

THE ROLE OF DATA IN FOOD SECURITY IN NIGERIA

Paper presented by

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1.0 Introduction

Every national government has an agricultural policy and makes efforts for the citizens to have access to adequate quantity and quality of food. One major objective of Nigeria's agricultural policy is the attainment of self-sufficiency in basic food commodities, especially those which the country has comparative advantage in local production.

Based on the experiences in the several agricultural programmes and projects implemented over the years, PCU is in a good stead to provide an insight into the role of data in food security as well as the problems associated in its generation in the country. Thus, this paper focuses on the problems of generating quality data in gauging food sufficiency and security. The scope of this discourse will include: a background on the programmes already in place; the roles/need for data; the types of food data generated and the methods employed; the existing constraints and limitations; and finally conclusion/recommendations on the way forward through remote sensing and GIS technology.

2.0 Government-Assisted Programmes for Food Security

It is evident in Nigeria that small holder farmers are the major producers of the food consumed in the country. The Federal Government of Nigeria (FGN) in collaboration with state and local governments as well as external agencies such as the World Bank, International Fund for Agricultural Development (IFAD) and African Development Bank (ADB) always initiate several programmes and projects in order to assist farmers by providing an enabling environment for their economic activities.

The Agricultural Development Programme (ADP), for example, commenced as an enclave project in Nigeria 1975. It started in a few states but by the late 1980s went statewide and nationwide including the Federal Capital Territory (FCT). Each state ADP has a number of frontline staff disseminating agricultural extension technologies to farmers. There are also a number of field staff (enumerators) engaged in food data collection from the farmers. The ADP system progressed from the statewide projects to the multi-state ADPs (MSADPs I, II & III). The ADPs have implemented and are still implementing a number of specific sub-sector focused projects such as the Cassava Multiplication Programme (CMP) sponsored by the International Fund for Agricultural Development (IFAD), which later progressed to the Roots and Tubers expansion Programme (RTEP). There is also the National Fadama Development Project (NFDP) of which the first phase was implemented in the late 1990s and the second phase has been on course since 2001. The National Agricultural Technology Support Project (NATSP) was also implemented in the late 1990s. The National Special Programme for Food Security (NSPFS) in Nigeria commenced in 2002. By sponsoring these programmes and projects, government and donor agencies aim to achieve food security, that is, ensure that all the residents in the country have physical and economic access to sufficient food at all times. Apart from food self-sufficiency and security, other expected outcomes in all these programmes and projects include increased employment opportunity, reduced post-harvest losses, improved standard of living, improved quality of life and economic status of the farmers and rural dwellers in Nigeria.

3. The Roles/Need of Data

In order to measure the attainment of the expected objectives and outcomes of the several programmes and projects, data are required. The data collected by enumerators, when analysed, provides information for Programme management and stakeholders in ascertaining the level of progress made in the expected programme objectives. The information can guide both current decision-making and future planning. It can assist in rendering accountability to programme stakeholders. It can also provide clues as to the strengths and weaknesses of the programmes implemented. It can equally provide lessons of experience and awareness of the positive and negative factors affecting programme implementation and sustainability.

The apex coordinating agency of the ADPs is the Projects Coordinating Unit (PCU) which plays a major role in the coordination of data generation activities of the ADPs and offers them technical guidance and support.

4. Types of Food Data Generated and Methods Used

Nigeria is naturally endowed with factors necessary for the production of various staple foods. The food types include cereals like maize, sorghum, rice, millet and wheat; legumes like cowpea, soyabean and groundnut; roots and tubers such as cassava, yam, potato and cocoyam; fruits and vegetables; fisheries and livestock; etc.

The types of food data generated are related to the various types of food and food products available in various forms, either as grains, oils, meat, etc.

For crops, the hectareage cultivated and tonnes of output are common statistics. For fisheries and livestock, the number and tonnes produced are usually measured.

Other agencies serving as sources of generating various types of data about food production estimates in the country, apart from the ADPs and PCU, include Federal Office of Statistics (FOS), Nigeria Institute of Social and Economic Research (NISER), Central Bank of Nigeria (CBN), etc. Their methods and modalities of collecting, analyzing and disseminating food data may not necessarily be the same with that of the ADPs and PCU.

The methods used in collecting data in the PCU-ADPs system include objective measurement techniques, Rapid Rural Appraisal (RRA) and Participatory Rural Appraisal (PRA) visits, guesstimates and farmers' memory recall.

A prominent objective measurement technique undertaken by the ADPs is the Cropped Area and Yield Survey (CAYS). This is an annual sample survey done for the purpose of estimating the area cultivated, and the production and yield of various crops in a project area. The CAYS format emerged in 1991 from the erstwhile Field Records for Agronomic Data and Yields Survey (FRADYS) which was conducted in the 1980s. CAYS methodology recommends an approach in which the enumerator obtains the cropped area, production and yield using survey equipment like prismatic compass, measuring tapes, ranging poles, pegs, measured ropes and weighing scales. All the farms cultivated by a selected farming household

are due to be measured by the enumerator. For each farm, the enumerator measures the dimensions for area calculation, and lays a 0.01-hectare triangular sub-plot from which production estimates are made and later extrapolated for the whole farming households in the zone or state.

The CAYS is done separately for the wet and dry seasons respectively. In the wet season survey, 20 ward-groups are randomly selected per ADP zone, and in each selected ward-group, four farming households are randomly selected, thus giving a total of 80 farming households per zone of the ADP.

In the dry season CAYS, 50 fadama farming households are randomly selected from the frame of fadama farmers in the state; and the procedures for data collection are the same as for the wet season CAYS.

The results of the estimates of output, hectarage cultivated and yield of various crops through small-holder farmers in the country are provided below in Tables 1 – 3 for major crops, namely, maize, rice, sorghum, cassava, yam and cotton. The Tables give an insight into the types of results emanating from the CAYS. It is observed that production by the small holder farmers declined consistently for maize, rice and sorghum from 1999 to 2002 but in 2003, production increased for most of the crops including maize, rice, cassava, yam and cotton (Table 1). It should be recalled that the NSPFS effectively commenced in year 2002 and the good effects could have been felt in 2003. The trend in decline/increase in production appeared to be in line with the trend in the area put under cultivation for these crops

(Table 2). The trend in the yield (Table 3), however, does not seem to reflect that of area cultivated or production put out. Thus, factors other than the area put under cultivation must have determined the yield as well.

Based on the findings from the data collected and analysed, government could make policy decisions on food importation and subsidies for production inputs and outputs.

TABLE 1:
PRODUCTION ('000 METRIC TONNES) FOR SOME CROPS
BY SMALL HOLDER FARMERS IN NIGERIA

CROP	1999	2000	2001	2002	2003
Maize	5,022	4,432	4,357	4,424	4,483
Rice	3,226	2960	2,388	2,236	2,367
Sorghum	5,779	5,126	4,802	4,649	4,626
Cassava	28,686	26,363	27,521	27,938	28,546
Yam	23,022	21,800	22,243	21,707	27,743
Cotton	305	303	332	353	363

Source: The CAYS

TABLE 2:
CULTIVATED AREA ('000 HECTARES) FOR SOME CROPS
BY SMALL HOLDER FARMERS IN NIGERIA

CROP	1999	2000	2001	2002	2003
Maize	3,286	2,946	2,908	2,909	2,990
Rice	1,625	1,511	1,284	1,204	1,263
Sorghum	4,877	4,378	4,191	4,021	4,044
Cassava	2,416	2,255	2,306	2,310	2,337
Yam	2,002	1,945	1,956	1,902	1,906
Cotton	318	317	325	373	382

Source: The CAYS

TABLE 3:
YIELD (KG/HA) FOR SOME CROPS BY SMALL HOLDER FARMERS IN NIGERIA

CROP	1999	2000	2001	2002	2003
Maize	1,529	1,509	1,498	1,521	1,500
Rice	1,984	1,929	1,858	1,857	1,874
Sorghum	1,185	1,147	1,146	1,156	1,144
Cassava	11,874	11,689	11,932	12,091	12,213
Yam	11,501	11,260	11,421	11,412	11,405
Cotton	960	1,009	1,020	948	950

Source: The CAYS

The RRA, PRA, guesstimates and memory recall methodologies often involve a team comprising staff from PCU, National Agricultural Extension and Research Liaison Services (NAERLS), Federal Department of Agriculture (FDA) and Planning, Research and Statistics Department of the Federal Ministry of Agriculture(PRSD) visiting a given state within 2 – 3 days to interact with agricultural officials and farmers. This is with a view to obtaining early warning data on the prospects of crop performance during the year or season. The types of information obtained, using a checklist during the exercise include: rainfall arrival and amount; incidence of flooding, erosion, drought, pests and diseases; status of procurement and application of seeds, agro-chemicals , fertilizers, drugs, livestock feeds and other farm inputs; cost of production inputs; and the likely levels of cultivated area and output in the current year/season compared to the

preceding one.

In the 2003 Wet Season Agricultural Performance Assessment, for example, it was observed that the total rainfall in Kaduna State between January – July 2003 was 825.1 mm in 48 rainy days compared to 711.3 mm in 43 rainy days in 2002, while in Abia State, it was 1166.8 mm in 72 rainy days as against 1473.9 mm in 77 rainy days the previous year (Table 4). Thus, there was no significant change in quantity and distribution between both years as the quantity and distribution were satisfactory for good crop performance.

Table 4

Rainfall Quantity in some States between January - July

S/ N	State	Total Rainfall (mm)		Rainy Days	
		2002	2003	2002	2003
1	Kaduna	711.3	825.1	43	48
2	Zamfara	424.4	524.9	53	69
3	Kogi	655.8	760.2	115	110
4	Kwara	508.6	559.7	30	25
5	Niger	427.2	747.7	40	31
6	Plateau	1,021.9	749.7	66	64
7	Abia	1,473.9	1,166.8	77	72

Source: Report of Field Situation Assessment of 2003 Wet Season Agricultural Production in Nigeria by PCU and NAERLS, December, 2003.

Available data from the survey also indicated that there was no major outbreak of pests and diseases on crops but some were observed in livestock.

It was also observed that the prices of some commodities as at June/July, 2003 were depressed, compared to same period in year 2002.

Another pertinent observation was that farmers in NSPFS sites nationwide had more prospects of better agricultural production than those in non-NSPFS sites.

5. Constraints and Limitations

Small holder farmers do not normally keep written records of their production and their units of measurement are not of consistent size and general applicability. This informed the need for methods of measuring or estimating production and yield either directly or by using some proxies, hence the application of several techniques including the sub-plot sampling method in CAYS.

There are a number of constraints and limitations of the existing food data estimates and methodologies:

- i. Generally, the quality of the data generated is often weak in terms of integrity, precision, accuracy, completeness, reliability and timeliness. The poor data quality partly emanates from deficiencies inherent in the methodologies in use coupled with measurement errors from unfaithful adherence to the methodologies.

In the objective CAYS technique for instance, one cannot say with certainty if the sub-plot estimates extrapolated for the whole plots of the farmer, then

for all the farmers in the state, actually reflect the true situation. There is always the suspicion of over- and under- estimation.

ii. A uniform threshing percentage (TP) is presumed during analysis of CAYS but actually it may differ significantly for the same area at different times or for different areas at the same time. This implies that it is necessary at least to determine TP anew for each area and each year but this is rarely done.

iii. Uniformity is assumed for ecological and climatic effects, cropping patterns, agronomic, farm management and economic practices among the small farmers in same cluster or locality but such assumptions may not be correct.

iv. The sample size measured which normally would have needed to be increased for greater precision is often reduced due to resource limitations.

v. The issue of measuring actual hectareage and output of individual crops under mixed cropping situation has remained problematic.

vi. In CAYS, the problem of under-enumeration has been observed in the cases of enumerators seeking to reduce their tedious workload by making measurements in some, instead of all the farm plots cultivated by the selected farmers for the survey.

vii. The multiple-nature of visits entailed in the tedious objective CAYS

technique makes it unappealing to the enumerators. Hence some enumerators do make a few measurements but resort to fabrication of the remaining data which will be unreliable and lacking of confidence and integrity. Such poor quality data will mislead any analysis and decision-making made between crops, between years and between areas.

Spurious and inexplicable observations sometimes seen in the trends of cultivated area, production and yield of crops could be partly due to faulty enumeration.

Another operational problem of the existing CAYS methodology is the fact that the period during which a particular crop is harvested is rather narrow while for some other crops harvesting is done on several occasions. It is therefore, difficult for the enumerator to be present at the required time and place to harvest and take measurement for all the crops.

Regarding estimates based on farmer's memory recall, problems inherent in this methodology include:

- The fact that the land area cropped is not accurately known by the farmer in a unit which can be directly related to standard metric measurement.
- The fact that crop production is assessed in traditional units which do not have consistent metric conversion and not all farmers report in the same units (e.g. bundle, basket, sack or bag, mudu, etc).

A key constraint or limitation common to both direct and proxy estimation methods currently in use is the fact that the household is taken as the sampling unit. Extrapolation is made for the total output of the total farming families based on the survey sample families. It has been noticed that the actual population of the farming families is not known for most of the states in the country as the village listing survey (VLS) meant to determine this number is not conducted up to date by the states. The VLS approach entails a visit by enumerators to villages (demarcated to geographical wards of human settlement) to interview the ward heads to know their guesstimates of the population of farming households in the area. Some correction factor is obtained through a physical count by enumerators of the farming families in selected wards in an LGA, and using this correction factor to deflate or inflate the number earlier guessed by the ward heads. Urban settlements are excluded in the VLS.

Finally, there is the limitation of the contributions of large-scale farmers not being included in the final crop estimates arrived at. This limits the usefulness of the estimates as complete and comprehensive national figures.

6. Conclusion

Given the lapses highlighted above for the existing data generation methodologies, a possible way forward is the application of satellite remote sensing and GIS space technology for sustainable national development. This is with a view to taking advantage of the recently launched Nigeria's SAT – 1.

In fact, some attempts have been made in the past (early 1980s) by APMEU to measure crop area data using advanced technology technique such as photo-mapping, airborne strip survey and remote-sensing imagery gathered by earth satellites.

The aircraft acquired by the former APMEU was used to fly at high altitude, using high-precision equipment to take aerial photograph of the land. However, the print produced by the photo-mapping was in a scale which only permitted distinction between cropped and uncropped land, but not between crops or crop mixtures.

In another effort, the satellite imagery of an area was obtained but not sufficiently resolved to distinguish different crop types. In the airborne strip survey, a series of rectangles along the aircraft flight path were recorded and later analysed to measure the cultivated area, but not the breakdown of area between crops.

Thus, our experience in using the above “high-technology” techniques – photo-mapping, airborne strip survey and remote sensing – is that they could provide estimates of total cultivated area but they had severe limitation on the amount of detail which could be obtained regarding different crops. This limitation is apart from the heavy financial cost in engaging foreign consultants who solely had the capacity for these technologies.

The launching of Nigeria’s SAT-1 and the recent availability of local capacity offer hope and opportunity for a renewed attempt to apply remote

sensing technology in agricultural data generation. It is known that three colour bands – red, green and blue – are captured as data in different intensities by the sensors of the earth satellite. There is a computer software for processing and analysing the remotely sensed data to identify land cover mapping and environmental indicators such as rainfall, drought, soil moisture, temperature, availability of nutrients, plant stress, time of planting, duration of the growing season, as well as several other types of information.

7. Recommendations

It is our hope that applying the remote sensing and GIS technologies will avail to us several benefits including the following:

- Comprehensive determination of cultivated area for crops either in sole or mixtures by all farmers in the country including small, medium and large-scale farmers.
- Quality data that have the attributes of integrity, precision, accuracy, reliability, consistency and timeliness.
- Obviate the problems of sampling and non-sampling errors due to human mistakes during measurements of food data
- Provide better results and information to guide policy and decision-making for sustainable national agricultural growth and development.