Action Plan of the Global Strategy to Improve Agricultural and Rural Statistics

Research Plan

The goal of the research plan in the Global Strategy to Improve Agricultural and Rural Statistics is to develop and disseminate advanced and cost-effective methodologies, tools, and standards for the use of agricultural statisticians in developing countries. Developed methodologies will be disseminated through methodological publications, which will be the basis for guidelines, handbooks, and documentation of good practices in priority research topics to foster the production of accurate statistics.

This goal will be achieved providing a framework for coordinated efforts of experts in various Regions to address the most important methodological issues and gaps for effective data collection, processing and dissemination on current and emerging demand for statistics to inform relevant policy debate for developing countries.

The research topics

Through a long process, including a survey undertaken among key stakeholders in agricultural statistics and various meetings (in Tunis in February 2010, in Rome FAO Headquarter, 13 and 14 September 2010), some research topics have been prioritised according to the following criteria:

- Responding to explicit country data needs
- Concerning the core set of variables and the pillars[1] of the Global Strategy
- Ensuring the integration of agricultural statistics with other domains (e.g. household data integrated with area frame data)
- Adding value to existing or planned operational programs
- Producing economic and social benefit.

The draft proposal for the Research Component was presented at the ICAS-V (see Keita and Carfagna, 2010), in order to receive feedback and contributions, particularly from the Friends of Chair task team for the research component.

Afterwards, FAO Statistics Division presented the proposal for the research topics to be included in the Global Action Plan and the strategy for conducting the research to the Joint Research Centre of the European Commission (JRC). The main purpose of the presentation was to discuss and receive feedbacks from the JRC concerning the relevance of the proposed topics and existing research gaps. The relevance of the research topics was recognized and it was suggested to add the improvement of methods for estimating post harvest loss and use of pesticides in the list of

[1]The pillars of the Global Strategy are: Pillar I: establishing a minimum set of core data that countries will provide to meet the current and emerging demands; Pillar II: integrating agriculture into the national statistical system; Pillar III: fostering the sustainability of the statistical system through governance and statistical capacity building.

prioritised research topics. The research topics and the strategy for implementation were also discussed at the first meeting of the Regional Steering Committee for Africa (which supported the inclusion of post harvest loss and use of pesticides in the list of prioritized research topics), with some FAO Divisions and other institutions.

The research topics are grouped in thematic domains which are described below.

Creating an appropriate reference framework – The second pillar of the Global Strategy is the integration of agriculture into the national statistical systems. Guidelines on developing an integrated agricultural programme will be prepared which will aim at identifying and addressing policy makers' needs and developing solutions for the organization and the legal framework which best fits the characteristics of countries. Also, guidelines on development of Sector Strategic Plans for Agricultural Statistics for mainstreaming agriculture into the NSDS will be prepared. The guidelines will address the difficulties which can be faced when different organizations have to cooperate to mainstream agriculture into the national statistical system and to develop an integrated agricultural statistics programme. Finally, technical solutions for the integrated survey framework will be developed and corresponding guidelines prepared. Strategies and good practices already adopted by some countries will be considered in order to identify appropriate solutions, taking into account the specificities of countries and stakeholders.

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

Research will be conducted for improving the use of GPS, GIS and remote sensing for setting up a master sampling frame for integrated survey for the various categories of countries, according to the landscape, the economic structure, the size of farms, the spatial distribution of important crops and livestock species, and the kind of data sources available in the country. The development of a master sampling frame will take duly into account the data and information from Population and Agricultural Censuses, particularly the Enumeration Area information used by many countries as Primary Sampling Units. The research will also identify the most appropriate list frame, multiple frame or area frame for the different categories of countries (point frame, square segments, segments with physical boundaries, the size of the segments etc.). Finally, it will focus on the improvement of methods for linking area frames with list frames.

Improving data collection methods – A satisfactory solution has not yet been found for many data collection problems. Research efforts seek accurate and cost-effective methods for improving estimates of crop area and yield, particularly in presence of mixed crops, repeated cropping, continuous cropping, and for root crops.

Attention will be devoted also to the development of methods for estimating post-harvest loss, and for measuring the use of fertilizers and pesticides; major inputs that have environmental consequences.

Research will be devoted to the improvement of methods for collecting data on livestock, including cattle, sheep, pigs, goats, and poultry because livestock production is a major contributor to food supply and income. Consumption increases as countries develop, therefore resulting in more livestock consuming grain and adding to methane emissions.

Accurate estimation of livestock numbers and production is a challenge in many countries, particularly in Africa (FAO, 1992) because of the nomadic and semi-nomadic livestock systems. Social constraints also create difficulties in obtaining accurate numbers on livestock in pastoral societies and estimation of livestock products, especially with regards to small animals.

Many of the above-mentioned considerations in relation to methodology also apply to fisheries and aquaculture which provide an important source of food security, nutrition (especially protein and trace nutrients) and livelihoods in many countries. In order to collect data on inland fisheries and aquaculture (both commercial and subsistence), appropriate methods for data collection and estimation need to be developed (FAO 1997; FAO 1999).

New technologies such as GPS, PDA, remotely sensed data from satellite and aircraft as well as geographic information systems (GIS) will play an important role in the development of cost effective data collection methods. Research will be conducted for assessing their effectiveness and cost-efficiency in developing countries.

The improvement of data collection methods and analysis of irrigated area and use of water for irrigation will be pursued as well.

The activities under this theme will start with taking stock of on-going methodological work being conducted by several institutions such as FAO, the World Bank and others in order to build synergy and complementarities.

Improving the methodology for food security data and indicators– The social dimension of the Global Strategy covers the need to reduce risk and vulnerability, especially for food security. The quality of supply-utilization accounts and of food balance sheets is linked to the quality of the food availability data, mainly production, trade and stock. The quality of data on food stocks is very low in many countries; thus, research is needed to identify strategies (survey designs, sample designs, estimators etc.) for producing more reliable data. Moreover, due to the influence of food stocks on the international prices, better methods for estimating stocks will allow better forecast of food price crisis.

Edible forest products are an important element of the diet of some populations; thus estimates of the quantities harvested are needed to avoid a downwards bias in the estimate of food available, an essential input data for the estimate of the prevalence of undernourished.

The research will also analyse the possibility of improving the methodology adopted by FAO for estimating the prevalence of undernourished taking advantage of other data sources, like households' surveys (e.g. LSMS) and nutrition indicators.

The activities in this thematic area will be well coordinated with on-going developments regarding Food and Nutrition Security Information System by FAO and other partners as well as improving food security measures/metrics/indicators.

The recent FAO/WFP Joint Strategy on Information System for Food and Nutrition System (ISFNS) includes an important component on developing standards, tools and methods for generating Food and Nutrition Security Information and Statistics. Partnership with other key agencies is also promoted through the newly established Food Security Information Network (FSIN) for developing standardised methods.

The development and use by countries of sound methods to produce reliable basic data on food availability (production, stock, trade) will support the development of food security information systems and indicators.

Improving the methodology for market statistics – Market information affects agricultural activities and farmers' decisions. Most important is timely estimates of supply and demand, ideally before harvest. Improvement of methods for crop production estimates and forecasts are included under "data collection methods" and "data analysis". Attention will be devoted to the improvement of methods for estimating farm gate prices, for collecting data on agriculture rural and border market prices and for estimating informal cross border trade data. Factors and product markets affecting agricultural activities will also be analysed, as well as the impact of bio-fuels on the market.

This research will complement and support the activities foreseen under the Agricultural Market Information System (AMIS) recently established under the auspices of the G20 with FAO as Secretariat. Methodological improvements in collecting market related data will support AMIS which focuses on selected crops and countries.

Improving the methodology for data analysis – Basic information has to be carefully analysed in order to understand and monitor the agricultural sector development issues. Reconciliation of census data with survey data, determination of users' information needs for decision making and use of small area estimation methods for improving agricultural statistics are particularly important in this domain. Methods for data analysis need to be developed or improved to inform policy decisions and monitor their impact on household incomes, rural development, and the environment.

Policy makers need statistics on small domains. A wide literature is available on small area estimation methods. Small area models are strongly dependent on the kind of variable to be estimated and on the kind of auxiliary variable available. Research will be conducted for

improving estimation methods for agricultural variables on small domains, taking into account possible kinds of auxiliary variables. Many systems for crop forecasting and early warning have been developed in the last decades since they can be vital in some developing countries. However, most of them tend to produce reliable results under ordinary conditions, but hardly under extreme conditions which are particularly important for policy issues. Thus a significant improvement is needed in the analysis of various sources of data (remote sensing data can be one of these sources) and in the development of models.

Improving the methodology for using administrative data – In developed countries, governmental interventions such as subsidies, regulation and legislation often require agricultural holders to report information on acreage. Land ownership and cadastral surveys provide useful information for constructing registers. Many references can be given on the use of administrative data for agricultural statistics, see Carfagna and Carfagna, 2010, ESSnet ISAD, 2008, Lavallée, 2005, Selander et al. 1998, Wallgren and Wallgren, 1999, 2007 and 2009. However, more research is needed for identifying where, how and under which conditions, administrative data can be used for producing agricultural, rural and agri-environmental statistics, with particular reference to developing countries. First of all, in many developing countries, administrative data have to be improved and specific guidelines will be created for this purpose.

Identifying appropriate indicators and collection methods for gender related data and indicators – Recent studies show that considerable difference exists in the level of use of inputs and other means of production and consequently on the yields and economical sustainability of farms managed by women. Several organisations are collecting data and making analysis on this topic. Ongoing and completed projects will be analysed and specific research will be conducted in order to identify appropriate indicators, corresponding data to be collected and survey designs.

Identifying appropriate indicators and collection methods for small scale fisheries including subsistence fisheries – In a large number of developing countries, capture fisheries (inland and marine) are major contributors to food and income for rural households. Small scale fisheries are also an important source of food supply and income generation. However reliable estimates are rarely produced, due to difficulties in frame identification and data collection (see de Graaf G.J et al., 2011). The problem of estimating subsistence fisheries will be addressed with particular reference to the following topics:

- Identification of the frame
- Development of methods for appropriate data collection (e.g. integration of fisheries in population census and/or agriculture census, see FAO. 1999)
- Estimation of self-consumption.

Better integration of geographic information and statistics – The research plan will address the need for better integration of geographic information and statistics. Particularly, it will propose new, more effective and robust methods for the use of maps to produce more accurate agricultural and rural statistics; especially to connect economic and social indicators to land use. In addition, more efficient methods will be studied for area frame construction, stratification, and calibration especially for improving models for small area estimation using geographic

information as auxiliary variables. Research is still needed also for developing robust and statistically based methods for spatial disaggregation and for integrating various kinds of geographical information and geo-referenced survey data, which is essential for crop forecasting and early warning.

Improving the methodology for using remote sensing – The development of more efficient and accurate methods is necessary for using remote sensing for crop area and yield estimation, crop forecasting and early warning, forestry and deforestation and land use/land cover monitoring, e.g. automatic change detection and quality control and validation of land cover data bases; see, for instance, Gallego, 2004, Carfagna and Gallego, 2005 and Carfagna and Marzialetti (2009 a, b) for a methodological contribution.

Remote sensing data have been used for producing vegetation indices that show overall crop conditions plus information about changes in land cover/use. Wide literature is available in these fields, for a recent review see Gallego et at., 2010, Doraiswamy et al., 2005, Dorigo et al., 2007, Hannerz and Lotsch, 2008. However, decision makers seldom use this kind of information because it is affected by high level of uncertainty, thus research will be devoted to its improvement.

A document on best practices for crop area estimation with remote sensing has been prepared by GEOSS (GEOSS, 2009). Remote sensing data can be used for estimating the cultivated area of countries or improving the precision of estimates for specific crops. In this field, the research activities will be devoted to the development of more efficient statistical methods and the assessment of their cost-effectiveness in developing countries.

A major topic for research is the improvement of methods for integrating remote sensing data and ground surveys. Other research topics are the use of AFRICOVER or more detailed land use/cover data-bases for stratification, the use of remote sensing data for small area estimation, the assessment of the most appropriate area frame for specific landscape types and the possibility of combining households surveys with remotely sensed data (see Gallego et al. 2010, Carfagna and Gallego 2005, FAO, 1988).

Identifying appropriate indicators and collection methods for agri-environment – The agri-environmental topics have been debated for a long time in developed countries with much focus on what the scientists would like to know and little on what can be measured or estimated. Thus, much research is still necessary in order to define the indicators to be adopted and consequently the guidelines on the data to be collected, the most appropriate sample units and sample design, the interactions among the variables to be investigated, the precisions to be reached and so on. These topics will be faced by the research. Existing literature will be analyzed and the organizations and the institutions working in this topic will be contacted for identifying the research gaps (see for example Selenius, 2010). Also the Italian Ministry of Agriculture is carrying out some research activities in this field, mainly devoted to delimitation of High Nature Value Farmland, which is an estimate of the distribution patterns on the basis of land cover and biodiversity data.

The interaction among climate change, environment, and agriculture will be investigated and particular attention will be devoted to the impact of bio-fuel and the use of Genetically Modified Organisms (GMO) on biodiversity and the environment.

Deforestation has a very strong impact on the climate and the environment, particularly in some areas of the world; thus methods for monitoring deforestation and, in general, land cover have to be improved and made available for developing countries, also because a fundamental way to evaluate agriculture's impact on the environment is to monitor changes in land cover and use.

Annex 1 shows the prioritized research topics, corresponding thematic domains, and the pillars of the Global Strategy related to each thematic domain.

Implementation of the research plan

The Global Office will promote, coordinate, and undertake the research on the relevant topics. It will facilitate contacts and exchange of information among relevant Divisions in FAO, Universities, other Research Institutes, Statistics Offices and Ministries of Agriculture, in order to build synergies and avoid duplication of efforts in developing advanced and cost-effective methodologies, tools and guidelines. A Scientific Advisory Committee will advise on the implementation of the research plan, including the identification of the best implementing partners.

Networking will be an important element of the implementation strategy. A living data base will be created that will include ongoing and relevant research projects conducted all over the world in order to facilitate access and sharing of knowledge. This data base will be complemented by an inventory of the best practices based on the results of the relevant research projects. The inventory and the data base will be an instrument for transmitting knowledge and best practices not only from developed to developing countries, but also among developing countries.

The outputs expected from the Research Plan and the corresponding activities to be undertaken are described in Annex 2. The Global Office will work with the most qualified regional and international structures for a decentralized implementation. Subcontracts will be assigned on tender basis or on comparative advantage basis (whenever possible to institutions located in developing countries) depending on the topic.

The outcome of the Research Plan will be advanced and cost-effective methodologies, tools, and standards developed and disseminated for the use of agricultural statisticians in developing countries. These will be in the form of methodological publications which will be the basis for guidelines, handbooks, and documentation of good practices in priority research topics to foster the production of reliable statistics. Specific outputs are:

1. Reports including, for each priority research topic:
    - ongoing or already completed research activities;
    - review of relevant literature («état des lieux» and «state of the art»);

- gaps analysis and remaining methodological issues identified; and
- potential partner technical institutions.

2. Empirical studies, where needed, designed and field-tested by relevant technical partner institutions;
3. Technical reports on the findings and recommendations for possible solutions to methodological issues prepared, peer reviewed, and validated by experts;
4. Methodological publications and dissemination of results;
5. Technical reports on findings, standards, and recommendations for possible solutions to methodological issues prepared, peer-reviewed, and validated by experts. These reports will be the basis for developing training material, guidelines and handbooks for advanced technical assistance and training on innovative methods. Annex 3 describes the relationships among research, training and technical assistance.

ANNEX 1: Relationship among Thematic Domains, Research Topics, and Pillars of the Global Strategy

Thematic domain	Research topic	Pillar of the Global Strategy
Creating an appropriate reference framework	Creating an appropriate framework for the development of an integrated agricultural statistical programme Mainstreaming agriculture into the National Strategies for the Development of Statistics Implementing an integrated survey framework	II
Identifying the most appropriate master frame for an integrated survey	Improving the use of GPS, GIS, and remote sensing for setting up a master sampling frame for an integrated survey Identifying the most appropriate area frame for specific landscape types Improving methods for linking area frames with list frames	II
Improving data collection methods	Improving methods for estimating crop area, yield, and production Improving methods for estimating crop area, yield, and production of • Mixed crops • Repeated cropping • Continuous cropping Developing methods for estimating yields of root crops Improving methods for estimating postharvest losses and use of pesticides Improving methods for estimating the cost of production in developing countries Improving the methodology for • Enumerating nomadic livestock • Estimating livestock products Adopting new technologies Improving data collection methods and analysis of inland fisheries and aquaculture Improving data collection methods and analysis of irrigated area and use of water for irrigation	I
Improving the methodology for food security statistics	Improving the methodology for the estimation of • Food security statistics in synergy with the FAO/World Food Program Information Systems for Food and Nutrition Security (ISFNS) strategy work on standards and methods • Food stocks • Edible forest products Using nutrition indicators for food security indicators Using households surveys and the Living Standards Measurement Study for collecting data to compile food security indicators	I, II

Improving the methodology for market statistics	Improving the methodology in synergy with the Agricultural Market Information System (AMIS) for • Estimating farm gate prices • Collecting data on agricultural commodity prices at rural and border market • Estimating informal cross-border trade data • Collecting data on factors and product markets affecting agricultural activities and the impact of biofuels on the market	I
Improving the methodology for data analysis	Improving the methodology for • Reconciling census data with survey data • Determining users' information needs for decision making • Using small-area estimation methods for improving agricultural statistics • Crop forecasting and early warning	II
Improving the methodology for using administrative data	Improving the quality of administrative data Developing more efficient and more robust methods for using administrative data for improving agricultural statistics	II
Identifying the appropriate indicators and collection methods for gender-related data and indicators	Identifying the • Appropriate indicators • Data to be collected and survey designs	I, II
Identifying the appropriate indicators and collection methods for small-scale fisheries	Identifying the frame and developing methods for the appropriate data collection Improving methods for estimation of self-consumption	I
Better integrating geographic information and statistics	Developing robust and statistically based methods for spatial disaggregation and for integrating various kinds of geographical information and geo-referenced survey data Improving statistical methods for spatial interpolation and presentation	I
Improving the methodology for using remote sensing	Developing more efficient and accurate methods for using remote sensing Evaluating the cost-efficiency of remote sensing in developing countries Improving methods for using AFRICOVER or more detailed land use/land cover databases	I
Identifying the appropriate indicators and collection methods for agri-environment	Identifying the indicators to be adopted and consequently the guidelines on • Data to be collected • Most appropriate sample units and sample design • Interactions among the variables to be investigated and the precisions to be reached Identifying the data to be collected and the survey designs for analysing the interactions among climate, environment, and agriculture Identifying the data to be collected and the survey designs for analysing the impacts of biofuels and genetically modified organisms on biodiversity and the environment Identifying the data to be collected and survey designs for monitoring deforestation and land cover change	I, II

ANNEX 2: Outputs and Corresponding Activities for Prioritized Research Topics

Outputs	Activities
1.1 Report on ongoing or already completed research activities on the selected priority topics 1.2 Potential partners identified 1.3 Reports on • Ongoing or already completed research activities on the specific research topic • Review of the relevant literature (state of the art) • Gaps analysis and remaining methodological issues identified	1.1 Collect information on the ongoing or already completed research activities on the selected topics. 1.2 Identify possible partner institutions. 1.3 Prepare the contracts for the partners (academic institutions, research centres, individual experts, etc.). 1.4 Coordinate the activities of the partners. 1.5 Facilitate networking among the partners. 1.6 Identify the relevant literature concerning the specific research topics. 1.7 Review the literature on priority topics. 1.8 Identify and analyse the gaps and remaining methodological issues. 1.9 Prepare a draft report on the ongoing or already completed research activities and the gaps in specific research topic and literature review. 1.10 Organize workshops on the ongoing or already completed research activities on the specific research topic and literature review.
2 Empirical studies designed and field-tested by the relevant technical partner institutions	2.1. Design studies for the field tests for the specific research topic. 2.2. Set up the methodology and the instruments (questionnaires, manuals, etc.). 2.3. Select the countries and the samples for the experiments. 2.4. Conduct the field tests.
3 Technical reports on the findings and recommendations for possible solutions to methodological issues prepared, peer reviewed, and validated by experts	3.1 Process and analyse the results. 3.2 Prepare a report on the findings and recommend possible solutions to issues. 3.3 Select the experts for the peer review and expert validation. 3.4 Submit the reports prepared to the experts. 3.5 Undertake peer review and expert validation through a technical workshop.
4 Methodological publications and dissemination of results	4.1. Analyse the results of the peer review and the expert validation. 4.2 Prepare and submit methodological papers to important journals. 4.3 Organize a dissemination workshop with countries and other stakeholders. 4.4 Disseminate the findings on the Web.
5 Methodological basis for the guidelines for advanced technical assistance and training	5.1 Prepare the methodological basis for the guidelines and handbooks for advanced technical assistance and training.

Annex 3: Linkages among technical assistance, training and research

Technical Assistance	Training	Research
-Provide assistance for the county assessment	-Training for the analysts conducting country assessment	
Develop standards for technical assistance		
-Develop and apply guidelines SSPARS for integration of agriculture into NSDS		-Research for Mainstreaming agriculture into NSDS
-Prepare and apply guidelines for statistical laws, confidentiality issues, establishment of national statistical council		- Conduct research for creating an appropriate framework for development of an integrated agricultural statistics programme
-Prepare and apply technical standards and guidelines on area statistics, yield forecasting and estimation, livestock and poultry inventory and production estimates, prices and trade, employment and labour, censuses, land use, fishery and forestry production	-Translate standards into training materials -Provide training	-Improving data collection methods -Improving the methodology for data analysis -Improving the methodology for market statistics - Identifying appropriate indicators and collection methods for small scale fisheries
-Prepare and apply statistical standards for coordination of agricultural with population censuses		
-Document and apply statistical standards for the development of the master sample frame, the integration of surveys, estimation practices, and for the use of administrative data	-Provide training materials for validation and reconciliation of the data from different sources	- Identify the most appropriate master frame for integrated survey -Develop more efficient and robust methods to use administrative data for improving agricultural statistics
-Develop and apply guidelines based on good practices and findings of the research for the use of remote sensing, global positioning systems, statistical software and portable data entry devices	-Contribute to translation of current and advanced practices into training materials -Train specialized staff in using GIS and remote sensing data	-Improve methods for using GPS, GIS and remote sensing for setting up a master sampling frame for integrated survey

- Develop and apply guidelines based on good practices and findings of the research for sample design, data collection, estimation, and data analysis	-Contribute to translation of current and advanced practices into training materials -Train specialized staff	-Improve data collection methods - Improve the methodology for data analysis
-Document, develop and support implementation of standards for data harmonization and dissemination using proven systems such as CountrySTAT	- Provide training materials and training the specialized staff in validation and reconciliation of the data from different sources and implementation of data management and dissemination systems	- methods, standards and systems to implement integrated data base for data management and dissemination
-Document and apply current and advanced analysis methods to add value to data and incorporate economic, social, and environmental dimensions		- Improve the methodology for data analysis - Identify appropriate indicators and collection methods for agri-environment
-Prepare and apply guidelines for technical assistance on advanced and cost effective methods developed by the research	-Prepare handbooks for training on advanced and cost effective methods developed by the research	- Contribute to the preparation of guidelines and handbooks on advanced and cost effective methods developed by the research
-Document and apply how analysis of data from the economic, social, and environmental dimensions can be used for policy purposes	- Prepare training materials to support joint workshops for statisticians and policy makers and other data users on the use of data	- Improve the methodology for determination of user' information needs for decision making
-Enhance collaboration and networking between regions: establishment of a network of agricultural statistics offices and exchange of best practices	Use to support training	
-Enhance coordination and collaboration with other providers of statistical TA and the international statistical community	Use to support training	
-Develop and maintain a roster of experts	Use to support training	
-Ensure effective coordination, quality		

assurance and overall monitoring and evaluation of the TA deliverables		

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