The role of the subject matter and the methodological skill in the profile of modern agricultural Statistician

Hugues K. KOUADIO
Director of ENSEA
Avenue des Grandes Ecoles, 08 BP 03
Abidjan, Côte d'Ivoire
hkouadio@ensea.ed.ci

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ABSTRACT

Agricultural statistician as others statisticians use statistical methods to collect and analyze data and solve real-world problems in the fields of agriculture. The World is changing, agriculture also. There are many mutations even in subject matter and methodological skill. The role of statistician is changing, through both the availability of large volumes of data and the recognition that informed decisions are sometimes best made by those who understand how such data might be used. There is so a need of a profile of modern agricultural statistician to come up with challenges.

This paper discusses the role of the subject matter and the methodological skill in the profile of modern agricultural statistician. We argue that facing new methodological developments, changes induced by ICT and current issues (economic, social or environmental), adaptation and retraining of researchers or practitioners or revision of training curricula remains a must. The interest of the issues discussed in this paper lies in the desire to meet the needs of the professional world and research to meet the thematic analysis requirements not only to current issues but also in the conceptual aspects related to the agricultural sector. Indeed, gender issues, sustainable resource management, poverty ... are specific analytical aspect that must be addressed and adapted to the agricultural sector. There then arises the question of the methodological approach, appropriate to identify the said aspects in conducting research and agricultural surveys.

Keywords: Statistician, methodological skill, curricula

"We need to build National Statistical Systems, in fact National Information Systems, consisting of official statistics, geospatial information and other non-traditional data, that are relevant for a multitude of purposes, and yet organised in a solid, coherent and integrated manner."

Stefan Schweinfest, Director, UN Statistics Division
Keynote address World Statistics Day 2015.

Introduction

Statistical science has undergone various changes over the years. Its development went hand in hand with the needs of society. Responding firstly to the provision of administrative data, statistical methods was developed with the methods of descriptive statistics (Sir Ronald Fischer 1890-1962) which has extended its application in various fields including econometric modeling, sampling techniques, etc. Its use is further enhanced with the development of computer technology, the increase in calculations power.

Today, more than ever, there is a new revolution in the use of statistics with information technology, the development of large masses of data, the growing need for evidence based decision on statistical data.

In the modern world of computers and information technology, the importance of statistics is very well recognized by all the disciplines. Statistics has originated as a science of statehood and found applications slowly and steadily in Agriculture, Economics, Commerce, Biology, Medicine, Industry, planning, education and so on. As on date, there is no other human walk of life where statistics cannot be applied.

The role of statisticians is changing, through both the availability of large volumes of data and the recognition that informed decisions are sometimes best made by those who understand how such data might be used.

This poses challenges both in terms of quality and topics covered in the training of statistician. This is particularly true for the agricultural sector. Indeed the importance of the agricultural sector is well established especially for developing economies. For example, in Africa the agricultural sector occupied at least half of the population and plays a key role in economic growth in reducing poverty. Also, it is crucial to have reliable and updated statistics for appropriate economic policies. This requires therefore well trained and qualified statisticians to address these issues. So there is a need of a profile of a modern agricultural statistician in line with technological and methodological developments.

This paper shows that the profile of modern agricultural statistician is shaped by new methodological skills related to technological developments, new subjects matter and business needs in this sector. Therefore, there should be a revision of training curricula and an adaptation and retraining of researchers and practitioners.

The argumentation is organized into sections. The first section recalls the challenges in the agricultural sector and in agricultural statistics. The second section presents the main methodological and technological developments affecting the profile of modern agricultural

statistician. Before conclusion the final section discusses the implications for training and capacity building of researchers and practitioners.

1. Agriculture and it's challenges

The place of agriculture in the economies is well established. Representing between 30 to 50% of developing country GDP, the agricultural sector is an important source of income for the population and a factor in reducing poverty. The expectations for this sector are important in terms of reliable and timely available statistics, both for the population and for policymakers. These expectations are reinforced by recent technological developments: social networks, high flow velocities of information, new technology development, etc.

Particular attention is thus paid to issues of agricultural policy which poses various challenges including that of the availability of reliable data itself connected to data collection problems in agriculture, methodological issues and research in the area of agricultural statistics.

Challenges of data collection in agriculture

Diverse challenges, consequence of the mode and the type of agriculture practised in developing countries, arise in term of quality and personal characteristics of the farmers, the diversity of the cultures and the agricultural practices between regions, the type of practised agriculture and the methodological questions relating thereto.

In developing countries, agriculture is mainly a family type of agriculture practiced on small surface. Farmers are generally of a low level of education and use a combination of farming practices and techniques.

The diversity of regions, the agricultural calendar and types of culture according to these regions requires appropriate estimation methodologies of the main aggregates.

The sub sectors of agriculture pose specific challenges in evaluation of livestock, small animals, for fishing and aquaculture.

The sub-sector of the fishing poses the challenge of measuring production both inland fisheries and non-continental, traditional fishing and non-traditional. At the forest level, the same challenges exist in terms of estimation of wood production, deforestation surface, etc.

Also, the agricultural sector is highly dependent on weather conditions. These climatic conditions represent external factors to consider for the treatment and estimates of agricultural statistics.

In many developing countries, most producers are also consumers and collecting relevant data for understanding the decision making of smallholder producers where they are making both production and consumption decisions simultaneously are another challenge. Other problems that affect statistical activities are the extent to which agricultural activities are determined by the environment in which they take place and the impact of external events, especially weather conditions. There is a requirement, therefore, for detailed time series data that are disaggregated by agro-ecological zone, which is a major challenge for data collection.

Meeting these challenges of agricultural statistics entails having technical and adequate instruments for measurement. This is very important especially for statisticians because with the recent technological development, decision makers and more generally populations demand accurate statistics that is available in time.

Statistical methods in the agricultural sector have evolved over time and have taken to supporting new technologies and social networking.

2. New methodological developments and subject matter

The development of information and communication technologies have revolutionized the collection, storage, processing and dissemination of data. For example the development of mobile telephony and popularization of smartphones enable the collection and transmission of data. The tasks with paper and pen are increasingly abandoned as well as data entry steps after collecting paper. The information and communications technology (ICT), especially mobile phones and tablets, applications for creating digital investigations and software that allow users to upload data to real-time storage, reduced conventional problems facing the activities of data collection and analysis.

The technology itself is not sufficient to meet the project objectives. Even a platform to collect data for free does not guarantee that the right data be collected efficiently. A team that can design the collection, implement and evaluate the data is as important as technology. Training is an important element in the data collection operations through ICT tools.

We are in a dynamic and rapidly changing era in the field of production and processing of information, especially statistics. The change agents can be grouped into four classes. There is first the data revolution that operates through the digital transformation, new data sources and competition between data providers. Then there are the new metrics that should consider globalization, reality growing complexity, geodata. Then there is still the values imparted to statistics that led to arbitration between quality and resources, simplification of procedures accompanied by reduced budget. Finally, the need to propose policies based on the facts in the requirements of quality and cooperation.

These drivers of changes can be broken in the thematic domain of agricultural statistics as noted by the global strategy of agricultural statistics. Defining a framework should help integrate agricultural statistics into the national statistical system to meet the needs of users and stakeholders in a coherent framework.

A master sample frame for agriculture which will be the foundation for all data collections based on sample surveys or censuses is required for the integration of agriculture into the national statistical systems. The master sample frame must provide the basis for the selection of probability based samples of farms and households with the capability to link the farm characteristics with the household and then connect both to the land cover and use dimensions.

Update data collection methods should include complete survey framework that also takes into consideration the data sources in addition to sample surveys that provide input into the survey framework. Improved methods are required for producing food security data, market information that affect agricultural activities and farmers' decisions.

Table 2 shows the thematic domains and of the corresponding training and research topics.

3. The implications for training

The challenges in agricultural statistics, technological development and thematic of interest for the agricultural statistics influence the profile of the modern agricultural statistician.

The combination of technological development, agricultural statistical challenges and topics of interest question the profile of the new agricultural statistician. The profile of the classical statistician does not seem now quite appropriate.

The profile of these statisticians is modified according to the skills they should acquire in connection with the thematic as noted in Table 1.

The modern statistician should dominate the challenges posed in conducting the work of the statistician.
In the scope of the specification of requirements, skills should cover the demand for data on small area and disaggregated data, real-time data request and in connection with a multi-sector programming.

In terms of design, the modern agricultural statistician should be able to mobilize the satellite data and technology related in term of methodological and technical practice.

For data collection, he should mobilize modern technologies for data collection and electronic technologies including applications for collection and transmission of data.

More generally, the technological skills will be adapted in all areas of processing, analysis, dissemination and evaluation of data.

Table 1 : Challenges in statistical process model

Key business process	New challenge in business process
Specify needs	Streamlining and Joint Programming of Multisector Needs; Demand for Small-Area and Disaggregated Data; Demand for More Current Data, Real-Time Demands
Design	Integration of Remote-Sensed Data; Leveraging Other Authoritative Data Sources; Changing Paradigm of Data Gathering Pilot-testing of census and/or survey instrument
Collect	Use of State-of-the-Art Technology for Data Collection; Georeferenced data collection Electronic data collection and transmission
Process	Integration of Scanning and Machine Intelligent Data Capture Technologies; Innovative Transfer of Mobile Electronic Data into Master Data Files Automated Preemptive Data Quality Checks and Data Cleaning Applications
Analyse	Multisector Thematic Analysis of Census and/or Survey Data Linked to National and Sustainable Development Goals; Needs of Citizen and Private Sector; User-Friendly Data, Easier to Understand Generate Reports and Maps
Disseminate	Electronics dissemination Web services, APIs, Cloud based Electronic storage and retrieval
Evaluate	Real-Time Census and/or Survey Monitoring Demand for real time analysis Historic comparison and measure

Source: author

Also, other more transversal skills should be mobilized for modern agricultural statistician. These complementary skills relate analytical and IT Capacities, process management capabilities, communication skills and the development of analytical expertise.

4. Issues to be addressed

Training programs

Training and capacity building programs will be adapted to these topics and technologies. There will be a combination of different modes that are

- Shorter duration training leading to certificate programmes
- Longer duration training leading to degree programmes
- Customized training programmes
- Training for corporate sector
- Ad hoc training programmes

These types of training will thus integrate a heavy dose of technology and technique. That is the use of GPS data in statistical production, the use of satellite data, changing data collection methods incorporating electronic technologies for collecting and transmitting data. A prominent place should be given to the mastery of statistical software in agriculture.

Table 2: Thematic domain for agricultural statistics

Thematic domain	Training and research topic
Reference framework	• Framework for development of an integrated agricultural statistics programme • Mainstreaming agriculture into NSDS • Implementation of an Integrated Survey Framework
Master frame for integrated survey	• Use of GPS in the production of agricultural statistics • Linking area frames with list Frames • Use of remote sensing
Data collection methods	• Improvement of estimation of crop area, yield and production • Methods for estimating crop area, yield and production (mixed crops, repeated cropping, continuous cropping) • Methods for estimating yield of root crops • Cost of production • Methodology for enumerating nomadic livestock, estimating livestock products • Adoption of new technologies • Forestry and deforestation • Crop forecasting and early warning • Inland fishery, aquaculture • Interaction between climate, environment, global warming and agriculture • Land cover monitoring
Food security	• Methodology for the estimation of supply utilization account, food balance sheets, food stocks, edible forest products • Nutrition indicators • Use of households surveys / LSMS for food security indicators
Market information	• Estimation of farm gate prices • Collecting data on agriculture rural and border market prices • Collecting data on factors and product markets affecting agricultural

	activities
Data analysis	• Reconciliation of census data with survey data • Determination of user's information needs for decision making • Use of small area estimation methods for improving agricultural statistics
Improvement and use of administrative data	• Improvement of administrative data • Use of administrative data for improving agricultural statistics • Estimation of informal cross border trade data

Source: author

Indeed, gender issues, sustainable resource management, poverty ... are specific analytical aspect that must be addressed and adapted to the agricultural sector.
The new agricultural statistician will be a sort of combination of classical statistician and information influenced by challenges in agriculture and in technologies.

Conclusion

The world changes, technologies are evolving in line with the needs for statistical information and policy management. There is an exponential increase in the volume and types of data available, creating unprecedented possibilities for informing and transforming society and protecting the environment. The agricultural statistician like the others statisticians is at the heart of the process and use the techniques and methods of collecting and analyzing data to provide solutions to problems in the agricultural fields. The statistician should adapt itself to changes in both specific thematic and in the methodological skills.

We have shown that the profile of the modern agricultural statistician built with these technological and thematic changes and that the training and capacity building should be adapted accordingly.
New technological developments and topics as well economic, social than environmental are drivers for curricula and capacity bulding of researchers and practitioners.

The necessity to profile definition of modern agricultural statistician lies in the need to meet the needs of the professional world of agriculture. It should also consider cross-cutting issues such as gender, sustainable development, poverty reduction and other related agricultural thematic. However, it should consider the methodological issues raised by these dimensions and aspects for research and the production of agricultural statistics.

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