the project lifecycle.

### 3. Part I: Digital Form Design

Develop digital forms for the following modules:

#### Module A

Household Registration

Capture:

- Demographic information, including first, middle, and last names; education; age; gender; occupation; etc.
- Household ID
- GPS Coordinates
- Household entry-point status (father, mother, son, daughter, etc.)
- Household size
- Phone number
- Agricultural activities, including whether the household has access to land, mode of access, farming activities, source of funds, source of labour, and farmers' association membership
- Community
- Ward
- LGA
- State
- Displacement Status (IDP, Non-IDP)
- Disability Status (PWD, Non-PWD)
- Field Agent (name of the data collector)
- Date (automatic)

#### Module B

Household Members

Capture:

- Name
- Gender
- Date of Birth
- Relationship to Household Entering Point
- Education
- Disability Status
- Occupation
- State (call up)
- LGA (call up)
- Ward (call up)
- Community (call up)
- Household ID (call up)
- Global/caseid (call up)

The form must support multiple household members.

#### Module C

Demonstration plot farm mapping

Capture:

- Demo plot ID
- Donor's full name
- Farm Size

- Ownership type (community, individual, religious body, etc.)
- Irrigation system used (rainwater, well water, etc.)
- GPS (farm boundary)

## **Module D**

Household farm mapping

Each household may have multiple plots.

Capture:

- Household plot number (same as household ID)
- Plot Size
- Soil Type
- Irrigation method used (rainwater, well water, etc.)
- Elevation (optional)
- GPS (plot boundary)
- Global/case ID (call-up)
- Household ID (call up)
- Global/caseid (call up)

## **Module E**

Crop Production

Each plot may contain multiple crops.

Capture:

- Crop Type
- Variety
- Planting Date
- Seed Source
- Area Planted
- Expected Yield
- Household ID (call up)
- Global/caseid (call up)

## **Module F**

Extension Visit

Capture:

- Household visited
- Date
- Field Agent
- Topics Covered
- Follow-up Actions
- Household ID (call up)
- Global/caseid (call up)

## **3.2 Part 2: Advanced Form Logic**

Implement the following:

- Skip logic
- Validation rules
- Required fields
- Constraint messages
- Calculations

- Dynamic choice lists
- Cascading selections
- Repeat groups
- GPS capture
- Photo capture
- Barcode or QR code (optional)

Examples:

- Only display irrigation questions if irrigation is selected.
- Demonstration plot farm size cannot exceed 1 hectare.
- Age must be calculated automatically.
- If "Other" is selected, request a description.
- Household plot size cannot exceed 1 acre.

### 3.3 Part 3: Case Management / Longitudinal Tracking

Explain how your solution would support:

- Household follow-up
- Seasonal monitoring
- New household members
- Farm expansion
- Household exit from the project
- Household transfers

If using CommCare, explain your case structure. If using another platform, explain your proposed methodology.

### 3.4 Part 4: Data Quality

Describe how you would ensure:

- No duplicate households
- No duplicate farms
- Data completeness
- Enumerator accountability
- GPS validation
- Data synchronization
- Offline functionality

## SECTION B:

### 3.5 Part 6: Analytics and Reporting

Using the sample dataset provided, comprising eight linked tables with approximately 500 records per module, design an interactive dashboard using any data visualisation tool of your choice (e.g., Power BI, Tableau, Looker Studio, Excel, or similar) to answer the following questions:

#### 1. Household Registration Coverage

How many unique households have been registered across each state, LGA, and community? What percentage of registered households are youth-led (18–35), female-led, IDP-status, and PWD-status? Present a breakdown that allows project managers to assess whether registration targets are being met for each equity group.

## **2. Household Size and Demographic Profile**

What is the average household size per state and LGA? Using the Household Members table, calculate the sex ratio, age distribution (children under 18, youth aged 18–35, and adults aged 36+), and education levels across the project. Which LGAs have the highest proportion of households with members reporting a disability?

## **3. Farm Acreage and Land Use Analysis**

What are the total and average farm sizes (in hectares) per state and LGA? What share of registered farms are irrigated? What proportion of households have farms that meet the project's 1-hectare maximum threshold? Visualise the distribution of farm sizes across the three states.

## **4. Crop Distribution and Seasonal Performance**

Which crops are most planted across project communities and by season (wet vs. dry)? What is the average expected yield compared with actual yield per crop type? Which crops show the largest yield gap, and in which states is this gap most pronounced?

## **5. Extension Visit Coverage**

How many households have received at least one extension visit? What is the ratio of extension visits to registered households per LGA? Which extension officers have the highest and lowest visit frequency? What are the most covered topics, and which households are flagged for follow-up?

## **6. Gender and Disability Inclusion Analysis**

What is the female-to-male participant ratio in trainings? What percentage of households with a PWD member have received at least one extension visit and at least one input distribution? Produce an inclusion heatmap showing coverage of marginalized groups across LGAs.

## **7. Input Distribution Tracking**

What is the total value (₦) of agricultural inputs distributed per state, LGA, and input type? What percentage of households have received each type of input (seeds, compost/bio-fertiliser, biopesticide, tree seedlings, and pruning tools)? Are there households that have received training but no inputs, or inputs but no extension visit? If so, where are they concentrated?

## **8. Harvest Estimates and Yield Trends**

Using the Crop Production table, calculate the total estimated harvest volume by crop type and season. Which season (wet vs. dry) produces the highest average yield? How does actual yield compare with expected yield as a percentage, and has this ratio improved across seasons?

### 3. Deliverables

Submit a zip file clearly labelled with your name:

1. XLSForm.
2. Web application link
3. Sample data (**Not more than two rows**)
4. Dashboard report link
5. User guide (maximum two pages).
6. A brief technical note (maximum three pages) explaining your design decisions and challenges encountered.

### 4. Time Allocation

Candidates will have **48 hours** from receipt of the assessment to submit their completed assignment.

Late submissions may not be considered.

Good luck!