INTERNATIONAL EXPERT GROUP MEETING
ENHANCING DATA FOR COMPLEX AGRICULTURAL ESTABLISHMENTS

Data Requirements for Policy and Private Decision-Making: Developing Country Perspective

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1. INTRODUCTION

The recent food crisis and food market volatility, the debate on environment and climate change and their interaction with agriculture and the 2008 World Development Report of the World Bank "Agriculture for Development" (World Bank 2008) have lead to a renewed recognition of the critical importance of the agriculture sector as source of economic growth, food security and poverty reduction and improvement of the livelihood of a large proportion of the population in many developing countries. Three out of four poor people in these countries live in rural areas and most rely directly or indirectly on agriculture for their livelihoods.

There is a growing recognition that the increasing trend of food prices is driven in part by droughts in grain-producing regions, increased oil prices, and sales of some food crop such as corn to produce biofuels in a context of lowered food reserves. Future food prices are expected to remain higher than they were in the 1990s and to be more volatile [FAO/WB/UNSC 2010].

The need for more effective policies related to the agriculture development has therefore become an increasingly pressing priority in order to achieve development goals. For these policies to be effective, they need to be grounded into factual evidence about the sector and make systematic and rigorous use of statistics for: a) issue recognition; b) informing policy choice and design; c) forecast the future; d) monitor policy implementation; e) evaluate policy impact and make the adjustments needed. Evidence based decision making is a prerequisite for policies to really have an impact on the target populations.

Decisions about investments that are intended to foster agricultural growth need to be based on sound information about land and input use, productivity, prices and the prevailing economic and social situations that producers face. The impacts of these factors can only be effectively measured and evaluated with appropriate statistics.

At the same time, short term food security situation needs to be monitored in order to take appropriate decisions and actions to mitigate the impact of food production deficit on the food security of the population.

However, in many developing countries, the agriculture sector is very complex and evolving rapidly with the simultaneous presence and inter-linkages of several farming systems. The typology of farms range from small subsistence family farms to large, modern, market-oriented and highly mechanized systems. To add to this complexity, particularly under

subsistence farming, mix-cropping, continuous planting and harvesting, combined with lack of recording systems, pose serious challenge for collecting sound data on the sector.

The following chapters will review some of the main policy issues and data requirements and the complexity of farming systems and corresponding challenges for data collection in developing countries.

2. POLICY ISSUES AND DATA REQUIREMENTS

There is a wide range of data required to effectively support decision making in the food and agriculture sector in developing countries. Data requirement depend on country situation, the type of policy action and the phase of design or implementation of the policy. A recent report published by United Kingdom Government for Science [UK Foresight 2011] recognises that "policy development in the global food system requires accurate data on the external factors driving change, as well as indicators of how the food system is functioning".

Two broad categories of data requirements are considered in this paper:
- Short term data needs, mainly for monitoring current agriculture production, food supply and early warning.
- Structural data for longer term policy needs.

1.1 Short term data needs: monitoring food outlook

In developing countries, emphasis is on food security particularly in the context of subsistence farming (early warning information, food balance sheets, etc) to provide information that can help governments and development partners in short-term decision-making.

Ensuring short term food security to the population is a vital issue in many developing countries. The FAO State of Food Insecurity 2010 [FAO-SOFI 2010] reported twenty two countries as Countries in Protracted Crises based on the longevity of crisis (FAO/GIEWS data 1996-2010) and the proportion of humanitarian assistance received by the country as a share of total assistance. The majority of these countries are Low-Income Food-Deficit Countries (LIFDCs) and more than 80% of the countries are from Africa Region (see annex 3).

The primary needs in these countries and many other developing countries in the short term are timely and accurate information and data in order to anticipate food shortages and take appropriate actions to mitigate the impact of food production deficit. Therefore some of the key information needed for national and international decision makers are:
- crop monitoring information,
- pre-harvest and post harvest crop production data,
- food market price monitoring information.

These data and information are required to evaluate prospective food availability, establish food balance sheets and estimate possible deficit.

In many countries with fragile eco-systems and prone to recurrent droughts or floods or other natural calamities, systems have been developed to collect regularly the short term information. Since the drought of the 1970's and 1980's, most Sahel countries in Africa, with assistance of European Union have established a system of annual crop production and forecasting surveys (for major food crops) which is more or less effectively functioning

depending on countries. An annual ministerial meeting is organized in October of each year to review the food outlook in the region and eventually serve as a basis for appeal for food aid. Agro-meteorological data and remote sensing images (from AGRHYMET) are also used for monitoring global crop situation in the region.

In many developing countries, short term information and current agricultural statistics, including crop area and production estimates are usually collected through a variety of methods including administrative reporting systems and/or through sample surveys. The majority of countries compile current agricultural statistics based on reports from local officials particularly for early warning and crop forecasting since reporting method of data collection is cheap and easy. However data quality is often poor because of lack of sound statistical concepts and procedures. In many countries, large discrepancies exist between these administrative sources and post harvest crop production survey results using sampling. The following example from Mozambique illustrates the discrepancies between various sources of crop production data:

Trends in Cereal Production Estimates from *Aviso Prévio* and TIA from 1996 to 2006 (thousand tons)

System	1996	2002	2003	2005	2006
Aviso Prévio(early warning)	1,377	1,767	1,811	1,900	2,098
TIA (crop production survey)	1,459	1,454	1,509	1,137	1,700
Difference	**+5.6%**	**-21.5%**	**-20.0%**	**-67.1%**	**-23.4%**

These types of discrepancies exist in many developing countries and pose serious constraints to decision makers. They are related to the complexity of the farming systems and diverging concepts, methodologies, tools used.

1.2 Structural data for longer term policy needs

Apart from current agricultural statistics, a variety of data and information are needed to support longer term policy making. Data on agriculture sector has a wide range of policy uses in developing countries. In the FAO World Program for Census of Agriculture 2010 (WCA2010), the following uses of data on the structure of agriculture are identified:

- Monitoring the Millennium Development Goals, particularly Goal 1 (eradicate extreme poverty and hunger and Goal 7 (ensure environmental sustainability).
- Poverty monitoring and analysis
- Food security monitoring and analysis
- Measuring the role of women in agriculture
- Agricultural planning and policy-making
- Monitoring and evaluation of the results and impacts of agricultural development policies, programmes and projects
- Marketing and investment decisions of the private sector

Structural data needed to support these policy issues are detailed in WCA2010. They are classified in twelve thematic data items:

01 Land: area, tenure, presence of soil degradation;

02 Irrigation and water management: irrigation according to land use type; method of irrigation; area of specific crops irrigated; source of water; payment terms for irrigation; other water management;

03 Crops: types of crop, area harvested, end-use of crops; crop production; net cropped area; area of productive and non-productive permanent crops in compact plantation, number of crop trees, fertilizer use for each crop type, area fertilized, source of seed; type of seed; area of nurseries, area of cropped land under protective cover;

04 Livestock: type of livestock system, number of animals by age and sex, use of veterinary services; milking animals; livestock population dynamics; type of feed;

05 Agricultural practices: use of agricultural pesticides; use of good agricultural practices; use of organic farming; use of genetically modified crops; selected machinery and equipment used, non-residential buildings, sales of agricultural produce;

06 Agricultural services: credit; source of agricultural information; extension services; access to food markets;

07 Demographic and social characteristics: household size, holding part of agricultural household, national/ethnic group; household structure, marital status of household members, educational attainment of household members;

08 Farm labour: activity status of household members, status in employment of household members; occupation and time worked by household members in main job and on the holding; number of employees on the holding, time worked and sex, form of payment for employees; use of contractors;

09 Household food security: household members could not afford to eat what they normally eat at any time during the last twelve months, months in which food shortage occurred, reasons for food shortage, how household's eating patterns were affected, steps taken to alleviate food shortage; fear shortage during future twelve months, frequency of eating selected food products, effects of natural disasters, extent of losses of agricultural output du to natural disasters, height and weight of children under five years,

10 Aquaculture: area according to type of site; area according to production facility; type of water; sources of water; type of organism;

11 Forestry: area of forest and other wooded land, purpose of forest; agro-forestry;

12 Management of the holding: identification of sub-holdings and sub-holders, sex and age of sub-holder, area of crops managed by sub-holder, number of livestock managed for each livestock group.

Examples of data requirement for selected policies

Policy issue	Data requirement
Agricultural planning and policy-making	Data on crop area and other physical variables can be used in combination with other socio-economic data to study small holdings (analysis of characteristics of small holdings in relation to other holdings) and for other in-depth agricultural research in support of planning and policy-making
Poverty monitoring and analysis	data collected in the agricultural census, such as farm size, land tenure, and ownership of farm machinery can be used as proxy for income/poverty measures
Food security monitoring and analysis	a wide range of data is needed to monitor progress towards food security: food availability, food access, stability of food supplies.

	For food availability: data on crop area, yield and production 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
Monitoring the Millennium Development Goals	Goal 1: Eradicate extreme poverty and hunger: census data can be used to measure the prevalence of underweight children under five years of age (Indicator 4). Goal 7: Ensure environmental sustainability. Census data can be used for monitoring Indicator 25: proportion of land area covered by forest. Data on the forest land operated by agricultural holdings. Indicator 32: land tenure in urban and rural areas. Land tenure data for agricultural holdings is of interest in understanding the effect of security of land tenure on agricultural practices and household food security.

Apart from data requirement for policy analysis and planning, tracking results in agriculture and rural development policies and programmes and their impacts on target population require the availability of specific indicators. Of particular relevance are the outcome and impact indicators.

A Sourcebook on indicators for Monitoring and Evaluation published by the FAO, the World Bank and the Global Donor Platform for Rural Development [FAO/WB/GDPRD, 2008] defines a menu of 86 indicators grouped in:
- sector wide indicators,
- specific sub-sector indicators (crops, livestock, fisheries and aquaculture, forestry, rural micro-finance, agricultural research and extension, irrigation and drainage, agri-business),
- indicators for thematic areas (community based rural development, natural resources management, land policy and administration, policies and institutions).

However, empirical studies conducted in Senegal, Nigeria, Cambodia and Nicaragua revealed that most developing countries do not have the data systems and M&E capacity for producing the full list of indicators in the menu. The publication therefore defines a core list of nineteen indicators that would allow for monitoring and evaluation of the results of Agricultural and Rural Development policies in difficult data conditions. It further specifies basic data requirement to compile these indicators and possible sources (see list in annex 2).

The Global Strategy To Improve Agricultural and Rural Statistics recently developed and adopted by the United Nations Statistical Commission in 2010 [FAO/WB/UNSC, 2010] defines a new conceptual framework which broadens the concept of agriculture to include forestry, fisheries, and aquaculture as described in the Conceptual Framework.

The conceptual framework is articulated around the following three interlinked dimensions:
- economic dimension,
- social dimension
- environment dimension

The Global Strategy identifies a minimum set of core data for each of the three dimensions that are needed to support decision making. The Strategy strongly recommends the need for integration through an integrated survey framework, based on an integrated master sampling frame with data being disseminated through an integrated database. The integration is essential for producing data that can be interconnected for in-depth analysis and better information in support of policy making. The list of the minimum set of core data is in annex1.

These are just some examples of a growing need for data to inform policies in the context of more attention being given to effectiveness in terms of results and impacts.

However, when dealing with the agriculture sector in developing countries, collecting these data is a very challenging task, given the complexity of the agricultural sector. The UK report identifies "the enormous complexity of the food system" as the primary challenge in developing metrics and measures. [UK Foresight 2011].

3. COMPLEXITY OF FARMING SYSTEMS AND CHALLENGES FOR DATA COLLECTION

The agricultural sector in developing countries is characterized by the existence of several farming systems in the same country and wide differences between countries. The FAO WCA2010 defines two categories of agricultural holdings:
(i)   holdings in the household sector which are mainly operated by household members,
(ii)   holdings in non-household sector which include a wide variety of units: corporations, governments and semi-government institutions, etc..

However, this categorization in two sectors does not fully reflect the complex reality of the farming systems. In fact, both types of holdings defined above are usually composed of units very different in terms of:
- size and level of production: from small farmer subsistence farms to very large farms
- purpose of production: self consumption or cash crops
- level of mechanization: simple tools to use of modern equipments
- type of management: no record keeping to modern
- holder characteristic, particularly the level of literacy

A wide range of possible typologies of holdings exist that combine a number of these characteristics. In most developing countries, the bulk of the agricultural production comes

from the household sector with a large number (sometimes, millions) of smallholder farms scattered across the country operating small parcels for self consumption.

In this small holder farming sector, the farmer tend to plant several crops in a small parcel. The following practices are common:

- Associated or mixed cropping with crops sown or interplanted with other temporary or permanent crops, for example, beans and maize.
- Successive cropping or catch crops sown and harvested on the same piece of land previously occupied by another crop, or even by the same crop, during the same agricultural year.

Most of these farmers are illiterate and do not keep any record of their production.

Collecting accurate data under this condition is a real challenge. In many countries in Africa for example, crop production estimates are often based on the objective measurement of crop areas and yields. Traditionally, this was done using, tapes, compasses, crop cutting.

However more cost-effective technical tools are emerging (GPS, PDA, remote sensing) that considerably facilitate data collection. Also, the agricultural sector itself is changing rapidly in many countries with an expansion of modern farms and also more educated farmers.

The data collection systems need to adapt to the changing face of agriculture and make use of emerging technologies to respond in a cost-effective manner to the growing data needs. This is the main purpose of the Global Strategy which is a framework for capacity building and development of cost-effective methods for producing basic data needed to inform policy.

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
- 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 research and development, in infrastructure	
	Household consumption	Consumption of core crops/livestock/etc. in quantity	

[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
		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		

LIST OF PRIORITY INDICATORS FOR TRACKING RESULTS IN LESS THAN IDEAL CONDITIONS

A Sector-Wide Indicators for Agriculture and Rural Development

P1   **Public spending on agriculture as a percentage of GDP from agriculture sector**

P2   **Public spending on agricultural subsidies as a percentage of total public spending on agriculture**

P3   **Prevalence (%) of underweight children under five years of age in rural areas**

P4   **Food Production Index**

P5   **Annual growth (%) in agricultural value added**

P6   **Rural poor as a proportion of total poor population**

B Specific Indicators for Subsectors of Agriculture and Rural Development

   B1 Crops (inputs and services related to annual and perennial crop production)

P7   **Change (%) in yields of major crops of the country**

   B2 Livestock

P8   **Annual growth (%) in value added in the livestock subsector**

   B3 Fisheries and Aquaculture

P9   **Capture fish production as percentage of existing stock**

   B4 Forestry (Developing, caring for or cultivating forests; management of timber production)

P11   **Percentage of the rural population using financial services of formal banking institutions**

P10   **Proportion of land area covered by forest (%)**

   B6 Agricultural Research and Extension

P12   **Public investment in agricultural research as a percentage of GDP from the agriculture sector**

   B7 Irrigation and Drainage (services related to water use in agriculture)

P13   **Irrigated land as a percentage of crop land**

   B8 Agri-business (agricultural marketing, trade and agro-industry)

P14   **Change in sales/ turnovers (%) of agro-enterprises**

C Indicators for Thematic Areas related to Agriculture and Rural Development

   C1 Community-based rural development

P15   **Proportion of farmers (by gender) who are members of producer organizations**

   C2 Natural Resource Management

P16   **Agricultural withdrawal as a percentage of total freshwater withdrawal**

P17   **Ratio of area protected to maintain biological diversity to surface area of the country**

P18   **Change (%) in soil loss from watersheds**

   C3 Land Policy and Administration

P19   **Percentage of land area for which there is a legally recognized form of land tenure**

LIST 1: Countries in Protracted Crises as reported in SOFI 2010:
(*Based on the longevity of crisis (FAO/GIEWS data 1996-2010) and the proportion of humanitarian assistance received by the country as a share of total assistance)*
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1 Afghanistan
2 Angola
3 Burundi
4 Central African Republic
5 Chad
6 Congo
7 Côte d'Ivoire
8 Democratic People's Republic of Korea
9 Democratic Republic of the Congo
10 Eritrea
11 Ethiopia
12 Guinea
13 Haiti
14 Iraq
15 Kenya
16 Liberia
17 Sierra Leone
18 Somalia
19 Sudan
20 Tajikistan
21 Uganda
22 Zimbabwe

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