Global Strategy for Improving Agricultural Statistics: Integration of the WCA2010 in the National Survey Programs and the National Strategy of Statistical Development, *N. Keita, FAO*

This text is mainly extracted from the Global Strategy to Improve Agricultural Statistics adopted by the 41st Session of the United Nations Statistical Commission in February 2010 and from the FAO World Programme of Census of Agriculture 2010. The text was adapted to the purpose of this workshop.

The main idea is that, in order to address a wide variety of data users' needs (existing basic needs and emerging needs) in a cost-effective manner, agricultural censuses and surveys should not be designed and implemented as ad-hoc operations. They should be part of an integrated agricultural statistics programme which should be also well integrated into the National Statistical System through the National Strategy for Development of Statistics (NSDS).

The main emphasis is on technical tools and methodologies which can facilitate this integration such as linking population and agricultural censuses, building a centralised master sampling frame, designing an integrated survey framework and an integrated database.

The new integrated and modular approach to agricultural census and surveys in this context is an important element of the statistics programme and sampling techniques become essential for proper implementation of this approach.

1. Importance of reliable data on agriculture for policy makers

Policy makers and development practitioners who are responsible for developing investment strategies to promote economic growth find many challenges in the changing face of agriculture in the 21st century. In addition to its productive role providing the food, clothing, fuel, and housing for a growing world population, agriculture assumes other roles, the importance of which has more recently been recognized. In addition to its essential role in food security, agricultural development is now seen as a vital and high-impact source of poverty reduction. It is also seen as a source of serious environmental problems and a major contributor to global warming, water scarcity and pollution, and land degradation. At the same time its potential as a source of environmental services needs to be defined, monitored, and evaluated.

However, various assessment of the current status of agricultural statistics in many developing countries, and particularly in African countries reveals that they do not have the capacity to respond to the basic needs and emerging needs. The situation is characterised by:

- Countries' capacity in agricultural statistics have significantly declined since early '80s, mainly because of reduction of resources allocated to agricultural statistics by countries and development partners (low priority)

- Basic data requirements are not met and a declining number of countries are reporting basic agricultural statistics
- Emerging data needs linking the economic, environmental and social dimensions (impact of agriculture on environment; livelihood of rural household; biofuels; water and land use, etc.) are not met
- Lack of coordination between National Statistical Offices and Ministries of Agriculture which often results in duplication of efforts and conflicting numbers
- Agriculture often left out of National Strategy for Development of Statistics
- Forestry, fisheries outside of national and agricultural systems

As a consequence, there is a lack of sound basis for agricultural development and food security policy formulation, implementation, monitoring and evaluation in many African countries at a time when this data is most needed.

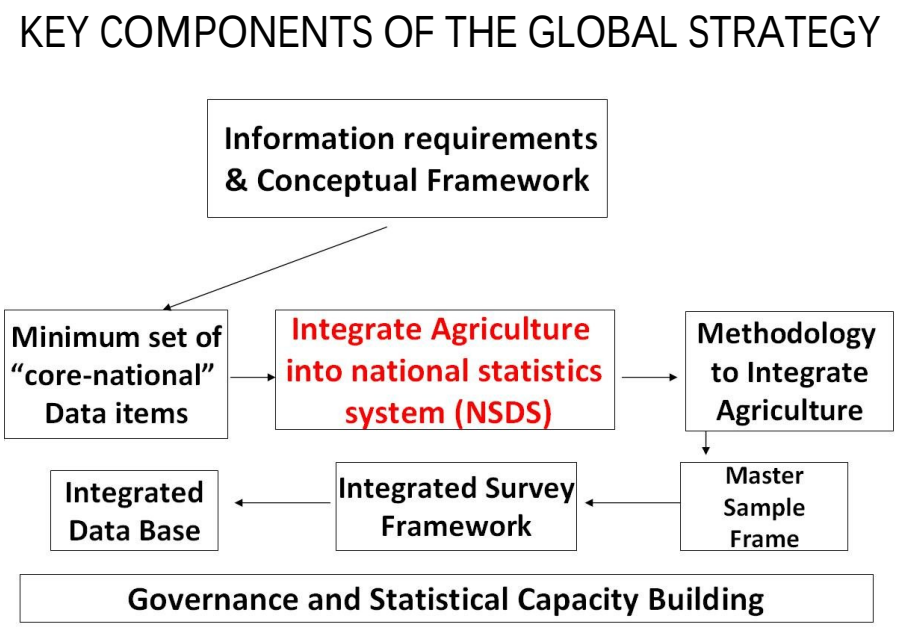
2. Global Strategy to Improve Agricultural Statistics

The Global Strategy is an initiative undertaken at international level under the auspices of the United Nations Statistical Commission (composed of the Directors of National Statistics Offices-NSOs of all countries in the World) to address the issues related to declining capacity in agricultural statistics' mainly in developing countries.

The purpose of the Global Strategy is to provide a framework for national and international statistical systems that enables them to produce and to apply the basic data and information needed to guide decision making in the 21st century. This Strategy is based on three pillars.

- The first is the establishment of a minimum set of core data that countries will provide to meet current and emerging demands.
- The second is the integration of agriculture into national statistical systems in order to satisfy the demands of policy makers and other users who rely on comparable data across locations and over time. The integration will be achieved by implementing a set of methodologies that includes the development of a Master Sample Frame for agriculture, the implementation of an integrated survey framework, and with results available in a data management system.
- The third pillar is the foundation that will provide the sustainability of the agricultural statistics system through governance and statistical capacity building.

The Strategy can be summarised in the following figure:



3. Determining priorities for core national data item

The Global Strategy identifies a minimum core data items that each country is expected to produce (see table in annex A).

However, data for some core items will not be required every year either because they do not change much from year to year or because they are difficult and expensive to obtain annually. Countries will also have additional items to add to the list of core items to meet national data needs. *Teff* for example is a major crop and food source in Eritrea and Ethiopia, but not in other countries. Items such as rice on the other hand are major global food sources, but are not produced in every country.

Each country therefore needs to select which core items to include in its national system. It must add other items relevant to its economy, determine how frequently data will be provided, and the scope of the national coverage required. For example, the core data do not include fruits and vegetables, or other livestock items that contribute to a country's food supplies and household income. Each country should consider how these should be included in its national system.

Annual data are generally required for those items which, combined, account for more than 75% of a country's value of production. Items with production that can vary significantly from year to year should be included, particularly if the production fluctuations are a major source of risk for vulnerable households and food supplies. Items that account for a significant proportion of land used, and that have short term effects on land use and the environment should be represented as well. Including items that are produced by only a small number of households or holdings or that account for only a small share of the country's land has sample design and resource implications. For example, sampling theory

shows that the relative variance of the estimated mean is approximated by the relative variance of the positive sample units plus the relative variance of the estimated proportion of positive population units.

$CV^2(Y) = CV^2(Y_p) + CV^2(P)$ where Y_p is the mean of the positive responses and P is the proportion of the population that has the item

Assuming that only a third of the households or holdings have a particular item, the sample size will have to be 4 times larger than if 3/4 have the item in order to achieve the same level of precision. If only 10 percent of the households or holdings have the item, then sample sizes triple over what is needed if a third have the item and would be 12 times greater than if (P) > .75 for the same level of precision. The general conclusion of this exercise is that minor and relatively rare commodities should be confined to the 5 to 10 year agricultural census, and omitted from more frequent surveys. The exception would be if the sample frame contains sufficient data that can be used in the survey design to target the rare items.

The next step is to review the rural development indicators for monitoring and development and include those relevant to the national situation (see table in annex B). Then each country should determine the level of geographic coverage and detail to be provided for the core plus additional items added. The same issue raised above about the proportion of households or holdings that have the item will also determine the level of geographic detail or other breakdown that can be provided from the sample surveys. These have implications about the methodology to be used and resources required. The annual collections of data will rely upon sample surveys which will limit the geographic detail that can be provided. Therefore, it may be only through an agricultural census that detailed geographic or size distribution data can be provided.

The question of what level of detail is required and how often data are required may be difficult to answer. The table below presents a decision matrix that is useful in many contexts. For example, it should be determined for each item whether the data will be provided for the entire country or only major producing areas.

It is generally true that policy makers will want data for within country administrative areas such as provinces; if so, this should be included in the national framework.

Frequency of coverage by geographic and structural detail:

	Level of geographic and structural detail			
Data Item	Major production areas only- production by holdings	National coverage of production by holdings	Within country administrative areas— production by holdings	Inclusive of households and HH plots
Crop A	Annual	Annual	Decennial census	Decennial census
Crop B	Bi annual	Bi annual	Decennial census	Decennial census
Crop C	Decennial			

Crop Z				
Livestock A				
Livestock B				

Livestock Y				
Aquaculture and Fishery				
Forestry				
Inputs				
Household income				
Change in Land cover				

Time and available resources result in a necessary compromise between frequency, level of geographic detail, and other breakdowns. These categories need to be considered for each data item.

At this stage, each country should have an overall picture of the content of its national statistical system for agriculture including the rural, forestry, and fishery components and the coverage and frequency of the data provided. Input from policy makers and other data users should shape this final picture.

4. Importance of an integrated statistical system for addressing basic and emerging data needs

Integration is a core element of the Global Strategy. The Strategy considers that the process of improving agricultural statistics will begin with the integration of agriculture into the national statistical system. This integration will be accomplished by the development of a master sample frame for agriculture to ensure relevance and completeness, its use in implementing a coordinated data collection program to produce timely and accurate data that are coherent and comparable, and a strategy for data dissemination to ensure accessibility. This integration of agriculture into the national statistical system is needed for several reasons.

One of the shortcomings of current statistical systems in most countries is that data are collected by sector, using different sampling frames and surveys. The division of data by sector leaves no opportunities to measure the impact of an action in one sector on another. Surveys are often conducted on an ad-hoc basis with no linkages to a master sampling frame or the use of geo-referenced units for data collection. It is therefore difficult to integrate data coming from various surveys for in-depth analysis with cross tabulation of variables. Data on crop and livestock production are drawn from separate surveys, which are based on separate samples. The separate data provide no basis for analyzing the characteristics of farms that produce both crops and livestock, or for comparing them to farms that specialize in one or the other. Household surveys are often conducted in isolation from production surveys with no coordination or with sample sizes too small to disaggregate the data into the rural/farm sectors. The results generated from these surveys are also not integrated into a common database for access by data users.

More than one governmental organization is often involved in the collection and analysis of agricultural, fishery and forestry data without coordination. While the National Statistical Office may produce the agricultural census, the annual production data could come from the ministry of agriculture, and the contribution of the fishery and aquaculture sectors may come from another authority and may be ignored or neglected by the National Statistical Office. In some cases, different organizations produce statistics for the same items, with different results which confuse the data users and make it difficult to aggregate results across countries. This means that results then differ also at the international level if those organizations use different sources to populate their data bases.

Integrated statistical systems can resolve many of these problems by avoiding duplications of effort, preventing the release of conflicting statistics, and ensuring the best use of resources. Concepts, definitions, and classifications become standardized, allowing more systematic collection of data across sources. These practical advantages of integrated data systems together with the increasing need for reliable and comparable data in a context of globalization and international concern about environmental issues point to the need for integrated national statistical systems. The FAO World Program for the Census of Agriculture argues forcefully for the development of such integrated systems.

In some countries, centralized organizational structures are already in place, and national statistical offices maintain the principal responsibility for agricultural statistics. However, this centralized role may not always meet the needs of the line ministries such as the ministry of agriculture. For that reason, the statistical responsibilities in many countries are decentralized with ministries of agriculture producing the agricultural statistics. Both systems have advantages and disadvantages. National statistical offices have experience with statistical methodology and sample frames that other ministries do not have. However, the other ministries have more knowledge about agriculture, forestry, fisheries and land use. The purpose of the Global Strategy is to propose a framework for integration that builds off the strengths of both systems.

The integration of agriculture into the national statistical system will be based on statistical methodology using tools that establish a closer link between results from different statistical processes and different statistical units. This can be achieved by the development of a

master sampling frame, the adoption of sample designs such as overlapping samples, and the synchronization of questionnaire designs and surveys.

The master sample, sample designs, and the survey framework need to be considered together because there are choices such as whether to monitor the same farms and households or whether to use different samples, and collect some of the same variables across surveys. It is also necessary that countries have some flexibility in how the master sample frame and resulting survey designs are implemented to consider their national requirements as well as statistical capabilities.

The statistical methodology to be used also needs to consider some basic data quality dimensions—timeliness, completeness, comparability, and accuracy. Measures for each quality dimension will be considered in the development of the strategy. The following sections provide the strategy to create a master sample frame followed by the sample and survey frameworks to achieve the integration.

The Strategy also builds on recent developments in agriculture statistics including the use of satellite imagery for monitoring land use, estimation of crop areas, and providing early warnings of changing growing conditions to name a few examples. In addition, the development of global position systems (GPS) makes it possible to geo- reference observations and data collection to the land cover provided by the satellite imagery. The emergence of the internet and other technology such as the use of personal digital assistants (PDA) equipped with GPS systems for data collection and their connection to databases has tremendous potential for shortening the period between data collection and dissemination with improved data quality.

5. Tools and methodology for integration

Master sampling frame

As indicated above, at technical level, the Strategy identifies the development of a master sample frame for agriculture as a starting point for integration. This will be the foundation for all data collection based on sample surveys or censuses. The master sample frame is to be constructed based on the requirements to include both households and farms as statistical units. It provides a linkage between the census framework and land use.

Examples of Sample Frames used for Agricultural Statistics include:

Population census enumeration areas. The population census is usually conducted using an administrative structure where cartographic or other mapping materials are used to divide the country into enumeration areas which is the first level of data aggregation. Depending on the country's capabilities, the only results from the population census in some countries are the enumeration area totals for numbers of people, households, etc. Therefore, the sampling frame is basically the listing of enumeration areas and associated aggregated data from the census. Random samples of enumeration areas are selected and screened for households from which subsamples are selected for household surveys--a two stage sampling process. Some countries use their administrative structure of counties, townships, and villages as their framework for the census with the village becoming the enumeration

area. Villages are also used as a first stage sampling unit in countries where the village is where the farm households are generally located.

Household registers from the population census. Countries with the statistical capacity are able to develop a register of all households included in the population census. The list of population households is the sample frame used for household surveys. One problem is that the list of households becomes out of date with households changing or dissolving and new households formed. Unless administrative data or other means are used to keep the population register up-to-date, survey results contain an increasing coverage bias over time.

Agricultural census enumeration areas. In many countries, the cartographic materials and data from the population census are used for the agricultural census. The sampling frame consists of enumeration areas and aggregated data from the census data collection. As in (a) above, random samples of enumeration areas are selected and screened for farms or agricultural holdings for agricultural production surveys.

Registers of farms from the Agricultural census. As in (b) above, countries with the capacity use the agricultural census to develop registers of farms. This provides a powerful sampling tool because it allows a choice of many alternative sampling designs. A major weakness is that the registers rapidly become out of date. Out of date population and farm registers erode all of the data quality dimensions because the completeness of coverage changes over time, thus affecting the comparability and accuracy of the resulting estimates.

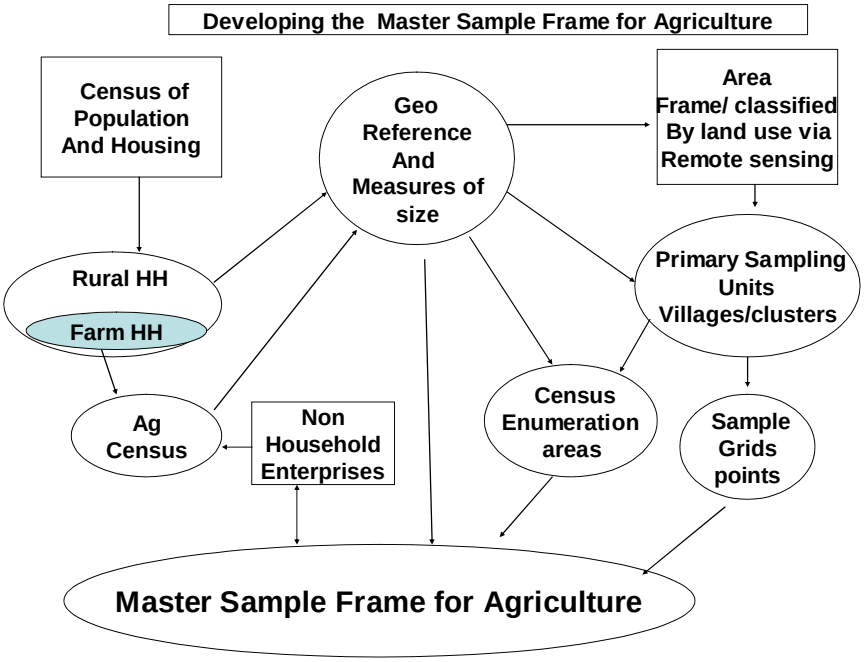
Registers of farms based on administrative sources such as business registrations or tax collections. This process is used in some developed countries. It offers the advantages of the registers from the agricultural census, but again, needs to be updated regularly. A disadvantage of the administrative sources is that they may not include the total population, especially units below a threshold required to be registered or pay taxes. In other words, while they will be inclusive of commercial farms, they are not likely to include small scale farms, and subsistence farming units.

Area Sample Frames. An area sample frame is the land mass of the country or the space within a country containing the populations of interest. Both maps and satellite images are used to divide the country into administrative areas such as provinces districts, etc. Satellite imagery can be used to subdivide the administrative areas into land use categories such as cropland, rangeland, woodlands, urban areas, etc. Sampling units of segments of land with identifiable boundaries can be formed, or each land use stratum can be divided into square grids and a sample of points becoming the sampling units. During the data collection process, rules of association are used to connect farm holdings or households to the segments or points. An area frame is suitable for obtaining information about variables associated with land such as crops, livestock, forests, and water. Depending on the process used, area frames can be costly and time consuming to construct. However, recent innovations using satellite imagery and two-stage sampling of points have reduced both the cost and time. An advantage of an area frame is that the frame does not go out of date, it is complete in its coverage, and provides a basis to geo reference survey data with the underlying land use. It also provides ground truth useful for classifying satellite imagery by land cover. The primary disadvantage of area frames is that the sampling is based on land

use and not the size and type of agricultural holding. Sampling variability becomes a problem if there is a large range in size of the agricultural holdings. A summary of the methodology of area frame sampling is provided by Gallego. Another disadvantage is that data collection costs exceed those based on registers where telephone or mail can be used instead of personal interviews.

Multiple Frames. A combination of the above frames is used, often involving the use of an area frame in conjunction with one of the list frames to take advantage of the strengths and weaknesses of each. The FAO provides an overview of multiple frame sampling. This is an appropriate where there is a large variation in the sizes and types of agricultural holdings with a subset of large commercial farms. The list of commercial farms can be stratified by size and type, and the area frame ensures the population is completely covered by providing coverage of the small and subsistence farms.

The concept of building a master frame can be summarised as follow:



Integrated survey framework

The Global Strategy advocates for an integrated survey framework that will be established to provide data measured consistently across time and comparable across countries using an annual survey of selected core items and periodic data from a set of rotating panels covering economic and environmental issues.

All data collection is to be based on sample units selected from the master sample frame, and integrated into the survey framework.

The timing and frequency of data collection are major issues for agricultural statistics. Crops have different production cycles that are seasonal while livestock production is determined not only by the respective reproductive cycles, but also the continuous production of

commodities such as milk and eggs. Aquaculture has characteristics similar to livestock production. The rural labor force is also affected by the seasonal nature of agriculture, which affect opportunities for work and earnings. The timing of data collection affects the quality of the data, especially if a lengthy recall is required. As a result data collection should coincide with harvest periods. For example, if crop yields are determined by crop cutting surveys, then these have to be measured shortly before harvest. Fish capture requires frequent sampling and surveys—for instance twice a week or once every five days—in order for the data to reflect developments such as frequent and unpredictable changes in species composition.

The classical methodology is to select independent samples and conduct separate surveys for each of the categories of data. While the optimum sample design often leads to the selection of samples specific to crops, livestock, and the respective economic, environmental, and social surveys, this limits data analysis across the respective categories.

Single purpose surveys generally make it easier to target the selected sample such as crops or livestock, especially where both are not present on most farms, or when present, differ considerably in size. It is difficult to use stratified designs using many different measures of size. There are recent developments in sampling theory that can provide an alternative using selection probabilities based on the measures of size for a number of different variables. This design is termed "Multiple Probability Proportional to Size" (MPPS) because the relative size of each farm (or enumeration area) is determined for more than one item of interest. The use of this method in China is described by Steiner (2007). It takes advantage of efficiencies of Probability Proportionate to Size sampling while adding the use of multiple measures of size. The use of MPPS is appropriate for multiple purpose surveys where the population sample units each only have a subset of the items of interest.

> China's Integrated Statistical System
> MPPS sampling using multiple variables from the Census of Agriculture is used to support an expanded survey program and to integrate the statistical needs for different levels of government.

For the purposes of data analysis, it is desirable to select one large sample to provide all of the data for production, the economic situation of the holding, its environmental impact, and the social-well being of the household. It would also be desirable for the same sample to be used over time for longitudinal data analysis. While the MPPS sample design provides the basis to use a single sample, at the same time it requires lengthy and complex questionnaires to include all items of interest. For this reason, a strategy to collect data for some core items annually coupled with periodic data collection for other items is required to allow analysis across subjects.

The integrated survey framework should be based on the minimum set of core and national data and the determination of how frequently they are required.

a. Determine the set of core items for which at least annual data are required. For those core items not needed annually, group them by category including economic variables such as farm structure expenditures and income; environmental measures such as the use of fertilizers and chemicals and land and water use; Social variables

such as household income and well being; and other items of national interest (minor crop/livestock items, for example). Data for these items will come from rotating panel surveys based on a subsample of the core survey.

b. Select for example a replicated sample for the annual core items using MPPS. In other words, instead of selecting one large sample, select several replicates. This allows a process to include some of the sample units in the survey across time for longitudinal analysis. Diagram B shows 12 replicates; 1 through 5 for year 1, 2 through 6 for year 2, etc. This provides longitudinal data, but also limits the number of times for respondent burden considerations.

c. Design a survey questionnaire to obtain the annual core data items. Each year the core questionnaire should contain supplemental questions regarding one of the subject matters described above. For example, in year one replicates 1 through 5 will be surveyed using the core questionnaire which will also contain key questions about economic variables. The core questionnaire can either obtain all information required, or a subsample could be selected for the collection of the detailed data. In year 2, replicates 2 through 6 will be surveyed using the core questionnaire which will contain questions about environmental issues. By year 4 all of the subject matters will have been included.

d. Each year, one of the sets of panel data will be linked to the annual core items. Also note that starting with year 4, at least one of the replicates will have been surveyed by all of the rotating panel questionnaires in addition to the core questions.

The table below provides an overview of a survey framework based on replicated samples which are surveyed each year for the annual core data items. In addition, each year the core questionnaire contain a set of supplemental questions for one of the subject matters that round out the minimum set of core data.

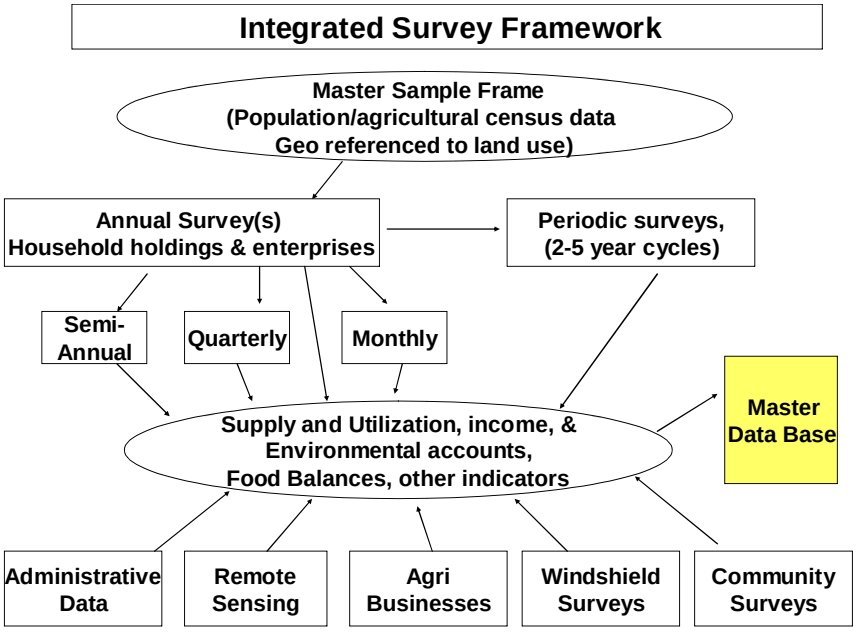
Example of a replicated survey design with the use of an annual core questionnaire and rotating sets of supplemental questionnaires.

Replicate / Year	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Rep 9	Rep 10	Rep 11	Rep 12
				Every replicate receives same core questionnaire every year for annual core data items. Each core questionnaire contains questions about the rotating panel surveys for sub-sampling purposes.								
1	A	A	A	A	A							
2		B	B	B	B	B						
3						C	C					
4						D	D	D				
5						A	A	A	A			
6						B	B	B	B	B		
7							C	C	C	C	C	
8								D	D	D	D	D
9									A	A	A	A
10										B	B	B
11											C	C
12												D

Detailed Questionnaires for Rotating panel surveys
A. Economic items including Farm structure, expenditures, income
B. Environmental items including inputs, chemicals, tillage, water use, land use
C. HH income, consumption, employment
D. Items of national interest

The above survey design provides a strategy to collect data for core items—some annually, others on a 4 year rotating cycle. Each country will need to make its own decisions about the content of each of the components. Once the above design is in place, the next consideration is whether some of the data collections for the annual core items should take place more frequently during the year. One example would be to conduct a midyear survey to determine crop yields before harvest, another to obtain the final production and stocks.

The integrated survey framework also offers the opportunity to compare sample unit data across time providing a major validation tool to improve data quality. The integrated framework also provides the opportunity to use alternative estimators. While the direct unbiased estimators based on the sample design form the foundation, they can be supplemented using ratio and regression estimators, and/or model based estimators using census results. The use of multiple estimators can improve data accuracy and reliability.
The integrated survey framework shown in the figure below provides an overview of how the annual and periodic surveys are connected in the data system. Note that within year surveys can also be conducted using sub-samples from the annual survey.



The survey framework also takes into account the additional data sources that need to be included in the overall framework. These include:

a. *Administrative data.* Governmental interventions such as subsidies, regulation, and legislation often require agricultural holders to report production information. Land ownership and cadastral surveys provide useful information for constructing registers. Food inspections, animal health inspections, and trade data provide input to the utilization accounts.

b. *Remotely sensed data.* These include vegetative indices that show overall crop conditions and information about changes in land cover and use. The

survey framework should include the need to provide ground truth data if remote sensing information is to be used to estimate cropland areas.

c. *Agri-businesses* are the source of utilization data and prices.

d. *Expert Judgment and Windshield surveys* can be used to collect data from experts whose judgments inform evaluations of agricultural conditions. For instance, the *Sourcebook* refers to a procedure in which experts travel a specified route on a periodic basis and record the condition of crops, which provide an input into crop yield forecasts.

e. *Community surveys.* The World Programme for the Census of Agriculture provides an overview of data that can be collected at the village level. These data include information about the infrastructure and services available to households and agricultural holdings, occurrences of food shortages, frequency of natural disasters, etc.

The integrated survey framework will provide annual data for a core set of items on agricultural production and other variables determined by the national statistical system. The survey framework enables longitudinal analysis of the core data and it provides linkages to the data that are collected regarding economic, environmental, and social issues. The use of the master sample frame ensures that the data collection is connected to land use as well. The remaining pillar of integration is the management of the data to maximize their use for analysis.

The Data Management System: Master database

The official statistics that are gathered are to reside in a data management system. These are the basic principles of the Strategy. Their implementation will require improved governance across the national statistical system. The concept of a master sample frame will be extended to include a data management system for all official statistics related to agriculture.

The data management system fulfils three main functions—access to official statistics for dissemination purposes, storage and retrieval of survey results, and access to farm, household, and geo-referenced data for research. The data management system should:

i. Support the dissemination of data to ensure the official statistics are readily available, clearly identified by source and time, and are comparable for aggregation purposes, both within and across countries. If more than one institution is involved in the national statistical system, there should either be a single database, or the databases should be coordinated to avoid duplication of official statistics. Such duplication can lead to different numbers, causing confusion among those using the data. These data could be part of CountrySTAT and FAOSTAT, and becomes a public good for data access.

ii. Provide the framework for the storage of the aggregated survey results and geo referenced land use data along with the supporting administrative and other data sources. Not all survey results are published, however, they should be available for research and analysis purposes. As described above, the sample and survey design enables the use of ratio and regression estimators requiring linkage to previous data.

iii. Build on the capabilities provided by the master sample frame's linkage to land use. The data management system should provide for the storage and maintenance of the farm and household survey data and for the linkage between the different sets of data that are geo-referenced to a common land use. For example, there will be five consecutive years of core production data for the same sample units plus data from the rotating panel surveys. The strength of the integrated survey system will come from the data analysis capabilities provided by this data set.

The value of the integrated database will increase over time as the database itself grows. It will enable more analyses across time, and it can be used to improve data quality by comparing survey information with census data or between surveys over time. The output of the aggregated values will be the input to Country Stat following its methods and principles.
The integration of agriculture into the national statistical system through the implementation of a master sample frame, an integrated survey framework, and an integrated database, will require countries to review their current governance structures. Some countries will have to make changes in order to meet the challenges of coordination and to ensure that the statistical system is sustainable.

6. FAO Integrated Agricultural Census/survey programme as a component of Agricultural sector statistical master plan within NSDS

Importance of the Census of Agriculture in integrated statistical system to meet data needs
As indicate above, agricultural census is an essential element of the statistical system for meeting priority data requirements of a wide variety of data users. The FAO World Programme for census of agriculture 2010 identifies the main domains for use of census data:

Monitoring the Millennium Development Goals
The new modular approach used for the current round of agricultural censuses, based on the census core and supplementary modules together with the programme of agricultural surveys, enhances the usefulness of the agricultural census/survey programme as a source of data for MDG monitoring.

Poverty monitoring and analysis
Achieving sustainable economic growth with the focus on combating poverty has become the key development goal for governments around the world, as reflected in the MDGs and, in particular, Goal 1. Most of the poor live in rural areas, often in isolated conditions, where they face problems of poor natural resources, underdeveloped infrastructure, lack of access to markets, fluctuating commodity prices, lack of employment opportunities, and vulnerability to natural disasters. The agricultural census helps to better understand the causes of poverty and provide baseline data for monitoring poverty alleviation programmes.

The community-level data collection, introduced for the first time in the 2010 programme, can provide a useful source of data on infrastructure issues affecting farmers' incomes, especially relating to the access farmers have to agricultural produce markets.

Food security monitoring and analysis

The importance of combating hunger while achieving economic growth is one of the cornerstones of the MDGs, as reflected in Goal 1. A wide range of data is needed to monitor progress towards this goal, and the agricultural census can play a role in this regard.

On the food availability side, data from the agricultural census helps in understanding the structure of the food production industry and the constraints faced by farmers in 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.

Measuring the role of women in agriculture

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

Agricultural planning and policy-making

Study of a specific crop. Census tables specific to agricultural holdings with the particular crop – for example, coffee – can be used to measure the number and location of coffee growers, the distribution of coffee growers by plantation area, cropping systems used by coffee growers, labour requirements for coffee growing, etc.

Study of a specific livestock production system. Census tables specific to agricultural holdings with the particular livestock type – for example, sheep – can be used to measure the number and location of sheep producers, the distribution of sheep producers by flock size, the integration of sheep raising with cropping activities, etc.

Structure of agriculture in a particular area. Census tables relating to the particular geographic area, such as a district, can highlight the main crops grown and livestock raised in the district, the agricultural practices used in the district in comparison with other districts, employment characteristics in the district, etc.

Inter-relationship between crop and livestock production. Census tables can be prepared showing the number of holdings with specific combinations of crop and livestock types.

Sources of farm labour. Census tables can be prepared to show the types of farm labour inputs for specific farming systems and the role of household and outside labour.

Farm typology studies. The agricultural census can be useful for classifying holdings by type, as an aid to developing agricultural development policies. For example, holdings can be sub-divided into whether they are subsistence or market oriented, and different policies and programmes can be developed for each group.

Studies of small holdings.

Improving current agricultural statistics

The agricultural census can provide reliable current data relating to crop and livestock production for the census year, and this can be useful as a benchmark for improving current crop and livestock statistics.

Providing baseline data for monitoring agricultural development projects

Typically, an agricultural development project aims to achieve certain outcomes in a defined project area. Baseline data are needed to help assess whether the project has been successful. An agricultural census provides detailed structural data for small geographic areas, making it an ideal source of baseline data.

Providing data for the private sector

As well as providing data for government planning and policy-making, an agricultural census is also a valuable source of data for the private sector. The main interest for the private sector is usually in data to help make commercial decisions. A food processing company could use agricultural census data on the number of growers and area for specific crops in each district to help identify suitable sites for its processing plants. An input supplier could use census data on input use for each crop by district to better understand market opportunities. Farm machinery suppliers could make use of data on the area of each type of crop grown and the number of growers to assess the potential demand for their products. A company planning to establish a business in a particular location could use census data to assess the availability of labour and the pool of skills available in that location.

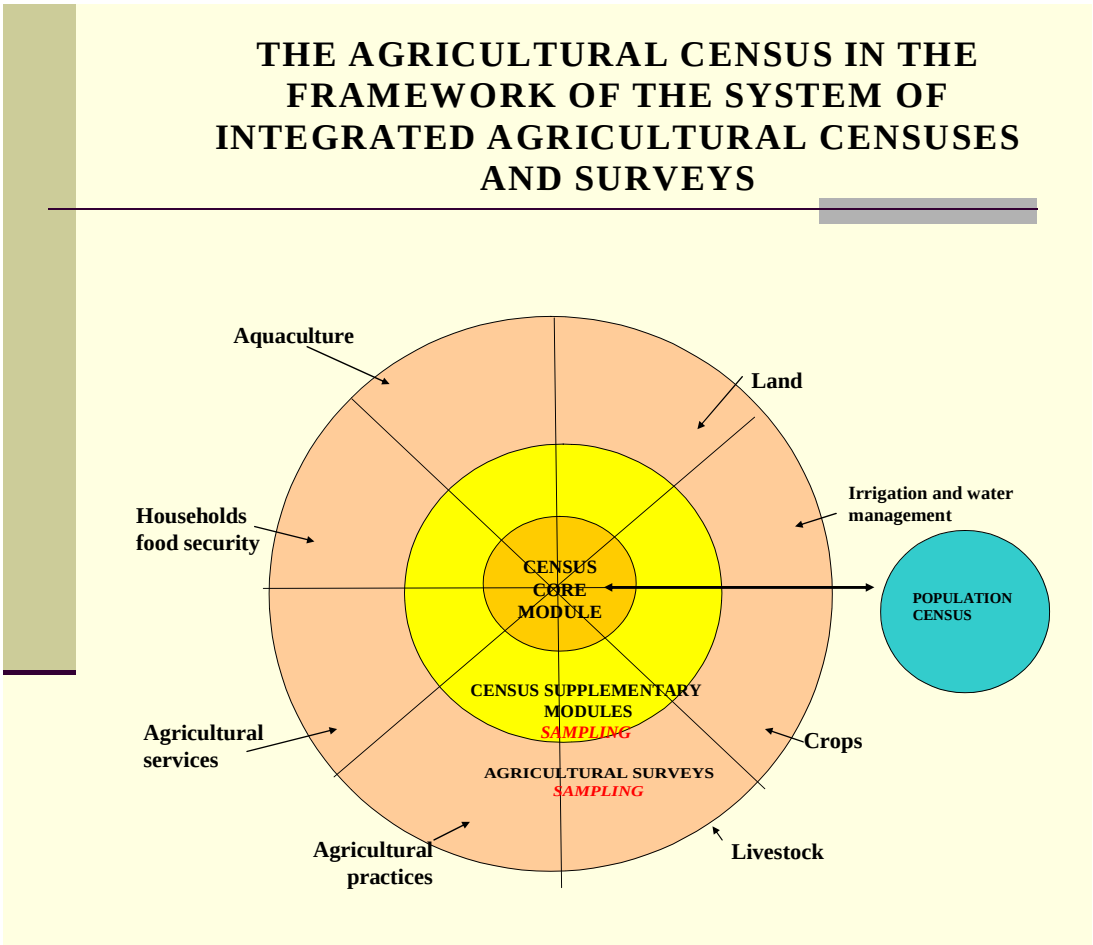
The Census of Agriculture in an Integrated Agricultural Statistics System

As indicated in the paragraphs above, integration, in a statistical sense, means that each statistical collection is carried out, not in isolation, but as a component of the national statistics system. In an integrated agricultural statistics system, the census of agriculture provides certain types of data as part of an integrated set of data on food and agriculture, needed for decision-making in food, agriculture and rural development.

The main advantages of an integrated statistics system can be summarised as follow:

a. It is possible to plan and develop a comprehensive statistical programme, without duplication of statistical activities or the release of conflicting statistics, while ensuring the efficient and balanced use of available statistical resources.
b. Concepts, definitions and classifications used in the different statistical activities can be made compatible, making it easier to interpret and analyse related data from different sources.
c. Any one statistical collection, such as the census of agriculture, can be restricted to a coherent and manageable set of items, in the knowledge that other related data are available in a comparable form from other sources.

Planning and implementing an integrated agricultural statistics system requires an efficient organization, trained personnel at various levels, and secured budgetary allocations over a period of years. Efficient organization implies strong cooperation between users and producers of agricultural statistics. The approach to integrated and modular approach to agricultural census and survey programme promoted by FAO can be summarised as follow:



7. Importance of sampling in integrated census survey programme

In the above approach, a limited number of core data items to be included in the census of agriculture are to be collected through completed enumeration. Some of these data items can be included in an agricultural module of a population census (Annex C provides African countries' plans for 2010 population census). Data items to be covered by Census supplementary modules and follow-up agricultural surveys are to be collected on a sample basis. This will be further developed through the other sessions of this workshop.

The effective implementation of this approach therefore requires intensive use of sampling and staff qualified in this technique and this workshop aims at contributing to this goal.

ANNEX A: Minimum set of core data

Group of Variables	Key Variables	Core data items	Frequency
Economic			
- Output	Production	Core crops (e.g wheat, rice, etc.) Core livestock (e.g. cattle, sheep, pigs, etc.) Core forestry products Core fishery and aquaculture products	Annual
	Area harvested and planted	Core crops (e.g wheat, rice, etc.)	Annual
	Yield / Productivity	Core crops, core livestock, core forestry, core fishery	Annual
- Trade	Exports in quantity and value	Core crops, core livestock, core forestry, core fishery	Annual
	imports in quantity and value	Core crops, core livestock, core forestry, core fishery	Annual
Stocks	Quantities in storage at beginning of harvest	Core crops	Annual
- Stock of Resources	Land cover and use	Land area	[1]
	Economically active population	Number of people in working age by sex	
	Livestock	Number of live animals	
	Machinery	e.g. Number of Tractors, harvesters, seeders etc.	
- Inputs	Water	Quantity of water withdrawn for agricultural irrigation	
	Fertilizers in quantity and value	Core Fertilizers by core crops	
	Pesticides in quantity and value	Core Pesticides (e.g. fungicides herbicides, insecticides, disinfectants) by core crops	
	Seeds in quantity and value	by core crops	
	Feed in quantity and value	by core crops	
Agro processing	Volume of core crops/livestock/fishery used in processing food	By industry	
	Value of output of processed food	By industry	
	Other uses (e.g. biofuels)		
Prices	Producer prices	Core crops, core livestock, core forestry, core fishery	
	Consumer prices	Core crops, core livestock, core forestry, core fishery	
Final expenditure	Government expenditure on agriculture and rural development	Public investments, Subsidies, etc.	
	Private Investments	Investment in machinery, in	

[1] The frequency for the following items will be established by the framework provided in the Global Strategy to determine the national priorities for content, scope, and frequency. The frequency requirement will also be considered in the establishment of the integrated survey framework where the data sources will be defined.

Group of Variables	Key Variables	Core data items	Frequency
		research and development, in infrastructure	
	Household consumption	Consumption of core crops/livestock/etc. in quantity and value	
Rural Infrastructure (Capital stock)	Irrigation/roads/railways/ communications	Area equipped for Irrigation / Roads in Km / Railways in Km / communications	
International transfer	ODA[2] for agriculture and rural development		
Social			
Demographics of urban and rural population	Sex		
	Age in completed years	By sex	
	Country of birth	By sex	
	Highest level of education completed	1 digit ISCED by sex	
	Labor status	Employed, unemployed, inactive by sex	
	Status in employment	Self Employment and employee by sex	
	Economic sector in employment	International Standard Industrial Classification by sex	
	Occupation in employment	International Standard Classification of Occupations by sex	
	Total income of the household		
	Household composition	By sex	
	Number of family/hired workers on the holding	By sex	
	Housing conditions	Type of building, building character, main material, etc.	
Environmental			
Land	Soil degradation	Variables will be based on above core items on land cover and use, water use, and other inputs to production.	
Water	Pollution due to agriculture		
Air	Emissions due to agriculture		
Geographic location			
GIS coordinates	location of the statistical unit	Parcel, Province, Region, Country	
Degree of urbanization	Urban/Rural area		

[2] Official Development Assistance

Annex B: Menu of Indicators for Agricultural Statistics

	Indicator	Data Requirements	Data Sources	Technical Notes
	Sector Wide indicators for agriculture and rural development			
1	Gross Domestic Product (GDP)—		Censuses and surveys of firms, farms, and households for small holders.	Value added should include unreported activities as well as the value of informal or small scale operations. Annual estimates between census or surveys based on extrapolations based on other indicators.
2	GDP growth from Agriculture value added.	Estimates of total production and value for all commodities produced in the country; including that from small holders/household plots minus estimates of the cost of inputs such as seed, feed, energy, fertilizer, labor, etc. Agriculture includes forestry and fisheries	Censuses and surveys agricultural enterprises, farm and rural households, administrative and processor. data	SNA concepts followed. Problems include estimation of output consumed by the household and the annual coverage of all commodities for which only periodic census data are available. Annual estimates made using previous census and other administrative data if available.
3	Amount of public spending on agriculture, subsidies, and infrastructure	Government budget allocations, and spending related to agriculture. Agriculture includes forestry and fisheries	Ministry of Finance, National Accounts, Planning commissions, Donor reports	The definition for public spending on agriculture should follow the UN Classification of Functions of Government (COFOG) for agriculture
4	Amount of public spending on rural infrastructure including health and education	Government budget allocations, and spending related rural areas	Ministry of Finance, National Accounts, Planning commissions, Donor reports	Rural defined using national description
5	Change in Investment in capital stock	Inventories of machinery and equipment owned by agricultural holdings, buildings such as milking purposes, animal breeding stock, area of semi-permanent crops such as trees and vineyards, number of trees and vines	Agricultural resource surveys of holdings and agricultural enterprises	Machinery and equipment inventories should be by purpose (tillage, harvesting, etc.) and size
6	Demographics of agricultural and rural population	Rural population and number of rural households, , number of agricultural households and population living in them, age and education levels. Agriculture includes forestry and fisheries	Census of Population, Census of Agriculture, Household surveys, administrative records	Rural defined using national description
7	Rural poor as a percent of total poor population	Household income and consumption estimates for national and rural	Household Surveys. International Comparison Program for comparisons	Countries should use poverty estimates based on PPPs and extrapolate between ICP

	Indicator	Data Requirements	Data Sources	Technical Notes
		poverty lines. Purchasing Power Parities for comparisons across countries	across countries	benchmarks
8	Rural hungry as a percent of total poor population	Household income and food consumption estimates for national minimum energy requirements.	Household Surveys. International Comparison Program for comparisons across countries	Countries should use hunger estimates for monitoring food deprivation levels
9	Food production index	Area, production and yield for food crops, livestock numbers and production of meat, milk, eggs, fish captured and cultured, and other food products, non-food use of food products, food imports and exports	Agricultural Census, surveys of agricultural enterprises, processors, fish landings, administrative data such as imports, exports. Food Balances and Household consumption surveys	Follow FAO guidelines for inclusions and exclusions
10	Change in value of Trade—imports and exports	Imports and exports—quantities and values of agricultural products including fishery and forest products	Customs inspections—in some countries the customs offices collect the data which then are turned over to the national statistical office for compilation	National statistical offices should collaborate with customs officials to ensure coding and classifications follow international guidelines
	Indicators for subsectors of agricultural and rural			
11	Productivity of Crop production as measured by crop yields	Quantity harvested per unit of area such as hectare and area harvested. Area harvested, distinguished between irrigated harvested crops and rainfed harvested crops	Census of Agriculture, crop cutting surveys. Production sample surveys, processor surveys, such as oil seed crushers, cotton ginners	Difficult to measure with mult-cropping or with crops that can be harvested > once a year. Crop cutting can over estimate yields
12	Change in components of crop balances	Area Harvested, Quantity harvested, quantities imported/exported, change in stocks, quantities by utilization such as food, bio fuels, own consumption, for every crop including those produced for fiber and oil	Surveys of agricultural enterprises, administrative data on trade, processors by utilization, household surveys for own consumption	Crop balances should reflect the growing cycle and marketing year which could be different from the calendar year.
13	Livestock value added	Estimates of quantity and value of production of meat, and poultry, milk, eggs, by products such as hides and skins, wool mohair minus costs of inputs such as feed and replacement stock	Surveys of agricultural holdings, enterprises such as slaughter plants, dairies, processors. Household surveys for own consumption	Own consumption should be included, difficult to measure.
14	Change in components of Livestock and	Number of animals born, acquired, slaughtered, deaths from disease.	Surveys of agricultural holdings at least annually but more often for	Data collection intervals should reflect the reproductive cycles. This suggests annual for cattle,

	Indicator	Data Requirements	Data Sources	Technical Notes
	poultry Balances by species	Number of animals by purpose such as breeding, meat, milk, wool, and by age breakdowns relevant to specie. (see FAO 2010 Census)	species with more frequent births during a reference period. This ranges from annually for cattle to monthly for egg production.	semi- annual for pork, quarterly or shorter for poultry, milk,
15	Change in productivity of Capture Fish production	Quantity of fish taken by unit of fishing effort; Scientific estimates of fish stock and exploitation rates;	National fishery surveys, surveys at landing sites, on-board observers, national, regional and global assessment results;	
16	Change in productivity of aquaculture	Estimates of quantity and value of production of fish by species minus costs and quantity of inputs such as seed, feed and fertilizers	Surveys of aquaculture enterprise, and holdings, aquaculture census, market certifications,	
17	Change in components of fish balances	Quantities and value of captures form coastal and offshore waters, rivers and lakes including non-landed catch; Quantities and value of products from aquaculture; utilizations including own consumption and discards, imports and exports, inputs such as seed and feed; outputs such as stocking; for each aquatic species	National fishery surveys, fishery census, aquaculture census, surveys of fishery and aquaculture enterprises, , processors, market information, administrative and inspection sources	See CWP Handbook, FAO coding and classification
18	Change in components of forestry balances	Quantity and value of removals of products from forested areas and respective utilizations	Appropriate ministries, satellite imagery, price surveys or processor data	
19	Commodity Price indexes	Market reports of prices being offered by commodity and location. Prices received by the enterprise at the first point of sale,	Market observers, Surveys of enterprises, agro enterprises purchasing commodities from agricultural enterprises	Care needed to ensure units of measure for pricing are comparable
20	Consumer Price indexes	Monthly/seasonal prices paid by the consumer	Consumer Price Index,	Care is needed to ensure highly seasonal products do not distort the price series.
21	Early warning of change in food security	Monthly/seasonal prices paid by the consumer	Windshield surveys of crop conditions, amount of precipitation, satellite imagery of vegetative indexes, changes in trade data, animal disease outbreak	These do not have to be statistically rigorous, mainly to provide an early warning that other interventions are needed
	Climate Change, land, and the environment			
22	Change in Land Cover and use	Land Cover Classification System (LCCS), Area and	Land use surveys, satellite imagery. Geo referenced	Ground truth data required to provide more detailed

	Indicator	Data Requirements	Data Sources	Technical Notes
		geo-referenced for Cultivated land, Grass/pasture, inland water, marine water, wetlands, shrubland, woodland, fallow/idle cultivated land, barren land, urban/developed areas, areas equipped for irrigation.	data on economic situation of agricultural holdings needed to understand effect of policy decisions on land use.	breakdowns of cultivated land, especially for crops in small plots. Difficult to apply in detail where multi- cropping is used.
23	Change in proportion of land area covered by forests, rate of deforestation	Area geo referenced to map materials	Ministry responsible for forestry, satellite imagery	Follow LCCS classification
24	Percent of land and water area formally established as protected areas	Land and water area and geo referenced to mapping material	Responsible ministry—satellite imagery	Follow LCCS coding with expansion covering inland and marine water bodies
25	Irrigated land as percent of total cropland Productivity of irrigation	Total cropland and area irrigated by source of water for irrigation—(surface water, groundwater, treated wastewater, etc.) - by method (surface, sprinkler, localized irrigation) Crop yields from irrigated land compared to yields from non irrigated areas.	Agricultural Census, other crop related surveys or water user survey	irrigation refers to the artificial application of water to assist in the growing of crops (and pastures). Can be done by letting water flow over the land ("surface irrigation"), by spraying water under pressure over the land concerned ("sprinkler irrigation"), or by bringing it directly to the plant ("localized irrigation")
26	Withdrawal of water for agriculture as a percent of total water withdrawal	Area under irrigation, number of irrigations, irrigation intensity and requirements by crop, water withdrawal and turn over rate for aquaculture consumption, per capita consumption by people and animals	Appropriate ministries, special studies or surveys to estimate water use in agriculture and aquaculture, surveys of aquaculture enterprises and holdings.	Should include both surface and ground water. Coding and classifications should be defined
27	Change in soil loss from watersheds	Reduction in crop yields, reduction in area of cultivated land	Appropriate ministries, geo referenced data with satellite imagery	
28	Change in affect of inputs on the environment	Fertilizer, pesticide, and other chemicals applied to the soil, water bodies, and plants by type of crop and watershed area, stocking	Agricultural census and or follow-up surveys to measure fertilize and chemical use, tillage methods	Data should be geo referenced to land cover and use
	The agricultural and rural economy			
29	Number of	Include Unpaid labour of	Labour force surveys of	Need to establish standards for

	Indicator	Data Requirements	Data Sources	Technical Notes
	family and hired workers on the holding	the operator of the holding and family members plus number of hired workers	holdings	minimum ages of workers and the number of hours worked per week to be considered a worker. Need to define reference period Need to ensure female workers are counted
30	Number of household members employed by farm and non farm	The employment status for work off the agricultural holding for each household member	Labour force surveys—household surveys	Need to distinguish defined employment from unpaid household service work such as domestic chores.
31	Change in Farm and Rural non farm household income from all sources	Income to the household by sector, crop, livestock, etc. Income from investments or employment outside the agricultural holding	Rural Household Survey.	Rural to be classified using range in population density using national definitions
32	Percent of rural population using services of formal banking institutions	Total number of rural households, number using credit or savings services	Central Bank or commercial banks, special surveys, agricultural census	
33	Change in sales of agro enterprises	Sales, net profits of enterprises providing services to agriculture	Special surveys	Use standard accounting principles

Annex C: African countries Plans for Population censuses in 2010 round

Year	Number of countries	Countries
2005	1	Cameroon
2006	5	Burkina Faso, Egypt, Lesotho, Libya, Nigeria
2007	3	Ethiopia, Mozambique, Swaziland
2008	6	Algeria, Burundi, Congo, Liberia, Malawi, Sudan
2009	5	Chad, Djibouti, Guinea Bissau, Kenya, Mali
2010	10	Angola, Cape Verde, Congo (DRC), Côte d'Ivoire, Ghana, Guinea, Mauritania, Senegal, Togo, Zambia
2011	7	Botswana, Eritrea, Mauritius, Namibia, Niger, Sao Tomé and Principe, South Africa
2012	7	Benin, Equatorial Guinea, Rwanda, Seychelles, United Republic of Tanzania, Uganda, Zimbabwe
2013	4	Central African Republic, Comoros, Gabon, Gambia
2014	3	Morocco, Sierra Leone, Tunisia
n.s.	2	Madagascar, Somalia
TOTAL	53	