PRACTICAL PROBLEMS IN THE ESTIMATION OF PERFORMANCE

INDICATORS FOR THE AGRICULTURAL SECTOR IN UGANDA

Last name, First name:	Ssekiboobo Agnes Mary
Institution, Department:	Institute of Statistics and Applied Economics, Department of
	Planning and Applied Statistics.
Street Address:	Makerere University
City, Country:	P.O.Box 7062, Kampala, Uganda.
Email-address:	agssekiboobo@yahoo.com or_agssekiboobo@isae.mak.ac.ug

ABSTRACT:

Annual agricultural surveys are implemented as core module of the Uganda National Household Survey program to provide current agricultural data and filling gaps where they exist. The performance indicators on which these surveys collect data include: characteristics of the agricultural households; land ownership and utilisation; planted area; yield and production; amounts of inputs used; use of labour; agricultural prices; livestock and poultry statistics.

The problems that have been identified include:

- (i) the practices of mixed cropping, shifting cultivation, incompletely harvested crops, continuous planting and/or harvesting still exist to a large extent;
- (ii) fragmented or even transitory holdings;
- (iii) timing of the data collection exercises;
- (iv) changing cultivation and marketing practices and cropping periods;
- (v) the majority of the respondents are unable to give accurate responses;
- (vi) time taken to complete the survey;
- (vii) comprehensive data on conversion factors missing;
- (viii) using the GPS tool to measure very small areas;
- (ix) under-reporting and use of different reference periods for different livestock types;
- (x) poor classification of agricultural households;
- (xi) recommendations regarding use of either open or closed segments; and
- (xii) many points of first sale of agricultural products; to mention but a few.

All the above problems have to be seen in the context of agricultural practices that are common in many developing countries including Uganda otherwise most of the published figures will be questioned. Some solutions have been suggested that can help to arrive at the best possible estimates under the circumstances. Reliable estimates are necessary in order to better the implementation of export and import policies of agricultural commodities in case of deficits or surpluses; to formulate price policies; to help in the estimation of the contribution of agriculture to GDP and measuring the level of agricultural productivity; among other things. At the end of the day planners and policy makers will be able to make informed decisions.

1. **INTRODUCTION**

Agriculture is the dominant sector of Uganda's economy. This sector contributes about 32% to total GDP and over 90% to total exports. Agriculture provides 80% of employment and most industries and services in the country are based on this sector (Ministry of Finance, Planning and Economic Development, 2007). In 1996, the Government of Uganda made poverty eradication the overarching development goal and to this effect, a Poverty Eradication Action Plan (PEAP) was formulated. The PEAP has prioritized agriculture as a key sector in eradicating poverty. The indispensability of comprehensive, reliable, consistent and timely data and information to the development of the agricultural sector is well acknowledged all round.

The Uganda Bureau of Statistics (UBOS) being a key contributor to the monitoring framework, has conducted large scale surveys since 1989. However, due to the paucity of Food and Agricultural statistics, it was decided to include an agricultural module in the Uganda National Household Surveys (UNHS) of 1995/96; 1999/2000 and the subsequent one of 2005/6. The Population and Housing Census)PHC) of 2002 had an agricultural module as well. The Pilot Permanent Agricultural System (PASS) also collected some basic agricultural data.

The 2005/6 round of household surveys to which the problems discussed in this paper relate was yet another in a series conducted by UBOS. The survey had an agricultural module in addition to the socio-economic module. The main objective of the UNHS 2005/6 agricultural module was to collect high quality and timely data on the farm economy and provide useful guidance to decision-makers charged with implementing the Plan for Modernisation of Agriculture (PMA). The PMA focuses on development of small holder agriculture and this has a strong emphasis on both growth and poverty reduction, in line with the PEAP. The data collected was basically for estimating agricultural production namely crop production and livestock/poultry numbers; characteristics of agricultural households, land ownership and utilization, inputs used and agricultural sales and prices at the holding level.

The problems identified in the 2005/6 Uganda Household Survey are discussed in the context of agricultural practices that are common in many developing countries, Uganda inclusive, which may lead one to question the validity of most of the published figures on the agricultural performance indicators. Some solutions and areas for further analysis/research have been suggested.

2. PROBLEMS IN THE ESTIMATION OF PERFORMANCE INDICATORS

As already stated above, the problems discussed in this paper relate to the UNHS 2005/6 data that was collected in this exercise and how the environmental within which the data was collected may affect its quality. The problems include the following:

2.1 Mixed cropping, shifting cultivation, continuous planting and/or harvesting and incompletely harvested crops

The practice of mixed cropping, shifting cultivation, incompletely harvested crops; continuous planting and/or harvesting still exist to a large extent. Some attempt has been made to handle the aspect of mixed cupping but for as long as determination of the percentage of the plot devoted to each constituent crop is left to the enumerator, then the estimation becomes subjective to some extent. To make matters worse no limit is usually set on the number of crops recorded for an inter-cropped plot. The main crop may be determined as having the largest cover and the rest recorded in order of decreasing coverage percent. Production estimated as a product of yield and area can easily be computed in the case of crops grown from in pure stand but the problem is however quite complex if crops are inter-cropped.

However the bigger challenge remains with the other practices. As far as shifting cultivation is concerned, the system of cultivation should be classified into settled and shifting and that the data basically on crop yields and areas be tabulated separately for the two parties. No efforts have been made to estimate the extent of shifting cultivation in Uganda yet it is practiced. It has already been ascertained that shifting cultivation is linked to declines in crop yields and productivity of the land, and therefore this makes it essential to evaluate the productivity of the land in cases where this type of cultivation is practiced.

The changes in the weather patterns over the years have aggravated the problem of continuous planting. A number of factors come into play namely rainfall patterns, labour requirements, natural or man made disasters leading to destruction of crops e.g. drought, hailstorms and floods, locust and other pest invasions, etc, to bring about repeated plantings in the same agricultural year. This may be in the form of replanting or enlarging the plot gradually and these practices are very common. The best way to handle this practice would be to have multi round surveys to enable the enumerator record the different conditions of the plot in terms of what is grown on it. But this exercise would be quite expensive and may require a permanent field team to enable proper follow up.

This practice of continuous planting makes the estimation of crop areas in mixed cropping even worse given the fact that the constituent crops in the mixture have unequal growing periods and different harvesting frequencies and usually assuming that the crop mixture is constant throughout the growing periods of the crops concerned, which assumption may not be well-founded.

Continuous harvesting usually comes in as a result of the fact that even for the same crop, it is not planted at the "same' time so as not to significantly affect the harvesting dates. The other issue is in relation to the fact that by the nature of some of the crops, the crop is harvested little by little from maturity over the season or between seasons either for sale or for home consumption. It therefore becomes a challenge to take note of all these withdrawals. If the holder is to give his / her estimate of the harvest, it will be easier to take note of what is harvested in bulk rather than what he / she may have harvested over time especially if it is for

home consumption where the harvesting may be done by any member of the household. It also makes it difficult to estimate the labour used for harvesting in such circumstances.

The extent to which incomplete harvesting for some crops takes place and therefore affects the estimate of potential production is not known. In Uganda and probably in a number of developing countries, this practice is quite common with what are sometimes referred to as food security crops like cassava, sweet potatoes and yams. The farmers may find themselves with more of a reserve crop than they need either for subsistence use or for sale (when there is no market for the crop or when the prices are so low). This therefore requires that enumerators go to the field as often as possible so that it can be ascertained whether incomplete harvesting is a significant feature of our type of agriculture by giving some estimate on proportion of the crop or area unharvested. It should however also be noted that a good number of the crops are root crops and this worsens the problem.

The Uganda Bureau of statistics in its last National Household Survey (2005/6) developed a crop card that was administered to all sampled households with an agricultural activity. This was basically to try and tackle the challenge earlier on identified in former survey series (UBOS, 2000) of estimation of production from own produce as well as that of the frequently or continuously harvested crops like cassava, sweet potatoes and bananas that are important food crops in Uganda. The respondents were supposed to record all harvests from own produce. A crop monitor who covered one cluster was supposed to visit all the crop farming households at least once a week. However, much as this card was supposed to solve the above mentioned problems to some extent, other challenges came in namely the crop monitors did not visit the households regularly and therefore did not identify some of the problems in the households like some respondents were not able to write and some recordings included purchases. There were also various units of quantities which had to be converted into standard units and these varied by area or location.

2.2 Timing of agricultural data collection exercises

In order to understand the magnitude of the problem of proper timing of the data collection exercise especially in relation to the crops, it is important to note that Uganda has two agricultural seasons, one covering the period between January and June and the second one between July and December. It should also be noted that these seasons are directly related to rains and only indirectly related to the growing cycle of crops. The first rains are generally longer than the second rains. Some areas in Uganda have only one significant agricultural season. Because of the practice of continuous planting it is not uncommon to find that there is no period between the completion of planting and beginning of harvesting. Even if this period existed it may not be the same for all crops, yet there are also crops like cassava, beans and sweet potatoes that are planted almost throughout the year. When mixed cropping is introduced into this scenario, it then means that a plot may be described as containing various combinations of crops depending on the timing of the enumeration.

It can therefore be seen that under such circumstances, having the estimation of areas

and yields within a very limited period of time and relating to a fixed time reference may not be appropriate. The estimates of crop areas and yields are likely to be biased. An important issue to note here with respect to mixed cropping is the fact that the yield of the crop in a mixture may greatly depend on what sort of mixture the crop was in shortly before the enumeration.

In the UNHS of 2005/06, information collected on the two major seasons entailed the respondents to recall what took place months back since the information was collected long after the harvests. The memory lapses of the respondents led to production of more estimated information other than the actual especially during the first visit.

2.3 Time taken to complete the Survey

If all the information required in the survey is going to be obtained by interview, then it is possible to conduct the enumeration in a short period of time. However this assumes that the farmers are settled, literate and numerate regarding their agricultural operations which is not the case for the majority of farmers in most developing countries, Uganda inclusive. This therefore means that for one to get reasonably accurate estimates especially regarding areas and yields of crops, some level of measurement must be undertaken. This definitely produces a much slower rate than the enumeration achieved by interview. The time taken to complete the survey will therefore greatly be increased. When the time taken for the survey increases, the probability increases of part of the enumeration taking place before all the crops are planted or after partial or complete harvesting with implications that the crop areas will be underestimated and that the yield estimation may not reflect the late planted or early harvested portion of the crop.

2.4 Lack of Comprehensive data on conversion factors

There is also need for comprehensive data on conversion factors. The units of quantities used in estimating the various crop harvests varied a lot from area to area. For example, a heap as one of the most common units of quantity for measuring cassava, vary tremendously from area to area. This requires determining conversion factors for each area and crop. There is need to consolidate data on conversion factors collected in UNHS (2005/6) and the pilot Census of Agriculture (2003). Data on conversion factors for the state and condition of the crop is from the 1960s.

It should also be noted that data was also collected on crop disposition or utilization covering quantities; for processed food, given to landlords or proprietor, already consumed, still sorted, wasted after harvest and sold. For each of the crops, a comparison was made between two estimates of production, one derived from the summation of the quantities under utilization and the other one directly estimated from quantities provided by the respondents. Ideally, the two should have been equal but were not. The difference arose from the fact that in the case of the production estimate from the farmers, condition and state were provided which helped in applying the conversion factors. In the case of production derived from the components of utilization, with the exception of sold quantities whose condition and state had been stated, the other components did not have them. Thus the estimated production from the respondents was lower than the estimate derived from the different utilization components. Therefore the data accuracy can be improved if the causes of the difference are dealt with.

2.5 Using the GPS tool to measure very small areas

Experience from area measurement during the agricultural census in 1963/65 and 1990/91 indicates that the measuring of areas by measuring tape (or wheel) combined with compass use and traversing the perimeter of the area to be measured is fairly accurate but very time consuming method. A number of experiments have been carried out in Uganda using the Geographical Positioning System (GPS) equipment as an alternative method for area measurement. This was in the pretest for the Uganda Census of Agriculture and Livestock in Masaka district (June/July, 2002); the Pilot Census of Agriculture (PCA), 2003; and the Pilot Permanent Agricultural Statistics System (PASS) (Uganda Bureau of Statistics, 2002b, 2003, 2004)

In UNHS 2005/6 there was the problem of using the GPS tool to measure area below 0.1 acres which it would record as 0.0. This led to conflicting information between measured and estimated areas. The problem was subsequently solved by measuring in square metres to cater for such discrepancies.

2.6 Under reporting and use of different reference periods for different Livestock and poultry types

As far as information on livestock, poultry and other related animals owned by the households is concerned, it is worth noting that the reference periods varied for different subsections; cattle and pack animals figures were collected on the basis of the 12 months prior to the survey data while small stock had a reference period of 6 months. Poultry and other related animals had a reference period of 3 months prior to the survey data. Data on livestock/poultry was collected regardless of whether the livestock/poultry were inside or outside the Enumeration Area (EA). The tendency with this approach would be to over estimate numbers but it should also be noted that under-reporting of livestock owned is still a challenge to data collectors.

2.7 Poor classification of agricultural households

The classification of agricultural households was based on only single criteria of holding size rather than the multi-criteria one that may be more adequate. This is because the multi-criteria would require longer listing procedures and more intensive training of field staff.

2.8 Use of open or closed segments concepts

It is also important to decide from the onset whether to use open or closed segments in the estimation of agricultural characteristics. A closed segment is often used when data on characteristics of land is needed e.g land areas, crop areas, production, livestock and poultry estimates as well as crop trees estimates. Generally an open segment is used when collecting economic data e.g income, prices, farm labour and wages, etc, since these characteristics mainly relate to the farm harvest. For UNHS 2005/6, crop production data was collected for parcels within and outside a given district rather than within EA. Similarly, livestock numbers were collected using the open segment approach. The question here may be what theory recommends to be done since socio-economic cross-tabulations have been carried out.

2.9 Lack of proper information on marketing procedures for different agricultural commodities

Proper collection of agricultural prices requires that there is proper information on the procedures adopted in the marketing of different agricultural commodities. If the price of a commodity is not available at the farm gate, it will have to be collected at the first point of sale which will vary depending on whether the commodity went directly to the exporter, to the processor, to the rural or urban market etc, before reaching the ultimate consumer. It is therefore necessary to have information on the marketing procedures followed for each commodity and on the seasonality of marketing and of prices.

2.10 **Other problems**

Other problems were identified that included:

- a) Respondents who did not want their plot areas measured despite the intervention of district leadership. These plot areas were not measured.
- b) Areas under crops were not measured for respondents in the Internally Displaced People (IDP) camps in the North of Uganda, an area that has been ravaged by rebel insurgency. This was because the plots were a distance from the camps in insecure areas. Therefore only estimates by the farmers were taken.
- c) Institutional and large-scale farms were not covered as the UNHS is household based. This led to high CVs for plot numbers and crop areas for tea for example as there were very few observations since tea is mostly grown on large estates. It can therefore be concluded that for some crops, it is may be necessary to use other methods of estimating production other than at the households level. For crops like tea, tobacco, cocoa cotton and to some extent coffee, the approach to use bottlenecks in the marketing chain may offer better data.
- d) When yield estimation is made, the condition of the crop has to be given i.e whether wet or dry. But there are bound to be various stages of wetness on dryness. The state of the crop is also required. This indicates whether the crop is in shell, without shell, with stalk, without stalk or in the cob/head. There are therefore a number of combinations and in all these situations; conversion factors to some standard

condition and state are needed for each crop. Thus the identification of the most common conditions and states of each crop is needed and yet these seem to vary by district which complicates matters further.

3. SUGGESTIONS FOR FURTHER ANALYSIS/RESEARCH

In relation to UNHS (2005/06), a lot of data was collected but a large proportion is not yet analyzed. Some suggestions for further analysis and studies are highlighted here namely:

- a) Only farmers' area estimates were used in the analysis yet areas were also measured by the enumerators using the GPS equipment. Analysis of the results using the two methods is therefore required to enable comparisons with results from earlier surveys where farmers' estimates were obtained.
- b) It is necessary to attempt another construction of the Food Balance Sheet to determine whether there is insufficient food since there appears to have been drops in the production of certain crops, livestock/poultry and their products and increases in others.
- c) Data from the crop cards has not been analyzed yet this could be a possible source of annual data on agricultural production and a few other selected variables.
- d) The qualitative data collected should be analysed together with the quantitative findings so as to provide more in-depth understanding of the issues that were investigated in the quantitative module.
- e) More studies should be done concerning the variable and consistency of the GPS equipment especially for very small areas and where tree cover/or hilly areas introduce shadow and projection problems.

4. CONCLUSION

The problems discussed above may indicate a change in the survey methodology from the one usually adopted. Instead of carrying out the survey in a short period of time, the enumeration may be phased throughout the entire season or agricultural year with major effects on the cost of the survey. This however makes it possible to have a relatively small, well-trained team of enumerators who may form a permanent survey team thus avoiding the disadvantage of employing short-term enumerators. With a permanent team, much better data can be collected on such items as labour utilization, inputs and crop yields. This can also enable the surveillance of a sub-sample of agricultural households that could be used in starting up on the early warning and food information system. The data collected should to a large extent be gender disaggregated and continuity in data production should be ensured so as to facilitate accumulation of experience which can then be ploughed back in order to improve the quality of data in subsequent rounds of data collection.

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