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AGRICULTURAL COST OF PRODUCTION STATISTICS – UPDATE ON THE RECENT EXPERT GROUP MEETING IN ROME AND NEXT MILESTONES

1. Background

Since its inception, at the request of the 21st session of the African Commission on Agricultural Statistics (AFCAS, Accra, October 2009), the work on agricultural cost of production (CoP) statistics has gained momentum, and produced several activities and outputs, which included:

- An expert group meeting (EGM) on CoP, a side event to AFCAS 22, held in November-December 2011 in Addis Ababa, Ethiopia;
- Three country cases-studies (Zambia, Mali, Ethiopia) on experiences in collecting and compiling CoP and price statistics, presented in the EGM in Ethiopia, listed above;
- A global survey on country practices in the field of CoP statistics;
- Funding in 2012, from the Global Strategy to Improve Agriculture and Rural Statistics, for a Handbook and field tests on CoP, targeted to developing countries;
- A second EGM on CoP during the 24th session of the Asia and Pacific Commission on Agricultural Statistics (APCAS), held in October 2012 in Da Lat, Viet Nam;
- A CoP literature review of key methodological issues and developing country solutions, prepared by the European Commission's Joint Research Centre (EC-JRC);
- A first draft of a Handbook on best practices in collecting and compiling CoP; *and*
- A third EGM meeting of a small high-level group of international experts, called the Friends of the Chair (FoC), held in Rome in November 2013, to review and advance the Handbook, and plan for field tests in various developing countries in 2014.

The EGMs in AFCAS and APCAS included international experts and government officials from developing countries, and led to the formation of the FoC, to advise on and peer-review the different outputs of the CoP project.

Since its inclusion in 2012 as one of the activities of the research component of the Global Strategy to Improve Agricultural and Rural Statistics, the CoP project will now follow the same workflow and timeline as the other research activities of the Global Strategy: the production of methodological guidelines and recommendations of the collection and compilation of CoP statistics (Handbook) and the undertaking of pilot field tests in the countries to assess the relevance and feasibility of the recommendations.

2. Organisation of the Expert Group Meeting in Rome, November 2013

The most recent EGM was held in Rome, Italy, from the 19th to the 21st of November 2013, in FAO headquarters. Approximately 10 participants from Africa, Asia, Europe and North America participated in the meeting, with experts from Agricultural Ministries, research organisations such as the EU-JRC and US Department of Agriculture's Economic Research Service (USDA-ERS), the World Bank, and FAO (Statistics Division, Fisheries Division).

The objectives of this third EGM on CoP were to:

- Gather feedback from the experts on the first draft of the Handbook on CoP statistics, circulated in November 2013, in order to identify the main gaps and the necessary revisions;

- Agree on the process to be adopted and the content of the field tests; and

- Propose and agree on a realistic timeframe and an appropriate sharing of responsibilities among the different partners to fulfil the objectives assigned to the project.

The EGM was structured in 9 distinct sessions:

- Session 1: Policy rationale for collecting and compiling cost of production statistics
- Session 2: Principles on the data collection process and planning
- Session 3: Land
- Session 4: Non-land fixed costs
- Session 5: Non-labour variable costs
- Session 6: Dealing with joint costs
- Session 7: Labour use, wages and imputed costs of family labour
- Session 8: Experience in data collection, processing and analysis
- Session 9: Next steps: developing survey tools, field tests and the 2014 project plan

This EGM was successful in identifying the gaps in the Handbook and to recommend priorities for meeting the needs of developing countries, especially for those that would like to revise their current CoP programs or engage in this new line of work. This paper presents the main questions that were discussed during this EGM and identifies the follow-up actions and the next milestones in carrying out this work in partnership with member countries.

3. Summary of discussions and key issues

3.1 General comments

Overall, the comments received on the first draft of the Handbook were positive. Several participants mentioned that it had been considerably improved compared to a previous version circulated earlier in 2013. Moreover, the Handbook is constructed in such a way that its scope, currently limited to the narrow agricultural sector, could be extended without much adaptation to other sectors, especially fisheries.

That said, the Handbook still needs to be improved and enriched in many aspects before considering it ready for field testing. In particular, it was recommended to:

- clearly define the sectoral scope with respect to the coverage of the value and distribution chain (e.g. treatment of highly vertically integrated activities, and inclusion/exclusion of fisheries and forestry);

- better define policy uses, drivers and benefits, and develop a business case for national statistics offices (NSOs) and agricultural ministries to secure funding to initiate or expand CoP programs;

- use the whole-farm approach to data collection, with compilation of crop-level estimates and indicators as an ouput of CoP statistical activities;

- provide information on the respective costs of implementing CoP programs, such as average per unit sampling costs and time for completion, based on existing experience;

- provide information and a business case on benefits to respondents/farmers in obtaining and using CoP information, such as benchmarking their own performance against both the average and distribution within their country/region, as is done in the U.S.;

- provide an annex on outputs/indicators produced by existing country-level CoP programs;

- improve the section on estimation of capital costs, both in terms of the methodologies presented and their respective data requirements;

- give more concrete and comprehensive examples/situations and solutions in estimating opportunity costs for owned inputs, when market-based measures are limited input market are too thin or nonexistent; *and*

- better define the trade-offs between competing methodologies and approaches within developing countries, particularly those with limited budgets and statistical infrastructure.

Given the large costs and respondent burden associated with CoP, the focus of the Handbook should be kept on CoP. Related and relevant topics, such as data collection strategies and sampling frames, that have a broader implication that CoP, should be left to the Global Strategy. similarly, other policy-relevant issues, such as gender disaggregation, should not be brought into CoP data collection in any situation where they increase respondent burden.

More details of the discussions that took place during each of the nine sessions of the EGM are summarized below.

3.2 Policy rationale for collecting and compiling cost of production statistics

The chapter of the Handbook referring to these policy rationales (Chapter 2) should better identify the key uses and users of CoP statistics. A minimum set of indicators and output tables consistent with the uses and users should be proposed, along with the associated costs of producing them. In particular, a "business case" for policy makers and farmers should be made.

It was clear from the discussions that CoP statistics benefit both policy-makers, through more efficient decision-making, and farmers, through benchmarking and identification of most profitable practices. It is rare that statistical programs provide the direct benefit to respondents that has been apparent in CoP, and this should be well marketed, using examples, such as the USDA. Other benefits to indicate include positive spill-overs to other sectors due to wider and more accurate statistics, and the feeding of national-level indicators and accounting frameworks (system of national accounts). Examples of indicators, outputs and uses of CoP data by developed and developing countries should also be given.

The Handbook should also clearly present and, when possible, quantify, the different costs and benefits associated with the different ways of producing CoP statistics ("clean" vs. "dirty" approaches). Trade-offs related to the scope of the data collection, estimation methodologies, frequency of data collection, etc. should be identified throughout all the chapters of the Handbook, along with their impact on data quality and usability.

3.3 Principles on the data collection process and planning

The different data collection strategies, their cost and their impact on data quality and usability should be presented in the Handbook. In particular, the Handbook should present different survey approaches, from stand-alone to multi-purpose and integrated surveys, the main sampling strategies, and the uses, data needs and limitations of the "typical" farm approach. It should however not be the purpose of this Handbook to propose a comprehensive framework for the collection of agricultural data, as this task is the responsibility of the Global Strategy.

The Handbook should focus on the issues associated with data collection which have a direct bearing on CoP. One of them is the question of frequency of data collection, which can be answered by identifying the main sources of variability in CoP: if variability is predominantly observable across space (for example, high variability of CoP across different agro-climatic conditions), then the data collection strategy should focus on undertaking a precise survey in the different regions or areas of relevance, without the need to repeat this very frequently. The choice of carrying out surveys for different crops every year, which is the approach adopted, among others, by the USDA, could in this respect be an appropriate one. One has to bear in mind however that in order to obtain a complete time-series, an estimation of the years for which the data has not been collected is necessary and this can create additional uncertainty and noise in the data.

There is also a necessity to collect regional and/or nationally representative data for analytical and policy purposes. In this respect, it is necessary to present in the Handbook sampling schemes (stratification, cluster sampling, etc.) that are both scientific and feasible given the various technical and financial constraints. This said, data collection schemes that cannot ensure a sufficient level of

regional or national representativeness, such as the so-called typical or average farm approach[1], can be useful in several ways:

- As a benchmark against which farmer can position themselves;
- To improve the identification of drivers of CoP, and therefore inform on possible stratification and post-stratification schemes;
- To generate, at minimal cost, parameters, statistics and information which have not been compiled before or for which the cost of implementing a proper survey would be prohibitive, thereby demonstrating the value and need for more representative data collection.

In addition, the lack of statistical representativeness of the "typical farm" approach can be addressed, at least in part, by broadening the number and type of "typical farms" to represent several strata (by size, agro-environmental conditions, and crops, for example), and by improving the determination of what is a typical farm through use of auxiliary information, such as the agri-environmental indicators developed at FAO. These approaches, their articulation and possible complementarities with survey-based approaches, should be better described in the Handbook.

For much of the remaining discussions on specific inputs, the EGMs made clear that the most significant measurement challenges arose with respect to owned inputs, or inputs purchased with in-kind rather than cash payments. Most of the rest of the section, as a result, focuses on such issues.

3.4 Land and land-related costs

Land is different from other fixed assets in many respects: it keeps its value for a relatively long time, land ownership structures and tenure agreements vary significantly and are influenced by both law, social conditions, and culture, and formal contracts defining land ownership may not always exist (some are written, others are just verbal). This has a bearing on data collection and the estimation of land ownership and rental costs and should be better reflected in the Handbook, although given the many specific cases, exhaustive coverage is not expected.

A common view emerged from the presentations and discussions that rental rates from local rental markets should be used to impute land costs for owned land or in cases where the rental rates actually paid are not known by the farmer. That is to say, the input price of owned land should be estimated as its economic opportunity cost, that is, by the market price for its alternative use multiplied by an appropriate interest rate. This method, though theoretically valid, is sensitive to highly uncertain parameters: the valuation of agricultural land, particularly when close to urban centres or subject to thin rental markets or rental prices paid in-kind, the choice of an appropriate interest rate, etc. For example, when rental prices are paid in-kind, partially or totally, it is recommended that the farm-gate or producer price for the commodity in which the payment is made should be applied, as this reflects the opportunity cost for the farmer, but FAO's experience shows that countries do not always collect true producer prices.

Even when market rental rates are available and appropriate to estimate opportunity costs of owned land, this should be applied with caution. First, there was no clear consensus whether rental rates for imputation of land costs should be determined for similar types of agricultural land (e.g. for similar crops in the same area), or in the true sense of economic opportunity cost (e.g. income

[1] This approach consists in determining activity-level statistics for an abstract "modal" farm on the basis of a combination of hard data and expert opinion from researchers, farmers and other actors.

foregone from the best alternative use, even if from non agricultural activity). Second, in the frequent cases where rentals markets for land do not exist, are too thin, or for which social, cultural or payment norms create non-competitive pricing, alternatives should be proposed. The Handbook does not sufficiently address such scenarios or propose ways to handle them, and should do so. These include the use of rental caps expressed as a share of total costs, for example 30% of total costs, the use of the net margin (i.e. rental costs constructed such that profits equal 0, which is a plausible assumption over the long-run), or administered prices (rental ceilings imposed by governments).

3.5 Non-land fixed costs

Capital costs are of two sorts: 1) when assets are fully owned, they include depreciation costs and the opportunity cost of the financial capital invested in the asset; and 2) when assets are not fully owned, the opportunity cost of capital also includes the interest incurred to purchase the asset. In addressing these and related issues, it was agreed that the Handbook still needs a significant amount of work.

The use of market prices are generally used to estimate depreciation costs for machinery, buildings and other agricultural implements that qualify as capital assets. These reflect obsolescence factors and the loss in service capacity of the asset. Changes in market prices for the asset can also reflect other factors, such as general inflation in the economy, inflation in the raw materials used to produce the asset, etc. These are still relevant to estimate depreciation costs as they reflect the cost of replacing the asset or the opportunity cost of holding on to it.

An inventory of farm assets and their technical characteristics is key in obtaining accurate depreciation costs. Data on salvage values, life expectancy of the asset, quality and technical characteristics, can be gathered from a variety of sources (interview with farmers and/or manufacturers of farm assets, etc.). This should be described in the Handbook.

As these assets are often used for many different farm activities, the allocation of the depreciation costs and opportunity costs of capital to the different activities is key in obtaining reliable estimates at commodity level. Allocation principles are discussed in another section, but should be made explicit in the Handbook with respect to various inputs, along with their limitations and data requirements.

The Handbook will also need to address the cases in which capital is rented by the farmer, and answer the following questions. Should the rent paid to use the asset be included as a capital cost and, in cases where the asset is owned by the farm, should the cost be imputed using rental rates? When rented assets come with interlocking services, such as labour and fuel, should each input be allocated to their respective categories or should all rented services be included under one single item? In general, the provision of custom services and their impact on CoP estimation needs to be better described and addressed in the Handbook, along with concrete examples of and rationales for their treatment in current national CoP programs.

3.6 Non-labour variable costs

The main methodological questions related to non-labour variable costs are the estimation and allocation of costs for inputs which are produced on the farm, such as manure or fodder crops. The appropriate opportunity cost to value these inputs should be the price that the farmer would have to pay to acquire them on the market. However, a significant problem arises when such markets are thin or non-existent, as is often the case for manure. One possibility would be to construct a price based on the cost of producing the input (for example, the cost of breeding cattle breeding), though

several participants thought this approach impractical to implement, and doubtful in approach (as manure is a by-product of cattle breeding, and not one of the key sought after outputs of cattle breeding).

When farm-produced inputs enter the production process of another activity of the farm, these should appear as a cost for the activity of the farm that uses the inputs and as a revenue for the activity that produces the inputs, in order to avoid double counting. For crop/output-level costs of production, this creates an allocation issue.

Irrespective of whether inputs are produced on the farm or purchased, an essential question concerns the level of detail at which information on variable inputs is required. This is tied to the uses of CoP and to the indicators and outputs that will be provided. For example, most of the participants mentioned the need to collect data at the level of the active components (N-P-K) of fertilizers purchased, to allow the construction of agri-environmental indicators relevant for public policies. EU countries will soon start collecting this type of information in the framework of the FADN. It is also essential to understand the application rates of the different inputs per crop, as this is key in compiling crop-level cost information. The Handbook should make mention of this, though the next draft is unlikely to address all, if not many, of the issues raised in this session.

3.7 Dealing with joint costs

Joint costs and their allocation across activities/farm outputs have been flagged by several participants as the main issue that the Handbook should address. The starting point is that both farm-level and crop-level information is necessary for policy purposes and for farmers themselves. The natural unit of observation for data collection (at least for those based on interviews with farmers) is the farm, because it is at this level that farmers record most of their inputs and/or expenses. Farms may undertake several activities, often linked through their common use of inputs. To obtain relevant activity-level information on CoP (such as the average per hectare cost of wheat production), it is necessary to allocate shared inputs to each of the commodities or outputs produced by the farm.

Different methodologies exist to allocate costs to individual activities, with varying degrees of sophistication and data requirements. The Handbook will provide detailed examples of allocation rules and methodologies. The application of one or the other depends on a series of factor, such as the nature of the input and the commodity, the purpose of the survey, budget constraints, the level of statistical infrastructure in the country, etc. It is therefore neither possible nor advisable to be prescriptive on this topic. As a reflection of this complexity, instead of recommendations to use one or the other allocation rule, the discussions that took place during the EGM led to a series of principles on the determination and implementation of the different allocation keys:

- Allocation of joint inputs should be based on objective criteria reflecting information on input allocations and levels (e.g. machine-hours, man-days, etc.); *and*

- Transparency on the determination and application of allocation rules is essential, as they directly affect CoP estimations, their interpretation and usability.

Choices and trade-offs will need to be made with respect to how costs will be allocated (e.g. use of methodologies less data demanding) and when they will be allocated (some information may be relevant at farm-level only and not at crop-level, and vice-versa). The information necessary to allocate costs to activities may be collected at a lower frequency than the farm-level data collection on costs (e.g. used of fixed allocation rules or technical coefficients). Crop-level information may also be collected only for a subset of the initial sample: for example, cluster sampling may be used

to select farming regions (where one key crop is grown), and with some type of second stage (stratified) sampling conducted to select farms, on the basis of which cost allocations are determined. Econometric techniques also constitute a cost-efficient way to allocate costs to activities, but their use requires a certain level of technical knowledge and the results might in some cases be difficult to interpret.

3.8 Labour use, wages and imputed costs of family labour

Many types of labour exist on the farm. These include family labour, casual or long-term labour, exchange labour, piece-rated hired labour, etc. The contractual arrangements, in particular regarding the nature and basis for the payment, are also very diverse. These include payment in cash, in-kind or both, based on hours or days worked or on the quantities or area handled, etc. This diversity is especially visible in developing countries.

The methodologies and approaches proposed in the Handbook to collect and estimate data on labour costs should reflect this diversity. In particular, the Handbook should include examples on what wages to use and when. In addition, indications on the importance of labour costs in total costs by activity should be given. This recommendation is also valid for other cost items as a way to help defining priorities in data collection programs. For example, it is relevant to devote time and money to collect and estimate data on labour costs for activities related to the cropping of fruits and vegetables, which are known to be labour intensive. This not necessarily be the case for activities which are more capital intensive.

Regarding the estimation of unpaid labour (essentially family labour, even if, especially in developing countries, unpaid labour may also concern non-family members, extended families, and the like), there is a common view that the wages used should reflect to the extent possible the skills and/or labour category of the worker. This ensures that the wages are imputed at the appropriate opportunity cost. While off-farm wages are usually used as a basis to impute unpaid labour costs, the question remains if these really approximate opportunity costs when non-agricultural sectors remain underdeveloped in the region of interest. Additional refinements can be made by using econometric techniques to relate (generally off-farm) wages to personal characteristics such as sex, age, level of education, etc. and any other parameter which might influence wages. These techniques, known as hedonic regressions, are used for example by the USDA to impute unpaid labour costs. At the same time, this requires a significant amount of response burden when the type and number of farm workers are significant for a given farm.

The Handbook should also better address the issue of contract farming, which, depending on the country and activity, might represent a significant share of total labour costs. With respect to this topic, questions of interest arise with respect to cost allocation in terms of:

- different cost items when labour services are attached to other services, such as machinery; *and*
- different activities when labour is not contracted to work on a specific activity of the farm.

3.9 Experiences in data collection, processing and analysis

The development of a software to integrate all activities related to the collection, estimation, validation and dissemination of CoP statistics is not, strictly speaking, part of the CoP project funded by the Global Strategy. However, it is necessary to start thinking about this question, as software can help in improving data collection and quality in a cost effective manner, and in ensuring that statistics are compiled according to common standards and methodologies, including

the use of established international classification systems and common validation rules. Moreover, this line of work is directly linked to the capacity development component of the Global Strategy.

The development of a future software on CoP can be based on the structure of an existing software, the FARMAP, which was developed in the late 1980s by FAO. The last update was made in the mid 1990s. It is still used today by a handful of countries only, including India. Its technical characteristics, processing system (DOS based) and coding structure are out of date, and its lack of transparency in processing and validation rules remains a challenge. Nonetheless, many of its built-in data collection and compilation principles remain valid, and provide some good practices that should be replicated in more up-to-date software.

A new software on CoP should respect a set of overarching principles: it should be modular, open-source, platform independent, internet-based and multi-language. Experiences from FARMAP and other systems, such as the developed by the agri benchmark network, need to be leveraged. Software development will require both the raising of new funds, as well as looking at alternative models for the development work itself, ranging from internal development at FAO, to contracting out.

4. Follow-up actions

Immediate action will be taken, in parallel, on refinement of the Handbook, field tests, and engagement with developing countries.

4.1 Handbook revisions

As a first step, the FAO project team will address issues raised during the EGM, and revise the Handbook accordingly. The post-EGM revised version of the Handbook will be circulated to EGM participants by late January, with each participant taking the lead in peer-reviewing one of the chapters or sections of the Handbook, and providing their comments and suggestions:[2]

- Policy uses and drivers – David Treguer (World Bank)
- Data collection process – Elisabetta Carfagna (FAO)
- Land costs – Mohammed Kamilli (Ministry of agriculture, Morocco)
- Non-land fixed and working capital costs – Jacques Delincé (EU-JRC)
- Labour costs – Romeo Recide (Bureau of agricultural statistics, Philippines)
- Non-labour variable cost – Yelto Zimmer (Thünen Institute)
- Allocation of joint costs – William Mc Bride (USDA)
- Software – Rachelle Rossi (EU-FADN)

4.2 Field tests

On the basis of the feedback received during the EGM, the project team will start to work on a plan for the field tests, and developing a full pilot survey module on CoP. Field tests may include CoP specific country-level assessment; survey module testing (in full or in part in up to 6 select countries); and testing of estimation and allocation methodologies. A first list of countries for the field tests will be established and contacts made with the relevant national authorities, using existing partnerships and for a to leverage interest and participation.

[2] The titles given below do not necessarily correspond to the titles of the chapters or sections of the Handbook. Further guidance will be provided to the experts on the exact scope of the peer-review.

4.3 Leveraging regional agricultural statistics commissions – AFCAS & APCAS

The work carried out by the EGM on CoP will be presented and discussed in regional agricultural statistics commissions in order to provide feedback to member countries; gather more information on existing CoP programs; solicit feedback from member countries on the status, contents and plans for the Handbook and field tests; and identify potential candidates for the field tests.

During AFCAS (Dec. 2013), a presentation on CoP will be given by Mohammed Kamilli of Morocco, and a paper distributed to participants. The same will be done during APCAS (Feb. 2014), with the possibility of a side-event to present the revised first draft of the Handbook and to officially launch the first round of field tests.

5. Proposed Timeline

Time	Activity	Lead
3 – 4 Dec. 2013	AFCAS – Presentation and discussion of the work on CoP	FAO project team, M. Kamilli
Dec. 2013	Revision of the Handbook based on comments and inputs received during the EGM	FAO project team
Jan. 2014 (1st week)	**Revised draft of the Handbook circulated to the experts**	**FAO project team**
Jan. 2014	Peer-review of the Handbook	Experts
Feb. 2014 (1st week)	**Revised version of the Handbook circulated to the experts**	**FAO project team**
Feb. 2014 (mid/end)	APCAS – Presentation of the revised draft of the Handbook, launching of the field tests and possible side-event on CoP	FAO project team, experts
March to Sept. 2014	Implementation of the field tests Incorporation of the findings on the Handbook	FAO project team, experts
October 2014	**4th Expert Group Meeting on CoP (Rome)**	**FAO project team, experts**
Nov. 2014	Final peer-review of the Handbook	FAO project team, experts
Dec. 2014	**Final version of the Handbook**	**FAO project team**

6. Recommendations for discussion

- FAO continue its work on measuring costs of production, and encourages countries to critically review the emerging methodological issues, and make contributions to the Handbook in preparation for 2014 field tests.
- Creation of a virtual (on-line) country-level CoP working group to provide feedback to the FAO project team on the Handbook, and to agree on, discuss, develop and implement country-level field tests in 2014.