EAST AFRICAN COMMUNITY

EAC GUIDELINES FOR IMPROVING AND HARMONISING AGRICULTURAL STATISTICS

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FOREWORD

The East African Community (EAC) is a regional inter-governmental organisation comprising of seven (7) Partner States, namely: the Republic of Burundi, the Democratic Republic of the Congo, the Republics of Kenya, Rwanda, South Sudan, Uganda and the United Republic of Tanzania with its headquarters in Arusha, Tanzania. The EAC's objective is to widen and deepen co-operation among the Partner States in, among other fields, political, economic, cultural and social fields for their mutual benefit.

To this extent, the EAC is pursuing four stages of integration to achieve its objectives: a) Customs Union - this involves the strengthening of the free trade area where Partner States adopt a common trade policy with common external tariffs; b) Common Market – this entails the free movement of people, labour, goods, services and capital across national borders; c) Monetary Union – the aim of the monetary union is to ease trade by introducing a single currency to be used across the entire region, and; d) Political Federation this is the ultimate stage of the integration. In 2017, the Summit of EAC Heads of State adopted a Political Confederation as a transitional model to the Political Federation.

The successful adoption and implementation of the East African Monetary Union (EAMU) Protocol places a high premium on close and effective monitoring of macroeconomic performance. The process requires quality, reliable, timely and comparable statistics. To this end, the harmonisation of methodologies and classifications of macroeconomic aggregates across the region becomes paramount. The EAMU Protocol requires that the Partner States' macroeconomic environment converge based on an agreed convergence criteria. In this regard, the EAC Secretariat has developed the *EAC Guidelines for Improving and Harmonizing Agricultural Statistics*. The guidelines provide a set of international standards, concepts and definitions during the production of agricultural statistics.

The guidelines were developed by the EAC's Statistics Department in close consultation with the regional Technical Working Group on Agriculture, Food and Nutrition Statistics drawn from the National Statistics Offices and Ministries of Agriculture in the Partner States. In addition, technical guidance and review of the Guidelines was undertaken by Mr. Naima Keita, a Senior International Consultant on agriculture statistics**,** among other stakeholders. I would like to register my profound appreciation and gratitude to all the contributors to the development of the guidelines.

The guidelines were adopted by the 6th Extra Ordinary Meeting of the EAC Sectoral Committee on Statistics in August 2023.

Finally, I would like to recommend the Guidelines to compilers and users of agriculture, food and nutrition statistics. Specifically, I urge all Partner States to adopt the guidelines, in addition to the international standards, concepts and definitions, as the bases for estimating agricultural statistics and for reporting to the EAC Secretariat.

Hon. (Dr.) Peter Mutuku Mathuki
Secretary General

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The Guidelines were developed by the EAC Regional Technical Working Group (TWG) on Agriculture, Food and Nutrition Statistics which draws membership from the National Statistics Offices and Ministry of Agriculture. The membership of the TWG included: Kwizera Arsene and Hassan Ngendakumana (Burundi); Patrick Mwaniki and Tom Dienya, (Kenya); Flavia Naiga Oumo, Patrick Okello and Steven Kayongo (Uganda); Issa Muvunyi and Dushimayezu Bertrand (Rwanda); Titus Mwisomba and Godfrey Mjatta (United Republic of Tanzania); Joice Jore Tiberius and Stephen Wani Ladu (South Sudan) under the technical guidance and coordination of Valerian Kidole (EAC Secretariat).

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AGRISurvey	Agricultural Integrated Survey Programme
ANZSCO	Australian and New Zealand Standard Classification of Occupations
AQUASTAT	FAO Information System on Water and Aquaculture
ARDP	EAC Agriculture and Rural Development Policy
CAADP	Comprehensive Africa Agricultural Development Program
CCRF	Code of Conduct for Responsible Fisheries
COFOG	Classification of Functions of Government
CPC	Central Product Classification
EAAF	Ecosystem Approach of Aquaculture/Fisheries management
EAC	East African Community
EAC-PS	EAC-Partner States
EUROSTAT	Statistical Office of the European Union
FAO	Food and Agricultural Organization of the United Nations
FNSP	Food and Nutrition Security Policy
FRA	Forest Resources Assessment programme
FSAP	Food Security Action Plan
GDP	Gross domestic product
Global Strategy	The Global Strategy to Improve Agriculture and Rural Statistics (Global Strategy)
GPS	Global Positioning Systems
HS	Harmonized commodity description and coding System
IC	International classifications
ICAS V	Fifth International Conference on Agricultural Statistics
ICC	Indicative Crop Classification
IDA	International Development Association
ILFS	Labour Force Surveys
ILO	International Labour Organization
IMF	International Monetary Funds
ISI	International Statistical Institute
ISIC	International Standard Industrial Classification of Economic Activities
JFSQ	Joint Forest Survey Questionnaires
LCCS	Land Cover Classification System

LSMS-ISA	World Bank Living Standards Measurement Study - Integrated Surveys on Agriculture
MDG	Millennium Development Goals
MPPS	Multiple Probability Proportional to Size
MSF	Master Sampling Frames
NSCA	National Sample Census of Agriculture
NASO	National Agricultural Statistics Offices
NASS	National Agricultural Statistical System
NC	National Classifications
NFI	National Forest Inventories
NGO	Non-Governmental Organizations
NSDS	National Strategies for the Development of Statistics
NSO	National Statistical Office
NSS	National Statistical Systems
OECD	Organization of Economic Cooperation and Development
PARIS21	PARIS21 Partnership in Statistics for Development in the 21st Century
PDA	Personal Digital Assistant
PHC	Population and Housing Census
PPP	Purchasing Power Parities
RC	Regional or supranational classifications
SDG	Sustainable Development Goals
SEEA	System of Integrated Environmental and Economic Accounting
SEEA AFF	System of Environmental-Economic Accounting for Agriculture, Forestry and Fisheries
SITC	Standard International Trade Classification
SNA	System of National Accounts
Stat/DHRP	Statistics Development and Harmonization Regional Project
TASCO	Tanzania Standard Classification of Occupations
TFP	Total Factor of Productivity
TFSCB	Trust Fund for Statistical Capacity Building
UNEP	United Nations Environment Programme
UNESCO	United Nations Educational, Scientific and Cultural Organization
UNODC	United Nations Office on Drugs and Crime
UNSC	United Nations Statistical Commission
UNSD	United Nations Statistics Division

USDA	United States Department of Agriculture
WCA	World Program for the Census of Agriculture-2020
WHO	World Health Organization
WSM	Wood fuel Supplementary Module

CHAPTER 1: INTRODUCTION

5.1. Importance of Agriculture for economic growth and achieving SDGs

Agricultural development is one of the most powerful tools to end extreme poverty, boost shared prosperity, and feed a projected 9.7 billion people by 2050. World Bank, (2021) reported that the growth in the agriculture sector is two to four times more effective in raising incomes among the poorest compared to other sectors and that 65 percent of poor working adults made a living through agriculture.

Agriculture development is also critical for achieving the Sustainable Development Goals (SDGs). It is recognized that investing in the agricultural sector can address not only hunger and malnutrition but also other challenges including poverty; water and energy use; climate change; and unsustainable production and consumption.

According to FAO in 2018, the Agriculture Sector accounted for 4 percent of global Gross Domestic Product (GDP) and in some developing countries, it can accounts for more than 25 percent of GDP. Therefore, effective agricultural development strategies and policies are essential for economic growth, poverty reduction and achieving SDGs.

5.2. Background for these Guidelines

Following the completion of the Millennium Development Goal (MDGs) which aimed at halving the number of hungry and poor by 2015, the International Community adopted the Sustainable Development Goals (SDGs) in 2015. The Goals of the SDGs include ending poverty and hunger, achieving food security and improved nutrition, and promoting sustainable agriculture by 2030.The Agriculture sector plays a key role for reducing poverty and achieving the Sustainable Development Goals (SDGs).

Given the importance of Agriculture, the Heads of State and Government of the African continent adopted in 2003 an Africa-owned and led initiative, namely the Comprehensive Africa

Agricultural Development Program (CAADP). The CAADP was further revised in 2014 with the aim of ending hunger and halving poverty by 2025. This objective is in line with the SDGs.

In East Africa, agriculture is one of the most important sector, with about 70 percent of the population in the region living in rural areas and depending on agriculture, for their livelihood. The central and strategic role of agriculture in the EAC makes the sector the key to economic growth, increased incomes, raising the standards of living of households, poverty eradication and increased food security. Relatedly, article 105 of the EAC treaty highlights the achievement of food security and rational agricultural production within the Community, as the overall objectives of cooperation in agricultural sector.

To achieve its objective, in February 2016, the EAC revealed the Community's Vision 2050 that lays out a broad perspective in which the region optimizes the utilization of its resources to accelerate productivity and the social well-being of its people. It portrays a future East Africa with rising personal prosperity in cohesive societies, competitive economies, and strong interregional interaction. The EAC operationalizes its vision through five-year development strategies. The current 6th strategy, covers the period 2021/22-2025/26. The overall objective of the 6th Development Strategy is to "*Transform the East African Community into a Stable, Competitive and Sustainable Lower-middle Income Region by 2030*". To realize this goal, the Community intends to implement programs, projects, and other interventions aimed at accelerating a people-centered and market-driven integration that will also facilitate faster and more sustainable socioeconomic development and transformation of the EAC region.

In line with the provisions of Chapter 18 of the Treaty Establishing the East African Community (EAC), the EAC Secretariat developed the Food and Nutrition Security Policy (FNSP). The overall goal of the EAC Regional FSNP is therefore to achieve food security and adequate nutrition for the people in the East African region throughout their life cycle, for their health as well as their social and economic well-being. FSNP should help the region to implement the provisions of the EAC Treaty (1999) Chapter 18 Article 110 which states: "Harmonize food supply, nutrition and food security policies and strategies" relating to stimulating agricultural development, eliminating hunger, eradicating poverty, and ensuring food security.

For these efforts to achieve the expected results, they must be based on accurate information, focus on the right targets, and have their results regularly assessed. In this respect, decision makers need timely and reliable data to analyze constraints, identify benchmark indicators, set quantifiable objectives, monitor implementation, and measure the impact of policies and programs.

The availability of relevant, timely and accurate data plays a vital role for planning, implementation, monitoring and evaluation of effective agricultural development policies and programmes, especially in the developing countries such as EAC countries. On the other hand, it is important to note that, quality agriculture statistics is essential for compilation of gross value added of agriculture sector for GDP and other national accounts statistics. Therefore, well-functioning agriculture statistics systems that meet the user needs is a key requirement for EAC-PS.

It is recognized within the Community that the consolidation of the Customs Union and smooth running of a Common Market and Monetary Union as well as various development strategies and programmes of community institutions will require availability of accurate, reliable, timely, harmonized and comparable statistics for policy, planning, decision-making, monitoring, evaluation and reporting purposes. In this connection, the Community is paying a lot of attention to the development and strengthening of the Community Statistical System so that it can produce harmonized community statistics now and in future to underpin regional integration and development processes.

Unfortunately, at present, EAC as many African countries do not have in place adequate systems to collect, store, and disseminate food and agricultural statistics. There is a great need for reliable and harmonized statistics and information in all areas. Indeed, the development of comparable statistical data, across time and countries, on the continent calls for the adoption of harmonized and standardized definitions and concepts; the adaptation of international norms to African realities and specificities, and the utilization of common methodologies for statistical production and dissemination by all African countries.

Most National Statistical Offices (NSOs) and relevant line Ministries in the EAC-PS[1] have been producing agricultural statistics using Agricultural Censuses and Surveys or Administrative Sources. However, the Standards, Classifications, Concepts and Definitions as well as the Scope and Coverage used by countries to fit each countries' context are not always harmonized for use in a regional perspective. Subsequently, there is a need for the establishment of minimum standards for the region for producing harmonized and comparable statistics that can be aggregated at regional level taking into account International Standards.

The EAC secretariat continues to improve agricultural statistics through collaboration with various stakeholders and partners. including the WB and FAO in capacity building and support of the production of harmonized and quality statistics in the EAC region.

Although all Partner States are currently compiling some agricultural statistics, there are a number of challenges they face. Among the challenges is the limited use of international concepts, standard, definitions and classification on compilation of agricultural statistics. Specifically;

For crops subsector, the challenges include the measurement of most basic variables such as crop area, yield and production with an acceptable degree of accuracy;

For the livestock sub sector, the challenges include estimating livestock production, enumeration of nomadic and semi-nomadic livestock, social constraints to obtaining accurate numbers on livestock in pastoral societies and estimation of livestock products;

For fishery sub sector, the challenges include estimation of fish production for in-land, traditional and marine fishery; and

For forestry sub-sector, estimation of edible forest products, firewood production, estimation of the extent of deforestation etc., raise additional methodological challenges.

In addition to issues related to the lack of common standard and harmonized methodologies, there is also a lack of a minimum set of core indicators and data that all Member countries

[1] At the time of production of these guidelines, EAC was composed of 6 Partner States (Burundi, Kenya, Rwanda, South Sudan, Tanzania and Uganda)

should produce on a regular basis and disseminate using best practices. For instance, due to limited funding, some countries fail to undertake an agricultural census which produces baseline data after a long interval.

There is therefore a need to ensure that comprehensive, consistent and harmonized statistics are compiled and timely produced in the region. Subsequently, the EAC Secretariat has developed the regional guidelines to guide compilation of quality and harmonized agricultural statistics. These agricultural statistics guidelines intend to improve the coherence between the agricultural statistics sub-domains, clarify and streamline the concepts and definitions, improve the integration between agricultural, forestry, land use and environmental statistics and increase the flexibility and reaction speed of the statistical system.

A key reference document used for the development of these Guidelines is *The Global Strategy to Improve Agriculture and Rural Statistics (Global Strategy)* developed by FAO and the World Bank under the auspices of the United Nations Statistical Commission (UNSC). The purpose of the global strategy is to provide a framework and methodology that will lead to the improvement of national and international food and agricultural statistics to guide policy analysis and decision making in the 21st century.

The Global Strategy was developed in recognition of the declining scope, quantity, and quality of agricultural statistics. It seeks to support emerging data requirements and to achieve synergy and cost-effectiveness in regional and international data systems. The Global Strategy is based on three pillars, namely: (i) the establishment of a minimum set of core data that countries will provide to meet the current and emerging demands, (ii) the integration of agriculture into the National Statistical Systems (NSSs) in order to meet policymakers' and other users' expectations that the data will be comparable across countries and over time, and (iii) the foundation that will provide the sustainability of the National Agricultural Statistical System (NASS) through governance and statistical capacity building. More detailed information on the Global Strategy can be found in World Bank, FAO, UNSC (2010).

5.3. Justification of the guidelines

The availability of reliable agricultural statistics will enhance the goal of EAC integration. Specifically, the convergence criteria such as Customs Union, Common Markets and Monetary Union.

Almost all of the EAC Partner States (PS) have carried out major data collection operations including censuses and surveys in recent years. These data sources have greatly contributed to the availability of data useful for agricultural statistics compilation, but countries are at different levels of agricultural statistics development as shown in ***ANNEX I***. As indicated in the above Section, there are methodological challenges and a need for improvement in census/survey data as well as data from administrative sources. Data from Administrative sources present weaknesses, including inconsistencies due to many factors, such as non-use of standard concepts and definitions and insufficient details. Harmonized and cost-effective methodologies are needed for EAC countries to ensure comparability and integration of data at regional level. There is also a need to define a minimum set of core indicators and basic data to be produced and disseminated by all EAC-PS using best practices.

The guidelines will improve the production of agricultural statistics with in EAC-PS based on the best practices on international standards, classifications, methodologies, concepts and definitions.

5.4. Objective of the Guidelines

The overall objective of the Guidelines is to enable harmonization in the production of quality agricultural statistics within the EAC region.

Specific objectives are: -

1) To guide adoption of common standards in terms of classifications, concepts and definitions used in the production of agricultural statistics to ease comparability of data;
2) To recommend a minimum set of core agricultural indicators to be produced and their sources of data;

3) To recommend the use of cost-effective methods for consistency and sustainable production of agricultural statistics;
4) To guide on the publication, dissemination and data management; and
5) To recommend on the optimal use of resources and coordination for sustainability of agricultural statistics.

5.5. Target Audience and Structure of the Guidelines.

Target Audience: The guidelines are intended for staff within the National Statistics System (NSS) tasked with producing official agricultural statistics using censuses, surveys and administrative sources. On the other hand, it will help data users to better understand concepts and methods used in production of agricultural statistics.

Structure: The Guidelines is structured as follows: The first chapter is about introduction and lays out in broad terms the importance of agriculture, the initiative undertaken by EAC secretariat to improve agricultural statistics, addresses challenges faced by EAC-PS in compilation of agricultural statistics, justification and objectives for their development. Chapter 2 discusses the conceptual framework, scope and coverage of agricultural statistics, chapter 3 discusses minimum set of core data and data sources.

Chapter 4 presents the common standards in terms of classifications, concepts and definitions used in the production of agricultural statistics. Chapter 5 presents crop statistics, reviews the minimum set of core indicators and the methodologies used for estimation crop area, production and productivity. Chapter 6 addresses the livestock statistics and provides detailed minimum core indicators and computation of livestock production and productivity. Chapter 7 presents Fisheries statistics production while Chapter 8 presents Forestry statistics. Chapter 9 addresses publication and dissemination of agricultural statistics. Finally, Chapter 10 recommends on the optimal use of resources and coordination for sustainability of production of agricultural statistics.

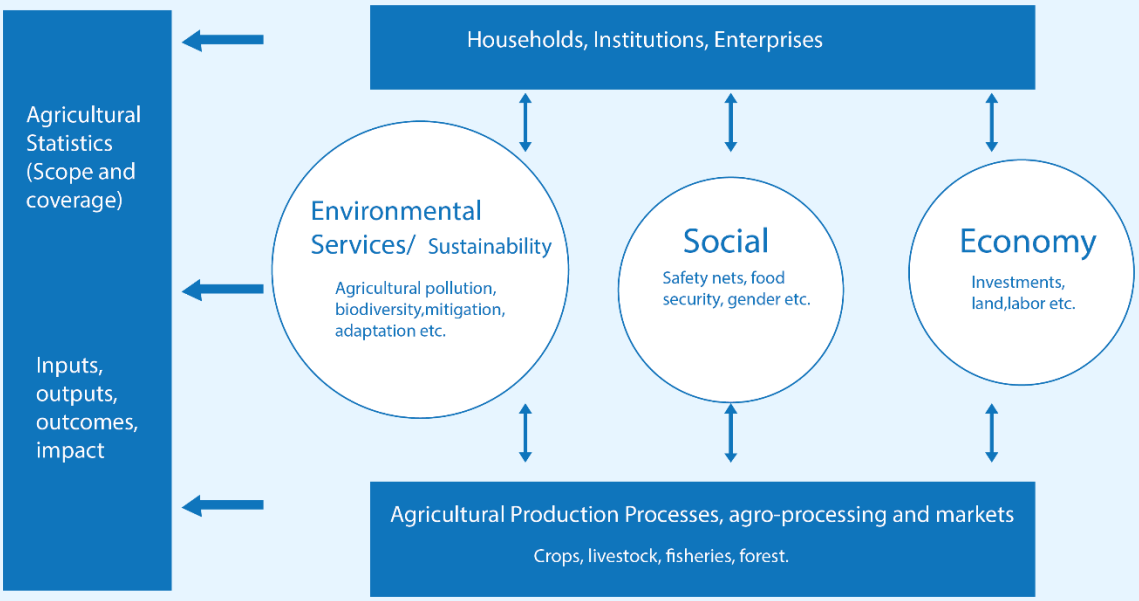
CHAPTER 2: CONCEPTUAL FRAMEWORK, SCOPE AND COVERAGE OF AGRICULTURAL STATISTICS

2.1. The Conceptual framework

The conceptual framework for agricultural statistics proposed by the Global Strategy to Improve Agricultural and Rural Statistics[2] (Figure 2.1), which is recommended for EAC countries, brings together the economic, environmental, and social dimensions of agriculture. The Framework also, recognizes the cause-and-effect relationship between these dimensions as they relate to the overall institutional framework under which it functions.

In turn, the three dimensions relate to agricultural production, processing and markets as well as income allocation, distribution and accumulation, and consumption. At each of these levels agricultural statistics are needed at the input, output, outcome and impact stages.

Figure 2.1: The Conceptual Framework for Agricultural Statistics



Source: ***Global Strategy to Improve Agricultural and Rural Statistics***

[2] Global Strategy to Improve Agriculture and Rural Statistics (Global Strategy)

Recommendation 1: It is recommended that producers of Agricultural Statistics within NSS should adopt the Conceptual Framework defined by the Global Strategy as a reference for producing agricultural statistics.

2.2. Scope

The starting point to determine the scope of agricultural statistics is the System of National Accounts (SNA) which provides international standards for concepts, definitions, and classifications of economic activities. The conceptual framework also points to the need for a system of environmental accounts that describes the effect of agriculture on the environmental dimension. The System of Integrated Environmental-Economic Accounting (SEEA)—which is a satellite account of the SNA—should be the starting point for the environmental statistics.

The International Standard Industrial Classification of Economic Activities (ISIC) provides the classification of enterprises to industries. The scope of agricultural production as defined by this classification includes group 011(growing of crops, market gardening, and horticulture), 012 (farming of animals), and 013 (growing of crops combined with farming of livestock). The Food and Agricultural Organization (FAO) uses this classification as the basis to determine the scope of the agricultural census as described in the World Program for the Census of Agriculture-2020 (FAO 2015a).

Another important international standard classification is the Central Product Classification (CPC). In its new revision, CPC v.2.0, substantial improvements have been made especially for the areas of agriculture, fisheries, forestry, and food. Items such as crops, livestock, machinery and equipment, fertilizers and pesticides as listed in the WCA,2020 are all well classified in CPC v.2.0. Both ISIC and CPC provide important tools for integrating agricultural statistics into national statistical system.

Because of the inherent and fundamental relationship between agricultural activities and land, the geo spatial aspects of land should be seen as an element of the scope of agricultural statistics. The geo spatial scope for agricultural statistics should focus on the use of land for agricultural and take place within a broader scope of national land use statistics.

The scope of agricultural statistics will include uses of water for agricultural purposes including irrigation and other uses, the source of irrigation water, the land under irrigation, the irrigation method, and the resulting production.

Recommendation 2: It is recommended that the producers of Agricultural Statistics within the NSS in EAC-PS should adopt the scope of agricultural production as defined by ISIC and CPC v2.0. They should also include geo-spatial dimensions and water use activities in the scope of agricultural statistics. In order to obtain a deeper understanding of the multifaceted aspects of rural development, the scope of agricultural statistics should be expanded beyond just agriculture to include activities relevant to the holistic development of rural areas, including social, economic, environmental, and infrastructural dimensions.

2.3. Coverage

According to the Glossary of Statistical Terms of OECD (OECD Glossary of Statistical Terms - Coverage (of data sources) Definition), "Coverage specifies the population from which observations for a particular topic can be drawn". The FAO World Programme for Census of Agriculture (WCA) which is published every 10 years is the reference document for the definition of the coverage of Agricultural Statistics. The latest edition is the WCA 2020 for the 2020 round of agricultural censuses. The WCA 2020 recommends that, the census should consider the agricultural holding (economic unit) as the statistical unit. According to WCA 2020 an agricultural holding is "an economic unit of agricultural production under single management comprising all livestock kept and all land used wholly or partly for agricultural production purposes, without regard to title, legal form or size. Single management may be exercised by an individual or household, jointly by two or more individuals or households, by a clan or tribe, or by a juridical person such as a corporation, cooperative or government agency". EAC-PS should customize this definition to their national context.

Example of Definition of an agricultural holding

Agricultural Holding Is any economic unit of agricultural production (like a garden of temporary and/or permanent crops or cattle rearing/plantation) under single management, without regard to title, legal form or size. Management may be exercised by an individual member of the household or by the entire household.

Source: TANZANIA 2019/20 CENSUS OF AGRICULTURE

The WCA 2020 also provides guidelines about the use of a Population and Housing Census (PHC) to capture data from households practicing agricultural activities.

The use of the population census to obtain basic information about agricultural and rural households provides the vehicle to broaden the coverage required to meet the emerging data requirements under the conceptual framework. The WCA also considers the rural community as a statistical unit for community related data and components of the social dimension that EAC-PS should consider. This broadens the scope of WCA to include rural development relevant activities and corresponding statistics.

Rural Statistics: By broadening the concept of statistics from just agriculture to rural statistics, a deeper understanding of the multifaceted aspects of rural development and work towards effective policies for rural areas can be achieved. This involves expanding the scope of data collection beyond just agriculture to include activities relevant to the holistic development of rural areas, including social, economic, environmental, and infrastructural dimensions. Data collection should include rural aspects such as demographics, education, healthcare, sanitation, employment, infrastructure and connectivity (roads, electricity and energy sources, water supply transportation, internet connectivity), housing, income distribution, and social services. It should also include data on non-agricultural economic activities in rural areas, such as small businesses and service sector employment

Also, the statistical unit should be expanded from holdings in the household sector to include rural households involved in nonagricultural activities.

Regarding the use of threshold for defining an Agricultural Holding, many countries use some minimum size criteria for holdings that must be met before they are included in the census or survey. Many countries may also concentrate their efforts on major producing areas and not provide estimates for the entire country. The minimum size criteria vary from country to country depending on local context. It can be based on the total area of the holding, number of livestock, the value of commodity sales or a combination of these individual criteria. The minimum size criteria are generally used for cost effectiveness purposes.

Example of Minimum size criteria used in Tanzania

For the purpose of 2019/20 Agriculture Sample Census, agriculture holdings were restricted to those that met one or more of the following conditions:

• Having or operating at least 25 square meters of arable land

• Own or keep at least one head of cattle or five goats/sheep/pigs or fifty chicken/ducks/turkeys during the agriculture year 2019/20.

However, the reality is that in many countries, the small scale or household plots make a significant contribution to household food supplies or a source of income. Therefore, in defining the minimum size criteria, care should be taken not to exclude a large segment of key agricultural production contributors, particularly the women and youth whose holding sizes tend to be smaller. In order to ensure inclusivity, data disaggregation to include the role of women and youth in agriculture should be considered.

The next section builds off the conceptual framework to establish a minimum set of core data that can be used to derive many of the required agricultural indicators based on crop, livestock, fisheries, and forestry.

Agricultural statistics must serve the information needs linked to all aspects of agricultural activities. As specified in the Conceptual Framework, there are three main dimensions which the agricultural statistics has to cover as shown in the conceptual framework above;

- **Economic** dimension of agriculture consists of the production, markets and income of farmers. It also encompasses land, labour, and capital that enter into the production process and the outputs that result from it;
- **Environmental** dimension of agriculture consists of the sector's role as a user of natural resources—principally land, soil nutrients and water—and as a provider of environmental services, while on the other hand the sector's contribution to the environmental pollution; and
- **Social** dimension of agriculture and rural development deal both with vulnerability issues (food security) and the living conditions and quality of life of farmers and rural households in larger context. Issues such as dimensions of agriculture and the different themes must be addressed in a common manner

across agricultural statistics. It is important that the user understands which part of agriculture is reflected in the statistics.

Economic dimension: Agriculture is an economic activity where the inputs include natural resources (solar energy, land, water, animals and plants), products from other industries and services (fertilizers, pesticides, energy, know-how etc.) and labour. The outputs consist of food, feed, other animal and crop products (e.g. leather), renewable biomass energy and more difficultly measurable ecosystem and socio-cultural services (e.g. carbon sequestration, landscape). The inputs and outputs are exchanged in the markets where the price mechanism regulates its functioning. Key elements are the amount of production, prices of inputs and outputs and the income of farmers. There are good ways of measuring the production and traditional commodity and service markets but more work needs to be done for developing appropriate tools to measure fewer tangible outputs, such as ecosystem and socio-cultural services. Agricultural statistics need to measure all aspects of economic dimension and deliver timely information on all interlinked economic aspects of agriculture.

Environmental dimension: Agriculture mostly depends on environment as it is part of primary production derived directly from biological processes. It impacts the environment on a wide front: climate, air, soil, land, water and biodiversity. Agricultural statistics need to depict correctly the inter-links and give as realistic picture of the magnitude of impacts as possible. Agro-environmental statistics are relatively new area of agricultural statistics. The methodology and data sources are mixed and often not the same as those traditionally used in agricultural statistics. Since the impacts are very complex, research, scientific measurements and modelling are often the most suited tools for developing a sound basis for agro-environmental statistics.

Social dimension: The social dimension is on one hand linked to the environmental and economic vulnerability on the other hand to living conditions of farming households and in a wider sense, rural population. The vulnerability is a result of the mixture of environmental and economic risks. The extreme weather conditions which have become more common with the climate change and the increasing production of biofuels in agricultural sector, have increased the changes in the production level and thus made the process more volatile. The above

conditions have a negative impact on both the food and Nutrition security as well as livelihood of farming population in general.

The social dimension covers also the living conditions of farmers and rural population. The decreasing income level combined with new responsibilities stemming from various policies make farming at smaller scale less profitable and thus threatens the traditional family farming as a way of living. The educational and gender aspects are also part of the social dimension.

The need for data on the different dimensions of agriculture varies, and it would not be efficient to collect all the data intended for analysis on these dimensions. In this regard, the priority thematic areas for data collection should be properly described centrally to allow data producers and users to understand clearly what type of data to be collected and their uses.

Food security: Assessing food security by means of the census/surveys of agriculture is challenging. For this reason, WCA 2020 introduces an innovative approach in its census supplementary theme on food security to access valid information on the severity of food insecurity as experienced by individuals in the population.

The approach, developed by FAO and known as the Food Insecurity Experience Scale (FIES), aims to measure household food security through experience-based food insecurity. This is based on the premise that the severity of the food insecurity situation of an individual or a household can be inferred from observing typical behaviors and experiences associated with food insecurity. These include, for example, the condition of being worried about not being able to procure food, having to compromise on the variety and quality of foods consumed, and being forced to cut portions or to skip meals.

On the food availability side, data from the agricultural census/surveys helps in understanding the structure of the food production industry and the constraints faced by farmers on increasing agricultural production, as well as suggesting strategies for increasing agricultural productivity. Cropping patterns can be studied along with information on the use of irrigation, farm machinery and improved varieties of seed to help develop programmes for increasing food production.

Food consumption is an important element for assessing the Food Security status of the population. Nutrition surveys or dedicated Food Consumption surveys can be used to measure dietary intake and quantify food consumed by Households and individuals. Food prices are

also a key factor that determine access to food. Therefore, market prices are important statistics for assessing Food security.

Gender in agriculture: It is globally acknowledged that the need for promotion of gender equality and empowerment of women are key elements for social and economic progress. Women are often disadvantaged because of discriminatory social norms and legal institutions, and this may be reflected in disparities in access to land, literacy, educational opportunities, participation in the labour market and the allocation of work on the family farm. The agricultural census/surveys are important source of gender data related to agriculture to help monitor progress towards achieving gender equality goals.

The contribution of women to agricultural development is often not well understood because of the lack of data and the challenges in accurately measuring women's involvement in agricultural production activities. The agricultural census/surveys can be an important vehicle for studying the social and cultural patterns of agricultural and rural development as they relate to women, distribution of agricultural work within households, and the interactions among different household members in the management and operation of agricultural holdings.

The identification of the agricultural holder provides the basis for comparing the characteristics of holdings operated by men and women. Analyzing aspects such as area of holding, cropping patterns, and use of different agricultural practices can help to focus on the problems faced by women in operating agricultural holdings. In WCA 2020, Theme 10 "*Intrahousehold distribution of managerial decisions and ownership on the holding*", can be used to better reflect gender-based differences in decision-making and ownership of key agricultural assets, such as land and livestock. Such understanding should lead to better-targeted policies and programmes.

Youth in agriculture: Participation of the youths in agriculture is a critical social dimension of agricultural development. It is noted that while agriculture plays significant roles in economic growth and employment creation, it generally remains unattractive to most young people. Globally, the majority of farmers are aged 60 years and above. In developing countries, the challenges limiting youth participation in agriculture include limited access to land, outdated/manual farming practices, limited use of modern technology and limited access to financial services.

Within the EAC-PS, the youth form majority of the population. They are not only the required source of labor but also the most educated to adopt modern technologies and innovations to spur agricultural growth. In order to enhance youth participation in agriculture, statistical systems should be designed to capture the critical indicators/data required to understand and develop policies as well as strategies for inclusivity of the youth in agriculture.

Recommendation 3: It is recommended that producers of Agricultural Statistics within the NSS should adopt the coverage defined by FAO WCA 2020. In particular, the Agricultural Holding should be considered as the basic statistical unit. In defining minimum size criteria in their censuses and surveys, care should be taken not to exclude a large segment of key agricultural production contributors, particularly the women and youth whose holding sizes tend to be smaller. Food security, gender and youth statistics should also be taken into account in the production of agricultural statistics.

In order to collect relevant rural development data, the statistical unit should be expanded from holdings in the household sector to include also rural households involved in nonagricultural activities.

CHAPTER 3: MINIMUM SET OF CORE DATA AND DATA SOURCES

3.1. Minimum set of core data

The Global Strategy proposes a minimum set of 58 core items in three domains – economic, social, and environmental – which each country should produce on a regular basis. A core item is defined as one whose data enter into a multitude of indicators needed to monitor and evaluate development policies, including sustainable agriculture and food security policies. With the development of the Post-2015 Sustainable Development Agenda, the minimum set of core data has been aligned accordingly, for monitoring progress toward meeting the Sustainable Development Goals (SDGs). This minimum set of core data will provide national and international policymakers with necessary information that goes across national boundaries.

With reference to the first pillar of the Global Strategy, the minimum set of core data is composed of a critical group of variables and indicators that countries should collect to produce key information on agricultural and rural statistics and establish the framework for the agricultural and rural component of the National Strategies for the Development of Statistics (NSDS). This set of core data will constitute the building blocks to establish methodologies and to integrate agriculture and rural statistics into the NSS (WB et al., 2010).

The selection is based on their relevance at global level, because the global statistical system requires them to monitor issues that transcend national boundaries. For example, the data should provide inputs for the national accounts and global balances of supply and demand for food and other agricultural products; core data items that are crops should account for a major proportion of land use, contribute significantly to farm and rural household well-being, and have an effect on the environment and climate.

3.2. Agricultural Data sources

There are several sources of agricultural data including censuses, surveys, and administrative records. The three sources are complementary as none of them can satisfy the user's requirements. For instance, the measurement of agricultural productivity relies on multiple

variables including agricultural outputs, intermediate inputs, factors of production and their respective prices, wages or rental values among others. The basic information on these different components is unlikely to be found in a single data source, such as an agricultural production survey, but rather from a variety of sources of information and data sets.

The objective of this section therefore, is to discuss the main data sources used by EAC-PS for producing agricultural statistics and the challenges encountered as well as recommendations to improve data consistency, harmonization and integration.

3.2.1. Main Data Sources used in EAC-PS

Currently, the main data sources used in EAC countries are summarized in the Table 3.1 below:

Table 3.1: Main Data Sources used in EAC-PS

Country	**Main statistics produced**	**Main Data sources used** *(surveys, censuses, administrative sources, other)*	**Coverage** ***(temporary/permanent/cash crop; sedentary, nomadic, livestock; maritime, inland fishery etc..)***	**Latest publication as of 2022**	**Main constraints** *(methodology, resources, staff, coordination, other)*
Burundi					
	Crop statistics	*National Agricultural Survey of Burundi*	Whole country *(temporary, permanent and cash crop)*	2021	
	Livestock statistics	*National Agricultural Survey of Burundi*	*Whole country (all livestock)*	2021	
	Fishery statistics	*Administrative sources*	*Whole country (inland fishery)*	2021	
	Forestry statistics	*Administrative Sources*	Whole country	1997	*methodology, resources*
	Price statistics	*Surveys*	Whole country	2022	
	Food consumption statistics	Household Living Conditions Survey	Whole country	2020	
Kenya		Administrative	National	Economic Survey year 2022	*methodology, resources, staff*
	Crop statistics	Administrative	National	Economic Survey year 2022	*methodology, resources, staff*

Country	Main statistics produced	Main Data sources used *(surveys, censuses, administrative sources, other)*	Coverage ***(temporary/permanent/cash crop; sedentary, nomadic, livestock; maritime, inland fishery etc..)***	Latest publication as of 2022	Main constraints *(methodology, resources, staff, coordination, other)*
	Livestock statistics	Administrative	National	Economic Survey year 2022	*methodology, resources, staff*
	Fishery statistics	Administrative	National	Economic Survey year2022	*methodology, resources, staff*
	Forestry statistics	Administrative, Survey	National	Economic Survey Year 2022	*methodology, resources, staff*
	Price statistics	Survey	Urban	2022	Inadequacy of resources
	Food consumption statistics	Survey	National	2022	Inadequacy of resources
Rwanda					
	Crop statistics	Seasonal Agriculture Survey	Whole country	2022	
	Livestock statistics	Administrative records	Whole country	2021	Methodology and coordination
	Fishery statistics	Administrative records	Whole country	2021	Methodology and coordination
	Forestry statistics	Administrative records	Whole country	2020	
	Price statistics	CPI Surveys & e-soko (Online system)	Whole country	2022	
	Food consumption statistics	Integrated Household Living Conditions Survey (EICV)	Whole country	March 2021	Covid-19 stopped 2019-2020 round to be accomplished.
South Sudan	Crop statistics	Crop and Food Security Assessment Mission (CFSAM) Annual Report	Whole country (food crops, cash crops and temporary crops	2022	*Resources, staff ,insecurity in some areas*
	Livestock statistics	Livestock Population, South Sudan	Whole country (sedentary, Agro pastoralist and trans human)	2010	Limited resource, Insecurity, poor coordination between
		Food Security and Nutrition Monitoring System (FSNMS)		2021	
	Fishery statistics	World Bank(Total fisheries production	Capture fisheries, Aquaculture	2018	Limited resource,

Country	Main statistics produced	Main Data sources used *(surveys, censuses, administrative sources, other)*	Coverage ***(temporary/permanent/cash crop; sedentary, nomadic, livestock; maritime, inland fishery etc..)***	Latest publication as of 2022	Main constraints *(methodology, resources, staff, coordination, other)*
		Survey, South Sudan)			Insecurity, poor coordination between
	Forestry statistics	Forest Survey and inventory	Whole country, (Natural Forest)	2011	Limited coordination between National and the State government, Resource, Insecurity
	Price statistics	CLIMIS(Crop and Livestock Market Information System)-South Sudan-Web/CPI	Whole country (CLIMIS) Whole country CPI)	2022	Limited number of food basket for CPI due to resource
	Food consumption statistics	FSNMS	(FSNMS)Whole country (CPI) grains, flour, pulses, meat, green vegetables, fruits	2021/ July.2022	Limited number of food basket for CPI due to resource
United Republic of Tanzania					
	Crop statistics	Sample Census of Agric & Administrative records	Whole Country	2019/20	Resources and Coordination
	Livestock statistics	Sample Census of Agric & Administrative records	Whole Country	2019/20	Methodology, Resources
	Fishery statistics	Sample Census of Agric & Administrative records	Whole Country	2019/20	Methodology, Resources
	Forestry statistics	Survey & Administrative Records	Whole Country	2022	Methodology, Resources & Coordination
	Price statistics	CPI Survey	Whole Country	2022	Methodology, Resources & Coordination

Country	Main statistics produced	Main Data sources used *(surveys, censuses, administrative sources, other)*	Coverage ***(temporary/permanent/cash crop; sedentary, nomadic, livestock; maritime, inland fishery etc..)***	Latest publication as of 2022	Main constraints *(methodology, resources, staff, coordination, other)*
	Food consumption statistics	Household Bugdet Survey	Whole Country	2015/16	Methodology, Resources & Coordination
Uganda					
	Crop statistics	Annual Agriculture Survey *Surveys/Censuses*	Whole country	(AAS) 2020	Covid-19 distorted survey cycle and hence reports delay.
	Livestock statistics	Preliminary Report National Livestock Census *administrative sources/Censuses*	Whole country	2021	Preliminary Report is based on Enumeration Area (EA) summary forms but Data capture for all questionnaires still being done
	Fishery statistics	*administrative sources*	Major Lakes in the country	2020	Beach Management Units collapsed yet they were responsible for compiling fish catch data at landing sites
	Forestry statistics	*administrative sources*	Biomass Studies by National Forestry Authority covering whole country	2020	These are supposed to be undertaken after every 5 years but sometimes this not the case because of lack of funds
	Price statistics	Producer Price Index *Survey/administrative sources*	Whole country	–March 2022	Shortages of Financial Resources has hampered

Country	Main statistics produced	Main Data sources used *(surveys, censuses, administrative sources, other)*	Coverage ***(temporary/permanent/cash crop; sedentary, nomadic, livestock; maritime, inland fishery etc..)***	Latest publication as of 2022	Main constraints *(methodology, resources, staff, coordination, other)*
					routine Supervision
	Food consumption statistics	Uganda National Household Survey (UNHS)	Whole country	2019/2020.	Delays in production figures from the AAS has caused delays in compilation of Food Balance Sheets.

Source: Information collected from EAC -PS

Most of the agricultural statistics data produced by EAC countries come from surveys or administrative sources (particularly for fishery and forestry).

3.2.2. Challenges related to the use of multiple sources of information

When basic data for compiling agricultural indicators come from multiple sources, their harmonization and integration may be challenging because of inconsistencies that may affect the quality of the indicator to be computed. Some of the factors contributing to the inconsistencies include, the basic definitions of statistical units, the reference periods, the base periods, the different types of data collection methodologies and tools (sample surveys, administrative records, experts' opinion, etc.). The level at which the estimates are statistically representative may also vary from one source to another.

A typical example in the agricultural context is the use of data from both household and agricultural surveys: the main statistical unit in household surveys is the household, whereas agricultural surveys may rely on different units: the agricultural holding (which is defined as an economic unit), the farm, the enterprise (specific farm activity), the field, etc. The reconciliation between the data collected for different units may require certain assumptions. For example, in the context of surveys in developing countries focusing on smallholders, the assumption is that a one-to-one relationship exists between the household and the agricultural holding. Other examples are input prices, which may be available only in the form of averages at high

administrative levels or for aggregated product categories, and thus not necessarily reflecting the purchase prices effectively paid by farmers.

The compilation of productivity indicators also requires working with statistical information available at different levels of aggregations or granularity, from the lowest micro unit to the highest macroeconomic level. This guideline describes the productivity compilation process from different aggregation perspectives: bottom-up, working from microdata up to the sector level, and directly from macroeconomic time series, the approach traditionally used in the field of national statistics. While the philosophy of the approach remains the same (constructing quantity or volume measures of outputs and inputs and weighting them to obtain a global measure of productivity growth), the process is different. The micro approach requires the computation of volumes and values at farm, activity or crop level using detailed quantity and price information (likely to come from farm surveys), while the macro approach is based on the processing of macroeconomic time series to determine volume and value measures (volume-price split), typically through the identification of the most appropriate deflators.

3.2.3. . Ensuring minimal consistency in the basic data

Before embarking upon the compilation of agricultural indicators, a considerable amount of preliminary data processing and manipulation is necessary to ensure the maximum level of consistency across these different sources of data and to minimize noise in the final indicators. This preliminary phase includes activities such as rebasing (to ensure that common base periods are used), retropolations or extrapolations to obtain time series of similar lengths, estimations of missing information as well as aggregations or, on the contrary, breaking down statistical information.

The following paragraphs discuss some of the most important dimensions relating to data quality, for which data compilers need to seek the maximum level of consistency.

I. Reference periods

Data on agricultural outputs and inputs should refer to the same period: calendar year, agricultural year, short rain, long rain and dry season. To compute meaningful productivity indicators, the period of reference of the statistical information for the numerator (output)

should correspond to the period of reference for the denominator (input). This may seem an obvious statement; however, because of the unavailability of information, this condition is often not met, at least in part. If real data is not available for the same years or reference periods, appropriate estimation methods (retropolations, extrapolations, estimations), should be formulated to fill in the gaps. For example, variables such as production or input use often refer to the agricultural season while information on prices, wages or assets is more often found for the calendar year. In these situations, the necessary adjustments should be made to ensure proper matching between the reference periods.

II. Base periods

In computing some of agricultural productivity indicators, it is important that the weights for the outputs and inputs refer to the same base period to ensure consistency in the numerator and denominator and to facilitate the interpretation of the results. This means that information on prices, which is necessary to construct values, should be available for the same base year. Where information for certain years is not available, these guidelines recommend choosing a different base period, with better data availability. It is not recommended to attempt estimating missing prices for missing years, as they are typically difficult to impute given their high variability. For example in calculating the Total Factor of Productivity (TFP) requires the aggregation of output volumes – using their respective value shares as weights – and the aggregation of inputs using expense shares.

III. Sectoral scope

Ensuring consistency in the scope of the different variables is also key to ensuring high-quality and usable results, with minimal bias. Given the diversity of the data items that enter the process of calculating productivity, ensuring consistency in the sectoral boundaries may not be as straightforward. For example, some of the data may be obtained from agricultural surveys, which may focus mostly on the small-scale or subsistence sector, and thus not be representative of the agricultural sector as a whole.

Indeed, in many developing countries, different data collection systems cover the subsistence and the commercial or large-scale farms, given the vast differences between these two farming systems in terms of farming practices and yields. Data on farm assets or land rents, for example, may only be available for the commercial farms. To the greatest extent possible, data compilers should avoid combining data that refer to different scopes, for example data on output from the subsistence sector and data on fixed assets or land rents from the large-scale sector. If data for one of the sectors are missing, estimating the missing data using auxiliary information or imputation should be attempted, to enforce consistency. If this is not possible with an acceptable level of accuracy, data compilers should, as a last resort, explain the possible differences in scope in the metadata reports, and assess their possible impact on the final indicators, in both quantitative and qualitative terms.

Ensuring consistency in the overall data collection and compilation process requires a significant amount of data processing, as well as a good knowledge of the data construction mechanisms and of the accounting rules governing the compilation of economic indicators at different aggregation levels. Therefore, it is essential to foster interaction with teams working on national accounts, as national accountants are used to working with a variety of data sources and performing reconciliation exercises that aim at enforcing compliance with the accounting principles prescribed at national and international level by the SNA.

In order to minimize the inconsistencies resulting from the use of multiple data sources to generate variables needed for compiling key indicators, in a cost-effective way, integrated survey frameworks and master sampling frames are promoted at international level. The FAO has developed the Agricultural Integrated Survey Programme (AGRISurvey) which provides an innovative survey toolkit to assist countries to develop an integrated and cost-efficient approach to generate the critical agricultural data they need. The toolkit provides a farm-based modular system of survey that is synchronized with each country's national census of agriculture and operates over a ten-year cycle. While AGRISurvey's core annual data collection module focuses on agricultural production, its rotating modules collected with lower frequency, take into account the social, economic and environmental characteristics of agricultural holdings.

The World Bank Living Standards Measurement Study - Integrated Surveys on Agriculture (LSMS-ISA), adopts also an integrated survey approach. The LSMS-ISA surveys are designed as “multi-topic household surveys focusing on linkages between productivity changes (human capital, labor productivity and later agricultural productivity) and welfare which are essential to policy analysis. A focus on household production also facilitates supply and demand comparisons for food security and agriculture sector analysis” (WB LSMS-ISA 2021).

More recently, the 50X2030 Initiative was launched. The Initiative scales and builds upon the experiences of the FAO AGRISurvey Programme and the World Bank’s LSMS-ISA (**THE 50x2030 INITIATIVE 2022)**. In particular, through its *Agricultural and Rural Survey Programme* component, the new initiative 50X2030 broadens the target population to incorporate rural non-agricultural households.

Recommendation 4: When using multiple data sources for compiling agricultural indicators, EAC -PS should ensure a minimum consistency regarding sectoral scope, definition of statistical units, level of statistical representativeness, reference periods, etc. The integrated survey approach being promoted at international level should be considered when planning censuses and surveys. In particular, through its *Agricultural and Rural Survey Programme* component, the new initiative 50X2030 broadens the target population to incorporate rural non-agricultural households.

CHAPTER 4: COMMON STANDARDS, CLASSIFICATIONS, CONCEPTS AND DEFINITIONS

4.1. Purpose

This chapter emphasizes on the adoption of common standards, classifications, concept and definitions used in the production of agricultural statistics to facilitate comparability of data. There is no standard definition of the boundaries of the agricultural statistics system, nor is there only one classification for agricultural statistics. On the contrary, a number of international statistical classifications (of both general and specific scope) exist to provide information relating to agriculture, and describe the sector from different perspectives. For the purposes of these guidelines, the boundaries of agricultural statistics comprise crops, livestock, fisheries and forestry.

4.2. Common standards, classifications, concepts and definitions

The international reference Guidelines used for concepts and definitions is the FAO World Programme for Census of Agriculture 2020 (WCA 2020). This paragraph presents the concepts and definitions to be considered in the development of a census of agriculture or an agricultural survey. The concepts of agricultural holding and agricultural holder remain the same as in the previous World Census of Agriculture programme. WCA 2020 clarifies the census reference period and the scope, coverage and timing of the census. The steps involved in developing and undertaking an agricultural census or surveys are also summarized in ***ANNEXES IX and X***.

The concepts, definitions and classifications used in the agricultural census/surveys should be consistent with SNA principles to ensure that agricultural census/surveys data are consistent with data from other economic censuses and surveys. In addition to concepts and definitions to be used, EAC-PS should give special attention to the use of international statistical standards and classifications.

4.2.1. International Classifications relevant to Agricultural Statistics

Classification systems are used to group statistical data according to criteria that make them more homogeneous and more likely to be used for accurate analysis. The harmonization and

adaptation of these reference classifications play a fundamental role in the overall harmonization process of agricultural statistics that EAC-PS should use.

At the international level, there are several reference classifications, recorded in the classification registry of the United Nations Statistics Division (for the most part, economic classifications). Several categories of economic classifications exist, among them are: Classifications of economic activities, e.g. International Standard Industrial Classification (ISIC); Product classifications, e.g. Harmonized commodity description and coding System (HS), Central Product Classification (CPC), Standard International Trade Classification (SITC); System of National Accounts (SNA) and Indicative Crop Classification (ICC).

The use of international statistical classifications in our regional community will enable data comparability across countries and improves data quality in general.
As with any statistical product at national level, the scope of activities and sectors should follow international classifications and standards to ensure consistency and international comparability. The United Nations International Standard Industrial Classification of all Economic Activities (ISIC), in its version (revision 4), breaks down agricultural activities into:

- Crop and animal production, hunting and related service activities
    5. Cash crops
    6. Food crops
    7. Animal production
- Forestry and logging
- Fishing and aquaculture

For the purposes of these guidelines, the boundaries of agricultural statistics will comprise in crop, livestock, fisheries and forestry statistics. International classifications are maintained by international organizations, which act as custodians. These organizations are, among others, FAO, the UN, the International Labour Organization (ILO), the World Customs Organization (WCO), the United Nations Educational, Scientific and Cultural Organization (UNESCO), the World Health Organization (WHO), the United Nations Office on Drugs and Crime (UNODC).

In international classifications, the level of detail available may not always be sufficient for sectoral applications, or the groupings established may not be suitable to all applications. However, this should not dissuade organizations and countries from using international standards. Indeed, customization is often possible, either by increasing detail at the lower levels or by developing alternative aggregations of the higher-level categories. Customization may be undertaken at country level and by international organizations themselves. For example, FAO and the UNSD have developed further detail in the CPC for agricultural statistics (CPC, Section 3.4). FAO has also designed alternative aggregates in the CPC for the purposes of the FAOSTAT database[3].

ANNEX III provides the list and purpose of the main international classifications relevant to agricultural statistics. All EAC PS use ISIC (except Rwanda) and CPC. Regarding the other classifications, SITC, HS, COICOP and COFOG are also used by all PS except Rwanda and Uganda. The rest of the classifications are less used by EAC PS. The classifications used by EAC-PS are presented in table 4.1 below:

Table 4.1: International Classifications used in PS for agricultural statistics

Classification		BURUNDI	KENYA	RWANDA	SOUTH SUDAN	United Republic of Tanzania	UGANDA
ISIC	International Standard Industrial Classifications of All Economic Activities	YES	Yes, during pop. census, KIHBS15/16, KCHSP	YES, It is used in Trade statistics. Including for Agriculture products	YES It is used for classifying data on National accounts and Demography	YES (20 groups are used)	Yes, Using it in PPI for classification of commodities. It is also used for defining the Scope of the Agriculture Censuses and surveys
CPC	Central Product Classification	YES	YES during compilation of FBS	YES, Seasonal Agriculture survey and Food balance sheet	YES classification based on the physical characteristics of goods or on the	YES	Classification of products in compilation of Food Balance Sheets. We

Classification		BURUNDI	KENYA	RWANDA	SOUTH SUDAN	United Republic of Tanzania	UGANDA
					nature of the services rendered. Each type of good or service		use Indicative Crop Classification (ICC) which is also based on CPC
SITC	Standard International Trade Classification	YES	YES	NO	YES Use for generation of cross border trade data	YES	Yes, in compilation of agriculture exports volumes and value
HS	Harmonized System	YES	YES, while extracting data on external trade eg fertilizer	YES, It is used in Trade Statistics	YES Used for harmonization of commodity description and coding system	YES	Yes, in compilation of agriculture exports volumes and value
COICOP	Classification of Individual Consumption According to Purpose	YES	YES	YES, it is used in Household Budget Survey	Yes Used for classification and analyzing the individual consumption expenditures incurred by the HHs	YES,CPC is closely linked with COICOP since expenditures on products are the basic building blocks of COICOP classes and correspondences can be established btn categories in the two classification	Yes, Using in PPI for classification of commodities and CPI
COFOG	Classification of the Functions of Government	YES	YES	YES, used by Ministry of finance and planning. (Ex: Governme nt	YES	YES	Yes, use in planning and budgeting

Classification		BURUNDI	KENYA	RWANDA	SOUTH SUDAN	United Republic of Tanzania	UGANDA
				expenditure in Agriculture can be found)			
ISCO	International Standard Classification of Occupations	NO	YES	YES, Used in Labor Force Surveys	NO	YES, during the Integrated Labour Force Surveys (ILFS) we used ISCO that was domesticated to TASCO. This indicator provides estimates of number of people engaged in agriculture activities	Yes, for soliciting major occupations in Agriculture Census
ICSE	ICSE International Classifications of Status in Employment	YES	NO	NO	NO	YES, During the 2019/2020 National Sample census of Agriculture)NSCA) household members provides information about the status of employment in main activity	Yes, used in the Labour surveys.
ISCED	International Standard Classification of Education	YES	YES	NO	NO	YES, during the 2019/2020 NSCA household members provides information about their highest level of education	Yes, Educational attainment is useful for examining the effects of education on characteristics such as cropping systems, agricultural practices and

Classification		BURUNDI	KENYA	RWANDA	SOUTH SUDAN	United Republic of Tanzania	UGANDA
							household food security
SEEA	System of Environmental Economic Accounting	NO	YES	NO	NO	NO	YES, used for compiling satellite accounts
ISSCAAP	International Standard Statistical Classification for Aquatic Animals and Plants'	NO	NO	NO	NO	NO	NO
ASFIS	Aquatic Sciences and Fisheries Information System	NO	NO	NO	NO	NO	Yes, used to guide fisheries frame surveys
ISSCFG	The international standard statistical classification of fishing gear	NO	YES	NO	NO	NO	Yes, used to guide fisheries frame surveys
ISSCFV	International Standard Statistical Classification of Fishing Vessels	NO	YES	NO	NO	NO	Yes, used to guide fisheries frame surveys
ISSCFC	International standard statistical classification of fishery commodities	NO	YES	NO	NO	NO	Yes, used to guide fisheries frame surveys

Source: Information collected from EAC-PS

4.2.2 Implementation of international classifications at country level

Depending on their level of applicability and whether the custodian is an international, regional or national organization, statistical classifications may be:

- National classifications (NCs) – country-specific schemes developed by national authorities that may be based on or comply with international or regional classifications (recommended), or be stand-alone tools independent of other schemes.
- Regional or supranational classifications (RCs) – these are implemented by supranational organizations and applied by their member countries (in some cases, regional classifications are produced by national statistical agencies or authorities from multiple countries and then used at regional level, e.g. NAICS, ANZSIC and the Australian and New Zealand Standard Classification of Occupations – ANZSCO).
- International classifications (ICs) – these are developed and maintained by international organizations; they are the result of an international consultation process and are applicable at global level. In particular;
    1) ICs are mechanisms essential to the harmonization and coordination of data compilation; they form the basis for internationally comparable data and serve as a model for the development of national and regional schemes;
    2) They enable the comparability of national data and indicators at global level, thus facilitating countries' inclusion in global statistical activities;
    3) They may be used in their original state or can be adapted to national specificities, to improve their relevance and applicability;
    4) With regard to countries in the process of developing their own national classification systems, efficiency gains are significant when it is decided to use an IC rather than developing an ad hoc scheme;
    5) For countries using ICs as the basis for their national classifications, efficiency is achieved in the short run-in terms of resource saving, and in the long run-in terms of data comparability and integration of national statistics into the global framework.

4.2.3 Benefits of using International Statistical Classifications

The adoption of ICs presents several potential benefits includes but not limited to;

a) Convenience; To implement an existing international standard is more convenient than developing a new one;

b) Resources are saved.; The resources that the country must spend for its maintenance are limited, as the review process is carried out at international level by the custodian organization in consultation with the countries themselves;

c) Reduced reporting burden; when countries report data at international level, there is no need to convert the data into different formats, thus reducing the reporting burden; and

d) Country data are easily Integrated-International Classification (ICs) allow for the data of an individual country to be comparable at regional and global levels

Statistics are improved at national level

a) ICs ensure accuracy and relevance through standardized item names, titles, definitions, descriptions, and data groups.
b) They are the result of international expert consultations, and are thus solid and based on sound methodologies; and
c) When used at national level by several different institutions, they enable data comparability and exchange across different national institutions; this contributes to the integration and sustainability of agricultural statistics in national statistical systems.

Recommendation 5: It is recommended that all EAC-PS should use relevant classifications. The use of international statistical classifications by all EAC -PS will enable data comparability across countries and improves data quality in general.

References and suggested readings on international classifications for agricultural statistics:

FAO (2015c): Guidelines on International Classifications for Agricultural Statistics. *Publication prepared in the framework of the Global Strategy to improve Agricultural and Rural Statistics.* ca6409en.pdf (fao.org)

CHAPTER 5: CROP STATISTICS

This chapter discusses the minimum set of core crop data to be collected by EAC-PS, their sources, data collection methods, frequency of data collection, the use of new technologies for data collection, as well as their advantages and disadvantages.

Crops are divided into temporary and permanent crops. Refer to Annex.

5.6. Minimum set of data on Core crops

In line with Global Strategy (World Bank, 2010) and EAC Regional Agricultural Investment Plan (2018-2025) investment plan, core crops in EAC-PS are staple food crops (cereals, pulses and roots/tubers); industrial/commercial and horticultural crops These account for a major proportion of agricultural land use, of overall food supply, and of value added from agriculture. Data required for these core crops include:

a) Area planted and harvested, production and yield;
b) Opening and closing stocks;
c) Cropland irrigated;
d) Farming inputs such as fertilizers, pesticides, farm implements, etc.
e) Producer and consumer prices for food commodities;
f) Amounts utilized for food(including own consumption), feed, seed, fiber, oil for food, bioenergy, manufacture of industrial products, imports, exports, postharvest and food losses/waste
g) Access to market and financial services
h) Access to extension services
i) Early warning indications such as pest and diseases; and
j) Agro-meteorological data/indices such as rainfall, temperatures etc.

The recommended minimum set of indicators (and corresponding metadata) that have to be compiled by Partner States during collection of crop statistics is attached hereto as ***ANNEX IV*.**

5.7. Source of data and data collection methods

Crop productivity estimates are the product of two components: crop area and production. Precise estimations of both harvested area and production are equally important in ensuring the accuracy of their product.

5.7.1. Sources of data

Data on area harvested, and production can be collected through agricultural censuses, agricultural surveys, other household surveys and administrative data.

5.7.1.1. Agricultural census

The census of agriculture underpins the agricultural statistics system. It is the main source of data on the structure of agriculture and provides data for monitoring SDGs, building or updating the sampling frame for the agricultural survey programme and a benchmark for the national agricultural statistics system. Agricultural censuses are periodically conducted by many countries, in line with FAO recommendations of WCA 2020 regarding its decennial programmes. The linkage between Population and Housing Census (PHC) and the Agricultural Census allows for the construction of an up to date sampling frames for agricultural censuses and surveys.

It is recommended that EAC-PS should undertake agricultural censuses within the WCA latest round of census. A summary of the FAO guidelines on how to conduct agricultural census is attached as ***ANNEX IX.***

5.7.1.2. Agricultural surveys

Agricultural surveys are credible sources of agricultural statistics. They can provide reliable statistics on crop production or yield and area. Their characteristics vary across countries, depending on available resources and requirements. Developed countries typically conduct a specific crop production survey using multiple frames per cropping season, while developing countries usually have one annual general-purpose agricultural survey.

If data are properly collected through agricultural surveys, the quality of the resulting estimates can be gauged using their corresponding sampling errors. Well-designed agricultural sample

surveys are expected to provide reliable estimates because the volume of data from a sample survey is more manageable compared to that of data from an agricultural census, data are processed, analyzed and disseminated timely. A summary of guidelines on how to conduct agricultural sample survey is attached as ***ANNEX X***.

5.7.1.3. Administrative sources

Administrative data can be derived from diverse sources, including government records, reporting systems and private organizations. This indicates the sheer complexity of the problem of defining administrative data. **FAO (2018f)** provides Guidelines on improving and using administrative data in agricultural statistics.

In these EAC guidelines, the definition used by (FAO 2018f) for administrative data in the context of agricultural statistics is adopted: "*information collected primarily for administrative (not statistical) purposes by government departments and other organizations usually during the delivery of a service or for the purposes of registration, record keeping or documentation of a transaction"*.

In most developing countries, basic agricultural administrative data (on crops, livestock, fisheries and forestry) is collected and managed under the ministries of agriculture, livestock, fisheries or forestry. However, in many other countries, parastatal organizations produce administrative data, especially on commercial or cash crops farms. Private-sector agencies or organizations also often collect and manage various forms of administrative data, especially following the restructuring policies adopted in many of these countries, on prices, marketing, inputs, etc. These agencies may collect and manage the data without any direct participation of the relevant NSO.

A lot of data used for monitoring and reporting on development processes are compiled by government ministries and agencies in the course of their routine operations. While these data are usually compiled for internal (own) administrative use rather than for statistical purposes, they constitute a significant portion of official statistics in the countries and in many cases, they represent the only sources of some of these data.

Under the agricultural reporting system of the Ministry of Agriculture, extension staff usually file monthly, quarterly, half–yearly, and annual reports on land utilization, rainfall conditions, crop plantings, production of food and cash crops, livestock and poultry data as a matter of course. The reports are collected by the responsible section of the Ministry and form the basis for much of the agricultural statistics provided by the Ministry.

The main appeal about administrative data is that they are compiled at relatively low cost compared to censuses and surveys. The quality of administrative data depends on how carefully the administrative records are kept and how accurately the figures are compiled.

Usually, however, administrative records are not well maintained or updated, and administrative systems are not efficient. What is more, data are usually compiled by people who lack skills in data-handling and statistics. Because of these and other reasons, administrative data have tended to be incomplete, out-of-date, and unreliable. Furthermore, the process of sharing administrative data has tended to be difficult.

Administrative data sources have been given scant attention in national statistical programs. Technical assistance (TA) will be required to review methodologies and instruments in use and to periodically audit existing data from both systems.

NSOs also use these records as sources of data for compiling different development indicators such as GDP. Their importance notwithstanding administrative data generally remains by and large inadequate, viz. incomplete, inconsistent, not timely, insufficient and unreliable for use with a high degree of confidence. There is a need for new focus on improving administrative data sources at Partner State level.

In EAC region, countries such as Kenya and Tanzania derive their crop statistics mainly from administrative sources.

5.2.2 Data collection Methods

Information on crop area, yield and production plays a vital role in planning and allocating resources for the development of the agriculture sector.

This section describes various subjective and objective methods used to determine crop area and productivity with their respective advantages and disadvantages. Estimation of crop productivity is always a challenging exercise, which is further compounded when crops are mixed, productivity estimation is carried out in farms owned by smallholders, or there is no cadastral information on land use.

5.7.1.4. Measurement methods used for crop area estimation

The availability of crop area statistics is an essential requirement of the agricultural statistical system of any country, as it is a key variable in estimating crop production and crop yield. The most appropriate measurement technique to estimate crop area depends on various operational factors, such as land configuration, field shape, crop type, cropping pattern, available skills and resources. For the collection of crop area statistics, both subjective and objective methods are currently used around the world. The subjective methods, often used in developing countries, include the field reporting system, eye estimation, farmer interview and expert assessment. These methods suffer from certain limitations in terms of the quality of the data on crop area.

Although objective methods of measuring area – such as the polygon method – are expected to provide reliable estimates, they are costly and time consuming. In these cases, modern technologies such as Global Positioning Systems (GPS) have the potential to provide more accurate estimates of the crop area in less time.

Several FAO and World Bank publications exist providing detailed discussions on the various methods for measuring crop area. The FAO *Handbook on crop statistics: improving methods for measuring crop area (FAO 2018a)* classifies the methods in three categories:

- Methods based on farmer declarations
- Methods using land surveying tools
- Methods using remote sensing

It further provides a comparison of existing methods for measuring crop area which is summarized in the table below:

Table 5.1: review of crop area measurement methods

Method	Cost-effectiveness	Scale	Estimate precision, biases, errors	Ways to improve the estimation
Farmer estimates	Cheap and fast	Plots to landscape	Fairly accurate. However, at times farmers may deliberately provide overestimations, underestimations or not have the information required.	• Apply correction factors with a known covariate, such as seed rate. • The enumerator should visit the plots with the farmer.
Traversing or polygon method Compass and Rope)	Cheap; however, time-consuming and cumbersome to implement	Plots to farm	Highly accurate when implemented with the necessary diligence. Traditionally used as a benchmark for crop area measurement	This method should be implemented by skilled enumerators equipped with computational tools.
GPS	Initial Cost very high; however, saves time	Farm to landscape	Highly accurate for large plots, with decreasing precision as plots get smaller. Underestimates plots with complex shapes.	• Select the appropriate combination of operator speed and GPS acquisition rate. • Secure an ample power supply for the GPS. • Impose proper field guidelines to control bias and missing plot measurements
Rectangulation and triangulation	Tedious and time consuming	Plot level to field	Reliable estimate for regularly shaped plots	• Increase the number of rectangles / triangles but will trade off time efficiency

Method	Cost-effectiveness	Scale	Estimate precision, biases, errors	Ways to improve the estimation
P2 /A (Perimeter squared over Area)	Quick and straightforward, if the perimeter is known	Field level	Subjective; estimates are rarely acceptable because no mathematical relationship is established between the perimeter and the area	• The enumerator must take note of the ratio to be used by inspecting the shape of the plot. • Must not be used as a standalone method
Remote sensing	Expensive, although the cost of satellite imagery is decreasing. Quick and straightforward area estimation.	Higher level of disaggregation	Fairly accurate, especially for vast geographical areas, if higher resolution images are used. Accuracy decreases for smaller plots and mixed crops.	• Ground-truth data must be collected to evaluate accuracy and, if warranted, improve the crop area estimates

Source: Adapted from FAO (2018a)

The FAO Handbook recommends to balance several factors in order to determine the appropriate area measurement technique to implement in a specific country context: *the target degree of accuracy, the available budget for the agricultural survey, the skill level of the enumerators and supervisors, the size and shapes of the parcels, and the type of crops covered in the survey*.

It may also be possible to combine these techniques. For example, if the available budget cannot cover the GPS measurement for all samples, then all of the sample's farmers or agricultural holders may be asked to provide their respective crops' areas, and the GPS measurement could be done only on a randomly selected subsample. If designed properly, this approach is capable of providing measurement error estimates that can be used to adjust, if warranted, the crop area estimates to improve their accuracy.

In the case of mix and continuous cropping, (FAO 2017a) provides detailed guidelines on apportioning parcel area to derive the area of each crop using objective and subjective methods.

Recommendation 6: It is recommended that EAC -PS should use GPS for large areas and compass & tape measurement for small areas during crop area estimation.

5.7.1.5. Production estimation methods

Crop production is the function of area and yield. As in case of crop area determination, both subjective and objective methods are currently adopted to collect yield statistics in various countries. The subjective methods of estimating crop yield include farmers' assessments, expert opinions and crop cards, while the objective methods include whole-plot harvesting and crop-cutting experiments. The table 5.2 below summarizes the main methods used to estimate production (FAO 2018a).

Table 5.2: Review of crop production methods

Method	Cost-effectiveness	Scale	Precision in estimation, errors and biases
Farmer's estimate	Cheap and fast method that saves time and money	Farm to landscape	Fairly accurate estimation; however, needs adequate supervision. Subjective. Farmers may deliberately overestimate or underestimate
Expert assessment	Moderately cost/effective	From farm to landscape level	Chances of error increases if different teams of experts are used or extension people are used to estimate yield in their own area. Subjective.
Crop cards	Cost- and labour intensive	Field to farm level	Bias because of illiteracy, use of local units
Crop cut	Time- and labor-intensive	Field, farm and sometimes landscape level	Tendency to overestimate
Whole plot harvest	Cost- and labour intensive	Plot level, farm level, case study	Almost bias/error-free
Sampling harvest unit	Cost-effective	Farm to landscape	Error-prone in the condition where farmers harvest from multiple areas at one time; cannot be used with staggered harvesting
Purchaser's insurance record	Cost-effective	Field scale	Suitable for cash crops only with no household consumption

Method	Cost-effectiveness	Scale	Precision in estimation, errors and biases
Crop modelling	Cost-effective	Landscape	Less, if adequately parameterized and calibrated. Does not include induced improvements in agricultural technology.
Allometric models	Cost-effective	Field scale	Suitable for few crops only
Remote sensing	Cost-effective	Landscape	Chance of error in cases where different crops have the same signature

Source: Adapted from FAO 2018a

Recommendation 7: It is recommended that EAC-PS should adopt either farmer estimates or crop cutting methods to estimate crop yield and production.

References and suggested readings on crop statistics:

Methods for measuring Crop area, yield and production

- **FAO (2018a):** Handbook on crop statistics: improving methods for measuring crop area, production and yield. *Publication prepared in the framework of the Global Strategy to improve Agricultural and Rural Statistics*
  Link: ca6408en.pdf (fao.org) and https://www.fao.org/3 /ca6408en/ca6408en.pdf

- **FAO (2017a):** Methodology for Estimation of Crop Area and Crop Yield under Mixed and Continuous Cropping. Publication prepared in the framework of the Global Strategy to improve Agricultural and Rural Statistics.
  Link : ca6514en.pdf (fao.org) and https://www.fao.org/3 /ca6514en/ca6514en.pdf

Census of Agriculture

- **FAO (2015a):** World programme for the Census of Agriculture 2020. VOLUME 1 Programme, concepts and definitions. FAO Statistical Development Series 15. World Programme for the Census of Agriculture 2020 (fao.org)-https//www.fao.org/3/i4913e/i4913e.pdf

- **FAO (2018f):** World programme for the Census of Agriculture 2020. VOLUME 2 Operational guidelines. Series 16. World Programme for the Census of Agriculture 2020 (fao.org)-
  https//www.fao.org/3/CA1963EN/ca1963en.pdf

Agricultural survey methods

- **FAO (2018d)**: AGRIS Handbook on the Agricultural Integrated Survey. *Publication prepared in the framework of the Global Strategy to improve Agricultural and Rural Statistics*. Handbook on the Agricultural Integrated Survey | Agricultural Integrated Survey Programme - AGRISurvey | Food and Agriculture Organization of the United Nations (fao.org)

- **Dillon, A., Carletto, G., Gourlay, S., Wollburg, P., & Zezza, A. (2021)**. Agricultural Survey Design: Lessons from the LSMS-ISA and Beyond. Washington DC: World Bank. Agricultural Survey Design. Lessons from the LSMS-ISA and beyond (worldbank.org)

Administrative sources

- **FAO (2018f)**: Guidelines on improving and using administrative data in agricultural statistics. *Publication prepared in the framework of the Global Strategy to improve Agricultural and Rural Statistics*. ca6413en.pdf (fao.org) and https://www.fao.org/3 /ca6413en/ca6413en.pdf

CHAPTER 6: LIVESTOCK STATISTICS

This chapter discusses the minimum set of core livestock production data to be collected by EAC-PS, their sources, data collection methods, computing of livestock indicators, frequency of data collection, key surveys for generating livestock production and productivity.

The terms "livestock" and "poultry" are used in a very broad sense, covering all domestic animals irrespective of their age and location or the purpose of their breeding. Non-domestic animals are excluded from the terms unless they are kept or raised in captivity, in or outside agricultural holdings, including holdings without land. Livestock is generally classified by countries by general, sub-divided in a few cases by species. More frequently, individuals of various general or families are being aggregated into a single group, e.g., the term "poultry" covers domestic fowls, guinea fowl, ducks, geese and turkeys.

6.1. Minimum set of core livestock data

Livestock types include cattle, sheep, pigs, goats, and poultry. These are major sources of food supply and agricultural income. Consumption increases as countries develop and incomes grow. Increased demand for livestock products leads directly to increased usage of feed grains and can lead to situations in which feed production competes with food production, even though the feed is ultimately an input to food production. Livestock are also sources of methane emissions, water pollutants, and disease risk. All of these factors can be affected by policy decisions. Data required for these livestock include:

a) Inventory and annual births;
b) Production of products such as meat, milk, eggs, and wool, and net trade or imports and exports; and
c) Producer and consumer prices.

The minimum set of indicators and definition that have to be compiled by Partner States during collection of livestock statistics is attached hereto as ***ANNEX VI*.**

6.2 Livestock production and productivity

Generally, livestock productivity is simply the ratio between the livestock outputs produced and the inputs used to produce these outputs. Livestock productivity relates inputs to outputs and it is well expressed as the amount of output produced by one unit of a given factor of production over a reference period. For example, labour productivity could be calculated as litres of milk produced/hours of labour devoted to milking per cow per day; feed productivity could be computed as kg weight gain/kg of dry matter fed to the animal over a stated period of time.

In a small survey of livestock stakeholders, Morgan and Ring (2013) found that productivity and production were the two most useful types of data for livestock data users. However, they also found that over 80 percent of livestock data users considered productivity and production data either unavailable or, if available, of low quality.

Traditional survey data is often insufficient to generate accurate estimates of livestock production in existing systems. In a presentation on recent advancements in livestock statistics, Okello et al. (2013a) note that even simple questions such as *'how much did your cows produce in the last month?' and 'what was the average carcass weight of the cattle you slaughtered in the last six months?' may not be captured.*

Nevertheless, Given the often-heterogeneous nature of agricultural enterprises, many recognized difficulties surround the collection of statistics for agriculture. Collection of data from the livestock production and productivity presents additional complexities, such as dynamic herd structures and, sometimes, non-sedentary populations. According to Pica-Ciamarra et al., 2014, p. 29, applying an appropriate framework to collect relevant and high-priority information while avoiding multiple or non-standardized collection of data by different government agencies has been recognized as an effective method that can assist in the design and implementation of policies to promote sustainable livestock sectors.

6.2.1 Data sources

Regarding the livestock data, no single survey collects all the data required to produce the core livestock production indicators at the requisite time intervals, which makes it necessary to integrate multiple collection systems. However, a number of key surveys collect data that can be used to produce livestock indicators. These include agricultural/livestock censuses, Living Standards Measurement Studies (LSMS), household budget surveys, administrative record data and a range of other sources (World Bank, 2012).

Other key sources of livestock data are; one-off livestock surveys, data from experimental stations, market information systems, enterprise surveys, labour force surveys and service delivery surveys.

A summary of the potential sources of core livestock indicator data, along with the relevance of each source for collecting the indicators, are indicated in the Table 6.1

Table 6.1: Summary of most likely sources of core livestock indicators

Core indicator	Agri/livestock census	Agri/livestock surveys	Household budget surveys	Living standards measurement studies	Administrative records
Livestock population	***	**	No	*	**
Livestock production	*	***	No	*	**
Market prices	*	***	***	**	**
Outbreaks of animal diseases / animals affected / animals at risk	no	no	No	no	***
		-	-	-	-
Animal stock, beginning and end of reference period	*	**	No	**	***
Imports/exports(Values and Qty)	no	no	No	no	**
Productivity related indicators	*	***	No	*	no
Constraint related indicators	*	***	No	*	no
Livestock livelihood indicators	no	*	No	***	no

Note ****** Most likely*** ***** likely*** **** possible***
Source: Adopted from FAO,20**15: Improving Methods for Estimating Livestock Production and Productivity**

6.2.2 Data collection methods for estimating livestock production and productivity

There are two main data collection methods for estimating livestock production and productivity (Pica-Ciamarra et al., 2014, p. 60): direct interviews involving an enumerator visiting a farm or household and asking detailed questions relating to certain livestock production variables; and visual observations by an actor (such as an extension officer or market agent) who records variables relating to livestock production using a semi-structured to structured technique. A method that is particularly prevalent in developing countries, in which the majority of livestock is held by a large number of smallholders (as opposed to the large commercial farms that are commonly found in the developed world) is that of face-to-face interviews using trained enumerators who administer a set of formal questions (World Bank, 2012). In this method, it is recommended that the face-to-face interviews be conducted using trained enumerators who are living within the villages and the involvement of village leaders and publicity during conducting censuses or surveys.

The livestock outputs, inputs and other factors as discussed above may be combined, using a range of formulae, to provide measures of production and productivity. Some of the main indicators and formulae used to estimate livestock production and productivity are set out in Table 6.2 below.

Table 6.2: Estimation of livestock production and productivity

Indicator	Equation	Note
Total production		
Total meat	no. of animals slaughtered * average carcass weight of the animal.	the computation should be done by livestock type
Total milk	mean no. of lactating animals * average daily production * 30 * no. of production months	By regions and by species. A range of different equations can be used to estimate this. The equation shown, when coupled with a lactation recall aid, has been found to provide reasonably accurate estimates (Zezza et al., 2014).
Total hides and skins(Quantity)	no. of animals slaughtered * hides and skins per slaughtered animal conversion factor	The conversion factor should include both salted and unsalted hides.
Total eggs(Number)	average no. of eggs produced per bird * no. of birds	This value should be disaggregated by species.

Indicator	Equation	Note
Total manure production (Quantity)	feed intake per adult animal * dry matter digestibility of diet coefficient * population of adult animals	This value should be divided by species. Technical coefficients may have to be used for manure production per adult animal, but will vary based on the production system and feed type.
Total draught power (Value)	total population of animals * proportion of animals used for draught power * average value of draught power per animal	Behnke (2011, p. 22) notes that the technical coefficient for the value of draught power per animal could be based on the proportion of the value of milk offtake; however, information on this value is scarce.
Production per animal		
Animals slaughtered		
Livestock and poultry	no animals slaughtered	Must be disagregated into species, type (i.e. lambs, ewes, rams) and should also be divided by sex (except for poultry).
Livestock health		
Total cases	no. of sick animals + no. of animals that died from a disease	Undertaken over a given time period, by disease and by species
Cases per 10,000	(no. of sick animals + no. of animals that died from a disease) *10,000/species population	Undertaken over a given time period, by disease type and by species
Total deaths from a disease	no. of animals that died from a disease during a given period	
Deaths per 10,000	no. of animals that died from a disease*10,000/species population	
Total animals destroyed	no. of animals killed for control of a disease over a given time period	Should be divided by disease type and animal species
Number of vaccinated animals.	no. of animals vaccinated against a disease during a given period	Should be disaggregated by disease type
Vaccination coverage	no. of animals vaccinated against a disease during a given period/species population	Should be divided by disease and animal species type
Efficiency		
Litres of milk per labour unit	total litres of milk produced/no. of labour units (paid + unpaid)	
Feed efficiency of poultry	weight of feed consumed/weight of eggs produced	

***Source: Adopted from FAO,2015*: Improving Methods for Estimating Livestock Production and Productivity**

6.3 Limitations on measuring Livestock production and productivity

In addition to the limitations due to inadequate quantity of livestock data and the sampling issues, several other issues must be taken into account when using data to measure livestock production and productivity. The livestock production system applied by individual farms and households will have a marked influence on the life cycle, growth and productivity of animals. Therefore, as the particular system implemented influences the production and productivity of the livestock, it is important to collect relevant information on the system used.

While commercial livestock enterprises tend to keep records of their production process along with the inputs and outputs, rural households tend not to regularly record this information. As a result, collection of data from rural households may raise several issues. Some of these issues relate to memory recall, when adequate written records are not kept. Others relate to the effective capturing and measuring of any characteristics that may influence the indicator data collected. Relevant data production issues that must be addressed are outlined in Pica-Ciamarra et al. (2014, p.9) and include, but are not limited to:

i.) An appropriate recall period for survey questions. Livestock species have different life cycles and the number of animals may be influenced by seasonality. The smaller the recall interval required of respondents, the lower the recall error (Samphantharak & Townsend, 2009, p. 110). Estimating livestock demographics from data collected on herd size based on respondent recall at the beginning and at the end of a twelve-month period can introduce biases, due to seasonality effects and other dynamics. However, collection of data of this type over extended periods of time can reduce bias variability (Lesnoff, 2008);

ii.) Milk production presents many peculiarities, such as continuous production, seasonality effects, varying lactating capacity over time and among a herd, and consumption of some milk by suckling animals (Behnke, 2011; Zezza et al., 2014). Typically, LSMS surveys in developing countries ask questions on milk production based on a 12-month recall period, using simplified questions related to the number of production months in the previous year and to average milk production during the production month. Zezza et al. (2014) argue that this collection method based on recall over a long period of time is not adequate and leaves results subject to large

errors. Questions to collect milk production data must be framed so as to enable assessment of or accounting for the quantity of milk consumed by young suckling animals. However, data on this proportion of milk production can be particularly difficult to capture and the LDIA (2011) notes that it may be more appropriate to quantify only the milk produced from milking for sale or personal consumption. Methods such as the use of average milk per day and lactation curves, where questionnaires ask for the average amount milked from each animal at three or four different time reference points (one week, one month, and three and six months after birth) have been proposed (Zezza et al., 2014);

iii.) Quantifying manure production in traditional production systems requires information on the number of animals and a technical conversion factor for the amount of manure produced in a given time period (such as manure per animal per day). Traditional production systems often exhibit heterogeneous feed consumption patterns, which result in varying manure production levels. The three main methods for determining manure production from livestock outlined by IAEA (2008) include (1) the direct measurement of manure production from livestock; (2) direct measurement of manure on the ground; and (3) using input-output measurements where the manure output is estimated on the basis of the total amount of feed input consumed minus the content of other products produced, such as milk, eggs or live-weight gain. These different methods can be expensive, and the indicator values measured may not capture the full variance or be representative of manure production in traditional production systems;

iv.) An intermediate livestock output product that is often not captured when determining the productivity and value of livestock is its use for draught power. The use of livestock for this purpose is often a major source of energy in agriculture in developing countries (Joshi, 2011; Metaferia et al., 2011);

v.) As with draught power, the value of transport services provided by livestock is also often overlooked when measuring livestock productivity (Metaferia et al., 2011);

vi.) Quantifying labour input and the resulting productivity of labour can often be complicated when mixed-livestock herds are managed by the same person.

Disaggregating and allocating the labour from joint activities (such as watering of livestock) can be difficult;

vii.) Often, a major source of livestock feed is forage from roadside hedges. Quantifying this important production input is difficult due to spatio-temporal variations. In addition to the quantity, the quality of forage too is an important consideration and also exhibits heterogeneity (Angerer, 2012). Techniques involving the use of satellite data and data processing, combined with ground measurements to determine herbaceous forage quantity, have been developed and tested in Africa (Egeru et al., 2014), and

viii.) As noted by Farmer (2010), pastoralists and highland livestock owners in Ethiopia typically sell their livestock to small traders in bush markets or primary markets. In these cases, traders purchase animals on a sight basis, without the use of scales. While experienced traders might be able to estimate the weight of sheep and goats, and sometimes even the dressing weight of cattle to a seasonable accuracy, records of these important production indicators are rarely recorded.

Recommendation 8: It is recommended that EAC-PS should collect and disseminate the minimum set of core livestock data and indicators specified in Annex VI using the concepts, definitions and methods presented in this chapter and in the key reference documents below.

References and suggested readings on Livestock statistics:

- **FAO (2018d):** Guidelines on methods for estimating livestock production and productivity. *Publication prepared in the framework of the Global Strategy to improve Agricultural and Rural Statistics*. ca6400en.pdf (fao.org)
- **FAO (2016):** Guidelines for the Enumeration of Nomadic and Semi-Nomadic (Transhumant) Livestock. *Publication prepared in the framework of the Global Strategy to improve Agricultural and Rural Statistics.* ca6397en.pdf (fao.org)
- **Lesnoff, M. (**2008). Evaluation of 12-month interval methods for estimating animal-times at risk in a traditional African livestock farming system. *Preventive Veterinary Medicine*, 85(1–2): 9-16.
- **LDIA. World Bank**. (2011). *Challenges in collecting household level livestock data in Africa: workshop summary report - Rome, IFAD Headquarters, 30 June - 1 July 2011*. World Bank Publication: Washington D.C.
- **Okello, P., Sserugga, J., Nsiima, L., Mwisomba, T., Issa, A. & Pica-Ciamarra, U.** (2013a) *Recent advancements in livestock statistics*. Paper presented at the Twenty-Fifth Session of the Asia and Pacific Commission on Agricultural Statistics, 18-21 February 2014. Vientiane.
- **Ugo Pica-Ciamarra, Derek Baker , Nancy Morgan and Alberto Zezza (2011):** Measuring the Contribution of Livestock to Household Livelihoods- *A Livestock Module for Multi-topic Household Surveys.* Measuring the contribution of livestock to household livelihoods : a livestock module for multi-topic household surveys (bancomundial.org)
- **World Bank. (2012).** *Collecting livestock data: a snapshot of survey methods*. World Bank Publication: Washington, D.C.

CHAPTER 7: FISHERIES AND AQUACULTURE STATISTICS

This chapter discusses the dynamics of the fish stocks, fishery operations, infrastructure, communities, and individuals involved in the fisheries sector in order to set policy and manage fisheries. Data collection and analysis should be on capture fisheries and aquaculture activities conducted in marine and fresh water.

The analysis requires certain types of data to produce indicators, which are used to guide decision-making. Although the analytical method has some influence, the types of data needed are largely decided by the indicators that the management authority requires to make its decisions.

Information in this context has great economic value, as investment in fisheries increases, harvesting rate and the risk of over-exploitation rise. Over exploitation results in decreasing catch per fishing unit, and may result in economic loss and hardship. Data collection for fisheries and aquaculture is necessary for monitoring and evaluating exploitation patterns for evidence-based policy and decision making.

Despite the economic and social importance of small-scale fisheries and aquaculture operations, statistics on these components are relatively poor and greatly underestimated; this may lead to the social and political marginalization of the people and communities that depend on these operations.

In addition, the significance of the harvest of wild aquatic organisms for rural food and nutrition security is not well quantified, and the actual contribution made by this practice and by aquaculture have yet to be accurately evaluated.

The Code of Conduct for Responsible Fisheries (CCRF) mentions reliable and timely data as a fundamental condition for the sustainable development of fisheries and aquaculture (FAO 1995). The activities in the fisheries and aquaculture subsectors are diverse and may be conducted on several different scales. The activities also have a broad range of effects on the natural environment and interfere with and are constrained by activities in other sectors.

The CCRF, the Ecosystem Approach of Aquaculture/Fisheries management (EAA/F) and the more recent Blue Growth Initiative all promote the concept of integrated sustainable fishery and aquaculture operations through fact-based management, which requires the adequate monitoring of all aspects of the sectors' performance.

The data required concerns not only sector performance in a production context, but must also cover the broader prospects of economic and social costs and benefits, environmental aspects and the sector's contribution to food security, together with its impact on the supporting natural environment. The core data for fisheries and aquaculture, data sources and methodologies are discussed in the sections below.

7.1 Core Data for fisheries and aquaculture

Once policy and management objectives have been defined with their relative reference points, appropriate performance indicators can be identified, and the variables needed for their estimation. The elaboration of many indicators requires the combination of multiple variables and certain variables such as total production and value are vital to a wide variety of indicators or may themselves be used as indicators.

The minimum set of core data item that will observe the accuracy and reliability of regional aggregation of fishery and aquaculture statistics would ultimately depend on the quality of national data sources, collection, methods, periodicity of up-dating, and reporting.

7.1.1. Minimum core data for Capture fisheries and Aquaculture

These data are;

1. Production from capture fisheries and aquaculture by type of fish for each year.
2. Assets used in fish production:
    - Non-financial assets e.g. fishing gear
3. Value of sold fish
    - Export sales and Import
    - Domestic sales
4. Employment by sex,
5. Income from fishing for the owner of the establishment
6. Fish consumed by households
7. Farm gate prices of fish
8. Aquaculture production systems e.g: Fish ponds, cages, hapa, tanks,

The minimum set of indicators that have to be compiled by Partner States during collection of fisheries statistics is attached hereto as ANNEX VII.

7.2 Sources of data and collection methodologies

Data on fisheries and aquaculture can be collected through agricultural censuses, sample household or dedicated surveys and administrative sources.

Census of agriculture: FAO (2015b) provides guidelines on collecting data on fisheries and Aquaculture Statistics through a Census Framework. It provides recommendations on the items that should be included in censuses to query engagement in fisheries and aquaculture. The FAO World Programme for Census of Agriculture 2020 (**FAO (2015a))** explains that Aquacultural data can be collected in the agriculture census by including a few items on aquacultural production only for agricultural holdings which also conduct aquaculture production. In a joint aquaculture and agriculture census, for both agricultural and aquacultural holdings in order to collect data from aquacultural units which are not also associated with agriculture. WCA 2020 also provides detailed discussion on an aquaculture module (theme 12) and Fishery module (theme 14) that may be included in the agricultural census using a modular approach. The aquaculture module describes the basic items proposed for aquaculture and the fishery module provides items for capture fisheries activities conducted at household level.

Sample surveys using households as statistical unit can also be used to collect data on fisheries and agriculture. FAO (2017b) provides guidelines on criteria used to define the target population as indicated in the table 7.1 below:

Table 7.1: Criteria used to define the target population in household surveys used to collect fisheries data

Basic criteria	
Statistical unit	Household engaged in fishing and aquaculture activities
Degree of engagement	Full-time, part-time and occasional
Characteristics of engagement in fishing and aquaculture	
Use of water resources	Inland and coastal water resources

Basic criteria	
Purpose of engagement	Subsistence or sale, artisanal and commercial (excluding recreational fisheries)
Type of activities	Fishing and aquaculture, in some cases associated to post-harvest processing within the household
Purpose of primary production	Food and non-food uses of fish and other aquatic animals and plant

Source: Adapted from Table 1 of FAO (2017b)

Sample-based fishery surveys: The standard FAO methodology of conducting a sample-based survey (FAO 2002) recommends that "enumerators collect the quantity of fish landed by species, from randomly selected boats, and the number of boats engaged in fishing at the date of the survey, in accordance with the predetermined sampling schedule". This will provide an average estimate of the catch per unit effort, estimate of average effort and the total catch per day, by species. FAO (2017b). In this case, effort is defined as one boat-day; the measurement would be utilized as a relative indicator of stock size.

Administrative sources: Many countries derive their data on fishery and aquaculture from administrative sources. In EAC region almost all countries use administrative sources for producing fishery and aquaculture data as indicated in table 2.1. In European Union, most of the fishery data compiled by EUROSTAT come from administrative data, such as national registers of fishing vessel. FAO (2018f).

In addition to administrative sources, periodically collecting data through censuses and well-designed sample surveys can improve the quality of fishery and aquaculture statistics. Detailed guidelines are available on implementing such censuses and surveys as listed in the references below.

Recommendation 9: It is recommended that EAC-PS should consider periodically collecting fishery and aquaculture data in the agricultural Census Framework. In addition, EAC-PS should undertake specialized fishery and aquaculture surveys/census in line with FAO recommendations.

References and suggested readings on Fishery statistics:

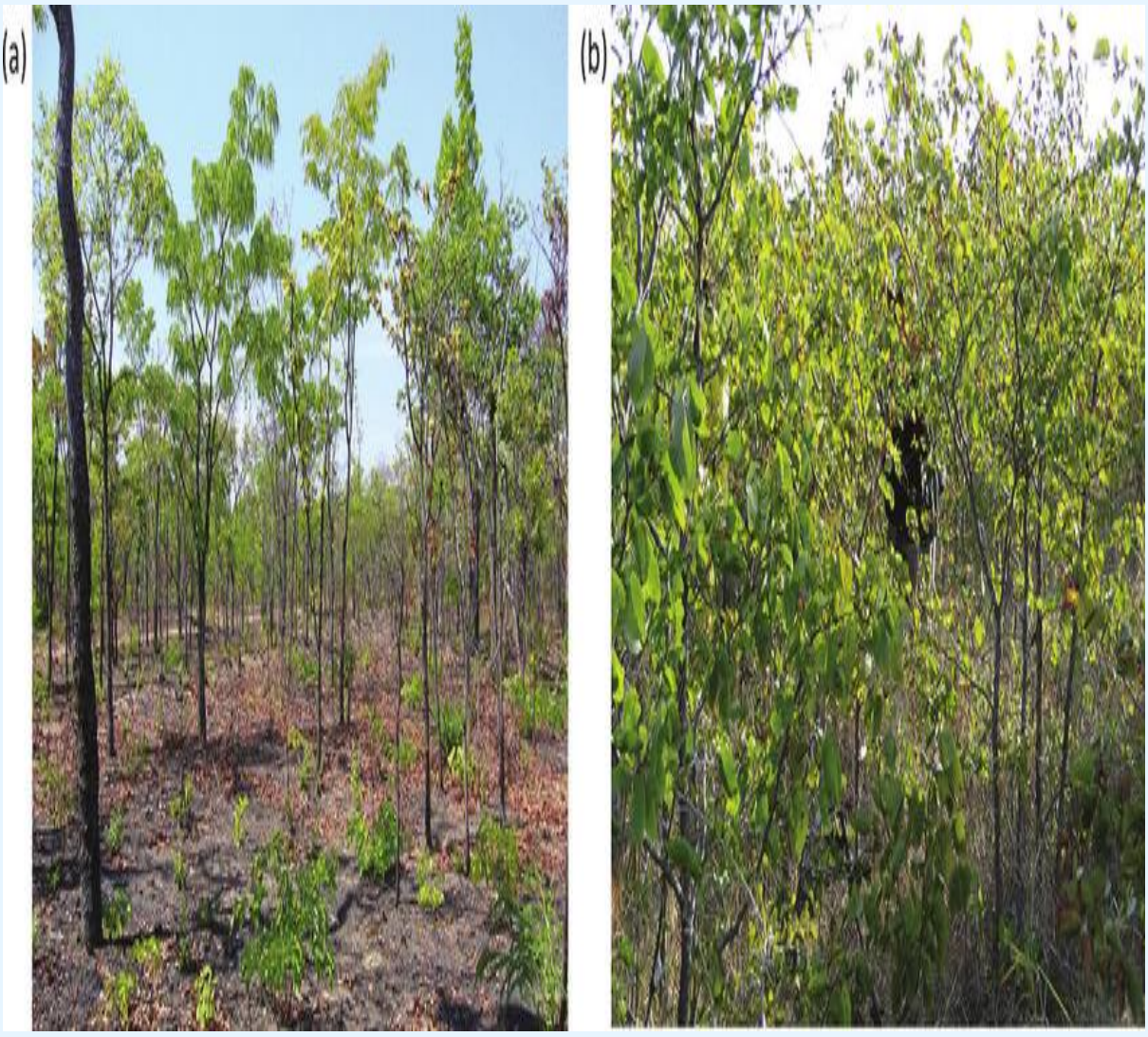
- **FAO (2018a):** Master Sampling Frames (MSF) for fishery and aquaculture statistics. *Publication prepared in the framework of the Global Strategy to improve Agricultural and Rural Statistics* ca6433en.pdf (fao.org)

- **FAO(2017c):** Handbook for fisheries socio-economic sample survey - Principles and practice (fao.org). https://www.fao.org/3 /i6970e/i6970e.pdf

- **FAO (2017b):** Guidelines to Enhance Small-Scale Fisheries and Aquaculture Statistics through a Household Approach. Publication prepared in the framework of the Global Strategy to improve Agricultural and Rural Statistics. ca6406en.pdf (fao.org)

- **FAO (2015b):** Guidelines to Enhance Fisheries and Aquaculture Statistics through a Census Framework. *Publication prepared in the framework of the Global Strategy to improve Agricultural and Rural Statistics*. ca6405en.pdf (fao.org). https://www.fao.org/3 /ca6405en/ca6405en.pdf

- **FAO (2002):** Sample-based fishery surveys A technical handbook. Sample-based fishery surveys - A technical handbook (fao.org)


(a)
(b)

CHAPTER 8: FORESTRY STATISTICS

East African Community forests are diverse and share many economic, geographic, ecological, political and socio-cultural characteristics. The region has remarkably wide variety of forests that support a wealth of biological diversity and endemism among plants, birds and mammals. The major forest types include tropical moist evergreen and moist semi deciduous forests, forests plantations, miombo woodlands (wet and dry miombo), savannah, acacia woodlands and mangroves (FAO 2002).

The forests which on average cover about 15.8 percent (IAF,2017) of the region's land surface are vital to people's livelihoods and regional socio-economic development activities through provision of goods and services. Apart from being the source of income for individual and families, the forests provide goods and services ranging from fuel wood for energy, timbers and poles for construction, medicine and foods, soil erosion protection, biodiversity and water catchment conservation and recreational opportunities.

The performance of the growing tourism industry which contributes 10 percent of GDP on average depends on the sustainability of forest sector. Furthermore, East African forests stores a great deal of carbon and therefore have potential to contribute to global efforts on climate change mitigation.

The provision of reliable information on forest products statistics will ultimately benefit the economic entities dealing with forests products and the livelihoods of forest-sector-dependent people, through improved data availability and quality for the purpose of formulating evidence-based policies in the forest and agricultural sector.

This chapter discusses the key forest information, the core data for forest and the data main data sources and methodologies.

8.1 Forestry statistics and Minimum Core Data

8.1.1 Forestry statistics

The aim of this section is to introduce key forest information and describe potential benefits at national and international levels.

According to FAO Manual on National Forest Inventory (FAO 2004), national forest inventory and assessment of all forest resources and tree resources outside forest can provide

qualitative and quantitative information on the state, use, management and trends of these resources. The assessment covers a large range of biophysical and socio-economic variables and thus, provides a broad and holistic view of land use for the country as a whole. In particular, the information can be used to plan, design and implement national and international policies and strategies for sustainable use and conservation of forestry ecosystems, and to understand the relationship between resources and users of the forest and tree resources.

On the other hand, a reliable time series of forest products information focused on production and markets is important to assist policy-makers in the formulation and impact assessment of national forestry policy. This information plays a pivotal role not only in developing forest sector strategies, targets, and policies, but also in the monitoring of forests and as inputs to scientific studies. In particular, accurate data are needed to allow scientists to make proper inferences and develop accurate market assessment models.

Forest products information complements the information from national forest assessments made within the scope of the National Forest Inventories (NFI), by describing the usage and flow of forest resources into the economy and the movement of wood material. These flows are not only important from a market perspective, but are also important for the estimation of the long-term carbon storage in harvested wood products.

At the national level, forest products information on primary and secondary products is key to quantifying the forestry sector's influence on forest conditions and contributions to the economy. Round wood is the source for saw logs, veneer logs, pulpwood, wood fuel and other industrial round wood. Intermediate products are derived from the primary products and include wood charcoal, wood chips, particles and residues, wood pellets and other agglomerates, sawn wood, wood-based panels, and wood pulp. While understanding product flows is important, it is also crucial to understand the flows at a disaggregated level. For example, product flows and amounts can differ by tree species or species group and source location of the material. This disaggregation allows for a more detailed examination of demand, demand shifts, and resulting growth to drain assessments.

At international level, national forest products statistics are the cornerstone of international forest products statistics. International statistics provide comparable information and support information exchange between countries, allowing international comparisons and a

comprehensive picture of the forest sector's development. The exchange of information in the forestry sector is an essential component of international cooperation in such matters as forest conservation and sustainable management, the use and trade of tropical forest products, and the assurance of legality in the international trade of timber and forest products.

There are several policies and agreements that shape forest products markets, and these policies and agreements are based on understanding production, markets and trade. Broadly, these policy mechanisms are either trade-related, energy-related, environment-related or carbon-related. Evaluating the effectiveness of policies and agreements is enhanced with reliable national and international forest products statistics.

8.1.2 Minimum Core Data

The collection of internationally relevant forest data requires a harmonized framework and consistent definitions at the international level to enhance comparability, so that statistics may be aggregated among countries. The Forest Products Classification and Definitions developed by the Global Strategy (2016) focus on a six-level classification scheme based on the following criteria:

1) Wood origin for the primary product;
2) Wood species origin;
3) Stage of manufacturing;
4) Chief component material;
5) Technology applied in the production process; and
6) Purpose or intended use

The minimum set of data that the EAC-PS should collect in forest sector based on internationally agreed standard set of recommendations on how to compile measures of economic activity are:

1) The production of round wood and
2) The production of timber, forestry activities result in products that undergo little processing, such as fire wood, charcoal, logs, natural honey, wood chips and round wood used in an unprocessed form (e.g., pit-props, pulpwood etc.).
3) Land Area under forest and other wooded land as primary land use

4) Main purpose of forest and other wooded land; and
5) Area under agro-forestry

The minimum set of indicators that have to be compiled by Partner States during collection of forestry statistics is attached hereto as ***ANNEX VIII.***

8.2 Sources of data collection and methodologies

The main sources of forest statistics are National Forest Inventory, agricultural census, sample surveys and administrative sources.

Given the scarcity of reliable forest statistics in many developing countries, the Research Component of the Global Strategy to Improve Agriculture and Rural Statistics (WB, FAO, UNSC, 2010) prioritized and developed two research topics which resulted in the publication of two Guidelines: "The Guidelines on data collection for national statistics on forest products" (FAO 2018b) and "Guidelines for the incorporation of a wood fuel supplementary module into existing household surveys in developing countries" (FAO 2018c). These two Guidelines, in addition to FAO Manual on National Forest Inventory, the FAO WCA 2020 Guidelines and the Guidelines on Administrative Data are key reference documents on Forest statistics. An overview of the main sources of data and methodologies is provided below:

8.2.1 National Forest Inventory

The National Forest Inventory is an initiative promoted by FAO and implemented in many countries for decades. It aims at generating cost effective information on forests and trees outside forests, including all benefits, uses and users of the resources and their management (FAO 2004). Another main objective is to build national capacities and harmonize methods, forest related definitions and classification systems among countries. FAO (2004) contains definitions and procedures used to plan and perform a national forest inventory and assessment following the approach developed by the Forest Resources Assessment programme (FRA) of the FAO. The methodology, based on nation-wide field sampling, has been tested and implemented in several countries since year 2000.

The purpose of the national forest inventory (NFI) is to assess forest resources and tree resources outside forest and to provide new qualitative and quantitative information on the

state, use, management and trends of these resources. The assessment covers a large range of biophysical and socio-economic variables and thus, provides a broad and holistic view of land use for the country as a whole. In particular, the information will be used to plan, design and implement national and international policies and strategies for sustainable use and conservation of forestry ecosystems, and to understand the relationship between resources and users of the forest and tree resources

8.2.2 Agricultural censuses and surveys

Forest data can be collected through agriculture census or surveys. The agriculture census focuses on the total count of the holdings practicing forest activities while the sample surveys collect specific variables based on the portion of the population during the reference period. Those variables involved in these two sources of data are, production, cost of production, area planted and cultivated, means of transport, access to market, sources of energy for various purposes, etc.

WCA2020 (FAO 2015a) recommend the following two frame items to be included in the Census of Agriculture:

- 1303 Presence of woodland on the holding
- 1304 Whether agroforestry is practiced

These items will allow the construction of an adequate sampling frame of all holdings involved in forest activities that can be used in the thematic module of the census or in a dedicated survey.

WCA 2020 also recommend a Forestry module (Theme 13) to be implemented in a Modular Census and based on Frame items. The main data items included in the thematic module on forest are:

- 1301 Presence of woodland on the holding
- 1302 Area of woodland (for the holding)
- 1303 Purposes of woodland (for the holding)
- 1304 Whether agroforestry is practiced (for the holding)

8.2.3 Sample surveys

It is recognized that among the Forest products, Wood fuel plays a critical role in the economic and social wellbeing of people around the world. Approximately 2.4 billion people use wood fuel as their primary energy source for cooking, predominantly in developing countries (FAO, 2014). Indeed, fuelwood and charcoal are often the cheapest and most easily accessible source of energy in remote rural areas, where they enable the poor to meet their basic needs in the absence of other sources of energy.

For the collection of data on Wood fuel, FAO Guidelines (FAO 2018c) recommends the integration of a Wood fuel supplementary module in relevant Household Surveys.

> The purpose of the guidelines "is to develop a tool, the Wood fuel Supplementary Module (WSM), to be incorporated in existing national household surveys. The ultimate goal is to enable countries to collect reliable and comparable data on woodfuel production and consumption".
>
> The WSM is designed to collect information on the consumption, acquisition, production and sales of woodfuel at the household level. It comprises four main sections covering the following topics: fuelwood use, collection and sales; charcoal use, production and sales; cooking and heating; and health problems. The statistical unit of the WSM is the household, intended as an independent user and producer of fuelwood and charcoal.

8.2.4 Administrative sources

In many countries, most of the Forest data are generated from administrative sources. For example, in the United Kingdom, the Forestry Commission records complement statistical surveys in estimations of forest area and woodland prices in the country. In EAC PS, almost all countries derive their Forest statistics from administrative sources as shown in Table 2.1.

The forest products sector is defined according to FAO as including "all economic activities that mostly depend on the production of wood fibre" (FAO, 2004; p. 3). The aim of data collection on FAO products is to estimate production, imports, and exports of various products as defined by the FAO/ECE/ITTO/Eurostat Joint Forest Sector Questionnaires

(JFSQs), these products are demand-driven and arise from activities performed by different entities in the forestry sector.

(FAO 2018b) explains that “in many developing countries, the collection of certain types of forest products data (particularly roundwood) is decentralized to non-statistical agencies (such as a national forest administrative agency or a ministry of forests). While these agencies do have knowledge about forest sector practices, frequently, they are not well trained in statistical methods. Such lack of training may cause difficulties in coordination and harmonization, namely with the use of statistical methods, definitions, codes and units. As a result, data quality is poor. In some countries, the forest products statistical system is not capable of producing a minimum set of estimates on a regular basis because of a lack of technical and financial resources”.

The FAO Guidelines also explains that” in addition to official estimates that are recognized by the governments, there are often also unofficial reports from forest enterprises and their organizations, non-governmental organizations (NGOs), the press and other stakeholders. While these efforts provide valuable information, the inconsistency between official and unofficial estimates is one of the major constraints on the management of forestry statistical programs”.

The FAO Guidelines (FAO 2018b.) focus on variables in the JFSQ. The JFSQs are an international framework to collect aggregate forest products statistics for each country and produce regional and international forest product statistical summaries. The JFSQ variables include production and removal quantities, as well as the quantity and value of trade (imports and exports) for primary and secondary products.

Recommendation 10: It is recommended that EAC-PS should consider periodically conducting National Forest Inventory using FAO methodology and collecting Forest products statistics as defined in the JFSQ through WSM in Household Surveys and administrative sources. Agricultural Censuses are also important sources of frame and thematic data on Forest.

References and suggested readings on Forestry statistics:

- **FAO (2018b):** Guidelines on data collection for national statistics on forest products. *Publication prepared in the framework of the Global Strategy to improve Agricultural and Rural Statistics*. ca6403en.pdf (fao.org)

- **FAO (2018c)** Guidelines for the Incorporation of a Wood fuel Supplementary Module into Existing Household Surveys in Developing Countries. *Publication prepared in the framework of the Global Strategy to improve Agricultural and Rural Statistics*

- **FAO (2004)** National Forest Inventory Field Manual template. Working Paper 94/E.

- Wardle, P., Brusselen, J., Michie, B. & Schuck, A. (2003). Forest Products Statistical Information Systems of EU and EFTA, European Forest Institute Research Report 16, EFI, EURO Quantitative Approach. STAT, European Commission, Leiden –Boston.

CHAPTER 9: PUBLICATION AND DISSEMINATION OF AGRICULTURAL STATISTICS

This chapter describes publication and dissemination of agricultural statistics. The publication and dissemination plan should be planned starting with a catalogue of publications and a timetable of data release as a commitment to data users on the availability of data. In addition to providing data, the users should also be informed of the corresponding metadata, including the concept and definitions, the scope and coverage and the methodological aspects of the data collection systems which will help in the interpretation of the data. In the case of Census data, the users should also be informed on the data quality based on the post-enumeration survey results if this has been conducted, in order to assist them in the interpretation and use of data.

The agricultural statistics is among the key components for compilation of country's GDP in EAC-PS. Its production can be also a costly operation which finds its value in the wide range of data uses, not only for policy decision-making but also for private use and general knowledge, etc. Providing timely and accurate data is a matter of great importance. The dissemination process should be well organized and discussed with primary data users within the agricultural statistics committee. This is particularly relevant for comprehensive data collection operations such as agricultural censuses and surveys.

Traditionally, the main access to results is offered through published reports. Nevertheless, new methods of dissemination exist which will undoubtedly be more readily available with the advance of new technologies. One of the duties of the unit responsible for dissemination of data is to make the best use of both traditional and new dissemination methods.

Although the tendency is to plan to provide a wide range of results, the importance of the time factor should be kept in mind because the usefulness of statistical information decreases in proportion to the length of time taken to provide it. Those responsible for the agricultural statistics should always search for the optimum compromise between an ambitious dissemination programme and a quick but definitive release of the main results. In fact, the dissemination should be seen (and thought of) as a dynamic process between these two extremes.

Along with the preparation of a work plan for the various agricultural statistics operations, a work plan and a specific budget should also be prepared for the dissemination programme discussed in the following paragraphs.

9.1 Informing the users

In the case of census and surveys, the publicity campaign should have made people aware of the importance of the activities and expected outputs. In the case of sample Census and surveys where the enumeration is conducted on the basis of a sample only a fraction of holders is contacted during the survey. Other holders, not part of the sample should also be made aware of the operation through the publicity campaign. The main aim of the census/survey publicity programme, is to make people aware of the objectives and purposes of the agricultural census/surveys and to obtain their full cooperation during the processes. Once curiosity has been created, the public will be expecting and looking for census/surveys results.

It is important to make the public aware of the available results from the census/surveys exercises. The presentation of the results to the stakeholders should be simple focusing on key parameters, importance of the agricultural sector in the country and trends since the previous census/surveys.

Generally, the media is eager to receive this kind of information and should be informed that the census/surveys dissemination process is now under way. Presentation of results might be done on media by the NSO, Ministry responsible for Agriculture or Planning (depending who is in charge of the census/surveys organization).

Opportunities to participate in seminars, conferences, lectures and talks on various media are often offered to staff to present and enhance the value of information provided by the census/surveys and other agricultural statistics data. Such talks, if carefully prepared, are an efficient means of provoking interest for census/surveys data. This should be considered as an important part of the dissemination process by those associated with the census/surveys.

The publicity for promoting the use of census/surveys results should take into account the primary users and these are:

i. Officials of the national government involved in planning, policy, programme evaluation, etc.
ii. Officials of local governments (interested particularly in detailed data for small areas);
iii. Pan African Organizations, AU, EAC, COMESA, SADC etc.;
iv. International organizations such as FAO, World Bank, IFAD etc., concerned with development planning;
v. Business, academia and research organizations; and
vi. Private sector and Civil Society Organizations.

The knowledge of potential users and their use of census/surveys data is of paramount importance.

9.2 Dissemination products and methods

FAO (2018g chapter 24) provides detailed guidelines and practical examples of best practices in disseminating census data, including dissemination products and services as well as the methods and tools for dissemination.

Dissemination products and services include reports (preliminary reports, final reports, thematic reports, technical reports), data products and services (Tabulated data, Providing access to macro-databases and micro-databases) and other products (Atlases and other geographic products, brochures and flyers, videos and sketches, etc).

The methods and tools for dissemination include printed materials, online dissemination, social media, other electronic methods and tools for safe access to microdata.

Recommendation 11: Publication and dissemination
In planning and conducting Agricultural Censuses and Surveys, EAC PS should:
- Identify data users and their needs.
- Prepare a work plan and a specific budget for the dissemination programme during preparation stage.
- Ensure timely dissemination of results (refer to the dissemination products and methods recommended in FAO 2018a).

References and suggested readings on data dissemination

- **FAO (2018g):** World programme for the Census of Agriculture 2020. VOLUME 2 Operational guidelines. Series 16. World Programme for the Census of Agriculture 2020 (fao.org)- https//www.fao.org/3/CA1963EN/ca1963en.pdf

CHAPTER 10: SUSTAINABILITY OF AGRICULTURAL STATISTICS

In order for EAC-PS to produce on a regular basis the minimum set of core data using cost-effective methods recommended in this Guidelines, it is important to ensure that a sustainable agricultural statistics system is in place. The Global Strategy indicates that “sustainability of a statistical system depends on stable and predictable funding that ensures ongoing support for data collection at appropriate intervals”.

The Global Strategy identifies relevance and demand for statistics as a key requirement for sustainability of the Agricultural Statistics System. It stipulates that “Policy makers and others who use the data are more likely to support the system that provides it and to sustain their demand for the data when it proves to be authoritative and relevant to their needs. In this way, the sustainability of a statistical system is largely a function of the demand for the data it produces and of the financial support that is required to satisfy that demand”.

The statistical system needs to be responsive to users and provide statistics that are relevant, accessible, timely, and with a level of accuracy that meets their needs. The Global Strategy also emphasizes the existence of an adequate Governance structure and Statistical capacity as necessary requirements for a sustainable agricultural statistics system.

Governance at the national level involves the organization of a national statistical system that includes sector ministries and other agencies that provide data, namely the ministries responsible for agriculture, forestry, fisheries, and any other institutions that collect agriculture-related data. The coordination mechanism should facilitate the mobilization of resources for the agricultural statistics system within the framework of the national statistical system. This should also enable the ministries and agencies involved in the collection of agricultural data to integrate agriculture into the preparation of the national strategies for the development of statistics through a Strategic Plan for Agriculture and Rural Statistics (SPARS).

A well-functioning Agricultural Statistics System requires adequate technical and operational capacity to plan and conduct statistical operations in the country. It is therefore essential to strengthen and upgrade levels of expertise in all domains of statistical production. Capacity building should be done not only at individual staff level but also at the level of the National Statistical System. This will ensure better sustainability even in case of high staff turn-over. In

addition to national capacity building programmes, EAC may support capacity building efforts in Partner States.

In order to ensure sustainability in improving and harmonizing agricultural statistics within the region, there is a need to strengthen capacity of EAC Partner States in:

a. **Development of institutional capacities:** Effective governance structures set up and functioning at all levels i.e. global, regional and national levels are needed to coordinate the efforts of different stakeholders, especially the NSOs and Ministry responsible in agriculture.
b. **Integration of Agriculture into National Statistical System:** The development of Strategic Plans for Agriculture and Rural Statistics (SPARS) well integrated into the National Strategies for the Development of Statistics (NSDS) will also support the sustainability of the Agricultural Statistics System. This will minimize duplication of efforts in producing statistics that is so common in developing countries. The development of a master sample frame for agriculture, the implementation of an integrated survey framework, and implementation of a data management system in form of an integrated database will also facilitate the integration of the agricultural statistics system into the National Statistics System.

c. **Financial and human resources:** The existence of collaboration between Government and Development Partners, willingness and commitment of Government to support agricultural statistics is essential for a sustainable Agricultural Statistics System. The, availability of skilled and experienced staff involved in undertakings of censuses, surveys and administrative data and regular training especially in adoption of advanced and cost-effective methodologies, tools, and standards is also needed**.** While donor funding and support will continue to be essential to improve national statistical systems, the collection of core data should, over time, become sustainable using national resources.

Recommendation 12: In order to ensure sustainability of the Agricultural Statistics System, it is recommended that EAC-Partner States should: -

i. Put in place Governance and coordination mechanisms for integrating Agricultural Statistics System into National Statistics System;

ii. Develop Strategic Plans for Agricultural and Rural Statistics in the framework of the National Strategy for Development of Statistics and National Agriculture Development Plans;

iii. Allocate adequate financial and human resources to Agricultural Statistics activities;

EAC secretariat, partner states and development partners should also support South to south cooperation within and outside the region.

ANNEXES

ANNEX I: STATUS OF AGRICULTURAL STATISTICS IN THE REGION

Census/Survey/indices	Burundi	Rwanda	Kenya	Tanzania	South Sudan	Uganda
Population census	Planned 2022	Planned 2022	Done in 2019, next planned for 2029	Planned 2022	No plan (However, population estimate survey done in 2021)	Done in 2014 and next planned for 2023
Agricultural census	Planned for 2022	Not done (however module incorporated in population census)	2019 census of agriculture targeting farming household done. 2020, census of commercial non-hhd farms Next is planned for 2024 (hhd and non-household based)	2019/20	Not done and not planned	2021 livestock census 2024- crop and aquaculture
Annual Agriculture survey	Done annually	Done on seasonal basis	planned for 2023, also does high frequency quarterly surveys/panel	Done annually Next planned for 2022/23	Not done (Crop assessment done annually)	Done annually
Household and budget Survey	Done in 2019/20	Done in 2016/17Planned 2023	Ongoing in 2021(continuous quarterly household survey), integrated planned for 2022	2017/18 and next is planned for 2023	Last was done in 2009. High frequency survey done in 2015	2019/20 and planned for 2022/23
Agriculture Producer Price Indices (APPI) -PPI	Done annually	Not done	quarterly basis from continuous hh survey	Panned for 2022	No	Done on a quarterly basis
Rebased Consumer Price Indices (CPI)	Done in 2016	Done in 2014	Ongoing in 2021	Last done in 2020	2012	Done in 2016/17
Rebase import/Export Price Indices	Done 2013	Not done	Done in 2016/2017	Oct-Dec 2017)	Not done	Done in 2016/17

ANNEX II: CONCEPTS AND DEFINITIONS OF AGRICULTURAL STATISTICS

Agriculture

Agriculture *(also called farming or husbandry)* is an economic activity mainly in cultivation of crops, rearing of livestock, aquaculture, fishing and forestry activities to sustain and enhance human life.

Agricultural Year

This is a twelve months cycle in which production of annual crops takes place

Agricultural Statistics

Is the aggregate of numerical information of different fields of agriculture and its economy. These include data and information on crops, livestock, fisheries and forestry activities. Agricultural statistics is classified under two major areas namely, Structural and Current Agricultural Statistics.

Structural Agricultural Statistics

These are statistics dealing with enduring characteristics of agriculture such as agricultural holdings, their numbers, form of land tenure, land utilization, agricultural population, agricultural implements and machinery. These statistics are enduring characteristics in that they do not change so frequently. Structural Statistics are mainly collected through censuses at a periodicity of 5 – 10 years.

Current Agricultural Statistics

These are statistics that provide information on the more dynamic aspects of agriculture. These activities include areas under crops, production of crops, yields of crops, livestock and their products and prices. These statistics change more often than the Structural Agricultural Statistics. Current Statistics are collected more frequently (i.e., annually, semi-annually or quarterly).

Season

Is the division of the year marked by changes in weather. It refers to a growing cycle of a crop. **Agricultural Land**

All land on which agricultural activities on production and management of crops, livestock, aquaculture, fisheries and forestry are carried out.

Agricultural Holding

An economic unit of agricultural production under single management comprising of all livestock kept and land used wholly or partly for agricultural production purposes, without regard to title, legal form, size or location.

Sub-Holding

A sub-holding is defined as a single agricultural activity or group of activities managed by a particular person or group of persons in the holder's household on behalf of the agricultural holder. There may be one or more than one sub-holding in a holding. A sub-holding could comprise a single plot, a whole field, a whole parcel, or

even the whole holding. A sub-holding could also be a livestock operation associated with a plot, field or parcel, or a livestock operation without any land.

Holder/Operator

A person who exercises management control over the holding operations and takes major decisions regarding resource use.

Area Harvested

Refers to the total area from which the crop is gathered. Area harvested, therefore, excludes the area from which, although sown or planted, there was no harvest due to damage, failure, etc.

Temporary Crops

Crops that mature within one or more rain seasons and are destroyed after harvesting, for example, beans and maize.

Perennial Crops

These are crops that mature after more than one season and are not uprooted after the first harvest for example, pineapples and sugarcane.

Permanent Crops

Crops which are not re-planted but are continuously harvested, for example, coffee and tea which are crops whose maturity exceeds one season.

Cash Crops

Crops grown specifically for sale. Examples of cash crops include coffee, cotton, tea, sugarcane, pyrethrum, sisal, horticultural crops *etc*.

Food Crops

Crops that are mainly grown for food consumption. However, many of these crops have

in the recent years been sold for cash including in the export markets, for example, Maize, Simsim, Beans, and Soya Beans.

Fertilisers

Is any organic or inorganic material of natural or synthetic origin that is added to soil to supply one or more plant nutrients essential to the growth of plants.

Organic Fertiliser

Nutrient sources of organic origin either natural or processed, containing at least 5% of one or a combination of the three primary nutrients (N; P_2O_5; K_2O). These include farm yard manure, compost, green manure and seaweed.

Farmyard manure refers to animal feces and urine mixed with litter mainly straw, to absorb the urine.

Compost is manure derived from decomposed plant remain, usually fermented waste plant material, such as straw, grass mowing, etc., heaped in alternate layers with lime, nitrogen and water added.

Green manure is a crop, such as sand hemp mustard, etc., grown specifically to be ploughed back into the soil to provide humus. Green manure crops are often planted before the rains.

Naturally occurring organic rock phosphate fertilizer eg Minjingu fertilizer

Inorganic or Chemical Fertilizer

Fertilizer materials derived from minerals, atmospheric gases, water, and inert materials. It can be natural or synthetic products of chemical reactions. These are classified into two types namely: Nitrogen, Phosphates, Potassium (NPK) and Ammonium Phosphates.

Pesticides

Any substance used in agriculture intended to control, destroy, repel, or attract a plant pest. Pests are animals (such as insects or mice), unwanted plants (weeds), or microorganisms (viruses, bacteria and fungi). Pesticides include different chemicals (organic and inorganic)

i. Insecticides

Natural or synthetic substances which kill insects. Insecticides are used in a number of ways, including spraying and dusting, or in granular forms as seed dressings.

ii. Fungicides

Chemicals used to kill fungi or restrict their growth. Fungicides are available as sprays or dusts for use on crops.

Herbicides

Chemicals used to control undesirable or noxious plant growth, generally called weeds, in areas dedicated to crop production or in non-crop areas where plant growth is unwanted.

Irrigation

Purposively providing land with water other than rain, for improving crop production.

Drainage

The removal of excess water from land surface and/or the upper soil layer to make non productive wetland productive and productive wetland more productive.

Livestock

All animals and birds kept or reared specifically for agricultural purposes including cattle, sheep, goats, pigs, horses, poultry, rabbits, and donkeys.

Indigenous Livestock

Refers to traditional livestock breeds of local origin by genetics commonly reared naturally in the villages, without special attention. Such livestock are neither fed by special feed nor special housing.

Exotic Livestock

Refers to pure livestock breeds of foreign origin commonly reared with special attention. Such livestock are fed by special feed and housing for example Friesians, layers, broilers.

Improved Livestock

Refers to livestock, which are breed specifically for producing meat, milk and eggs. These are cross-bred.

Livestock System

Features of livestock keeping practices adopted and maintained in the country.

The commonly used systems include:

Nomadic or totally pastoral - a practice of livestock keeping which involves moving from place to place in search of water and food for animals.

Semi-nomadic or semi-pastoral – where livestock is kept by households that establish permanent residence and might also cultivate crops as a supplementary food source, but move herds on transhumance to assure forage and water.

Agro-pastoral - Livestock keeping and crop cultivation are carried out by establishment of farms or households with permanent residence.

Commercial Livestock System - where Livestock are kept in fenced farms on a commercial scale.

Livestock Population

The total number of animals (cattle, sheep, goats, pigs, horses, poultry, rabbits, and donkeys) present on the holding on the day of enumeration regardless of ownership. Livestock population excludes livestock temporarily absent or in transit at the time of enumeration.

Overgrazing

Feeding by livestock or wildlife to the point where the grass cover is depleted, leaving bare and unprotected patches of soil. It is a consequence of over-stocking beyond the current carrying capacity of an area.

Carrying Capacity

This refers to the optimum number of livestock per unit area.

Agricultural Inputs

Consumable and expendable inputs in agricultural production for crops, livestock, fisheries and forestry, for example fertilisers, seeds, seedlings, fingerlings and veterinary drugs.

Machinery and Equipment

All tools and implements used in agricultural production for example: Tractors, Ploughs, and Hoes.

Mode of Transport

Movement of agricultural goods and produce by the holding, members of the holder's households, or workers from one place to another for agricultural purposes. These include head loading, oxen, donkeys, bicycles, etc. The cost of transport will include cost of production and marketing

Machinery and Equipment Source

The way the holder has obtained the right of use of machinery and equipment.

"Owned solely by the holder" refers to agriculture machinery and equipment that the holder has exclusive and full right to use, primarily for agricultural work on his holding;

"Owned jointly by the holder and others" refers to agricultural machinery and equipment, the right of use of which the holder shares with others primarily for agricultural work on his holdings. Machinery and equipment owned by co-operatives, of which the holder is a member, are not included in this class;

Machinery and equipment provided by the landlord, other holders, private contractors, co-operatives or government agency and owned by holder, either individually or jointly with others, but are provided by landlord private contractor, cooperative or government agency, without a fee for use in agricultural work on the holding; and

"Machinery supplied by private contractors" refers to machinery and equipment provided on a contractual basis by private enterprises.

Forest Trees

Trees found in their natural habitat and those planted to produce wood for industry, wood fuel, forage protection of other purposes, but not included among trees grown as permanent crops. Forest trees include bamboo and other woody vegetation used for above- listed purposes.

Natural Forest Trees

Forest trees that are growing in their natural habitat.

Plantation Trees

Trees that are planted by the holder on the holding e.g. Eucalyptus trees.

Shifting Cultivation

Land utilization method where a particular piece of land is cultivated for a given number of years (x), and then abandoned for a period (greater than x), sufficient for it to restore its fertility by natural vegetation growth before it is then re-cultivated. The distinguishing characteristic of the shifting cultivation is that neither fertilizers nor manure is used to replace soil fertility.

Agro-ecological Zone

A geographical area which is fairly homogeneous with the climate (rainfall, temperature, humidity), soils and altitude.

Terracing

A terrace is a piece of sloped plane that has been cut into a series of successively receding flat surfaces or platforms, which resemble steps, for the purposes of more effective farming. This type of landscaping, therefore, is called terracing

Mulching

Process of covering the soil, with organic matter such as leaves, straw, or peat, placed around plants to prevent the evaporation of moisture, the freezing of roots, and the growth of weeds.

Crop Farming Systems

The classification of populations of individual crop farm types that have similar resource bases, enterprise patterns, household livelihoods and constraints, and for which similar development strategies and interventions would be appropriate.

Producer Price Index for Agriculture

A measure of the average change in farm gate prices of agricultural products with reference to a specific period (Base Year) in the country.

Off-take Rate

The percentage of animals slaughtered in a given period.

Land Management

Is the process of administering the use and development *(in both urban and rural settings)* of land resources in a sustainable way. Land resources are used for a variety of purposes which interact and may compete with one another; therefore, it is desirable to plan and manage all uses in an integrated manner.

Land Utilisation

Different ways in which land is used in a holding. Broad categories of land utilization include:

i. Arable land

ii. Land under permanent crop

iii. Land under permanent pastures

iv. Wood or forest land

v. All other land.

Arable land

All land generally under rotation whether it is under temporary crops, left temporarily fallow or used as temporary pastures. Total arable land may be divided into the following four classes.

i. Land under temporary crops

ii. Land under temporary pastures

iii. Land temporarily fallow

iv. All other arable land.

Land under Temporary crops includes all land used for crops with a growing cycle of under one year, sometimes only a few months, which needs to be newly sown or planted for further production after the harvest.

Land under temporary pastures is the land temporarily cultivated, with pastures. Because some practical difficulties may arise, differentiating temporary from permanent pastures, it is suggested that such crops cultivated for a period of less than two years be considered temporary.

Land temporarily fallow is land at rest for a period of time before it is cultivated again. If the land remains fallow for more than two years, it might acquire certain characteristics, which would determine its inclusion in other major land-uses groups, such as Permanent Pastures" (if it could be used for grazing) or "wood or forest land" (if it has become overgrown with trees and could be used as timber, firewood, etc.) or "all other land"(when it becomes wasteland).

All other arable land: All rotation land not put to any of the uses mentioned above during the reference year such as arable land temporarily damaged by floods, land prepared for cultivation but not sown because of unforeseen circumstances and abandoned land.

Land under Permanent Crops: Land cultivated with crops which occupy it for a year or longer and which do not have to be destroyed after harvest.

Land under trees, is included under this broad category (except land under forest trees, 'which should be classified under, "wood or forest land". Permanent pastures are excluded.

Land under Permanent Pastures: Land used permanently (i.e. for five years or more), seeded and cared- for or grows naturally (grazing land) permanent pastures on which trees and shrubs are grown should be recorded under this heading only if the growing of grass (naturally growing grass) is the most important used of the area.

Wood or Forest Land: Wood lots or tracts of timber, natural or planted, which have or will have value as wood, timber, or other forest products. Nurseries of forest trees should also be classified under this category. Wood or forest land used only for recreation purposes should be reported instead under "land not elsewhere Specified".

All other land includes all other land not elsewhere specified, whether potentially productive or not. Generally, it refers to unused lands and areas under buildings, roads, parks, swamps, rocky areas, etc.

Total Land Owned

All land owned legally, traditionally or conventionally by members of the household or

enterprise singly or jointly.

Cultivable Land

Land that can be put to use for crop farming purposes. This excludes land under permanent pasture, wood or forest and all other non-agricultural land put under residential use or for other enterprise activities.

Land for Cultivation taken on Rent

Land obtained for cultivation from the rightful owner by another, subject to terms and conditions agreed upon by the two parties.

Land for Cultivation Leased out or given on Rent

The portion of cultivable land that is given to others on lease or rent.

Land Tenure

Land tenure refers to arrangements or rights under which the holder holds or uses land

Freehold Tenure

A form of tenure which involves the holding of registered land in perpetuity or for a period less than perpetuity which may be fixed by a condition or enables the holder to exercise subject to the law, full powers of ownership of land.

Mailo Tenure

This involves the holding of land in perpetuity, permits the separation of ownership of land from the ownership of developments on the land made by a lawful or bona fide occupant, and enables the holder to exercise all powers of ownership. The owner of the Mailo land should have a land title.

Leasehold Tenure

A form of tenure created by contract or by operation of law.

Customary Land

Land owned through prevailing customs, traditions or tribal laws of the community. Utilization of the land is determined by the community.

Public Land

Land that is owned and taken care of by Government. Can be occupied by private entities on the basis of an agreement from the concerned authority for a temporary period till the government decides to take it over for public utility.

Squatter

A person or holder who operates land without ownership title and without paying rent, or without retaining legal rights of land use.

Agriculture Plot

A piece of land within the holding on which a specific agricultural enterprise is carried out. It may be made up of one or more plots.

Size of Holding (Total Holding Area)

The combined area of all the Parcels in a Holding within a given Area. It covers;

Land owned by the holder but rented to others should not be included in the total holding area.

Land rented in/hired should be included in the total holding area

The holding area includes farmland, and land occupied by farm buildings if the house is located within the holding.

Land area of the holder's house is also included in the total holding area if the house is not located off the holding and is not used solely for residential purposes.

The total area of the holding practicing shifting cultivation should include area under crops during the reference period and area prepared for cultivation but not sown or planted at the time of enumeration. It should exclude land abandoned prior to reference period.

Holders having access to communal grazing land should not include their estimated share of such land in their total holding area. The total holding area should be equal to total land area under various uses.

Registered Land

Land that has been entered in the register of titles administered by the Commissioner of Land Registration. The owner of such land is called the "Registered owner",

Agriculture loan/credit

Is money, goods or services lent to farmers solely for agricultural purposes such as paying wages/salaries or buying of inputs. As for goods it can come directly in the form of fertilisers, seed or chemicals etc.

Agriculture, value added

Is the net output of the agriculture sector after adding up all outputs and subtracting

intermediate inputs.

Crop yield

Harvested production per unit of harvested area for crop products.

Draught Animals

This includes all animals that are used to draw carts, plough etc regardless of sex e.g. oxen, bulls, cows, horses, donkeys and heifers.

Live weight of animals intended for slaughter

This is the weight taken immediately before slaughter.

Census of Agriculture

Is a large-sale, periodic statistical operation for collecting, processing and disseminating data on the **structure** and organization of agriculture, covering **whole or significant part** of the country. The word '**Census**' implies a complete enumeration of all agricultural holdings. However, by extension, it can be conducted by a **sample enumeration**, provided the sample is large enough to generate **sub-national data**. This is contrary to a belief by some people that in a Census of Agriculture, all agricultural holdings are enumerated.

Agricultural Household

A household is an agricultural household when at least one member of the household is operating a holding (farming household) or when the household head, reference person or main income earner is economically active in agriculture.

Agro-forestry

Farming system involving growing trees in conjunction with crops and livestock production

Aquaculture

Farming of aquatic organisms including fish, crustaceans, molluscs, and aquatic plants

Aquacultural census

Collection of structural data from all aquacultural production units.

Aquacultural Holding

Means an economic unit of aquacultural production under single management, comprising all aquaculture facilities without regard to title, legal form, or size. Single management may be exercised by an individual or household, jointly by two or more individuals or households, by a clan or tribe, or by a juridical person such as a corporation, cooperative or government agency. The aquacultural holding's aquaculture facilities are located in one or more separate areas or in one or more territorial or administrative divisions, providing the facilities share the same production means, such as labour, buildings and machinery."

Food Security

A situation that exists when all people, at all times, have physical, social and economic access to sufficient, safe and nutritious food that meets their dietary needs and food preferences for an active and healthy life

Food Insecurity

A situation that exists when people lack secure access to sufficient amounts of safe and nutritious food for normal growth and development and an active and healthy life. It may be caused by the unavailability of food, insufficient purchasing power, inappropriate distribution, or inadequate use of food at the household level. Food insecurity, poor conditions of health and sanitation, and inappropriate care and feeding practices are the major causes of poor nutritional status. Food insecurity may be chronic, seasonal or transitory.

A productive activity

Is defined as an economic activity falling within the production boundary of the System of National Accounts (SNA): it is the type of production in which units engage.

According to the SNA, economic production is an activity that is carried out under the responsibility, control and management of an institutional unit, which uses labour, capital, and goods and services inputs to produce outputs of goods and services.

Establishment This is an enterprise or a part of an enterprise that is situated in a single location, and in which only a single (non-ancillary) productive activity is carried out

The term "products"

Follows the SNA definition, i.e. all output of economic activities that can be the object of domestic or international transactions or that can be entered into stocks, including transportable goods, non-transportable goods, services and other products

A statistical classification is "a set of categories which may be assigned to one or more variables registered in statistical surveys or administrative files, and used in the production and dissemination of statistics. The categories are defined in terms of one or more characteristics of a particular population of units of observation. A statistical classification may have a flat, linear structure or may be hierarchically structured, such that all categories at lower levels are sub-categories of a category at the next level up. The categories at each level of the classification structure must be mutually exclusive and jointly exhaustive of all objects in the population of interest".

ANNEX III: International Classifications relevant to Agricultural Statistics

Classification		Object	Year of development	Latest update	Number of levels	Custodian
ISIC	International Standard Industrial Classifications of All Economic Activities	Economic activities	1948	2006/2008	4	UN
CPC	Central Product Classification	All products (including services)	1989	2015	5	UN
SITC	Standard International Trade Classification	Products (goods only)	1950	2006	5	WCO
HS	Harmonized System	Products (goods only)	1988	2012	3 (6 digits)	UN
COICOP	Classification of Individual Consumption According to Purpose	Expenditure according to purpose (individual consumption)	1999	2000	3 (4 digits)	UN
COFOG	**Classification of the Functions of Government**	Expenditure according to purpose (functions of govt)	1980	2000	4 (4 digits)	UN
ISCO	International Standard Classification of Occupations	Occupation	1957	2008	4	ILO
ICSE	ICSE International Classifications of Status in Employment	Employment	1958	1993	1 (flat)	ILO
ISCED	International Standard Classification of Education	Education	1970	2011	3	UNESCO
SEEA classification for land use	System of Environmental Economic Accounting	Land use	2012	2012	4	UN
SEEA classification for land cover	System of Environmental Economic Accounting	Land cover	2012	2012	1	UN
FAO classifications for the WCA		Crops, livestock, machinery and equipment, land use	2005 (WCA 2010)	2005 (WCA 2010)	2 to 4	FAO (ESS)

FAO classifications for fisheries and aquaculture						FAO (FIPS
ISSCAAP	International Standard Statistical Classification for Aquatic Animals and Plants'			2001	2	
ASFIS	**Aquatic Sciences and Fisheries Information System**			2014	1	
FAO Major Areas for Statistical purposes			since the 1960s	2003	1	
ISSCFG	The international standard statistical classification of fishing gear			endorsed in 2013 (yet to be published)	2	
ISSCFV	International Standard Statistical Classification of Fishing Vessels			1984	2	
ISSCFC	International standard statistical classification of fishery commodities			2014	6	

Purpose and application of international standards

ISIC

ISIC is the international reference classification of productive activities. Its main purpose is to provide a set of activity categories that can be utilized for the collection and reporting of statistics according to such activities.

ISIC is applied in various domains: statistical, economic and administrative (e.g. tax collection, business licenses);

Censuses and surveys of industry and economic activities;

Household surveys;

Labour force surveys;

Monitoring, analysis, and evaluation of an economy's performance over time; and

Compilation of national accounts.

For more information refer to: seriesm_4rev4e.pdf (un.org)

CPC

The Central Product Classification (CPC) constitutes a complete product classification covering all goods and services. It serves as an international standard for assembling and tabulating all kinds of data requiring product detail, including statistics on industrial production, domestic and foreign commodity trade, international trade in services, balance of payments, consumption and price statistics and other data used within the national accounts. It provides a framework for international comparison and promotes harmonization of various types of statistics related to goods and services.

The CPC is used for data collection (e.g. in production surveys) and as an instrument for assembling and tabulating all types of statistics that involve products, such as statistics on production, intermediate and final consumption, capital formation, foreign trade, prices and national accounts.

It provides a framework for the international comparison of statistics concerning products.

It serves as a guide for developing or revising existing classification schemes of products to make them compatible with international standards.

For more information refer to: Central Product Classification (CPC), Version 2.1 (un.org)

SITC

SITC is a product classification of the United Nations (UN) used for external trade statistics (export and import values and volumes of goods), allowing for international comparisons of commodities and manufactured goods.

The SITC was once used as the basis for customs nomenclatures and for data collection at customs level;

Currently, it is used more often as an analytical tool and to present international merchandise trade statistics;

The HS fulfils an administrative purpose: it is the basis for customs tariffs for the collection of import duties and taxes, monitoring of controlled goods, rules of origin, freight tariffs, price and quota control;

It also performs a statistical purpose, the collection and presentation of trade statistics;

For more information, see: Glossary:Standard international trade classification (SITC) - Statistics Explained (europa.eu)

HS

The Harmonized System is a standardized numerical method of classifying traded products. It is used by customs authorities around the world to identify products when assessing duties and taxes and for gathering statistics

The HS is used to monitor the social and environmental impact of trade in goods;

It is often used as a reference classification at international and national level; international statistical classifications, such as the SITC and the CPC developed by the UN, are also aligned to this scheme.

For more information see: Harmonized System (HS) Codes (trade.gov).

COICOP

The Classification of Individual Consumption According to Purpose (COICOP) is the international reference classification of household expenditure. The objective of COICOP is to provide a framework of homogeneous categories of goods and services, which are considered a function or purpose of household consumption expenditure.

COICOP classifies transactions undertaken by households, non-profit institutions serving households (NPISHs) and governments that result in payables

Price statistics

Statistics on purchasing power parities

Household statistics and household budget surveys

Compilation of national accounts

For more information see: COICOP 2018 (un.org)

COFOG

COFOG is a standard classifying the purposes of government activities.

COFOG classifies transactions undertaken by government for individual and collective services.

It enables the examination of trends in government outlays on particular functions or purposes over time.

COFOG may be used in:

Compiling national accounts

Public finance, government budget

Public expenditures surveys and databases

Official Development Assistance (ODA) statistics

Public sources for investments and subsidies in agriculture

For more information see: Glossary:Classification of the functions of government (COFOG) - Statistics Explained (europa.eu)

ISCO

ISCO is a tool for organizing jobs into a clearly defined set of groups according to the tasks and duties undertaken in the job.

ISCO facilitates the international comparison of occupational information, including statistics.

It provides a conceptual framework and model for the development or revision of national occupational classifications.

It may be used directly in national applications, when countries are unable to develop national occupation classifications.

ISCO may be applied in various domains, including statistical, administrative and client-oriented activities such as:

Household surveys

Labour force and employer surveys

Prices statistics (e.g. labour cost index)

Population censuses

Compilation of statistics derived from administrative and client-oriented activities

Matching jobseekers with job vacancies

Management of work-related migration

Planning of vocational education and training

For more information see: ISCO - International Standard Classification of Occupations (ilo.org)

ISCE

ISCE classifies jobs in employment for pay or profit into ten detailed categories based on the type of authority that the worker is able to exercise in relation to the work performed and the type of economic risk to which the worker is exposed.

ISCE constitutes the basis for the production of internationally comparable statistics on employment relationships, including the distinction between salaried employment and self-employment.

It provides a model for the development of national classifications for statistics on status in employment.

It may be applied in several domains, including:

Employment statistics

Economic and social analysis

Economic and labour market policies

Statistics on the socioeconomic status of persons and households

Labour force and employment surveys

Censuses of population and agriculture

Inputs for the compilation of national accounts

Household surveys.

Compilation and presentation of:

Education statistics, both nationally and internationally

Statistics on participants, entrants, graduates and educational attainment

Administrative registers

Individual and household surveys

Population censuses

For more information see: International Classifications of Status at Work and Status in Employment (ilo.org)

ISCED is the reference international classification for organising education programmes and related qualifications by levels and fields.

For more information see: International Standard Classification of Education (ISCED) - Statistics Explained (europa.eu)

SEEA

The System of Environmental-Economic Accounting (SEEA) is a framework that integrates economic and environmental data to provide a more comprehensive and multipurpose view of the interrelationships between the economy and the environment and the stocks and changes in stocks of environmental assets, as they bring benefits to humanity.

For more information see: System of Environmental Economic Accounting |

SEEA-Land use classification may be applied to:

Environmental statistics

Environmental and economic accounting

Agricultural statistics

Land use surveys

SEEA-Land cover classification may be used for:

Environmental statistics

Environmental and economic accounting

Agricultural statistics

Translation of maps into statistics (LCC)

Construction of area sampling frames for agricultural statistics

Compilation of land accounts:

The “land cover x land cover” matrix shows the changes in types of land cover and the flows within their categories over a specific period of time

“Land use x land cover” matrix enables accounting for activities carried out by type of land cover.

World Census for Agriculture classifications may be used in:

Agricultural surveys and

Agricultural censuses.

FAO classifications for fisheries and aquaculture

ISSCAAP

The **International standard statistical classification of aquatic animals and plants**, abbreviated as **ISSCAAP**, is a nomenclature developed by the United Nations (UN) Food and Agriculture Organization (FAO).

For statistical purposes, nominal catches of aquatic animals and plants, taken in inland and marine waters or derived from aquaculture, for all kinds of commercial, industrial and subsistence purposes, are presented at either species, genus or family level in approximately 1250 statistical categories called "species items"; these species are classified in 50 groups of species and 9 divisions in ISSCAAP.

For more information see: Fisheries and Aquaculture - All Information Collections - ASFIS List of Species for Fishery Statistics Purposes (fao.org)

ASFIS Aquatic Sciences and Fisheries Information System.

ISSCFG

The ISSCFG constitutes a comprehensive classification of all gears and tools used for fishing. It includes categories of gears used for both artisanal and industrial fishing methods. This standard classification is developed to identify the fishing technology for the compilation of catch and effort data and to support fish stock assessment. It is also used as reference for fisheries statisticians, fisheries technology development and the training of fishers.

For more information see: The international standard statistical classification of fishing gear (ISSCFG) - Datasets - "FAO catalog"

ISSCFV

For more information see: International Standard Statistical Classification of Fishing Vessels (ISSCFV) - Datasets - "FAO catalog"

ISSCFC

The ISSCFC covers products derived from fish, crustaceans, molluscs and other aquatic animals, plants and residues caught for commercial, industrial or subsistence uses, by all types of fishing units operating in all

aquatic environments, in inshore, offshore or high seas fishing. Commodities produced from the raw materials supplied by all kinds of aquaculture are also included.

For more information see: International standard statistical classification of fishery commodities (ISSCFC) - Datasets - "FAO catalog"

The classifications on ISSCAAP, ISSCFG, ISSCFV and ISSCFC have the following applications:

Collection and dissemination of fisheries statistics by FAO, regional fishery bodies and other intergovernmental organizations

Use by countries when reporting and exchanging information (e.g. High Seas Vessels Authorization Record (HSVAR), Highly Migratory Species (HMS), Port State measures) based on international legal instruments

ISSCAAP, ASFIS, FAO Major Areas for Statistical Purposes: for compiling capture and aquaculture production statistics

When establishing new regional fishery bodies, FAO Major Areas often becomes a basis to determine the scope of their jurisdiction

ISSCFG may be used for fishing gears or fishing effort

As for ISSCFG, this classification was initially designed to improve the compilation of harmonized catch and effort data through questionnaires and fish stock assessment exercises. However, it has also proven to be very useful for fisheries technology and training fishermen. In particular, it has been used as a reference in works dealing with the theory and construction of gear and for preparing specialized catalogues on artisanal and industrial fishing methods.

ISSCFV is used for fleet statistics.

The ISSCFV for vessel type was initially designed to promote the harmonized compilation of fleet statistics, and was defined strictly on the basis of the shape and structure of vessels. However, there is substantial confusion in using this classification, partly due to difficulties in distinguishing vessel structure from the fishing methods or gear used by these vessels, and partly because the multipurpose nature of vessel structures has increased. In principle, the use of the ISSCFG is recommended to describe fishing methods.

The ISSCFC is used for the production and trade of fishery commodities.

ANNEX IV: RECOMMENDED AGRICULTURAL AND CROP INDICATORS, BASIC DATA AND MET DATA

(SEE EXCEL)

ANNEX V: ADVANTAGES AND DISADVANTAGES OF CROP AREA AND PRODUCTION MEASUREMENT METHODS

CROP AREA MEASUREMENT METHODS

Farmer assessment of crop area

In this method, the farmers are asked to estimate the area of their fields. The enumerator and the farmer may visit all of the farmer's fields and estimate the surface area by visual inspection. Notably, if some plots are located far apart from each other, the farmer can declare the size of the area without necessarily having to visit the plot with the enumerator. The results of the field tests conducted in Indonesia and Rwanda show that the method can provide satisfactory estimates of parcel area for small parcel sizes. The evidence shows that the farmer assessment method is workable in countries where farmers are aware of the units of area measurement.

Advantages. This method is relatively less time-consuming and inexpensive. Farmer assessment does not require the enumerator to visit the individual plots, which is cost-effective particularly if the plots are located far away from the location of the initial interview. Furthermore, farmer assessments of crop area can serve as a baseline for imputation where objective measurements are missing.

Disadvantages. This method is highly subjective, as it depends on farmers' knowledge and experience. Furthermore, any nonstandard units of measurement used by farmers may be difficult to standardize. The farmers may also have incentives to misreport crop area for reasons such as taxation. The data analysis conducted within the World Bank's study of four African countries (Carletto et al., 2015) indicate that self-reported land areas systematically differ from GPS land measurements, and that this difference leads to biased estimates of the relationship between land and productivity and consistently low estimates of land inequality. Results from methodological experiments carried out by both the World Bank and the Global Strategy indicate that farmers tend to over report plot area for small plots, and underreport area for very large plots.

GPS Method

This is a space-based satellite navigation system that provides location and time information anywhere on Earth. 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. Initially, GPS was used to determine the location of a particular point. However, with advancements in technology, it is now capable of determining the elevation and even the area covered. As a result, GPS has become a very important tool for measuring the area under a crop, with the added advantage of requiring reduced time and labour.

Advantages. Area measurements with GPS are more rapid, time-efficient and feasible. In addition, data collected are in digital format, and thus traceable and easy to incorporate into a database. One major advantage of GPS, as with any objective measurement, is that it is immune to the potential biases linked to respondent characteristics and the use of non-standard measurement units. In three field-testing countries, the area measured by GPS was used as the gold standard for comparing other measurement methods. The World Bank study reports that the more systematic use of GPS-measured land area may result in improved agricultural statistics and a more accurate analysis of agricultural relationships.

Disadvantages. The accuracy of GPS measurements is influenced by (i) the tree canopy cover (accuracy is high with no tree canopy cover and lower with partial or dense tree canopy cover); (ii) the weather conditions (accuracy is higher under sunny conditions than under cloudy conditions); (iii) the plot size (the larger the size of the plots, the more accurate the results); and (iv) the land in hilly areas. Securing ample power supply is one of the major problems faced when using a GPS device for measurement, as is travelling to the plot to take the measurement required. As a result, data is commonly missing when plots are located in remote areas that are difficult for the enumerator to reach.

Area measurement through maps.

This method involves the preparation of orthophotography and/or high-resolution satellite imagery, and the enumerator drawing the plot boundaries directly on the map. Sometimes, the plot boundary is visible and can be easily drawn on the map. However, in most cases, enumerators use measuring tape to measure the size of the plot and, using the map scale, then draw the plot on the map. To draw plots accurately, triangulation can be used. Screening is required before the maps are digitalized. The plot area can be calculated from digitalized maps with any Geographic Information System (GIS) software.

Advantages. This method can provide complete coverage and accurate measurements if the satellite image is of high quality and up-to-date

Disadvantages. The acquisition of orthophotographs and digitized maps can be expensive, although the costs are gradually declining. To accurately determine plot area, maps must be updated on the basis of remote sensing satellite imagery, because plot boundaries may change due to the combination of two or more plots into a single plot, or a division split of one plot into two or more plots. This method also requires clear satellite imagery, which may not be possible to obtain due to weather conditions.

Tape-and-compass method.

This method, also known as the polygon method, traverse measurement, traversing, tape-and-compass, or Topofil method, is one of the most prevalent traditional methods used to measure crop area. Until GPS methods became available, it was considered the gold standard for crop area estimation, in view of its potential to provide accurate area figures. Where the plots are of a regular shape, the method involves measuring the length of each side and the angle of each corner using a measuring tape and a compass. The plot's surface area can then be calculated using trigonometry. For irregularly shaped plots, an approximate polygon with straight sides is obtained by demarcating its vertices on the ground. Due care is taken to balance the protruding pieces left out from the process by including other small pieces that are not part of the plot. During the give-and-take process and the measurement process, errors are introduced. If the polygon does not close and the closing error exceeds 3 percent of the polygon's perimeter, the measurement procedure should be repeated.

In this method, the boundaries of a field to be measured are first identified by use of sight poles, and taking compass bearings and measuring the length of each side of the polygon obtained.

Advantage. This method often provides accurate area measurements and can be used directly in the field when measurements are made. The closure error can be evaluated on the spot, and when the error of the measurement is considered to be too great, the process can be repeated.

Disadvantages. Obtaining area measurements through this method is laborious, time-consuming, and expensive. At least two enumerators are required for each plot.

Remote sensing and GIS.

This technology have been widely adopted to estimate crop area statistics. For this purpose, classified satellite images and land cover maps produced by photo-interpretation are useful tools. It is not recommended to directly use satellite images (in terms of pixel counting) for the area measurement or simple area measurement of polygons of a land cover map.

Initially, two broad approaches to the use of remote sensing to generate crop statistics were recognized: Direct and independent estimation that uses remote sensing data and a recognition technique to estimate the crop area in the study region and use of remote sensing data as an auxiliary variable, to help enhance the precision of the estimates based on ground surveys and reduce the amount of field data to be collected, if the precision to be reached has been fixed; if the sample size is fixed, this approach provides more precise estimates.

Advantages. This method provides quick crop area estimates covering a vast geographical area. It is also useful for obtaining estimates of areas in hilly terrains and in areas that are inaccessible.

Disadvantages. The method is expensive. There may be problems in obtaining estimates for areas under cloud cover. The area estimates may not be accurate for small plots. However, the method may be satisfactorily used to determine plot area in countries where plots tend to be very large (e.g. the United States).

Visual Adjustments of crop proportions

Most applicable where the secondary crop, eg beans, is scattered in the field occupied by the main crop (eg maize)

Divide the plot size proportionally between the crops planted in the mixture with a view to "adjusting" the area of each crop to pure stand estimations. Consider, for example, a plot of 0.5 ha intercropped with maize and beans, whereby beans take up about 30 percent and maize take up 70 percent of the plot area (% estimate based on visual observation of how the crop occupies the field). The adjusted areas for beans and maize would be 0.15 ha (0.5X 0.3) and 0.35 ha (0.5 X 0.7), respectively.

Use of seed rates

This is most applicable where the farmer used the correct seeding rate (amount of seed per unit area) for each crop planted together. For example, beans mixed with maize; farmer planted 18 kg of beans seed. The recommended beans seed rate is 50 Kg per ha. Hence area to be occupied by 18 kg seed is 0.36 ha or 0.88 acres.

Use of fixed ratios

This is applicable where the secondary crop is planted using same spacing as that of the main crop, which has been planted with correct spacing (eg beans planted in same hole with maize planted at 75 cm X 30 cm)). Example: Suppose plot of 2 ha has maize planted to correct spacing and beans planted in same hole with maize, what is the actual area of plot occupied with beans?

The spacing of beans in this case is 75 cm X 30 cm or 0.225 M^2 (same as maize spacing). But ideal beans spacing is 45 cm X 15 cm or 0.0675 M^2. The ratio of land space occupied by beans inside the maize to ideal beans planted on pure stand is thus 0.225: 0.0675, or 22.5: 6.75. So, if 22.5 of the ratio occupies 2 ha, then 6.75 of the ratio should occupy 0.6 ha, which is the real area occupied by beans.

But suppose beans was planted in rows between maize rows with smaller spacing, eg 75 cm x 20 cm, then the new ration would be 0.15: 0.675, or 15: 6.75. This new ration gives actual area occupied by beans as 0.9 ha.

2. CROP PRODUCTION MEASUREMENT METHODS

2.1 Whole plot harvest.

This method is employed in detailed farm surveys and in demonstration plots. This method is regarded as the absolute standard for crop production estimation, especially if applied together with the farmer.

Advantages The main advantage is that it is almost bias-free, as all sources of upward bias reported for crop cuts can be eliminated when the whole field is harvested. This method is suitable for small-scale investigations of a case-study nature. Complete harvesting generates more accurate data than crop cuts, because the bias from within-field variability which is commonly 40 to 60 percent of total yield variability is eliminated.

Disadvantages. The main drawback of the method is that it involves a large volume of work, making it unsuitable for moderate and large sample sizes or multiple crop studies.

2.2 Crop cut method.

The crop cut method was developed for estimating crop yield on the basis of the sampling of small subplots within cultivated fields. It was created by pioneers in the field of sampling and survey design. The method involves the random demarcation of a plot of a specified size and shape, harvesting the produce from the plot, and threshing, winnowing and drying the produce to determine its dry weight.

Advantages. Since being endorsed by FAO in the 1950s, the crop cut method has been commonly regarded as the most reliable and objective method for estimating crop production/yield. A sufficient number of cuts in a sufficient number of fields provides a valid estimate of average yield. Another advantage of the crop cut method is that the productivity of parcels, sub parcels or fields can be determined without knowledge of their size.

Disadvantages. The crop cut method measures the biological yield, which does not necessarily take into account harvest losses and therefore does not reflect the economic yield that is of use to the farmer or planner. However, certain countries, such as the United States, take into account harvest loss at the time of crop cutting. Obtaining yield estimation through crop cuts is both time consuming and labour intensive. To facilitate fieldwork and reduce costs and time required, a clustered sampling procedure is usually applied when crop cuts are used for larger-scale surveys. The results of all of the field tests show that this method tends to overestimate field production.

2.3 Farmer recall.

This method of post-harvest estimation is commonly performed at the farmer's house or at the site where the harvest is stored, for the enumerator to cross-check the estimates with the available storage capacity. Depending on rainfall distribution, the recall period may range from six months or one season to three years, or three to six seasons. The method has the potential to provide accurate estimates of crop production in countries that have achieved higher levels of mechanization, commercialization and record keeping. It is useful where farmers are literate and knowledgeable.

Advantages The method is simple, the data are quickly available, and is less expensive to implement. The method can be used as an auxiliary variable in crop yield estimation.

Disadvantages. The method is subjective and likely to yield inaccurate data if the recall period is very long. It is useful for determining crop production. Therefore, the availability of accurate estimates of crop area is a prerequisite for determining crop yield. Some of the method's shortcomings are (i) ignorance of in-kind payments; (ii) non-standard harvest units; (iii) intentional over- or underreporting; (iv) low accuracy with longer recall periods; (v) historical average production factors; (vi) poor quality responses in lengthy interviews; (vii) insufficient supervision; and (viii) illiteracy, especially in African countries, which results in inaccurate responses.

2.4 Farmer prediction.

This method of pre-harvest estimation is commonly performed on a plot-by-plot basis, and both the enumerator and the farmer are in visual contact with the growing crop. The method is useful when it is used to predict crop production 15 days before harvest. The results of the field test conducted in Indonesia reveal that the farmer prediction method exhibits a high correlation with the CCE and sampling of harvest unit methods. The method is useful where farmers are literate and knowledgeable.

Advantages. The use of farmer prediction is not particularly laborious. In comparison to the crop cut method, farmer estimation is less costly and faster to carry out. Consequently, farmers' estimations with the same resources allow for a larger number of yield estimates to be collected, than do crop cuts. This method is a valuable source of auxiliary information if problems are encountered in crop yield estimation.

Disadvantages. Some of the method's shortcomings are: (i) use of non-standard harvest units; (ii) intentional over- or underreporting; (iii) use of historical average production factors; (iv) poor quality responses in lengthy interviews; (v) insufficient supervision; and (vi) illiteracy, especially in African countries, which results in inaccurate responses. Several studies indicate that the use of farmers' estimates is affected by the bias in estimation. The use of this method as a source of auxiliary variables for crop yield estimation lacks consistency, as evident from the field test results. Furthermore, farmers are only capable of predicting the crop produce in local units; this requires local units to be converted into standard units.

2.5 Expert assessment.

Experts that have extensive experience with crops, such as extension staff, field technicians or subject matter experts, can estimate crop yield by either visually assessing the field or by estimating yield, combining tools such as visual assessment, field measurements, and empirical formulas. This technique provides an estimate of biological yield. The method could not be tested in the field-testing countries. However, the results of the field test in Rwanda revealed that the method of enumerator assessment of crop produce has the potential to provide satisfactory estimates of crop yield. Similarly, the results in Jamaica revealed a promising performance of the method of farmer assessment (by eye estimate) of crop produce on the day of harvest.

Advantages. It can be applied on a relatively large scale, compared to the crop-cut and farmer estimation methods; in addition, it does not require area estimation and eliminates a source of potential bias. Other important advantages are that one team of experts can be used throughout a study, which results in a similar bias for all yield estimation (Rozelle, 1991), and it is cheaper to implement than other methods.

Disadvantages. Eye estimations of crop yield require not only practical but also technical familiarity with the yield potential of different varieties of a crop and their relative performance in different environments. The

accuracy of the yield assessment, therefore, strongly depends on the expert's level of expertise. When assessments are made by extension officers, yield estimation may be biased upward, especially if the assessments are made in their own work area and the information collected thus pertains to the quality of their own work. In contrast, Bradbury (1996b) reported that yield estimates by means of expert judgment in Europe were generally considered to be biased downward. Considering that a national survey or an agricultural census requires yield estimates of a large range of crops, it is difficult to identify experts that possess the practical and technical expertise required to provide accurate estimations across all crops.

2.6 Crop diary and crop diary with telephone calls.

In this method, diaries are given to farmers for recording the crop produce on a continuous basis. In the method of crop diary with telephone calls, in addition to the crop diary, the enumerator makes two telephone calls per week to ensure that the farmers properly make the recordings in the diary. The crop diary method is useful to capture produce from crops with extended harvest periods, such as cassava, banana and sweet potato, because farmers may encounter problems in remembering the amounts harvested over time for one or several plots. The method was extensively used in the Living Standard Measurement Study (LSMS) in Zanzibar, Tanzania under the Measuring Cassava Productivity (MCP) study.

Advantages. The method is cost-effective and provides reliable yield estimates of crops with an extended period of harvest.

Disadvantages Illiterate farmers may find it difficult to fill the diary.

2.7 Crop cards.

The crop card method is a refined version of the farmer recall method. It also estimates the economic yield. The method was evolved to obtain more reliable yield estimates of crops with an extended period of harvest, e.g. cassava, banana and sweet potato, because farmers may have difficulties remembering the amounts they harvested over time for one or several plots. Under this method, each farmer in the survey is given a set of crop cards by a Crop Card Monitor (CCM) and receives training on how to use them to record the quantity that the farmer harvested in local harvesting units after each harvest operation. The CCM is expected to visit each farmer on a regular basis, to monitor the farmers' recordings and to correct any problems the farmer may have. Then, after a certain period, the CCM collects all cards for processing.

This method was tested in Uganda during the Uganda National Household Survey of 2005-2006 and was compared with farmer recall estimates. Further, using the data collected for UNHS 2005-2006, Carletto et al. (2010) showed that crop card production estimates were 40 to 60 percent lower than the farmer recall production estimates for both crops with an extended harvest time (cassava and banana) and for other crops (maize and beans). This was in line with the findings of Sempungu (2010), who, using the same data set, found that cassava and sweet potato yield estimates from the crop card method were, respectively, 30 and 46 percent lower than those obtained from farmer recall. The above studies suggested, first, that farmers were either seriously overestimating crop production during the recall exercise or underestimating crop production with the crop card method and, second, that the upward or downward bias that resulted does not seem to depend on the type of crop. This contradicts the assumption that farmers have difficulties in accurately recalling multiple harvests of crops over an extended harvest period.

Advantages This method provides more reliable yield estimates of crops with an extended period of harvest than the farmer recall method, as farmers find it difficult to remember the amounts, they harvested over time for one or several plots.

Disadvantages This method presents several problems, including irregular monitoring by enumerators, illiterate farmers who are incapable of filling in the crop cards, some recordings that included crop purchases, and a very large range of observed harvest units (Ssekiboobo, 2007).

2.8 Crop modelling.

This method is widely used to estimate average biological yield in the case of smallholder farmers. Crop models vary widely in their complexity. The simplest sets of models are of empirical-statistical nature, whereas the most complex models are based on crop physiology. The former aims to find the best correlation between crop yield and environmental factors such as weather parameters (temperature, humidity, rainfall, etc.) from long-term data sets. Using the established relations, the model attempts to predict crop yield at a regional or national level on the basis of actual environmental observations, whereas crop growth models estimate crop yield as a function of physiological processes and environmental conditions.

They range from relatively simple models that take into account only basic crop physiology processes (e.g. Penman-Monteith models based on the estimation of actual evapotranspiration) to extremely complex models that estimate daily gains in biomass production by taking into account all known interactions between the environment and physiological processes (Sawasawa, 2003). The crop modelling approach is used in India for multiple season crop forecasting, utilizing weather parameters as well as parameters such as crop area and price in previous years, under the project entitled Forecasting Agricultural output using Space, Agro-meteorology and Land based observations (Parihar & Oza, 2006).

Advantages. Crop models can be used to predict crop yield in specific conditions or a range of conditions, and are an extremely useful tool in research studies exploring the impact of specific factors on average crop yield.

Disadvantages. Crop models cannot be used to predict crop yield for individual farmer fields, as this requires a far too great amount of input data.

ANNEX VI: RECOMMENDED LIVESTOCK INDICATORS, BASIC DATA AND METADATA

(SEE EXCEL)

ANNEX VII: RECOMMENDED FISHERIES INDICATORS, BASIC DATA AND METADATA

(SEE EXCEL)

ANNEX VIII: RECOMMENDED FORESTRY INDICATORS, BASIC DATA AND METADATA

SEE EXCELL

ANNEX IX: KEY STEPS AND PROCEDURES FOR CONDUCTING A CENSUS OF AGRICULTURE

In 2015, FAO published Volume 1 of the World Programme for the Census of Agriculture 2020 (WCA 2020) "Programme, concepts and definitions", the tenth decennial programme that provides guidelines for implementation of national agricultural censuses in the 2016-2025 decade. Volume 1 deals with the methodological and conceptual aspects of the census of agriculture. It also presents the different ways of conducting an agricultural census depending on available resources and national conditions. The WCA 2020 Volume 1 discusses four possible modalities for conducting an agricultural census: (i) classical approach; (ii) modular approach; (iii) the integrated census and survey programme modality; and (iv) use of registers as sources of census data. In addition to the Volume 1, FAO also issued in 2018, Volume 2 of WCA 2020 "Operational guidelines". WCA2020 Volume 2 deals with the practical steps involved in actually conducting an agricultural census in the field.

This Annex presents basic principles for planning and carrying out an agricultural census based on the FAO Guidelines for census of Agriculture, WCA 2020, Volume 2 "Operational guidelines). The Annex only provides a summary of selected key steps to be checked when carrying out a census of agriculture. For more details, EAC-PS should consult the FAO World programme for the Census of Agriculture, 2020, Volume 2: Operational Guidelines (FAO ..).

1.0 OVERVIEW

The census of agriculture is defined as a statistical operation for collecting, processing

and disseminating data on the **structure** of agriculture, covering the whole or a significant part of a country. Structural information are those that give broad, general features of agriculture focusing on items that do not change rapidly with time, such as total number of farming households by various administrative levels, total number and average sizes of holdings; types of enterprises and main proposes of production; general land use in the country: sizes of land used, idle land, etc. Unlike surveys that focus on items that change rapidly with time, the items under census of agriculture change slowly. In this regard, most countries conduct census within 5 to 10 years cycle. Census is the only statistical programme that produces structural information on agricultural holdings at the lowest geographical and administrative levels and, therefore, it is an essential source of information for government officials and other stakeholders.

The census of agriculture should not be carried out in isolation, but as a component of an integrated system of agricultural censuses and surveys. This integrated system must be a constituent of the national statistics system and aligned with a well-designed National Strategy for the Development of Statistics (NSDS).

The FAO World Programme for the Census of Agriculture supports and guides countries in carrying out national agricultural censuses. Currently, FAO is running the 10-year round of censuses that started in 2016 and will end by 2025. The FAO WCA Operational Guidelines (Volume 2 of WCA 2020) is a revised and updated edition of "Conducting Agricultural Censuses and Surveys," first published by FAO in 1996. The revision takes into account the new census programme and methodology, as well as the substantial technological changes over the last two decades. Some of the technological changes include the availability of digital, mobile, and more affordable tools for data capture, geo-positioning, remote sensing imaging, digital archiving, and online dissemination that can provide new cost-effective alternatives to traditional ways of conducting the agricultural census. EAC-PS should follow and use the WCA 2020 guidelines, particulary the use of modern technology such as the Computer Assisted Personal Interview (CAPI) as much as possible during census data collection and processing.

The following sections provide relevant extracts of FAO Operational Guidelines on some key steps involved in conducting a census of agriculture.

2.0 PLANNING PHASE AND BUDGETING

A census of agriculture is one of the most complicated and extensive statistical activities, consisting of a complex series of interrelated processes. To ensure that the diverse census' operations occur in a proper sequence and in a timely manner, the entire census and its various component steps must be planned carefully in advance.

The implementation of an agricultural census is also a resource-intensive operation for countries and there is growing pressure on national statistical offices to use the most cost-effective strategies to collect data. The aim of the planning process is to ensure not only that each phase is properly resourced and organized but also that the output of each phase is of sufficient quality for all subsequent phases and that all dependencies between the different phases are identified. The level of complexity of the planned census modality should be carefully considered.

Inadequate planning and/or underestimating the financial requirements are the basic reasons for serious problems in census operations. It is very important for the census managers to be aware of the time and resource requirements for this operation and to make realistic estimates when preparing the work plan and budget. Time is an essential dimension that should never be neglected and even for a census in a small country, at least two to three years is required from the initial planning and preparatory work to the dissemination of the final census results.

2.1 Census Concept note

The first task is for the census team to prepare a detailed concept note or justification for conducting the census of agriculture. The census concept note should justify the importance of the census; which for the data users include:To support and contribute to evidence-based agricultural planning and policy-making. The census information is essential, for example, to monitor the performance of a policy or programme; to provide data to facilitate research, investment and business decisions both in the public and private sector; to contribute to monitoring environmental changes and evaluating the impact of agricultural practices on the environment such as tillage practices, crop rotation or sources of greenhouse gas (GHG) emissions;to provide relevant data on work inputs and main work activities, as well as on the labour force in the agriculture sector;

to provide an important information base for monitoring some key indicators of the Sustainable Development Goals (SDGs), in particular those goals related to food security in agricultural holdings, the role of women in agricultural activities and rural poverty; to provide baseline data both at the national and small administrative and geographical levels for formulating, monitoring and evaluating programmes and projects interventions; to provide essential information on subsistence agriculture and for the estimation of then on-observed economy, which plays an important role in the compilation of the national accounts and the economic accounts for agriculture.

For the data producers the need for the census of agriculture include: to provide a reliable benchmark for reconciling and improving current crop and livestock statistics; to provide frames for sample surveys in the agricultural survey programme, as well as information for building the Master Sampling Frame; to support the establishment or update of the statistical farm register.

Censuses do not follow a uniform pattern but certain major elements must be taken into account. Overall, the census work should be undertaken as a single project comprising a series of project phases and steps. In general, census operations can be divided into five main phases: (i) preparatory work and testing; (ii) enumeration; (iii) data processing and building of databases; (iv) evaluation of the results; (v) analysis, dissemination of census results and archiving. Each phase should be further broken down into appropriate activities and similarly each activity is broken down into tasks. However, given the size and complexity of the census, it can be divided into a series of inter-related sub-projects that are dependent on one another, for example mapping and data processing can be considered a subproject, taking into account their specialized nature of work in terms of the required skills, technology and methodology used.

In planning the agricultural census, countries should be realistic about what can be done within available budgets and staff resources, and ensure that activities are done well. In countries with limited statistical capacity and experience, the national government may ask for technical assistance, together with external financial support. Such technical assistance in preparing and implementing an agricultural census constitutes an important dimension of the collaboration with the FAO.

A detailed workplan should be one of the key aspects of the Concept note. The work plan (timetable) indicates the sequence and estimated duration of each of the component operations of the census. At the early stages of census planning, a provisional work plan of selected milestones should be prepared as an overall framework for the census. A good starting point would be to look at the previous census work plan, or (if this is not the case) to similar operations (like economic or population and housing censuses). The time dedicated to each task in the past should be looked at and adjusted for known changes and new working assumptions for the upcoming census. The provisional work plan should be shared with stakeholders in advance for advice and support. It should be revised and made more detailed as planning proceeds, with the aim of establishing final dates as soon as practicable.

The census work plan is usually presented as a chart identifying all the key census activities grouped into census phases or steps. The activities can then be further broken down into tasks to establish resource estimates and responsibilities and to confirm dependencies and timing of interrelated tasks. The workplan should define the detailed activities in a logical sequence and including staffing and resource estimates for each phase of the census process. Budget estimates, staffing requirements, equipment and supply needs will all be derived from the work plan and planning and monitoring will be based on it. The workplan should be built with a realistic time schedule for each activity in chronological sequence and show the relationship between the various phases of the operation.

2.2 Budget and expenditure control planning

An agricultural census budget should be prepared covering all census phases from the preparatory work to publication of results. The budget should show, for each fiscal year, permanent and temporary personnel required, salaries and wages, travel costs and expenditures for acquisition and operation of machinery, stationery and other supplies, and office space, communications, transport etc. with provision made for unforeseen expenses. The agency legally responsible for executing the census should be empowered to reallocate resources in case of unforeseen difficulties, especially during data collection and data processing.

The budget for data collection, processing and dissemination should show the volume of work to be performed, performance rates and measurable costs of all activities in the work programme. The budget should be reviewed periodically and work accomplishments compared to budget expenditures. Corrective action should be taken when necessary.

Some countries have been forced to delay or even cancel a census because of funding constraints. Countries that have been able to secure partial funds or secure funds but at a late stage of their census preparation can be forced to compromise their data collection, data processing and dissemination of census results because of the shortage of funds. It is therefore recommended that all census operations, including planning, cartography, enumeration, processing, Post-enumeration Survey, analysis and dissemination, be budgeted from the beginning and efforts made to mobilize the required funds.

The components and estimation of a census budget

All costs should be specifically identified and cover each of the three major census phases:

(i) **Pre-enumeration phase**: covering preparatory work, such as: consultation with data users, frame preparation and obtaining/purchasing of required cartographic material, aerial Orto photographs, satellite imagery; development of the publicity strategy/programme and its implementation; number and employment period of each type of central census office personnel (including training needs); information and communication technology costs, including purchase and/or rental of equipment, software, system development and maintenance; purchase and/or rental of transport and other technical material, equipment and supplies, etc.; rental of offices for census staff; development, field testing and printing of questionnaires (when PAPI is used) and/or of other census documents and their distribution to the field staff; procurement of mobile devices (when CAPI is used), other kits and tools for field data collection, and their distribution to the field staff; conducting pre-tests and pilot census.

(ii) **Enumeration phase**: should consider estimates for: recruitment and training of field staff; number and employment period of each type of census field staff (including training needs); field supervision costs, internet connection fees (especially when CAPI is used); telephone/communication cost, including phone calls between enumerators and supervisors; shipment of completed questionnaires and other census documents to the respective provincial offices or central office; transportation cost, etc.

(ii) Post-enumeration period: The cost estimates should reflect estimates for: Post-enumeration Survey (if considered); number and employment period of each type of census personnel involved in receiving and controlling the questionnaires and other census documents; all steps/stages of data processing (manual editing,

data coding, entry, editing, validation and tabulation); analysis, evaluation, dissemination and archiving of micro-data and census results (printed and electronic publications; dissemination events, etc.).

The budget should have built in some contingency allowance for inflation and unexpected expenses, such as higher transportation costs because of the increase in fuel prices or a larger number of enumeration units than initially estimated. In some cases, a contingency account may be needed to cover the costs of repeated field data collection in selected areas, where the quality of fieldwork was inadequate.

Outsourcing of census activities: As a general rule, core census activities, such as preparation of census frame, design and piloting of questionnaires and instruction manuals, census enumeration/data collection, preparation of census reports, dissemination of census results and archiving, should not be outsourced. If, for some reason, some of these core activities need to be outsourced, then it is essential that the strategic control of such activities should firmly be with the census national census agency at all times. In general, some of the agricultural census activities that may be considered for outsourcing include: cartography and mapping; communication and publicity campaign; layout and printing of census questionnaires, other census material; census publications and other dissemination products; information and communication technology systems development for data collection, processing and dissemination; scanning/data entry.

Establishing effective Census budget and expenditure control system: The central census office (CCO) needs to ensure that the census work is done transparently without any scandal or complaints. In general, any reports of financial management is likely to affect the credibility and acceptability of the census results. The CCO should establish a strong financial and administration unit to ensure that all the finances and procurement work is done in line with the country's financial and procurement regulations. Effective financial management will prompt release of the financial allocations for the census work, and a clean outcome from a financial audit adds credibility to the census process so that the government and civil society are more likely to accept the final result.

2.3 Census Legal framework

Census legislation is one of the key aspects to be considered when starting to plan the census of agriculture, since it constitutes one of the most important instruments for facilitating the census work. Agricultural censuses, like other comprehensive statistical operations, entail major commitments, especially of resources, and it is essential that adequate and timely legislative provision be made for their preparation and conduct. Legal basis for the census is required for assigning the right department that should be responsible for conducting the census; making provision for the necessary funds, determining the general scope and timing of the census, defining the obligations to respect confidentiality of the respondents' data, enforcing obligation of respondents to provide accurate data to the best of their knowledge, etc. The existence of an appropriate legal framework is one of the key conditions for the successful implementation of the census of agriculture. If a country lacks an appropriate legal framework for taking periodic censuses, it is important to act early to establish it.

In the process of development or updating of the census legislation, subject matter specialists from the census executing authority should work closely with administrative officers and legal experts to ensure the coherence of census acts with other relevant legislation.

In general, the census legal framework should address the following issues: scope and coverage of the census;

the responsible agency and responsibilities of the agency for the census; frequency of the census and time reference; administrative and financial provisions;rights and obligations of the public with respect to the census;

confidentiality of information; identification, obligations and rights of enumerators and other census staff;

access to administrative data sources; census data dissemination; sanctions: which spell out the penalties that census officials 9after taking legal oath) will suffer if they do not follow the legal provisions (eg disobeying confidentiality); or what the respondents will suffer if they fail to answer census question or sabotage the census work.

2.4 Census Institutional Framework

The main responsibility for the adequate preparation and implementation of the agricultural census normally rests with the census agency and this is commonly specified in the primary census legislation. However, success depends on the support and assistance of other ministries and public agencies at various stages of the work. In these circumstances, establishing between the various agencies is paramount. However, this is sometimes difficult because each agency may have a different mandate regarding the purpose, scope and timing of its work. Managing an agricultural census entails working in a multi-institutional environment, involving many people with little or even no experience in census taking. In addition, it entails long project timelines within which there may be turnover of key personnel and also a geographic spread that covers the entire country. It requires the cooperation and collaboration of a range of organizations, both public and private. Therefore, strong political support and establishing an efficient coordination between the census agency and other agencies are essential.

Foremost, the agency responsible for conducting census should establish a permanent central census office. Such an office assures continuity in census work and is the principal centre for the formulation of the programme and the initiation of preparatory work for the next census. Along with this, an inter-ministerial Steering Committee is considered essential to guide and coordinate all census activities. Other national and subnational bodies and committees should also be created. Such formal structures may be composed of representatives of central and subnational public agencies, farmers' associations, other agriculture and food organizations, nongovernmental organizations, academia, etc.

In some cases, the country may establish a census advisory board. The main role of the board is advising the central census office on technical aspects of census operation. The members of such boards could be experts on agriculture, agricultural statistics, sample design, information technology, representatives of important users segments, such as those involved in analytical studies of the agricultural and rural development of the country, etc.

2.5 Census Communication and publicity

The main aim of census communication and publicity is to sensitize the public about the purpose of the census of agriculture and, ultimately, to ensure the cooperation of the households, target respondents and other stakeholders to provide complete and accurate data. This is an essential part of the census preparations and has to be planned in good time, taking into account local conditions. Experience shows that inadequately informed and hence uncooperative citizens may jeopardize the entire census.

The national census committee should set up a census communication and publicity unit headed by a communication expert. The scope and coverage of the census should be clearly explained in the national and local press to familiarize people with the type of questions to be asked. The publicity programme should explain the uses to which the data will be put, particularly for development planning and formulation of agricultural policies; making the census meaningful to people, and highlighting, in particular, the possible benefits to farmers, thus establishing confidence between people and census authorities. The confidential treatment of

data collected and the need for accurate replies should also be emphasized. Included in the publicity is a special need to stress women's involvement both as holders and in holding operations and the importance of their support in participating in the census.

The best means of achieving effective publicity will vary from country to country. In many countries, regular press releases, radio interviews, television, mobile shows and posters are used as means of publicity. In others, the publicity may target local religious and community leaders, business associations, labour groups, women and family groups, civil society and public service organizations. School publicity programmes may be effective since schoolchildren would easily pass information to and influence their families.

The campaign team should craft a simple but powerful **census slogan** that can be repeated, printed in various media, T-shirts, etc to reinforce the purpose and significance of the census. Example: USA in 2007: Census of agriculture; your voice, your future, your responsibility; France 2010: For a complete vision of agriculture today, each one of you counts; Botswana 2015: Make a difference to the future of agriculture in Botswana.

3.0 CENSUS IMPLEMENTATION

3.1 Staff recruitment

Senior administrative and professional staff need to be highly skilled and qualified, recruited from personnel familiar with agriculture, census methods and procedures, and government work. Supervisory personnel for enumerators can be recruited or borrowed from government agencies or local sources, such as statistical and agricultural extension services and educational organizations. Such personnel need to be intimately familiar with local conditions, customs, transportation systems, dialects and other relevant facts. Effective enumerators should be recruited independent of sex; but in some societies it may be necessary to use female enumerators to interview female holders.

Enumerators are best recruited from the localities in which they will work. They should undergo simple tests designed to measure their ability to read and apply instructions, understand maps, communicate easily with people, enter information on questionnaires accurately, and perform simple arithmetical operations.

Successful enumerators are tactful and resourceful in handling problems that arise when meeting and talking with holders and others; their actions and attitudes should gain the respect and confidence of those they encounter. They must be willing and able to work fulltime, without engaging in other activities, until the job has been completed. They must work carefully and diligently and always maintain required records.

3.2 Questionnaire and CAPI Design

A questionnaire is the medium for recording, in a standardized manner, the data obtained in censuses and surveys. Development of the census questionnaires is an important and exacting task in census preparation. Final data quality depends largely on the questionnaire design and the selection and training of enumerators.

Constraints during enumeration and the required format for tabulation of the data must be kept in mind when designing the questionnaire. It must use unambiguous concepts and definitions easily understood and clearly explainable by enumerators to the respondents. The questions must be simple and plainly phrased. The questionnaire aims to provide a standardized interpretation of the meaning of census items and data to be collected.

Countries are encouraged to use tablets (android phones) and use Computer Assisted Interviewing Techniques (CAPI). This will assist in immediate data transfer, minimize labour work such as data entry and ensure that data analysis and statistics release is done in time. Countries such as Kenya (2019) have been able to do 100% CAPI census (with very minimal use of paper questionnaire in the field). CAPI design require ICT experts with programming skills to design the CAPI in line with the question. Experience from Kenya on 100% CAPI during the census (2019) revealed that: (i) The county team should work with the strongest/most dominant service provider with most spread network and capacity to handle a national exercise; (ii) on the material day when all enumerators switch on their tablets (depending the total number; Kenya had about 160,000 enumerators) there is likely to be a temporary national network challenge that the service provider should strive to deal with; (iii) there is need for a strong ICT team working at the backend at both national and regional levels to respond quickly to emerging CAPI issues during the census period. (iv) there should be extra tablets available for use in case enumerator losses a tablet, or tablet malfunctions last minute.

Before the data collection tools are used in the field, they should be tested. A major objective of pretests is to ascertain deficiencies in the CAPI as well as the questionnaire and to detect any problems that the respondents may have when answering questions. Also important is testing of the time it takes to administer the questionnaire, which will have an impact on the budget.

3.3 Preparation of Tabulation plans

The tabulation is about selection of key indicators and agreement on how the results with be laid out in table (usually excel) formats. For example, to depict census results on the number of farmers growing sorghum, the census team may prepare a table with column by administration level (national, district/county/province; by place of residence (rural/urban), by size of holding (defined range of land size), by gender (male, female, intersex), etc. ideally, for each set of question being asked, there should be a tabulation plan indicating the significance of the data to be collected.

The design of the questionnaire crucially affects the tabulation plans. Experience shows that often data are recorded on the questionnaire in such a way that they cannot be readily extracted for processing and tabulation, involving extra expense in time and resources. Countries are recommended, therefore, to prepare the tabulation plans concurrently with the final stages of questionnaire design.

It is necessary, during initial consideration of the tabulation programme, to decide upon the number of tabulations to be produced at various levels of aggregation according to administrative units and agro-ecological zones.

3.4 Cartographic preparation

Enumerating all, or a large sample of, agricultural holdings in a country, without omission or duplication, in a short period of time, requires utmost attention to all the details. The work of the Cartographic team is to map out and create all the Enumeration Areas (AS) boundaries. The exact delineation of each EA is a tedious job that should commence in time. Once developed, each enumerator should be provided with a physical map of the EA, and training done on how they can identify the EA boundaries. It is also possible to have the EA maps in the CAPI (tablets). In addition, supervisors and local offices should have copies of these maps for their respective enumeration areas. The census cartographic team should investigate availability of cartographic resources at an early stage of census planning. If the country does not have cartographic unit, then this should be outsourced.

The sources of the maps used for creation of the EAs may include administrative maps, topographic charts, aerial photographs or satellite images.

Where maps, satellite imagery, or aerial photographs are not available and the agricultural census is undertaken on a sample enumeration basis, a complete list of villages or other identifiable geographic units should be prepared in advance. The list should include, as far as possible, complementary data on size of villages or units such as agricultural population or people engaged in agriculture, population of ethnic groups, total area and agricultural land area, main crops and agricultural practices, and facilities including water availability for irrigation and agricultural machinery. These data are useful for stratification purposes which will improve the efficiency of the sample design.During mapping of the EAs, the cartography team should work closely with village elders who have knowledge of the boundaries.

Omissions in the list of holdings require special supervisory attention. In many countries, significant listing errors result from difficulties in identifying households along the enumeration area borders. If the EAC map or locality (Village) sketch map does not clearly distinguish the EA boundaries by natural features, the supervisor, with help of village elder, should check carefully the accuracy of listings on the enumeration area perimeter.

3.5 Preparation of an up to data sampling frame with the Holding list

The listing of all holdings within each enumeration area is another important and difficult agricultural census operation. This refers to screening the entire population (all households) within the area with a short questionnaire requesting information on: (i) whether the household practices agriculture; and if so (ii) the types of enterprises kept and the area cultivated (or number of trees, for perennial tree crops that may be grown in scattered forms), types of animals kept, their numbers and ownership in order to arrive at the list of agricultural holdings to be enumerated. Due to changing nature of agriculture, previous list of holdings (say from last census or survey) as well as other list of holders that may be found at administrative offices are frequently incomplete and out of date and unsuitable for census enumeration. Some countries lacking the above sources may have to prepare for each selected enumeration area a new listing of households and holders within households in order to identify the holdings.

3.6 Preparation of Instructions and training manuals

The census technical team should strive to prepare census instruction and training manuals to support extensive training of the census enumerators. The training manuals should be prepared by experts in each thematic areas of the and ensure the standard procedures, and common understanding of tasks are achieved during the enumeration. Instruction manuals and enumerator training programmes are essential because census data quality depends primarily upon the enumerators. There is a risk that all efforts and investments made for the census will fail if adequate training is not given. Instruction manuals should contain detailed explanations of procedures for conducting the enumeration, interview techniques, guidance on how to handle major and frequently encountered problems (such as uncooperative holders), and examples of properly completed questionnaires. Preparation of these instruction manuals is a high priority task and should be the responsibility of persons with a thorough knowledge of census design, holders' characteristics and interviewing techniques and with wide experience in preparing such manuals.

3.7 Recruitment and training of Enumerators

Regional /sub-national committees or offices should be allowed to recruit enumerators at local level, who understand local culture and can, if possible, speak local language. Due to unavoidable possibilities such as one

becoming ill last minute or refusing to report last minute, it is usually useful to have contingency enumerators who should on standby. Sometimes during actual work, one enumerator may have certain challenges such as being very slow. In which case the spare enumerators can be deployed to assist. The enumerator should have right qualifications: ability to read and write, use CAPI and speak local language. Training of enumerators is usually done at cascaded level, with national trainers training regional/provincial trainers, who in term train lower level enumerators. Training venues should be identified and secured in time. At local level, many are done in schools or local church/ mosque facilities.

The venue should have basic facilities, security and means to provide snacks/ meals. During enumerator training, the following items should be covered and explained fully:

Terms of Reference

detailed job description and the terms of employment, clear agreement on payment terms and funds will be disbursed; the scope of responsibility carried by the enumerator; how to identify and deal with holders and their families (including overcoming sex-stereotyping);taking legal oath and the importance of confidentiality of data.

The management and conduct of the census: details of data to be collected; details of how the census is organized, the management, supervision and logistics of the operation; when and how the census is to be taken.

Definitions and procedures (including extensive practice field work):definitions and concepts; introductions and making appointments; from whom to obtain data; techniques for conducting a good interview; completing questionnaires; checking questionnaires; calling back to obtain missing data and ensure coverage; cover coming community resistance and holders' objections to responding; use of interpreters; how to take objective measurements (if relevant).Administrative instructions: time management and hours of work; Personal conduct such as dressing, misbehavior (eg drinking while working),Actions to be taken when absences from work are unavoidable or not cooperating; pay and allowances; arrangements for supervision and contact on other administrative matters;record keeping required on time and attendance.

3.8 Recruitment and training of supervisors

Like enumerators, supervisors should also be appointed at regional or district levels and trained through the prepared manual. In view of their important role, supervisors should be selected preferably among candidates having field experience in similar activities and undergo an intensive training programme combined with field work. In addition, the supervisors should have extra training on how to supervise work and manage the enumerators.

The supervisors' work in overseeing enumerators' work and assisting them to solve problems encountered is essential to the census success. The supervisor's presence and inspection of enumerators' work helps prevent carelessness, and facilitates error detection and correction while enumeration is in progress. Supervisors should encourage enumerators to perform acceptable work, ensure they complete work assignments on time and help enumerators to promote holders' cooperation.

Supervisors should follow and record enumeration progress, and take appropriate action when work is not performed in accordance with instructions or according to a prescribed time schedule. The best supervision is achieved by constantly working in the field with enumerators. The supervisor should be present at several initial intervals, to detect deficiencies and take immediate remedial action. Subsequent regular visits should be organized to observe at least one interview and inspect a sample of completed questionnaires for completeness

and internal consistency. When the enumerator has completed one work phase in a locality, the supervisor must review the enumerator's work, ensuring that all households have been accounted for, all holders interviewed and all questionnaires properly completed. Omissions must be detected and visited and unsatisfactory interviews may need to be repeated, if necessary, with the supervisor's assistance.

This supervisors training programme should include the full training course provided to enumerators. In addition, supplementary training on the following subjects specific for the work of supervisors:

General Supervisory work: supervisor's responsibilities and role within the census management; how to read and check area maps; how household or holder lists are prepared and used; organization of field editing and aggregating completed questionnaires; periodic progress reporting. Supervision of enumerators: recruiting and selecting enumerators; conducting training sessions for enumerators; observing the enumerator at work;

reviewing questionnaires and other records prepared by enumerators; recording and making periodic appraisal of enumerators' work; handling special problems encountered by enumerators; taking action required to replace enumerators; taking appropriate action when work is not completed satisfactorily; handling cases of community resistance or holders' refusal or unwillingness to provide required data.

3.9 Pretesting and pilot of the census

Pretesting involves the census team working in small groups or role models to administer the questionnaire and CAPI, to see the flow, time taken, challenges in entering and saving data, etc. if the census team is working closely to a village, they may get out to a nearest farm and test the questionnaire and CAPI. Pre-testing is therefore mainly to ensure that the questionnaire and CAPI are well designed.

Apart from pre-testing, there is need for census piloting. This involves selecting (purposely) some representative EAs and enumerating a very limited number of holdings as if it was a real case. The purpose of the pilot is to collect evidence, through interviews and/or objective measurement techniques, of the adequacy of various census procedures. Piloting of the alternative census methodologies, the questionnaire, and enumerators' instructions are vital and no census should be undertaken without it. Piloting must be performed exactly as prescribed for the main census enumeration. Some purposes of pretesting are to: Provide evidence on the adequacy of time allocated for each part of the census programme. Indicate the questions, definitions and procedures not fully understood by enumerators, Measure how well enumerators perform their duties after training, Measure enumerators' ability to communicate to holders census objectives and content, Measure holders' abilities to provide qualitative and quantitative answers. Indicate which questions holders do not fully understand, identify questions the answers for which are not known. Ascertain the feasibility of complete enumeration or using the size of sample chose, Estimate time required for various activities to be carried out by enumerators, Help chose between complete enumeration and sampling, or a combination of both and Provide sample data required for testing computer programmes and other data processing operations.

Quality control records of enumerators' activities during the pretest should be kept, preferably by supervisors or other census members who participated in the pilot even without having gone through training. Such records should include the number and type of errors made by each enumerator and the time required for each operation or part of the training programme. Summaries of time used and problems recorded during pretesting should also be prepared. These records and written suggestions from supervisors and staff members participating in the pretest provide the basis for revising the questionnaire or instructions to enumerators. A pilot census is a final test of the census programme, used to detect and correct any weakness in the programme

before the actual census or sample enumeration is conducted. If considerable changes are made in the census plans after the pilot, then a second smaller test may be required.

3.10 Census enumeration

Actual data collection, or enumeration, is the most important part of the census and usually takes the largest share of the funding (about 40% of total cost). In an agricultural census, data are mostly collected through interview and/or by mail, or questionnaire left for some respondents to fill in and submit to the census team later.

In the interview technique, the enumerator visits the holding, interviews the respondent and records the responses on the questionnaire. Interviews may be supplemented by observations or measurements carried out by the enumerator. Interviewing is the method adopted in most developing countries where postal services are not fully developed and the literacy rate is relatively low. Where a questionnaire is to be mailed or left behind to be filled in, the census team should ensure that the target respondent has adequate education level. Besides, the questionnaire should have supportive explanatory notes, and the mail should have a stamped preaddressed return envelope. Reminders may be necessary to increase response rate.

Sometimes data may have to be collected from private registered holders, institutional holdings or holdings owned by higher level government officials (such as the President on Governor), who enjoys special security. In such cases, the census team may send a special enumerator, or a supervisor to visit such private/special holdings and collect data. For such special holdings, each country must decide its own technique, based on local conditions and available resources.

4.0 CENSUS DATA PROCESSING AND DISSEMINATION

4.1 Planning for data processing

Early preparation for the census data processing is an important phase of the agricultural census requiring adequate planning and preparation. Such planning and preparation should include acquisition of hardware and software for data processing, data analytics personnel training, participation of data processing experts in questionnaire design, and developing the right CAPI prior to enumeration. Specifically, a detailed tabulation plan and instructions for manual and computer data editing should be finalized early enough to make possible an efficient organization of data processing. Since the quantity of data to be processed is large during census work, insufficient preparation may cause serious delays in obtaining the expected census results.

In modern times, use of CAPI and electronic data processing is recommended for all countries. Countries without computer facilities may need to further restrict the census scope and/or limit the number of units covered. A combination of manual and computer processing may be appropriate for a few countries. For example, a number of preliminary data processing operations, including preliminary editing of questionnaires and preparation of district or provincial totals for some important census items, may be undertaken manually by qualified field staff in each administrative district or province. However, with the rapid advances in low cost powerful small computers, each country undertaking an agricultural census should strive to obtain necessary appropriate computer capabilities.

Whereas data processing details will depend upon the equipment and software packages available for the purpose, a number of operations are common. The most important of these include:

Maintaining control of questionnaires: where data is collected manually, controls should be established to ensure that questionnaires are received from every enumeration area and every enumerator. Questionnaires should be grouped so that such controls are simple and not too time consuming. Questionnaires for large or special holdings within a region, province or district might be batched together. All questionnaires for one enumeration area covered by a single enumerator should also be batched together. Records need to be kept of the flow of batches of questionnaires through the various processing steps and should be checked periodically to detect delays, misplacement of questionnaires, etc. Please note that these are not necessary when census is 100% CAPI.

Checking for enumeration completeness - Questionnaires for large holdings must be checked against the complete list of such holdings and action should be taken to obtain missing questionnaires. Questionnaires for each enumerator must be checked against the holding list for the enumerator's area, and a satisfactory explanation sought for missing questionnaires. Adequate field organization, including supervision of enumerators' work and questionnaires received in each district and province, will appreciably reduce work in the central office.

Checking for questionnaire completeness - A visual check should be made to ensure that each questionnaire has entries in essential sections (land use, livestock, etc.). Questionnaires lacking essential entries should be referred back to the originating office for action. Questionnaires for large or special holdings should be reviewed for completeness by professional staff. Again, efficient control of field work before completed questionnaires are sent to the central office is essential. The speed and accuracy of data processing will be greatly influenced not only by the accuracy but also the legibility of the questionnaires sent in. Enumerators must be trained to write clearly.

Verifying office processing - Some verification of data processing work should be performed. Complete or sample verification of data entry and other routine operations is important. Training of processing staff must take into account the time needed by data entry operators or clerical personnel to acquire the skill and practice required in order to perform the work at relatively stable quality and acceptable error levels. Complete verification is costly and does not detect all errors, although computer editing has advanced the possibilities of such complete checks. Once a data processor produces work of satisfactory quality, verification of a sample of the work is sufficient to ensure quality standards are maintained.

When the census is based on sample enumeration, verification of the data at each process is even more important than for complete enumeration. Complete verification of data is preferred.

Computerized data processing requires various routines to have been decided in advance: precoding of questionnaire items; types of corrections to be made during questionnaire verification; coding of the data; correcting errors detected during data entry operations; and the tabulation plan. This advance work requires experienced agricultural statisticians to work with computer system analysts and programmers during the census planning operations.

Overall, the success of data processing depends on:

Making provision for the processing of census data within the overall plan for data processing built into the national statistical programme.

Preparing outlines of all statistical tables (stubs and headers) concurrently and in coordination with the preparation of the questionnaire.

Preparing computer programmes, selecting, purchasing and installing software packages for modifying (or initiating) the data system to accommodate any new census needs, including user access to census data after the basic census operation is complete, and thoroughly testing them before data collection begins.

Requiring the computer system analysts and programmers to fully document all programmes, so that they are transparent to later users.

4.2 Post enumeration data validation and cleaning

Error detection and correction by computer include measures to deal with missing and or outlier data entries which are beyond normal ranges in the values entered and data inconsistencies. Generalized edit specs and imputation algorithms can be used to impute values to replace erroneous entries. The design of data entry, editing and correction programmes should be based on a set of tests and procedures defined jointly by statisticians and data processing specialists. Caution must be exercised to ensure that these procedures do not falsify data. Parameters used for editing such as minimum and maximum acceptable values should be carefully determined, based on pilot census and/or other independent data sources in order to avoid eliminating valid entries. If missing data is insignificant, it may be preferable to tabulate them under holdings not reporting rather than imputing values. A record should be retained of the number of cases imputed or changed.

Some common types of automatic error detection include: checks for missing entries; checks for inadmissible entries (for example, age of holder below minimum specified, crop codes that do not appear on the definitive list of codes; data outside specified limits e.g. yield of specified crops);checks of totals (for example, total area reported under different land use classes should be equal to total area of holdings).

Census data processing requires time, often more than a year, to complete. Steps should be taken to obtain priority data in advance through advanced tabulation planning. In modern times, most data processing is done using laptops. The number of laptops or work stations required and compatibility with other available ITC platforms should be carefully planned. Other important factors to consider before acquiring a data analysis system include ensuring adequate software is available, ensuring service and support for the system is available, and that the power supply is sufficiently reliable to avoid the risk of damage to the computerized data files.

Despite several precautionary measures that may be taken in the course of data processing, some errors will remain and be incorporated into the census tables. The effect of these errors may be considerable, hence it is advised that in general, all tables generated during data analysis should be subjected to reviewed by technical experts before publication, to eliminate or at least minimize the effects of errors. Various methods can be used to carry out this review.

4.3 Quality checks and post enumeration surveys

Non-sampling errors may arise from numerous sources. The census frame or list of holdings may be incomplete or inaccurate; the wording of questions ambiguous or misleading; enumerators may introduce their own biases; respondents may not really know the true answer, or cannot recall the data requested, and others may consciously answer incorrectly; field work may be inadequately organized or supervised; enumerators may lack specific training or unsatisfactory standards may have been used for their selection; completed questionnaires may be lost. Specifically, the following error types commonly occur during field work and need to be kept in mind during field and office checks:

households or holdings are omitted during listing;

household, or holders are absent at time of enumeration; failure to identify all the holders in a household; failure to record data for all parcels in holdings, particularly when some parcels are located in another locality;

omissions by holder, due to lapse in memory or for other reasons; failure to obtain correct area because actual area may not be known to holder; land incorrectly identified due to misunderstanding of definition of land use;

inaccurate crop areas where mixed, associated and successive cropping methods are used; failure to report livestock which is temporarily away on public or common pastures, or in transit outside holding; failure to report use of jointly owned agricultural machinery; recording responses from respondent incorrectly on the questionnaire.

Efforts to reduce errors arising from all field work sources and data processing stages have been emphasized in the earlier sections of this chapter. One further stage may be required, namely the carrying out of sample enumerations as quality checks during or just after the main census enumeration. Statisticians have an obligation to their profession and to data users to undertake these checks. Such post-enumeration checks may represent the only serious attempt to obtain evidence of census methodology deficiencies, types of errors occurring, and magnitude of such errors. Such evidence provides a concrete basis for overall improvement in the census methods and the elimination or reduction of errors and biases.

4.4 Census Results dissemination programme

Census work, having taken huge public resources, should published with end results represented to the public, not just as a return for the public expenditure, but also as goodwill to the holders and respondents who participated in the census work. Immediately after the technical teams have finalized the census work, a planned schedule of publication of the results should be organized in order to achieve wide public reach.

A general census report, prepared by professional staff, may be issued in several volumes. The report should include, in addition to statistical tables, all information that might be useful to better understand and evaluate the data. Details of organizational and administrative aspects of the census should also be included as they may be useful in preparing and implementing future censuses. The report may also include material on objectives, legal authority and administration, scope and coverage, essential definitions, concepts and classification, assessment of reliability of results, copies of questionnaires, summary of main instructions for enumerators and supervisors, data collection methods, data processing and tabulation methods, description of administrative and agro-ecological zones used, and comparisons with statistics from prior censuses or other sources. The report should also provide all relevant sample design details where samples were used.

The dissemination programme including the publication list is as important as other components of census operations. Availability of computers and feasibility of storing primary data permit utilization of results in a variety of ways in addition to those included in main census publications. The micro data within a census file contains a wealth of information awaiting further use. Short reports with graphics of data reflecting changes in structure or new trends can be very important in exposing the value of information in the data base. The data dissemination plan should consider the need to get basic data in the hands of data users as early as possible.

When preparing the census reporting and data release schedules, the following should be kept in mind.

The priority tables should be released as soon as possible. These should include data from all holdings enumerated but with limited cross-tabulation and possibly in different volumes so that more important data

are available very early. Some datasets may be disseminated to key stakeholders using ICT micro-chips such as CDs, flash discs (USBs), etc;

additional cross-tabulations may be required, for example, making available disaggregated data to other users on demand, for special analysis;

making available facilities for the production of special tables requested by users, including provision of cross-tabulations for small areas, below the level released in the census report.

Notwithstanding the above, measures should be taken to safeguard data confidentiality, particularly when data refer to individual or small areas. Moreover, as users become more computer-literate there is a danger of excessive demands for cross-tabulations at highly disaggregated area levels which are below the level that professional statisticians would accept as valid.

ANNEX XI: OVERVIEW OF MAIN PHASES FOR CONDUCTING AGRICULTURAL SURVEYS GUIDELINES FOR EAC-PS

1.0 OVERVIEW

The food crisis that occurs in the region sharply highlights both the importance of sound agricultural policies as well as the weaknesses in agricultural information systems that hinder knowledge generation, innovation and change. Despite the importance of the agricultural sector and its critical role in meeting the SDGs and strengthening governments‟ poverty reduction and growth strategies, weaknesses in agricultural statistics persist. To address these weaknesses, it is recommended that EAC-PS undertake regular data collection operations such as annual agricultural surveys.

Detailed methodological publications and guidelines are available as references for undertaking a sample agricultural survey (examples are FAO 2018d, FAO 1989, Dillon& al 2021) that EAC-PS should consult in planning and undertaking their agricultural surveys. This annex provides an overview of the main phases for conducting an agricultural survey.

The survey should have 4 distinctive phases, namely (i) planning, (ii) survey design and preparation, (iii) Piloting of the survey and actual data collection; and (iv) Data processing, analysis and dissemination. Before starting the survey, key stakeholders should be consulted and agreement reached on how they will support the survey. In the interest of the region, Member Countries are encouraged to follow the following steps in undertaking agricultural surveys for comparability purposes and survey quality.

2.0. PLANNING PHASE

Key planning activities include the following:

2.1 Preparation of a detailed concept note to justify the survey, including: the rationale for the survey, relationship of the proposed survey to prior surveys, survey goals and objectives (including priorities within these goals and objectives), definitions of key variables and estimated budget.

2.2 Constitution of the survey committee and consultations with key stakeholders including government Ministries, Departments and Agencies, the sponsors, the potential users mainly to take care of their data needs and expectations, agree on joint implementation teams and use of resources (vehicles, manpower, technical material such as GPSs and office space across the country). Where need arises, experts may be hired to support the team especially in the field of sampling, GIS, data processing and report writing;

2.3. A review of related studies, surveys and reports from various sources to ensure that part or all of the survey are not unnecessarily duplicated and development of instruments. Design the data collection instruments in a manner that minimizes respondent burden, while maximizing data quality. The following strategies may be used to achieve these goals:

Questions are clearly written and skip patterns easily followed;

The questionnaire is simple and with reasonable length;

The questionnaire includes only items that have been shown to be successful in previous surveys or the questionnaire that has undergone pretesting;

Methods to reduce item nonresponse are adopted;

2.4. Adhering to the laws and regulations on data confidentiality and privacy; and alignment of the survey to these laws;

2.5. Use of the latest available master sampling frame and where gaps exist, these should be documented;

2.6 A consultative compilation or review of all survey data items to be collected, the justification for each item to be collected, and how each item will be collected practically. The survey concept note should assemble reasonable evidence that these items are valid and can be measured both accurately and reliably, or develop a plan for testing these items to assess their accuracy and reliability;

2.7. A plan and budget for the survey including purchasing survey materials, preparatory meetings, questionnaire development, testing, sensitization, training, data collection, report production and dissemination. A complete survey plan be developed and presented to the committee.

2.7 Conduct a pilot survey in few selected areas representing the diversity of the variables to be collected, review of the pilot and making final adjustments to the survey plan mainly to detect validity (ability to measure what it is supposed to measure or appropriateness of the instrument) of all survey items, logical flow, clarity, time and completeness;

2.8 A plan for quality assurance during each phase of the survey process to permit monitoring and assessing performance during the survey implementation. The plan should include contingencies to modify the survey procedures if design parameters appear unlikely to meet expectations. The plan should also contain general specifications for an internal project management system that identifies critical activities and key milestones of the survey that will be monitored, and the time relationships among them.

2.9. A plan for evaluating survey procedures, results and measurement error.

2.10. An analysis plan that identifies key issues to be analyzed and tabulation plan in line with the core data items agreed upon.

2.11 A dissemination plan that identifies target audiences, proposed major information products and the timing of their release.

2.12. A data management plan for the preservation of survey data, documentation and information products as well as the authorized disposition of survey records.

3.0 SURVEY DESIGN

3.1 The design of the survey should include the following: evaluation of the completeness of the sampling frame, validity, documenting related issues, dealing with response burden and response rate, data collection methods to be employed (CAPI, hard copy questionnaires etc), the frequency and timing of field visit in line with standard statistical procedures including determination of sample size, sampling procedure, target response rate, standard error and coefficient of variation. The design should be presented to the survey committee for approval and ownership.

3.2 Review of the Sampling Frame: the survey designers should ensure that the frame for the planned sample survey is appropriate for the study design and are evaluated against the target population for quality. During the sampling frame review, the following items should be considered:

At the national level, attempts should be made to improve quality and reliability of the master sampling frame. This is done by conducting periodic evaluations of coverage rates and coverage of the target population in survey frames that are used for recurring surveys, for example, at least every 5 years. Coverage rates in excess of 95 percent overall and for each major stratum are desirable. If coverage rates fall below 85 percent, the survey designers should conduct an evaluation of the potential bias. To increase coverage, consider using frame enhancements, such as frame supplementation or dual frame estimation, to increase coverage.

The manner in which the frame was constructed and the maintenance procedures; Any exclusions that have been applied to target and frame populations; Coverage issues such as alternative frames that were considered, coverage rates (an estimation of the missing units on the frame (under-coverage), and duplicates on the frame (over-coverage), multiple coverage rates if some addresses target multiple populations (such as farming households and individuals in the households who may be different farmers), what has been done to improve the coverage of the frame, and how data quality and item non-response on the frame may affect the coverage of the frame; Any estimation techniques used to improve the coverage of estimates such as post-stratification procedures; and Other limitations of the frame including the timeliness and accuracy of the frame (e.g. misclassification, eligibility etc.) be documented.

3.4 When a non-probabilistic sampling method is employed, include the following in the survey design documentation: a discussion of what options were considered and why the final design was selected, an estimate of the potential bias in the estimates, and the methodology to be used to measure estimation error. In addition, detail the selection process and demonstrate that units not in the sample are impartially excluded on objective grounds in the survey design documentation.

3.5 In case of probability sample surveys, whenever possible, construct an estimate of total mean square error in approximate terms, and evaluate accuracy of survey estimates by comparing with other information sources. If probability sampling is used, estimate sampling error; if nonprobability sampling is used, calculate the estimation error.

3.6 When possible, estimate the effects of potential non-sampling errors including measurement errors due to interviewers, respondents, instruments, and mode; nonresponse error; coverage error; and processing error.

3.7 Dealing with the challenge of Response Rates: ensure the survey is designed to achieve the highest practical rates of response, commensurate with the importance of survey uses, respondent burden, and data collection costs, to ensure that survey results are representative of the target population so that they can be used with confidence to inform decisions. Nonresponse bias analyses should be conducted when unit or item response rates or other factors suggest the potential for bias to occur. Where possible, calculate the sample survey unit response rates without substitutions. Plan for a nonresponse bias analysis if the expected unit response rate is below 80 percent.

4.0 DATA COLLECTION

4.1 Recruitment and Training of enumerators based on languages spoken: identify the key personnel to participate in the survey, e.g. enumerators, field supervisors, regional supervisors etc. Identify the major thematic areas for training and the experts who will deliver the training. Apart from the training on the technical aspects, the enumerators should also be trained on techniques for obtaining respondent cooperation and building rapport with respondents, respect for respondents' rights, follow-up skills, etc. If the training is to be cascaded at various lower levels, the survey team should arrange on how the field trainers will get backup support.

4.2 Pretesting Survey Systems: The survey team should ensure that all components of the survey will function as intended when the survey gets implemented in the full-scale. To control measurement errors, do not assume that everything will be perfect on the ground. The following should be considered during pre-testing and piloting of the survey: Test any new components of a survey using methods such as cognitive testing, focus group discussions, role play, and usability testing, prior to a field pilot of the survey system and incorporate the results/feedback from these tests into the final survey design.

The survey team should undertake a mini/pilot test that highlights the potential challenges when the survey is fully rolled out. The design of a field test should reflect realistic conditions, including those likely to pose difficulties for the survey. Elements to be tested include, for example, frame development, sample selection, questionnaire design, data collection, item feasibility, electronic data collection capabilities if it's to be used, data processing in line with the core indicators, estimation, file creation, and tabulations. Also, to be considered is the timing of data collection, the flow of interviews, security management, logistics that will be required, contingency plans for extra or replacement enumerators where necessary. After the survey pilot, the team should go back and re-design the survey, taking into account the observations and feedback from the pilot work.

4.3 Sensitization of stakeholders mainly to; Informs potential respondents that they have been selected to participate in a survey;

- Inform potential respondents about the name and nature of the survey; and
- Provide any additional information to potential respondents that the survey team will require such as call-back visit plans for the missing target respondents

Inform the country of the longitudinal (targeting same respondents of over several period of time) consider provision of some basic incentives (eg community level training, thank-you letter, public recognition or any other sustainable incentive).

4.4 Actual data collection: The survey team should note that the way data collection is administered will significantly contribute to the data quality. The following issues should be considered when collecting the data:

Agree on the best main method of data collection from the respondents. Taking into account the characteristics of the target population, the objectives of the data collection, the resources available, and time constraints, the survey team should agree on best method of data collection (e.g. hard copy questionnaires or otherwise);

Ensure that the field data collection is done at the most appropriate time of year/ season/ month/ week/ days;

Establish the data collection protocol to be followed by the field staff (eg how many respondents per day, data submission processes, how to deal with internet connectivity issues, frequency of meeting with supervisors, etc);

Set the teams to go to the field, taking into account the contingency plan for replacement enumerators, replacement of lost gadgets (eg tablets), plans to recover data that may be lost during the field work.

During data collection, implement quality and performance measurement and process control systems to monitor data collection activities and potential problems. Establish a central control team/person to receive feedback emanating from the performance measurement process. Ensure quick response to emerging challenges such as the speed of data collection and response rates, the quality and consistency of data being received, efficient disbursement of resources, among others.

Use internal reporting systems that provide timely reporting of response rates and the reasons for nonresponse throughout the data collection. These systems should be flexible enough to identify important subgroups with low response rates for more intensive follow-ups.

Where the response rates are very low and it is impossible to conduct more extensive procedures for the full sample, select a probabilistic subsample of non-respondents for the more intensive data collection method. This subsample should permit a description of non-respondents' characteristics, provide the data needed for nonresponse bias analysis, and allow for possible weight adjustments or for imputation of missing characteristics.

Determine a set of required response items to obtain when a respondent is unwilling to cooperate fully. These items may then be targeted in the nonresponse follow-up in order to meet the minimum standard for unit response. These items may also be used in a nonresponse bias analysis that compares characteristics of respondents and non-respondents using the sample data for those items. These required response items may also be used for item nonresponse imputation systems.

5.0 Data processing, analysis and dissemination

5.1. According to (FAO 2018g), data processing includes data coding, entry, editing, imputation, validation and tabulation. Data processing depends on the country's capacity in terms of information and communication technology (ICT) (i.e. hardware, software and infrastructure, including the data collection method [e.g. paper or digital]. It is also important to pay attention to data archiving as it enables wider use or reuse of data, time series and other types of historical analysis.

5.2. The dissemination process should be well organized and discussed with stakeholders and primary data users during the preparatory phase, enabling the allocation of necessary funds in the survey budget. In addition to published reports the dissemination of survey results can be through summarized data, using interactive Web products and safe access to microdata files for more in-depth analysis.

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