Cost of Production Statistics

Guidelines for Data Collection, Compilation and Dissemination

Draft Handbook – May 2013

Statistics Division, FAO

Contents

Preface

Production of agriculture economic performance indicators is a key instrument in economic analysis and a fundamental requirement for effective policy-making. Among these indicators, calculating the cost of production has historically been one of the most useful of these indicators. Providing users with access to complete and comprehensive production costs allows all stakeholders with information that will contribute to making markets more efficient.

This publication presents recommendations for designing and implementing a program of cost of production estimation for countries. It takes into account the academic literature which defines the cost of production concepts and the experiences from statistical agencies that have an ongoing cost of production program. It acknowledges that not all statistical agencies have the same endowments with respect to its statistical infrastructure and that the target universe varies greatly across countries and makes challenges unique for all countries. Nevertheless, these guidelines serve as a useful reference tool for agriculture statisticians to build a program for estimating commodity cost of production and for analysts to understand the basics for the estimates.

The development of these guidelines has taken into account revised statistical standards and recommendations that include the *International Standard Industrial Classification of All Economic Activities (ISIC) Rev.4*, the *Central Product Classification (CPC) Ver.2*, and the *Global Strategy for Agricultural and Rural Statistics (Global Strategy)*.

In addition to outlining the standard methodology, this publication also provides practical guidance for actual calculation of cost of production estimates and presents recommended methods for countries to produce high-quality indicators that are also internationally comparable.

Acknowledgements

This publication draws from or makes direct use of text from a number of sources, in particular the American Agriculture Economics Association's Task Force Report on Commodity Costs and Returns Estimation Handbook and various methodology reports from National Statistical Agencies on cost of production programs.

This manual could not have been completed without the cooperation and input from the members of the Friends of the Chair Expert Working Group formed by the Food and Agriculture Organization of the United Nations. Members contributed time and expertise during all stages of the preparation of this document. The handbook was also the subject of workshops held in 2011 and 2012. The recommendations from these workshops were presented to and approved by the African Commission on Agricultural Statistics (AFCAS) held in 2011 in Ethiopia and by the Asia Pacific Commission on Agricultural Statistics (APCAS) in 2012 held in Vietnam. The Friends of the Chair Expert Working Group members consisted of Ms. Samia Zekaria and Mr. Biratu Yigezu, Ethiopia; Mr. S. Bhavani, India; Mr. Mohammed Kamili, Morocco; Mr. Romeo S. Recide, Philippines; Mr. William McBride, United States; Mr. Adrian Tambler, Uruguay and Mr. Michael Isimmwaa, Zambia.

In addition, the work was supported by staff members from the FAO's Statistics Division, notably, Mr. Josef Schmidhuber, Ms. Carola Fabi, Mr. Dominic Ballayan, Mr. Robert Mayo and Mr. Franck Cachia. Peter Lys, a consultant from Canada, wrote the initial draft of this report.

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1. Purpose

The Handbook on Cost of Production for agricultural commodities sets out to provide national statistical organizations with a “how to“ guide for the production of cost of production data. It will recognize the principles laid out in the Global Strategy and will serve to build the statistical capacity for these institutions to augment and improve their agriculture statistics programs.

This Handbook is meant to complement the work already undertaken in the area of national statistics and as such, does not attempt to replace or supplant this work. The concurrent work underway in other areas of the Global Strategy Action Plan is not the subject of this handbook but nevertheless needs to be considered as integral to the overall system of improved agriculture statistics base. In particular, items that ought to be considered when applying recommendations with this handbook and taken from the Action Plan include[1]:

- The guidelines for statistical laws, confidentiality issues, and the establishment of national statistics;
- Guidelines to meet regional specificities;
- Statistical legislation to reflect the integration of agriculture into the national statistical system;
- Technical standards and guidelines to produce statistics on crop area and yield, livestock and poultry, prices and trade, employment and labor, land use, and fishery and forestry production;
- Dissemination standards;
- Technical standards and guidelines for the coordination of agricultural censuses with population censuses;
- Guidelines and practices for the development of a master sampling frame; and
- Guidelines based on good practices and findings of research for sample design.

[1] Taken from the Global Strategy Action Plan, FAO 2012

2. Considerations on the survey process and design

Commodity classification and the selection of outputs for data collection

Cost of production surveys, as with other agriculture surveys, should respect the international classification system for Agriculture as defined in ISIC rev.4[2]. Using this definition of the industry leverages the uses of ensuing data collections, allowing estimates to be used in the compilation of agriculture sector accounts, national income and expenditure accounts.

Using a consistent classification is the only way to ensure that the statistical agency can obtain estimates for the economy that are complete, unduplicated and comparable internationally. Using ISIC rev.4 will also ensure that the survey process will be coherent with the integrated survey element of the Global Strategy.

The selection of the product or commodity to measure is made according to user needs and uses. In making this decision, one must consider factors such as:

- Budget;
- Relative importance of product, measured in quantities or value terms;
- Any legislative or statutory requirement, such as price support policies;
- The existence of strategic commodities for food security in the country; and
- Distribution of production across the country.

No fixed answer can be provided as individual countries are in best position to judge which commodity works best for them.

Agriculture and the integrated survey process

The Statistical Division of the United Nations has been actively preparing guidelines and recommendations for the conduct of economic surveys. Based on best practices observed from national statistical agencies, these guidelines exist in draft form[3] and are subject to adoption by the UN statistical commission. The essence of the guidelines recommends a holistic approach to survey taking.

Greatly simplified, the approach recommends that countries design economic surveys that can explicitly be used in the preparation of the national accounts. This in turn

[2] its detailed structure can be found at http://unstats.un.org/unsd/cr/registry/isic-4.asp

[3] **Guidelines on Integrated Economic Statistics,** Draft, subject to final editing, Prepared by Friends of the Chair on Integrated Economic Statistics, February 2012

means that surveys be designed from start to end with this purpose in mind. Concepts and standards must conform to the end use and that the classification systems that are used are consistent with that purpose. The guidelines suggest the use of a central register of businesses as the sampling frame and several approaches to manage respondent relations.

Noteworthy is a suggestion embodied within, that agriculture surveys be folded within the integrated survey system approach. The integrated survey approach is, in turn, a key component within the Global Strategy.

Highlights of the integration process as it relates to the collection of agriculture data and with explicit recognition that all countries present unique challenges are as follows:

- The basis for the integration starts with the sampling frame(s);
- Population censuses be used to create a register of agricultural and rural households. All households, urban and rural/agricultural be geo-referenced;
- Remote-sensing products be used to create an area frame if necessary;
- A register of farms that are above a size threshold and which produce mainly for the markets will need to be established (so-called commercial farms). These are generally specialty farms or those so large that it is difficult to establish a linkage with households;
- The area frame containing the geo-referenced master household register and the commercial farm register will be the basis for all data collections for use in estimating agricultural production;
- A business register will be established and geo-referenced. The commercial farm register will be a subset. Another subset of this register will be enterprises involved in servicing agriculture, such as storage facilities and firms that process meat, poultry, milk, eggs, cotton, wool and other products;
- A core set of data requirements will have been established for agriculture and rural statistics and a set of core data classified for the remaining sectors of its statistical system;
- Once the core statistical system has been defined, the basic data collections for household and enterprise surveys should be defined; and
- Official statistics should be disseminated in a timely manner and made readily available to all data users, including micro-data (respecting country confidentiality requirements).

Box x   Survey design – Lessons from the experience of Indonesia

Introduction

[Complete – 10 lines approx.]

Description of the survey design

[Complete – 10 lines approx. Stratification, multi-stage sampling, method of selection of sampling units, etc.]

Stand-alone vs. integrated surveys for cost of production

[Complete]

Box x   Using integrated surveys to collect data on cost of production : Advantages, drawbacks and challenges – Lessons from the experience of Zambia

Introduction

In Zambia, data on costs of production is collected and compiled annually on the basis of information gathered from two main sources:

- Farm surveys: the Crop Forecasting Survey (CFS) and the Post Harvest Survey (PHS);
- Household surveys: Living Conditions Monitoring Survey (LCMS) and Household Budget Surveys (HBS).

[Complete if needed – 10 lines approx.]

Nature of the information collected in each survey

[Complete – 10 lines approx.]

Main advantages of using an integrated approach in Zambia

[Complete: advantages in terms of costs (provide information on the costs of each survey if possible), consistency with production/revenue estimation, frequency of data collection, sample coverage, etc. – 20 lines approx.]

Main challenges associated with the use of an integrated approach in Zambia

[Complete: challenges in terms of restrictions on the scope of CoP items (e.g. coverage limited to the main items as survey deals with other topics as well), ensuring consistency between the different data sources, etc. – 20 lines approx.]

Unit of Observation

The choice of the unit of observation has impacts on the design of the program, on the reusability of the data collected for other purposes and on its comparability with other data collected. It will also directly affect the ability to link these data to other data sets.

The choice of unit is also important from a data accuracy perspective: more reliable data are obtained if questions correspond to the farmers' ability to report. Consequently, the farther removed from the farm practices and farm record keeping, the more exact and detailed data collection and verification strategies will need to be. In those countries which can afford to use expert field staff for data collection, the non-sampling errors introduced by poorly understood questions can be minimized through on the spot verification and in some instances objective measurement.

To the extent that farm record keeping practices are sophisticated, then it is important that the survey be designed to coincide with these practices to minimize respondent burden. Evidence suggests that respondents will report according to their own record keeping practices anyway.

The main factors that need to be considered in the selection of the unit of observation are:

- The nature of farming in the country;
- The rate of literacy of the respondent;
- The sophistication and extent of record keeping in the sector;
- The respondent's ability to report or the enumerator's capacity to collect the required data;
- The complexity of the questionnaire; and
- The choice of the geographic scale.

When an imputation or an allocation is required, then this is better done by the statistical authority, either at the data collection step by trained and qualified interviewers or by asking questions that permit the desirable allocation during the processing stage.

Box x   Challenges posed by the collection of CoP data for small-scale family farming – Lessons learned from the experience of agricultural surveys in Ethiopia

Introduction

[Complete – 10 lines approx.]

Implications on the survey process

[Complete – 20 lines approx. Use of enumerator completed diaries, collection of objective information (e.g. using GPS devices) to estimate land size, dealing with farmer's illiteracy, use of direct interviews, etc.]

Frequency of data collection

All statistical programs must deal with the question of frequency of data collection. There is no general prescription for this decision. Rather it is a judgemental question that is best answered though ongoing dialogue between the statistician and the ultimate data user. Options range from collecting data annually to collecting data on a predetermined or ad hoc basis.

Some considerations that help better frame the questions revolve around the following:

- Is there a statutory requirement that dictates the frequency ?
- Are there international statistical obligations to suggest an annual survey ?
- Will the agency infrastructure accommodate conducting the survey annually ?
- What are the respondent load implications ?
- Can the budget accommodate an annual survey ?

Obviously if there is legislation compelling the collection of annual data, then the question of survey frequency becomes moot. Many countries have price and income support programs that dictate how and how often data will be collected. This argument applies equally to any international obligation or commitment that has been made.

The question must also consider the agencies capacity to handle the workload associated with the enquiry. Factors include the number of trained staff, current workloads, technical and physical infrastructure. Should a survey be conducted during a census year for example ? Not all statistical organizations have the capacity to handle an annual cost of production survey.

Collecting data for all commodities each year will necessarily be more expensive and impose a significantly greater reporting load on respondents which in turn could lead to respondent fatigue in the longer term. Notwithstanding this, data collected each year will yield more accurate data and not be reliant on assumptions that are inherent to other approaches. Collecting data on a rotating basis reduces costs and response burden, but is dependent on having access to certain data points if one is interested in producing annual estimates. It also makes the implicit assumption that the farm's production function is stable in the near term.

Country experts generally acknowledge that not conducting an annual survey would be less than perfect, but they also note that in most cases this was a reasonable trade-off given the benefits of reduced costs and reduced respondent reporting load given the relative stability in farming practices from one year to the next.

If countries choose a periodicity less than annual, there remains a requirement that base level data (e.g. area harvested, etc.) be collected on an annual basis with which to update the previous cost of production survey data. Further, the interval between CoP survey iterations should not be excessive, for example not greater than 5 years. This is not only due to the change of technology or evolution in farming practices, but also that a non-representative year might have been selected for the previous survey or “benchmark”.

The use of alternative data sources

Data sources other than survey data can be used as auxiliary information to estimate costs of production. These sources are essentially administrative information (tax records, cadastral records, administered prices, etc.) and market data on inputs (market prices of fertilizers, regional wages, interest rates etc.). These sources are generally used in combination with survey data when information is missing (data available on volumes but not on values), to impute costs of inputs owned or produced by the farm (e.g. manure, unpaid family labour, etc.), to estimate opportunity costs (e.g. opportunity cost of capital) and to project cost of production estimates between two survey years.

The US and especially the EU use projections to produce CoP data in non-survey years.

Box x The use of non-survey sources to estimate cost of production – The example of the European Union

Introduction
[Complete – 10 lines approx. This case-study should include a description of how these data are acquired, adjusted to conform with desired concepts and used in the program.]

Nature of non-survey sources
[Complete – 20 lines approx.]

Uses of non-survey sources
[Complete – 20 lines approx. Interpolation purposes (estimation of CoP for non-survey years), survey information incomplete, used to cross-check/fine-tune results]

Cost of production for agricultural products: basic concepts

Estimating the cost of production for agricultural products involves estimating all economic costs and revenues associated with the production of the commodity. Economic costs differ from standard business or accounting costs because they represent all costs and opportunity costs, not just out of pocket expenses. This becomes significant for some items such as labour costs and own farm product consumption.

All costs should be measured, whether purchased or owner supplied. The basic concept is that if it is necessary for production, then it must be valued. Cost items that are purchased and expended during the production period include inputs such as seed, fertilizer and pesticides. They can also be hired capital expenses such as rented machinery or bullock livestock. Costs also include all charges for labour whether paid for or not, hired or owner provided, paid in kind or in cash or sourced to unpaid family members.

Cost items whose service life extends over several production periods, such as capital service costs (depreciation on owned machinery and buildings), also need to be measured. Finally, the imputed opportunity cost of owned capital, including cash used to purchase inputs and the alternative investment return from the use of owner supplied land and animals, needs to be estimated if one is to fully account for the economic costs associated with producing agricultural goods.

It is absolutely critical that revenues (returns) be related to costs as they form the basis of the construction of gross and net margins. The questions on revenues will be greatly affected by the timing of the data collection vehicle. To collect cost data, it is preferable to conduct the survey as soon as possible after the point when the product has been produced and most variable costs have been incurred. This reduces memory bias and increases data quality. The different timing of production, cash expenses and selling of products might create inconsistencies between the different indicators. This needs to be taken into consideration from a data collection perspective (design of the questionnaire and interview process) as well as from an data estimation point of view (inflation adjustment and time discounting, see below). In the case where one common survey is used, questions could focus on total production and expected marketed production as well as on the amount to be used on the farm or taken for own consumption. What is not sold can be valued as a prospective sale or accounted for in inventory using market (or administrative) prices.

Measuring revenues consist of the adding together returns from the sale of agricultural products, government program receipts, and other miscellaneous revenues. In principle, measuring revenue from the sale of farm products is straightforward and is the price received from the sale of the product multiplied by the quantity sold, while government program receipts are program or support payments that relate to the sale or production of these same products. Miscellaneous receipts are those receipts related to the sale of the agriculture product under investigation (sales of cows from a dairy operation for example).

Valuation: which prices should be used

The prevailing market price is the best price to use to value economic costs and returns. Where there is no market, then an imputation that best approximates the market price should be used. In particular, owner supplied inputs should be valued at the market opportunity cost, i.e. the cost of purchasing the same (or similar) input on the market. This includes owner and unpaid family labour.

The principle of opportunity cost also applies to other inputs produced and used on the farm, such as animal feed: the cost of purchasing this input should be valued as if the input were purchased from an off farm source at prevailing market prices.

There are also inputs that are by products of another farm activity. For example, manure, a by-product of livestock production, is used to provide fertilizer for crop production. When this is encountered, the manure used should be valued at the prevailing market price. If it is possible to separate the different activities of the farm, manure should be accounted for as a cost for the cropping activity of the farm and as production for the livestock activity. This ensure consistency and completeness of farm accounts.

Ideally the statistician needs to take into account the variability in the quality of the commodity produced since it affects its marketability and ultimately its selling price. A true result can therefore be obtained for the revenue component of the cost and returns equation. Not all national statistical institutes gather production data with quality attributes in part because quality is often determined only in the marketing channels. Nevertheless the use of average market prices can be used to value this production since average prices reflect the spectrum of product sold and when used to value product sold mirror the variation in quality of product sold.

Timing, inflation adjustment and time discounting

It is important that collected revenues and costs refer to the same time period, such as the typical growing year or the calendar year. Both costs and revenues can be adjusted to other time periods if there is an analytical need, provided appropriate adjustments are made to the data to account for the time value of money and inflation.

With the goals of using the data for sector and national accounting as well as for facilitating international comparisons, selecting a calendar year is a convenient and in most cases reasonable option. Most agricultural production can be measured on a calendar year basis and most statistical systems are designed around disseminating data on a calendar year basis.

Quantities produced should be valued at the farm-gate price at the time the production is actually sold. Inputs should be valued using the corresponding market price at the time the input is used. Revenues and costs should be brought to a common point in time (e.g. last month of the growing year, mid-point of the calendar year, etc.) to ensure that they are comparable (i.e. expressed in common prices) using an inflation rate and, if possible, a time discounting factor (a proxy of which can be given by long-term interest rates).

Production unit

It is important that revenues and costs are collected and reported for the same production unit. This means that if data are collected for a given land area, then revenues and costs be collected for the same land area. It is best if this unit is equal to the customary or typical selling unit (per kg of meat, litres of milk or dozens of eggs for example). This is because users and suppliers of the data can easily relate to the unit of sale. In the case of crops, using a planted area basis will allow all costs associated with the growing of the crop to be counted even if the area is not in production due to farming practices or is set aside to qualify for government program payments.

Stocks

Any unsold production that is carried forward in the next production period should be valued as part of accumulated owner-held inventories or stocks.

Joint inputs

There will often be inputs that are used in the production of more than one commodity. In the absence of detailed records which document the quantities of inputs used for a particular commodity, the volume and subsequent value will need to be allocated. This is common for inputs such as animal feed or fertilizer. There are several ways to allocate these common inputs, but the use of volume units multiplied by the appropriate area (in the case of crop land) or animals (in the case of livestock) would be an acceptable allocation key. In the case of fertilizer for example, because most is purchased from off the farm at a known market price and is applied at a known rate per acre, then the allocated cost is the simple product of price and quantity.

Joint products

It is common with agriculture activities to produce more than one product. A common example can be observed with dairy farms where the primary product is milk but the farm also produces calves and cull cows (meat production). In situations such as these where a clear distinction cannot be made between a primary and secondary products, revenues from the joint product should be added to the revenue from the primary product and costs computed for the whole farm. When different activities within an agricultural holding can clearly be distinguished, each with a specific production function, costs and revenues should be computed at the level of each activity and not at the level of the farm.

3. Detailed guidelines and recommendations

3.1. Scope

In this section, concrete and applicable guidelines are provided for the collection and estimating of cost of production information. The main categories of inputs are considered: purchased inputs, capital inputs, non-specific (or overhead) inputs, labour, land and pre-productive costs. They are succinctly defined below:

Purchased inputs Defined to be those items that are purchased and entirely used during the production year and that can be unambiguously attributed to the commodity production process (fertilizers, pesticides, seed, etc.).

Capital inputs Defined to be those items owned by the farm that are necessary to the commodity production process and that are not entirely used up during the production year (buildings, machinery, land, etc.). A capital input in turn is defined as an input which provides services for multiple time periods.

Non-specific inputs Defined to be those inputs that are shared in the production process, i.e. that cannot be objectively attributable to a specific commodity production process. Non-specific inputs include machinery and building upkeep, energy, contract work, property taxes, and other indirect costs (water, insurance of farm buildings, for example). An allocation key has to be determined to allocate the costs to the respective commodities.

Labour inputs Defined to be the amount of labour used for the commodity production process during the production year. Paid and unpaid external and family labour should be valued, as well as the time spent working on the farm by the owner of the agricultural holding.

Pre-productive costs Defined to be the costs incurred in advance of the time period when the commodity can actually be sold on the market. These expenses can be incurred several years in advance of a sale from the farm and culminate with the sale of the product (Christmas trees) or have a life extending to several productive years (orchards).

In the following guidelines on the estimation of each of these cost items, a distinction is made between the ideal or “first best” approach and other approaches, which are not less correct, but less demanding in terms of data requirements and technical know-how. Finally, examples are provided to illustrate the methodologies described.

3.2. Purchased inputs

Fertilizers, pesticides and herbicides

Scope Purchase or use of (if owner supplied) fertilizers, pesticides and herbicides. Costs related to the actual application of these inputs should be excluded and recorded under the appropriate cost items (labor costs, fuel, etc.)

1st Best Approach Information is collected at the farm-level on the quantities of fertilizers, pesticides and herbicides used throughout the growing or calendar year in the typical unit (by kg, bag, etc.), either purchased or owner-supplied. The market prices in practice at the time of the application of the inputs are used to value the quantities in order to obtain an estimate of the costs. The costs are then adjusted to a common reference period using an appropriate inflation rate (and, possibly, time-discounting factor).

Other Approaches i) If information is available only on the quantities of fertilizers, pesticides or herbicides purchased and not used but if it is common practice in the region/country for farmers not to stock these inputs, then the cost estimate can be computed by multiplying the quantities by the appropriate market price as explained above; ii) If, in addition, information is only available for the amounts purchased (and not the quantities), then the cost can be estimated by adjusting these values to the chosen reference period. Iii) Finally, if the information collected is to scarce to provide reliable estimates, a standard commodity and region specific application rate (kg per acre for example) can be used to estimate the quantities of fertilizers, pesticides and herbicides used and costs computed by applying the appropriate market price.

Example Information has been collected for one farm on the amount of purchased and owner supplied fertilizers used during the cropping year**:** 1000 kg of urea and 100 kg of compost produced on the farm. No information is available on the detailed timing of the fertilizer applications, but we assume that they have been bought during the month preceding the growing season (March to September in this example) and that all the inputs purchased or produced on the farm have been used during the growing season. The market price for urea is 300 USD per metric ton and 50 USD for compost at the time of purchase or production. The reference period is the last month of the calendar year (December) and the inflation rate measured between February (month corresponding to the purchase or production of fertilizer) and December is 2%. The estimated fertilizer cost is calculated in the following way:

$$\text{Cost} = (1+2\%) * [\ (1*300) + (100*0.05)\ ] = 306 + 5.1 = 311.1 \text{ USD}$$

(1+2%) is the factor adjusting prices to the reference period, in this case December.

Feed and seed

Scope Purchased animal feed products such as feedstuffs blended from various raw commodities (maize, soybeans, oats, etc.) and additives as well as feedstuff produced on the farm (straw, etc.); purchase or owner supplied seeds. As in the case of fertilizers, the costs associated with sowing and animal feeding should be accounted for in the relevant cost items (labor, machinery, etc.).

1st Best Approach cf. Fertilizers, pesticides and herbicides

Other Approaches cf. Fertilizers, pesticides and herbicides

Example i) The statistical unit is a farm producing cattle for slaughter. Information is available on the quantity of maize-based meals used on the farm during the calendar year (500 tonnes). Corn waste for silage is used to complete the feeding of the cattle (150 tonnes) produced in the same agricultural holding. The average price of the maize-based meal for the preceding year is 400 USD / tonne. As there is no market for corn silage, the price used is an estimate based on the price of grain: 80 USD / tonne. The annual inflation rate is 2.5%. The estimated feed cost is:

Cost / year = (1+2.5%) * [(500*400)+ (150*80)] = 205000 + 12300 = 217300 USD

The size of the cattle is 250 heads. The feed cost per head is therefore :

Cost / year / head = 869 USD

ii) Assume now that monthly market prices are available for the animal meals and that the feeding rates are uniformly distributed over the year (500/12=41.6 tonne / month). Monthly inflation rates are also available. The supplementary information is provided in the table below:

Months	Jan	Feb	Mar	Apr	May	June	Jul	Aug	Sep	Oct	Nov	Dec
Meals price (USD/ton)	385	410	400	405	408	410	408	415	415	410	410	408
Current month value ('000 USD)	16.0	17.1	16.7	16.9	17.0	17.1	17.0	17.3	17.3	17.1	17.1	17.0
Inflation rates	0.20%	0.25%	0.10%	0.20%	0.30%	0.30%	0.30%	0.20%	0.20%	0.20%	0.20%	0.20%
Dec. value ('000 USD)	16.5	17.5	17.0	17.2	17.3	17.4	17.2	17.5	17.4	17.2	17.2	17.0

The total cost is:

Cost / year = 16500 + 17500 + … + 17000 = 206420 USD

And the cost per head:

Cost / year / head = 826 USD

The costs are slightly lower than in the previous computations, as the inflation adjustments are done on a monthly basis: the annual inflation rate is applied to the value of feedstuff used in January, the Feb-Dec rate for the value used in February, etc.: in the previous exercise, the annual inflation rate was applied to the full value of the feedstuff used, implicitly assuming that all the feedstuff had been used at the beginning of the year.

Veterinary expenses

Scope

1st Best Approach

Other Approaches

Example

Custom tillage and harvesting

Scope

1st Best Approach

Other Approaches

Example

Other purchased costs

Scope

1st Best Approach

Other Approaches

Example

3.3. Capital Costs

Consumption of fixed capital (depreciation costs)

Scope Capital costs are of two types, the first of which reflects the reduction in the useful service life or capacity of a capital input (less usable storage space, less number of hours of use for machinery, etc.). This cost, accounted for as consumption of fixed capital (depreciation cost), is normally ascribed to farm machinery and equipment and to farm infrastructures (irrigation infrastructure, etc.) and buildings. The second type of capital cost represents the opportunity cost of the capital supplied by the owner. This represents the return on the capital invested in the farm operation had it been invested elsewhere. The purchase of capital inputs is not considered as a cost but as an investment (acquisition on nonfinancial assets). Costs associated with the purchase of trees or cattle for diary or slaughter should be accounted for as investment costs, not as depreciation costs or purchased costs. Loan reimbursements and interest payments associated with the purchase of capital assets are accounted for as a cost (expense) for the farm.

Consideration needs be given to “carry over“ effects, that is those applied inputs that have benefits extending beyond the current production period. In this case, these inputs should be treated as a capital asset. These expenses extend to costs associated with land (e.g. terracing) and building improvements and structural repairs that maintains or extends the service life or service capacity of the capital asset.

In both cases, measuring capital costs for cost of production measurement purposes is markedly different from standard business or tax accounting.

1st Best Approach The depreciation of a capital asset is a function of two components: the decline in the service life of the asset and its technical obsolescence. The market value for the capital asset embodies these two components and should therefore be the preferred approach to estimate depreciation costs. For a given asset, the depreciation cost is equal to the inflation-adjusted change in the market value of the asset between the previous and the current period:

$$\text{Depreciation Cost}(t) = P(t)-P(t-1) ,$$

Where P(.) is the market price of the asset expressed in the prices of the reference period.

Market prices for certain machinery items such as tractors may be available in public listings, in the same way that there are market prices for used cars. The market prices used should relate to an asset with given characteristics (e.g. tractor of a certain brand and power), which best matches the farm asset, and for a given millesime (e.g. bought in 1998). As it is highly unlikely that market prices will be available for exactly the same asset than the one that is used on the farm, depreciation cost can be estimated by applying the change in the market value of the pivot asset to the purchase price of the farm asset:

$$\text{Depreciation Cost (t)} = \Delta P(t) \,.\, P(1) \,,$$

Where $\Delta P(t)$ is the % change in the market value of the pivot asset and P(1) the inflation-adjusted purchase price of the asset.

Other Approaches When market prices are not readily available, alternative methods such as straight line depreciation can be used. The difference between the purchase price of the asset and its estimated value at the end of its expected life divided by the estimated number of years of productive service yields the straight line depreciation estimate:

$$\text{Depreciation Cost (t)} = [\, P(1) - P(T) \,] \,/\, T \,,$$

Where P(T) is the estimated asset price at the end of its expected service life (i.e. its salvage value) and T the number of years of expected service life. P(T) is generally a strictly positive number, for example representing the price of the asset when sold to the wrecking yard.

Example 1 – Machinery

Example 2 – Buildings

Example 3 – Other capital assets (e.g. trees and cattle)

Opportunity cost of capital

Scope

1st best Approach To estimate the opportunity cost of capital used in the production process, the capital assets must first be valued, preferably at current market value. An investment return associated to this amount is then computed by applying an appropriate annual rate of return on capital.

Other Approaches In the absence of region and/or area specific rate of returns, long term bond rates are generally used.

Example

3.4. Non-specific inputs

The non-specific nature of farm inputs depends on the record keeping practices of the farmer and on the statistical unit (farm/holding or enterprise/sub-holding) chosen for the survey. While some farmers may keep track of their fuel expenses for each of the activities of the farm, others may just record the overall expenses. Heating and lighting expenses for buildings may also be distinguished if buildings can be clearly allocated to one specific production unit (e.g. poultry production). This depends on a number of factors, among which the type of farm activity, the size of the farm, the literacy level of the farmer, etc.

In any case, non-specific inputs have to be allocated to each production unit using allocation keys based on objective information on each of the farm's product. For example, fuel expenses for tractors seldom are known by commodity because the tractor is used for multiple activities. Fuel costs can still be attributed to a single product by using the proportion of land that is cultivated for the crop in question. For those expense items that are spread out over multiple products and are of an "overhead" nature, one could allocate these expenditures using net or gross margins or receipts.

Buildings and equipment

Scope Electricity and heating expenses, generally paid on an annual or monthly basis and subject to contractual agreements with service providers; premiums paid to insure buildings against any type of weather related events (flooding, tornadoes, etc), accidental fire, etc.; other insurances related to farm equipment (theft insurance for farm vehicles, etc.). In cases where the farmer and its family lives on the farm, which is often the case of smallholders, expenses incurred by the household may not be clearly distinguished from overall farm expenses: examples include insurance premiums which indistinctively cover farm buildings and the households private living space, fuel expenses for vehicles which are used for private purposed as well as for the farm, etc. In such cases, household-related expenses need to be estimated and subtracted from the total estimate in order to avoid artificially inflating farm expenses.

1st Best Approach

Other Approaches

Example 1 – Electricity expenses

Example 2 – Insurance premiums

Farm management

Scope xxx

1st Best Approach R

Alternative Approaches

Example

Taxes, permits and other overhead costs

Scope xxx

1st Best Approach R

Alternative Approaches

Example

Box x Allocation of non-specific production costs – The example of China

Introduction

[Complete – 10 lines approx. Definition of indirect/non-specific production costs in the case of China]

Allocation keys

[Complete – 20 lines approx. Allocation keys used for the different types of cost items.

3.5. Labour Costs

Three types of labour costs can be distinguished: hired labour, unpaid (generally family) labour and owner-supplied labour.

Hired Labour

Scope Paid labour hired to assist with the production of the commodity. These costs include salary (in monetary terms and/or in-kind) as well as all payroll-related taxes usually paid by employers. Taxes and contributions paid by employees should be excluded.

1st Best Approach In the event that part or all of the remuneration consists of in-kind payments (share of crop production, food, etc.), then this should be valued using appropriate market prices (the price that the commodity would sell for if taken to market, etc.). If the hired labour is used in the production of several products, then it should be allocated to the product in question using allocation keys (cf. section on non-specific inputs). Again, several techniques exist with the recommended allocation variable being hours worked on that commodity.

Alternative Approaches

Example

Unpaid family labour

Scope Unpaid work on the farm of the spouse or any other family member, including working age children. Paid family labour should be treated in the same way as any other type of hired labour.

1st Best Approach Labour should be should be valued as if the labour was hired in the marketplace. Methods range from using hedonic wage equations to average regional wages in the agricultural sector. For young children, the general practice is to use minimum wages when they exist.

Alternative Approaches

Example

Owner supplied labour

Scope Hours worked by the legal owner of the farm to carry out tasks directly or indirectly linked to the production process.

1st Best Approach Unpaid operator labour should be valued at what the operator would receive if he or she were to work in the labour market. Where no market readily exists, then the labour should be valued at what it would cost to purchase the labour services from off the farm. These wages are generally higher than those received by other farm operators.

Alternative Approaches

Example

3.6. Land costs

Land

Scope xxx

1st Best Approach Rented land should be valued at the price paid provided it is priced at fair market value. If the land in question is rented on a share basis (the land owner receives a portion of the crop), then the value of the crop assigned to the landlord should be valued at the equivalent market price for the crop.

Alternative Approaches

Example

3.7. Pre-productive costs

Scope All costs incurred in advance of the production of the commodity. To obtain relevant and comparable cost and revenue estimates, pre-production expenses need to be allocated to the year or years in which production takes place.

Case 1: Production occurs entirely in a given year

Approach The first step is to total all the preproduction costs in the year in which they were incurred. These costs should be valued in current monetary units, adjusted for inflation (to the reference period) and for the annual cost of carrying the preproduction expenses (opportunity cost representing the return that could have been obtained if the amounts had been invested elsewhere) using a market interest rate. This adjusted accumulated total is simply charged against production at the time when the commodity (e.g. trees) are harvested.

Example

Case 2: Production extends over several years

Capital Cost Accounting Approach This is considered as the traditional approach. It consists in considering the stock of animals, trees, etc. as capital, much like farm machinery for example. This capital stock can be depreciated according to its productive years and an opportunity cost be attached to it. In favour of this method is that it is familiar to most analysts and the method is already being used to price capital into the CoP calculations. The drawback revolves around the selection of the interest rate to estimate the opportunity cost on the capital and selecting a depreciation schedule (be it straight-line or something else).

Cost Recovery (or Annuity) Approach This method allows for an estimation of the pre-productive costs that embodies both a charge for depreciation and an opportunity cost of return on capital over the life of the investment. Simply put, the method accrues annual preproduction expenses to a future value (the point where production first begins and preproduction expenses end). The accumulated total is then amortized over the productive life of the asset by converting the accumulated total to an annual amount (annuity). The annual amounts are then charged against production for each year over the entire life of the asset.

Current Cost Approach This method consists in determining a share of current costs to cover the cost of pre-productive expenses. For example, for livestock breeding stock, the analyst can use a specified replacement rate for the breeding stock or, for crops, the rate at which the land needs to be "recapitalized". Current costs (examples ?) are then applied to these rates and the resulting amount is charged against production. This method has the advantage that it is simple to calculate, but its main disadvantage is that it is really only relevant for steady state farm operations (either crops or livestock) and also assumed that the technology is fixed.

Market Value Approach This method, as its name suggests, calls for the use of current purchase prices for assets (breeding livestock for example). This method is easy to implement and particularly adapted for livestock preproduction expenses. Once the level of animal replacement is known, then the preproduction expense share can be determined by obtaining the replacement cost from the market and adding this to the production cost. For land cost, land lease rates can be used. A significant drawback to the use of the market value method is that markets might not exist or may be too thin to provide robust estimates. Market valuations might also be biased towards future earnings and not historical costs.

Example

Box x Estimation of pre-productive costs for the diary sector – The example of Uruguay

Introduction
[Complete – 10 lines approx.]

Data collection framework
[Complete – 15 lines approx. Succinct description of the sources of CoP data for livestock]

Estimation method
[Complete – 20 lines approx. Description of the methodology (current costs, market value, etc.) and identification of main issues/challenges in the context of the country.

4. Quality Assessment

All official statistical outputs should provide an assessment of the quality of the data and related indicators. Unlike in the 1980's, when documenting data quality was synonymous with making known measures of sampling and non-sampling survey errors and census undercounts, today it is generally accepted that quality can and should be described using multiple dimensions.

Quality assessment frameworks are used and documented by all advanced statistical organizations and there are many examples that countries can look into, to describe and quantify the quality of their efforts. What follows is first a brief description of the main dimensions of a data quality assessment framework which countries should keep in mind and try to implement when describing their product; second, examples of measures of statistical quality are provided and their process of compilation described.

4.1. The different dimensions of quality for statistical products

Most quality assurance frameworks describe quality in terms of the following seven dimensions:

Relevance The extent to which the compiled statistics meet the demands of data users, analysts and policy makers. In this context, relevance depends upon both the coverage of the required topics and the use of appropriate concepts;

Accuracy The extent to which the compiled statistics measure the desired or true value (bias);

Precision Measure of the uncertainty surrounding the estimation of the desired or true value (variability or variance);

Credibility The extent to which the compiled statistics resonate and instill confidence with the user(s);

Timeliness The distance, measured in time units, between the date when the data are released and the reference period;

Accessibility Closely related to dissemination, the accessibility dimension describes the availability for users to access the data in formats that are user-friendly;

Interpretability Is a dimension of quality that attempts to gauge how easy it is for users to understand the official statistics and the extent to which there is support for the data user. It extends to include the availability of metadata; and

Coherence The extent that the released numbers conform to or are supported by similar indicators in the statistical domain, in other words the data are consistent within survey vehicle and are consistent across similar measures.

To properly assess data quality, data providers should assess their outputs according to the dimensions noted above. For a more complete description of UN guidelines on quality assurance please refer to the National Quality Assurance Frameworks at: http://unstats.un.org/unsd/dnss/QualityNQAF/nqaf.aspx

4.2. How to measure the quality of statistical products

Relevance, credibility and interpretability of data and statistics are to a large extent informed by the judgments of the users, which can vary considerably as users may not have the same expectations. These dimensions of data quality are therefore less prone to objective measurement or appraisal. However, a few principles can be provided on how to carry out these quality assessments.

Relevance To assess the relevance of the data collected and of the statistics compiled on CoP, the office in charge of data collection needs to have a clear understanding of the main objectives, uses and users - which can be multiple - of the data and related indicators. Will the data be used essentially for policy purposes, such as the setting of price support schemes ? Is the data destined in priority to researchers and academics for micro-level analysis ? Is the data essential in the compilation of other statistics (e.g. National Accounts for Agriculture) ? etc.

The answer to these questions will to a large extent condition the design of the CoP program (its commodity coverage, level of detail, etc.). These scoping studies should be carried out on a regular basis (at least every 5 years) to be consistent with policy objectives and emerging research topics. For example, in recent years, information is more and more needed on the environmental impacts of agricultural practices and their linkages with the economic performance of the agricultural sector. The extent to which the survey responds to some of these data requirements will determine the relevance of the data provided.

Regular ex-post user satisfaction surveys can be carried out on a regular basis as a way to collect information on the relevance of the data and statistics.

Credibility It depends to a large extent on the perceived quality of the data and of the metadata accompanying it. It is also linked to the intrinsic credibility of the institution carrying out the survey. As in the case of relevance, ex-post user surveys are the only way to assess the credibility of CoP statistics.

Interpretability It relies on objective criteria, such as the availability of detailed and quality metadata information, as well as on subjective judgments which relate to the users own technical capacity, background and expectations. Again, the most direct way to assess interpretability is to ask users for their feedback on this dimension of statistical quality.

Accessibility A few examples of questions and indicators that are useful in assessing data accessibility: is the data publicly available on an online platform ? If yes, what is the type and coverage of the data publicly available (the whole dataset, only a few indicators, national averages, farm-level data, etc.) ? If not is there a procedure to have access to the information ? Are there any fees involved ? Is the data downloadable in ready-to-use formats (.xls, .csv, .txt, etc.) ? Is the downloading platform efficient in dealing with requests (speed, stability, etc.) ? Is the data disseminated raw or is it accompanied by graphs, tables, reports, notes, etc. ?

Box x Example of user satisfaction questionnaires – The example of USDA

Introduction

[Complete – 10 lines approx.]

Main survey questions

[Complete – copy-paste main sections of the questionnaire]

Coherence The use of common classification schemes, statistical units, sample frames and designs, interview process, etc. across surveys improves the coherence of the data and the possibility to carry-out cross-survey analysis, compile derived indicators (e.g. net margins) and combine them in synthetic frameworks such as national accounts. In this respect, using integrated surveys is likely to facilitate the consistency of the data across different domains (e.g. production, revenues, producer prices, costs, etc.)

Timeliness It can be measured in a straightforward and relatively unambiguous way: for example, if the reference period is the end of the current year and if the data is released to the public at the end of the following year, then the timeliness expressed in months will be m+12 or y+1 if it is expressed in number of years.

Accuracy It is very unlikely that direct measures of the bias be provided as sources of bias are multiple, difficult to quantify and because by definition the true value is unknown. However, any type of information likely to give an indication on the possible size and direction of the bias should be provided: estimates of under or over-coverage of a specific item (commodity, farm-type, etc.) likely to lead to an estimation bias, choice of a survey period in which farmers tend to over or under-estimate their costs, etc. Sources of bias, of course, should be minimized to the extent possible ex-ante when designing and carrying out the survey (stratification, etc.) and reduced ex-post by appropriate techniques (ex-post stratification, estimation of totals or averages using auxiliary variables, etc.).

Precision Several sources of uncertainty, of a probabilistic or deterministic nature, can affect the estimates of CoP. Survey-based estimates are all affected by sampling errors. To the extent that these are of a probabilistic nature (which is the case if the process of selection of the individuals is random), sampling variance can be calculated. This variance is relatively simple to compute for simple sample designs but requires sophisticated approximation techniques for more complex ones. A few examples are provided below:

[Add examples of sampling variance for different sample designs]

Uncertainty related to deterministic sources (e.g. data-entry mistakes, etc.) is by essence difficult to measure, but likely sources should be identified when possible.

In any case, the observed variance or standard deviation for any given cost item (total costs, non-specific costs, etc.) can be calculated for homogeneous sub-groups (by farm-type, commodity produced, region, etc.) as well as for the total population of farms to provide an indication on the overall variability of the estimate in the sample. The construction of homogenous groups of farms is important to provide meaningful and interpretable estimates of variance as well as indicators (see next section and box xx). In addition to the final estimate, upper and lower-bounds based on the observed standard deviation can be provided (e.g. estimate + or – 2 standard deviations).

Box x Construction of farm typologies – The example of Morocco

Introduction
[Complete – 10 lines approx.]

Process of construction of farm classes
[Complete – 20 lines approx.]

Farm classes: uses
[Complete – 20 lines approx. What is the purpose of constructing farm classes, are they used to present results, calculate indicators, estimates of precision/accuracy, are results aggregated at the global level ?]

5. Compilation of derived indicators and analysis

The best data are meaningless without putting them into the proper context. Often setting the context involves defining an analytical framework with which to work. There is no perfect analytical framework and this handbook will not suggest a one size fits all approach. There are, however, some principles that can guide analysts and if adhered to, will give the ensuing analysis and its conclusions credence, confidence and respect.

This section will define some principles to guide analysts and analysis and then suggest some analytical constructs that might prove useful when confronting cost of production data. The list is not meant to be nor can be exhaustive, but rather suggestive as individual needs and circumstances will vary thereby leading to divergent tools and methods.

5.1. Analytical principles

To be credible, the analyst must adhere to a set of fundamental and over-arching principles to guide his or her work. These principles are stated below.

Utilize appropriate and peer reviewed analytical techniques The analyst must first and foremost utilize proper analytical techniques. The approach must be appropriate for the question examined and the technique executed in the correct manner. The technique should be judged as acceptable after an appropriate peer-review process. A peer review is a thorough and comprehensive review by others deemed competent in that subject area.

Openly state and disseminate analytical tools, methods and data sources employed The analyst should describe the analytical tools that were employed, the manner in which they were used and the data that were used in arriving at conclusions. Any and all deviations from prescribed methods or alterations to the data set should be fully disclosed and made available to subsequent users. Of special interest is the identification and treatment of outlier values in the data sets as these can unduly distort results and are most often subject to individual treatment.

The results should be reproducible using the same technique with the same data This principle goes to ensure that the conclusions are credible.

5.2. Main analytical indicators

There are many choices available to the analyst who undertakes to exploit the collected data on costs and returns. And like most analysis, there is not one best indicator or template for this work because individual circumstances and needs vary. Still, this manual sets out some examples of analytical indicators and explains how they might be employed by the country statistician or analysts.

Many of the indicators presented can be calculated on a per land unit basis or on a per unit of production basis. There is analytical support for both and it is recommended that both be calculated and made available. The cost per land area is likely to be more stable in the short term as technology and production techniques vary less year to year than say crop yields which are also affected by growing conditions. Gross indicators will also be more stable than residual or difference indicators since they have fewer dimensions. This makes interpreting the results correspondingly simpler, but can also limit the conclusions drawn. In all cases, the indicators presented can be presented on a per unit of production basis and on a unit of land used (crop production) or volumetric or weight measure (livestock) and it is recommended that both be calculated.

The full power of these indicators lies in the ability to analyse micro data and to perform distributional analysis. For example, for many variables, it is analytically valuable to understand the marginal contribution of some or all inputs. Having a database that allows this kind of analysis is optimal. Organizing the outputs to reflect distributions (quintiles, or tertiles) would be superior to just releasing aggregates.

A non-exhaustive list of indicators is provided below:

Indicator 1: Total Costs / Planted Area
Purchased inputs + cost of operating capital used + paid labour + imputed labour (unpaid owner and family and in-kind compensation) + capital replacement (depreciation) + imputed farm overhead expenses + opportunity cost of capital (farm machinery, buildings and land).

Of course, subsets of the cost indicators can be produced. Individual expenditure items or groups of items can and are often displayed separately. A common sub aggregate is to display purchased inputs/ unit of land or animal e.g. feed costs/ animal unit or seed cost / land area.

Box x Example of different indicators computed using CoP data – The example of India

Introduction

[Complete – 10 lines approx.]

Indicators

[Complete – list and description of the main indicators, including information on the level of product and regional aggregation]

Indicator 2: Total Returns (revenues) / land unit
[Quality adjusted production (area x yield) - waste and handling losses] x the transaction price + receipts from co-products + government program payments.

Indicator 3: Breakeven price per unit of output
This is a derived variable that combines the cost per unit of production and actual production. The cost variable should reflect total economic costs (purchased inputs + capital replacement costs + labour (paid and unpaid) + opportunity costs of capital and owner supplied labour). These costs are normalized to a defined land unit and then calculated on a marketable production basis. This total is then divided by the output per identical unit (land area or product) and the resulting quotient represents the "breakeven" price or the price to cover the production cost for one unit of product. Of course several other quotients make sense as well. For example, one could calculate the price required to cover purchased inputs or total costs except opportunity costs.

5.3. Additional indicators

There are several special interest indicators that can prove useful to track across farms and through time. A few are described below.

Environmental Indicators

A range of indicators that relate farm activity to environmental variables can be envisaged. These indicators would be of special interest to farm extension workers because they put into context the use of some purchased inputs by an individual operator compared with local averages.

Indicator 4: Energy Use/ Land unit

This indicator would sum all of the energy costs used in the production of the commodity under review and express the fuel use and energy cost per land unit or energy cost per unit of production. In addition, the energy used could be converted to standard energy units. Statisticians might want to do this as an input into energy balance accounts. The individual items summed would be user-defined and include the cost (or volume) of fuel used by machinery, equipment and buildings.

Indicator 5: Fertilizer Use/ land unit

This user-defined indicator would sum fertilizer costs used in the production process.

Indicator 6: Pesticide Use/ land unit

Like the fertilizer use indicator, this indicator would be a user-defined sum of costs divided by the chosen land unit or production unit.

Farm and land productivity indicators

There are additional analyses and indicators that could be produced to better understand the characteristics of the farm sector. Again these indicators would vary by country with some being very relevant and others totally irrelevant depending on circumstance. Again, there are countless examples and again these indicators are limited only by the imagination of the analyst and the depth of the data set. Examples are noted below.

Indicator 7: Costs and returns by soil type or climate zone

Indicator 8: Costs and returns per standard unit of labour

This should be refined to adjust the labour variable to reflect the skill level of the labour.

Indicator 9: Comparative costs and returns for production on irrigated and non-irrigated land

Farm Organization Indicators

In many countries, there is an interest in the effect of farm organization on output and productivity. It would be useful to classify costs and returns by farm type to further understand the impact that organization has on production.

Indicator 10: Calculate farm costs and returns by farm type, farm size (land area or number of livestock or …), organization type (corporate vs. non corporate) and ownership (state or private).

Macro Indicators

Indicator 11: Calculate concentration ratios for specific commodities (Herfindahl indexes)

Indicator 12: Calculate macro indicators (value-added) for the commodity in question These could feed into national macroeconomic accounts.

6. Data dissemination and international reporting

Box x The dissemination of cost of production data and derived indicators – The example of the Philippines

Introduction

[Complete – 10 lines approx. What are the dissemination supports used (reports, Xcel databases, available online?, reporting restrictions and confidentiality issues ?)]

Nature of the information disseminated

[Complete – 20 lines approx. What is the frequency of dissemination, timeliness of the data, level of aggregation available (commodity-wise as well as regionally), availability of micro-level data]

Indicators, analysis and display of the data

[Complete – 20 lines approx. Any derived indicators displayed (cf. above), are they provided in “hard” or can they be calculated within the system, what type of views/graphs are provided ?]

Box x The dissemination of micro-level data – the USDA/ERS experience

Introduction

[Complete – 10 lines approx. Why disseminate micro-level data ?]

Nature of the information disseminated

[Complete – 20 lines approx. Is the whole farm-level data set disseminated or only a extract of it ? What variables are included and excluded ? frequency of dissemination different than aggregate level data ?]

Ensuring confidentiality of farm-level data

[Complete – 20 lines approx. How does the USDA/ERS ensure that farm-level data are not identifiable ? Is there any randomisation involved ?]

7. Conclusion and Main Challenges

[To complete]

8. References

9. Appendices

Appendix 1 – Example of questionnaires for the collection of data on agricultural costs and inputs

Appendix 2 – Agriculture and the Integrated Survey System

Appendix 3 - Case Studies