The (Under)utilization of Agricultural Statistics in Tanzania and Uganda Evidence and Innovations

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ABSTRACT

Official statistics, and the underlying datasets, are essential for stakeholders to take informed decisions. National Statistical Officers (NSOs), however, often have little systematic information on the use of official statistics by stakeholders. This makes it challenging to appreciate whether investments to improve the quantity and quality of official statistics are generating good returns or, rather, whether they represent a net cost for taxpayers. The lack of the feedback on the use of official statistics also prevents NSOs to allocate their scarce resources more efficiently, i.e. to generate statistical products that better suit the information needs of stakeholders.

This paper first analyses the extent to which public and private sector stakeholders in Tanzania and Uganda use official agricultural statistics as provided by the National Bureau of Statistics (NBS) and the Uganda Bureau of Statistics (UBOS) respectively. It builds on data of an online survey implemented by NBS and UBOS in the first quarter of 2016. Results show that stakeholders use only a minor share of the agricultural data collected by the NSOs. The paper then proposes two innovations to enhance the utilization of agricultural data and statistics, which have been tested and implemented using household level livestock data in both Tanzania and Uganda. The first is to complement investments that improve the quantity and quality of official statistics with investments that collect the information needed for decision-makers to design and implement policy reforms. Collecting data to depict, monitor and evaluate the situation on the ground, which is what official statistics largely do, is in fact not sufficient on its own to generate evidence to find effective ways to improve it. The second innovation is on data utilization: data can be disseminated not only in NSOs' reports and as statistical software files but also in simple spreadsheets with embedded statistical commands, which suit the need of stakeholders. This approach empowers stakeholders and is implementable with a more efficient allocation of NSOs' available resources.

Keywords: agricultural data utilization; data dissemination; evidence-based decisions

1. Introduction

The importance of strengthening the evidence base for policies and investments cannot be over-stated. Target 17.18 of the UN Sustainable Development Goals aims to "*increase significantly the availability of high-quality, timely and reliable data … relevant in national contexts*", and target 17:19 to "*develop measurements of progress on sustainable development*". The UN Report "A World that Counts: Mobilising the Data Revolution for Sustainable Development" reads: "*Data needs improving. Despite considerable progress in recent years, whole groups of people are not being counted and important aspects of people's lives and environmental conditions are still not measured*" (UN, 2014).

A number of initiatives and investments are currently being implemented for improving the quantity and quality of data for decision-making. Cases in point are the Partnership in Statistics for Development in the 21st Century (PARIS 21); the Global Strategy to Improve Agricultural and Rural Statistics (GSARS); the Living Standards Measurement Studies – Integrated Surveys on Agriculture (LSMS-ISA); and the May 2016 Bill & Melinda Gates Foundation's commitment to provide national statistical offices with USD 80 million in the next three years to collect gender-related data (BMFG, 2016). Underpinning these investments is the assumption that the generated information will contribute to better decision-making. However, there is so far little systematic evidence on the use of official statistics by stakeholders. This makes it difficult for National Statistical Officers (NSOs), and for other interested stakeholders, to appreciate whether investments to produce quality statistics are generating good returns; the lack of the feedback on the use of official statistics also prevents NSOs to improve the way they allocate their (scarce) resources.

This paper first analyses the extent to which public and private sector stakeholders in Tanzania and Uganda make use of official agricultural data and statistics, as produced by the Tanzania National Bureau of Statistics (NBS) and by the Uganda Bureau of Statistics (UBOS) respectively. It builds on an online survey on the utilization of NSOs agricultural data and statistics implemented by NBS and UBOS in the first quarter of 2016. Results suggest that stakeholders use only a minor share of the agricultural data collected by the NSOs, and notably only the statistics published in NSOs reports and websites. The paper then proposes two innovations to enhance the utilization of agricultural data and statistics, which have been tested and implemented using household level livestock data in both Tanzania and Uganda. The first is to complement investments that improve the quantity and quality of official statistics with investments to collect the information needed for decision-makers to design and implement policies and investments on the ground. Collecting data to portray, monitor and evaluate the situation on the ground, which is what official statistics largely do, is in fact not sufficient on its own to generate evidence to find effective ways to move forward. The second innovation targets data utilization: microdata can be disseminated not only in NSOs' reports and as statistical software files but also in simple spreadsheets with embedded statistical commands, which suit the need of stakeholders. This approach empowers stakeholders and is implementable with a more efficient allocation of NSOs' available resources, provided of course that all ethical and legal issues associated with microdata dissemination are successfully addressed

The next section presents the NBS and UBOS survey on stakeholders' utilization of agricultural data and statistics. Section 3 illustrates how NBS and UBOS innovated to improve stakeholders' utilization of livestock data and statistics in Tanzania and Uganda respectively. Section 4 presents conclusions.

2. The (under)utilization of NSO's agricultural data and statistics

In February and March 2016, the Tanzania National Bureau of Statistics and the Uganda Bureau of Statistics joined forces to undertake an online survey among agricultural stakeholders to

appreciate their utilization of official agricultural data and statistics. The survey collected information on respondents' affiliation; relevance of agricultural data; sources of data; purpose of using the data; available statistical-related software; outputs produced; ease of access and ease of use of agricultural data; and other.

NBS and UBOS sent an email with a hyperlink to the survey to 491 potential respondents, of which 263 in Uganda and 228 in Tanzania. The target population included all UBOS and NBS agricultural-related contacts for which an email address was available. 149 stakeholders or 30 percent of the target population completed the survey, which is an expected response rate for online surveys (Nulty, 2008; Shih and Fan, 2008). Respondents largely include staff in national and local governments responsible to invest taxpayers' money for agricultural development (fig.1). In particular, 59 percent of all respondents work for the public sector, including the Ministry of Agriculture (27.9%); Other Ministries (5.4%); Semi-autonomous Government Agencies (5.4%), such as the Dairy Development Authority; and Local Governments (20.2%). Other respondents represent the private sector, the civil society, the academia, and international organizations.

**Fig. 1.** *Survey respondents by affiliation*
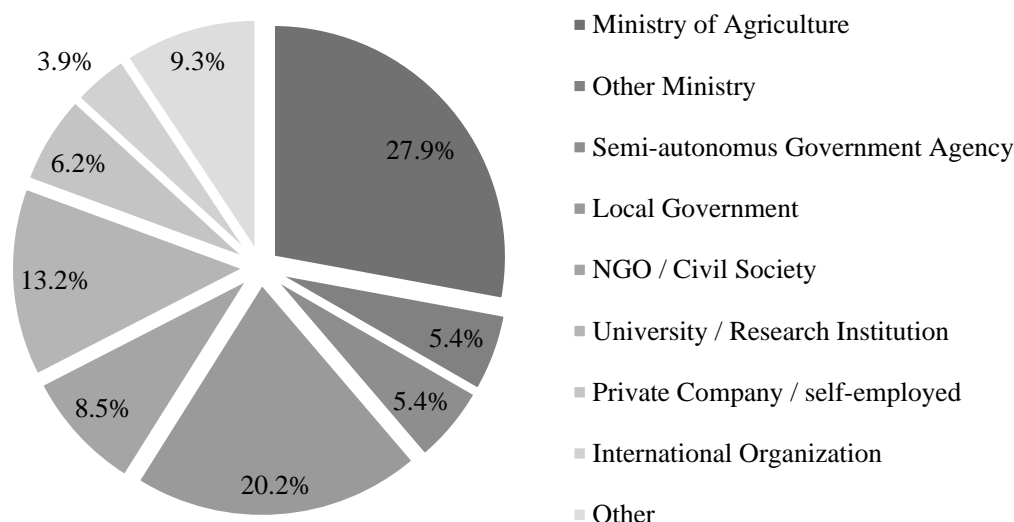
Respondents highly value NSOs' agricultural data and statistics: 76 percent and 35 percent of them indicate that agricultural data and statistics are "very important" and "important" for their work respectively. At the same time, 90 percent report to utilize NSOs' agricultural data and statistics: 42 percent use them on a regular basis, that is at least four times per year or more; and 48 percent use NSOs' agricultural data and statistics occasionally, i.e. less than once per quarter.

Fig. 2. *Frequency of use of NSOs' agricultural data and statistics*
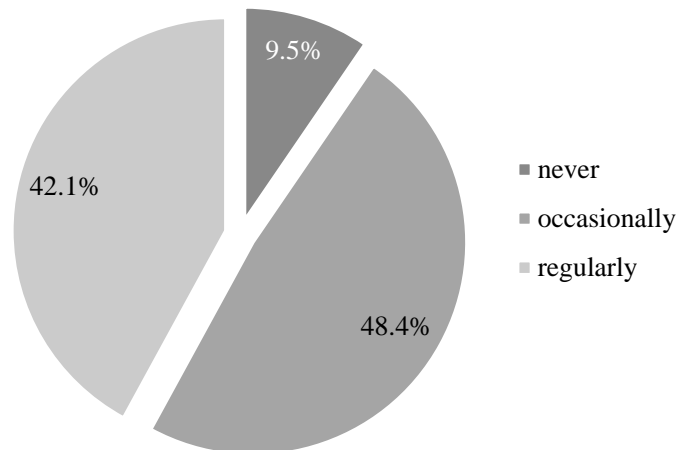
Respondents primarily use census data, with 70 percent and 81 percent on average utilizing data either from the Population and Housing Census or the Census of Agriculture (Livestock) in both Tanzania and Uganda respectively. Fewer respondents utilize data from sample surveys, notably an average of 35 percent in Tanzania and 27 percent in Uganda.
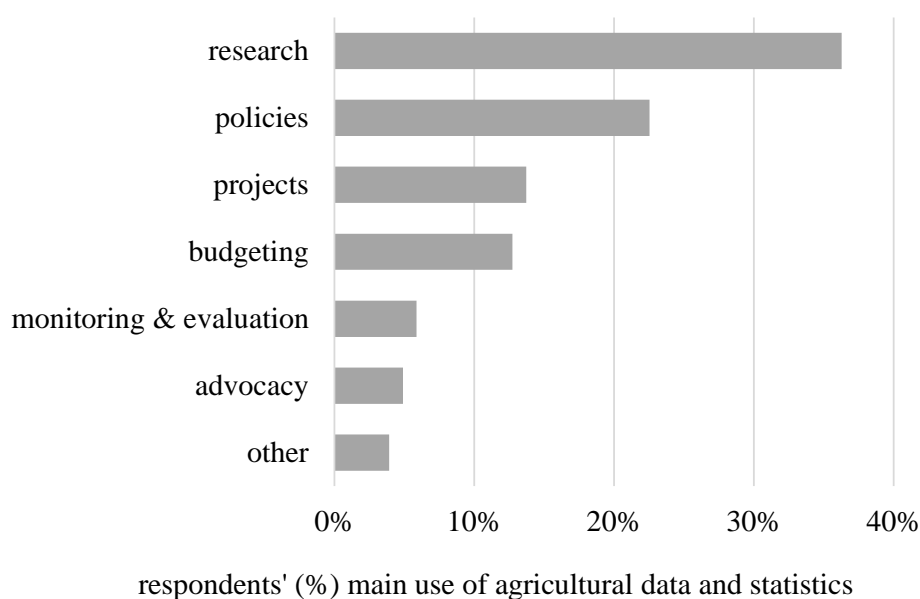
Fig. 3. *Main agricultural data and statistics utilized by stakeholders*

Uganda

% of respondents using agricultural-related datasets
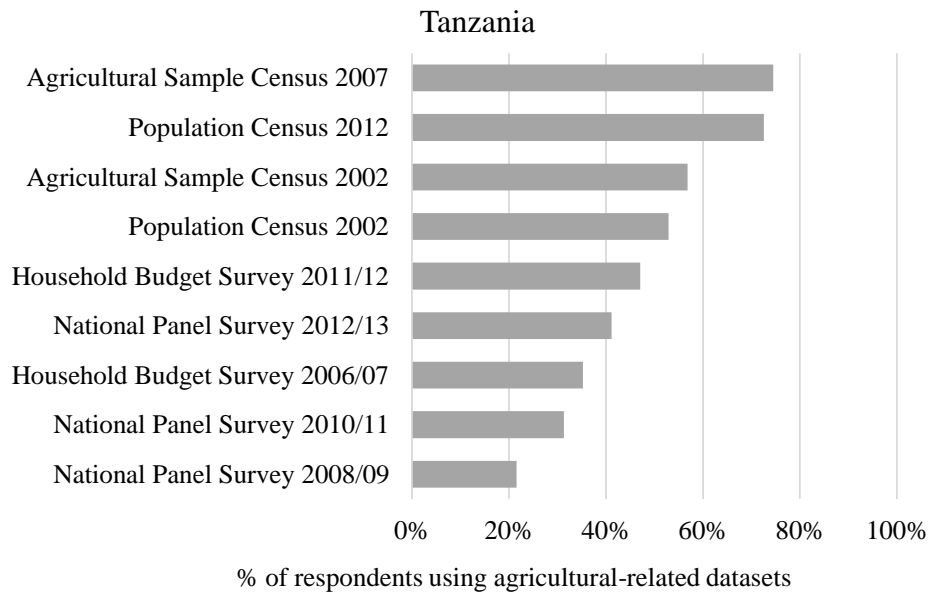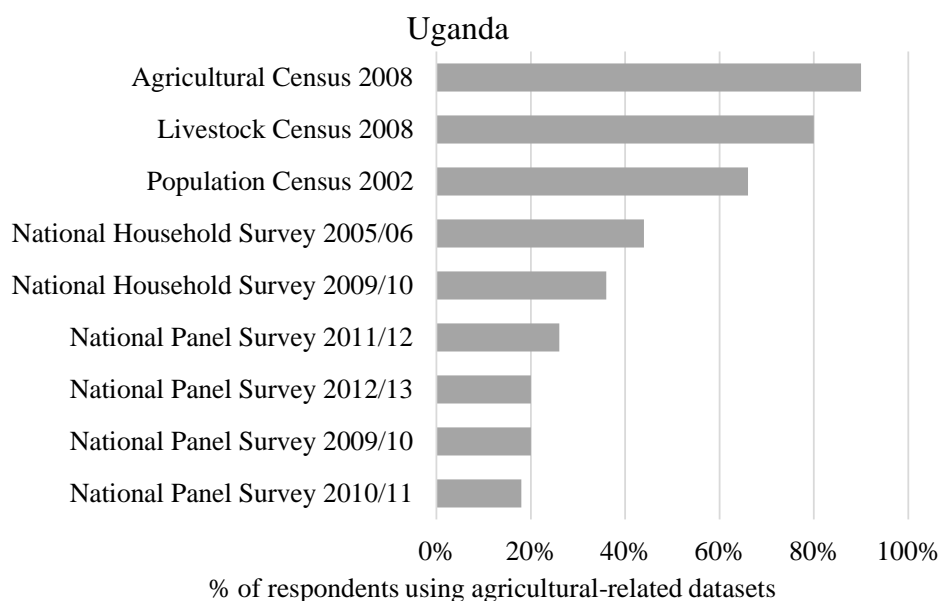
Research is the main single purpose for using official agricultural data and statistics (35% of respondents). However, the use of agricultural data and statistics for designing policies and projects, budgeting, monitoring and evaluation accounts for 55 percent of all uses. This is consistent with the finding that about 59 percent of all respondents are employed by the public sector.

Fig.4. *Purpose for using NSO' agricultural data and statistics*

respondents' (%) main use of agricultural data and statistics

The survey results also reveal that 45 percent of the respondents contributed to some outputs that build on NSOs' agricultural data and statistics, while 55 percent did not contribute to any. This is consistent with the evidence that about 42 percent of all respondents claim to use NSOs' agricultural data and statistics with regularity.

Fig.5. *Share of respondents producing outputs based on NSOs' agricultural data and statistics*
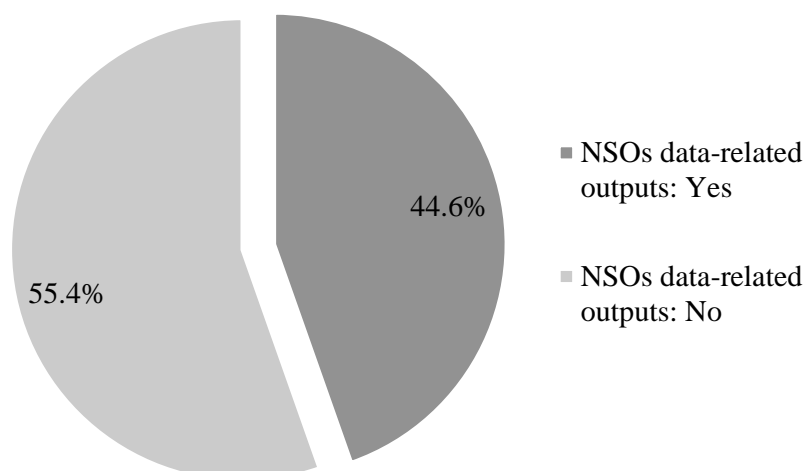
The story so far is one of a good use of NSOs' agricultural data and statistics. However, a closer look at the survey data reveals not only that over 58 percent of stakeholders do not make use or only occasionally use available NSOs' agricultural data and statistics (fig.2), but also that they only use a minor part of the collected data. Fig.6 displays stakeholders' source of NSOs agricultural data and statistics, including NSOs' reports; secondary sources, such as papers and documents that build on NSOs' data and statistics; and raw datasets. The figure indicates that 62 percent of all respondents find agricultural data and statistics in NSOs' reports; 28 percent find them in secondary sources; and 10 percent access the raw datasets for different use.

The Census Reports admittedly comprise a detailed analysis of the collected data – largely because Censuses gather relatively few information – but provide information only on those aspects of agriculture that change slowly over time. This information is valuable for policy makers when complemented with more detailed and frequent data on agricultural production practices, including on non-structural variables such as on type of fertilizers used or crop yield. Sample surveys are the tool that provide this information to decision-makers. The issue is that NSOs' reports of sample surveys only contain statistics for few of the collected data. For example:

a) The NBS Report of the Tanzania 2011/12 Household Budget Survey presents one table on land ownership by plot size and one on land ownership by type of tenure (NBS, 2014). The underpinning dataset, however, also includes information on the use of the plot (e.g. cultivated, rented out; etc.); on income from renting; on the value of in-kind production; on soil type; on the quality of the soil type; on irrigation; and on the value of the land parcel. Unless stakeholders analyse the raw data, all this latter information remains unexploited; and

b) The UBOS report of the 2011/12 National Panel Survey (NPS) includes two tables and one graph on animal rearing, which all focus on livestock ownership (UBOS, 2013). The NPS agricultural questionnaire, however, includes about 80 questions on livestock. Unless stakeholders analyse the raw data almost all of the collected information on livestock is not used for decision-making.

The evidence that only 10 percent of the stakeholders access and use NSOs agricultural datasets (fig. 6) indicates, therefore, that official agricultural data and statistics are largely unutilized for decision-making. This is an issue also because stakeholders often participate in survey design and would be eager to analyse available data. The implication is, at least for the agricultural data of Tanzania and Uganda, that the budget allocated for data collection and dissemination is not supporting a wide use of the data. The NSOs should innovate to facilitate the use of agricultural

data and statistics by policy-makers and other stakeholders, thereby ensuring that the resources allocated for data collection are an investment with good returns for society and public at large.

Fig.6. *Source of agricultural data and statistics by share of stakeholders*
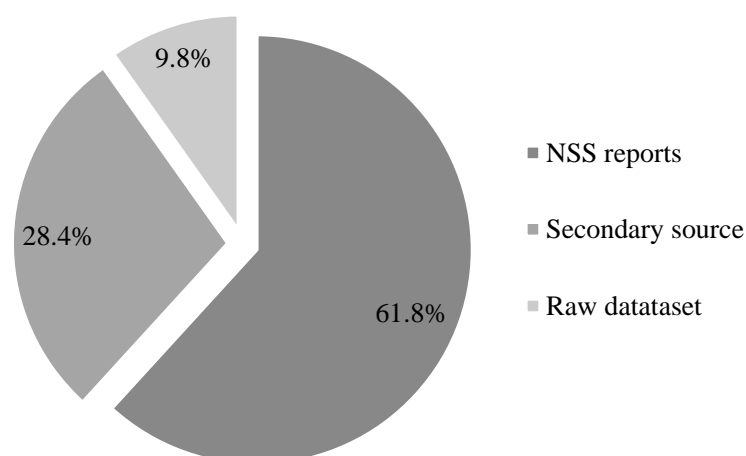
3. Innovations to enhance the utilization of agricultural statistics

Since 2011, NBS and UBOS have been collaborating with the Tanzania Ministry of Agriculture, Livestock and Fisheries (MALF), the Uganda Ministry of Agriculture, Animal Industry and Fisheries (MAAIF) and the FAO Livestock in Africa: Improving Data for Better Policies Project to increase the quantity and quality of livestock data available to decision-makers, while at the same time ensuring their use for policy purposes. There are two major lessons out of this process:

a) The first is that investments to improve the agricultural (livestock) statistical system generate good returns particularly when complemented with investments that generate the information needed for decision-makers to design and implement policies and investments on the ground. Collecting data to portray, monitor and evaluate the real situation on the ground, which is what official statistics largely do, is in fact all but sufficient to generate evidence to find effective ways to improve it; and

b) The second lesson is that NSOs can adopt simple and low-cost methods to disseminate entire or selected sections of complex datasets to stakeholders, which allows them to perform their own statistical analysis. In particular, as in most cases stakeholders only perform explorative data analyses, disseminating data in simple spreadsheets with embedded statistical commands is an effective way to empower them.

3.1. Evidence-based decision-making: beyond official statistics

"*The real value of data is that they can track performance and serve to indicate to decision-makers whether they have met their specified targets or not. While this is, of course, vital, they do not help decision-makers understand what they need to do in order to improve their performance going forward*" (UK Statistics Commission, 2007). This simple fact is poorly understood: investments to improve the statistical system, in fact, are rarely complemented with investments to generate data and information for decision-makers to effectively design and implement policies on the ground. For ease of clarity, let's assume that the decision-maker is the Ministry responsible for the agricultural sector; and that the Ministry's overarching goal is the design ex-novo of a comprehensive agricultural sector policy and associated investment plan. To this end, data and information needs span five main domains (Pica-Ciamarra and Baker, 2014).

a) *Agriculture, economic growth and poverty reduction*. Data and information are needed to show that the development of agriculture, and in particular a given new initiative in the sector, contributes to one or more broader socio-economic development goals of the country. Statistics representative of the agricultural as a whole, of typologies of farmers and production systems, are necessary to this end. Official statistics serve this purpose, such as living standard measurement studies, agricultural / farm surveys and household budget surveys;

b) *Productivity constraints*. Identifying the binding constraints that prevent different types of farmers from making efficient use of their productive resources is indispensable in identifying priority areas for policy reform and investment. Such constraints could include, for example, inadequate access to seeds and fertilisers, or animal disease prevalence. The agricultural census and/or sample farm and agricultural surveys are excellent sources of data to identify typologies of farmers and their productivity constraints;

c) *Policy and investment priorities.* Moving on from constraints, identifying their root causes is essential for establishment of policy and investment priorities. For example, the root causes of animal diseases could be a low vaccination rate; poor application of vaccines and drugs; use of counterfeited drugs; broken cold chain; uncontrolled animal movements across districts; contaminated water points or animal feed; uncontrolled livestock-wildlife interaction; and other. The NSOs are neither mandated nor expected to provide regular data and statistics on all the possible determinants of animal diseases, or of any other constraint for that matter. Indeed, it would be an inefficient use of resources for NSOs to regularly collect data on, for example, all possible intrinsic and extrinsic determinants of even one animal disease – including "living" agents such as viruses, bacteria, and other; "non-living" agents, such as temperature, nutrients, and other; and the multidude of climate, soil and man-driven causes. Only when animal diseases are identified as a main development constraints, therefore, decision makers should invest resources to identify their root constraints: they need to opportunistically engage and exchange information with a multitude of stakeholders, as well implement *ad hoc* statistical surveys targeting some detailed information that cannot be efficiently generated on a regular basis by the NSOs. This is necessary to identify policy and investment priorities;

d) *Policy and investment design.* Once the root cause of a constraint has been identified, decision-makers need data and information on the pros and cons of alternative policy instruments for easing and/or removing the root causes of one or more binding constraints. Data and statistics to identify the first best policy instruments are not immediately available, as the implementation of policy reforms usually co-occurs with some form of institutional change – new ways of doing things – which calls for changed behaviors of both implementers and beneficiaries. For example, it could be difficult to say ex-ante whether the system of animal health services is better improved through hiring additional animal health workers, or through providing transport allowances to existing extension agents. Stakeholder consultations and experimentations on the ground, possibly supported by some scientific data collection or survey, assist policy makers in gathering the information needed for identifying the first best policy instrument; and

e) *Monitoring and evaluation*. Monitoring and evaluation are necessary to ensure that policies and investments be properly implemented and to provide guidance on adjustments. NSOs' data and statistics are a major source of indicators for both monitoring behavioral changes (e.g. farmers' utilization of extension services) and evaluating their impact (e.g. crop yields).

It should be clear from the above that official statistics, while an essential component of the decision-making process, provide on their own little guidance to policy makers to design and implement policies on the ground. And that any rational decision-maker, either for the public or the private sector, has little incentives to analyse NSOs' data and statistics unless s/he is sure that

resources are also available to fill her/his information needs along the entire decision-making process. In Tanzania and Uganda, before embarking in any improvement of the agricultural (livestock) statistical systems, NBS, UBOS, MALF and MAAIF agreed to jointly generate all the evidence needed along the entire decision-making process, i.e. to complement investments to improve the agricultural (livestock) statistical system with investments to generate the additional information needed to design and implement effectively policies on the ground. This approach provided major incentives for the Agricultural Sector Lead Ministries (ASLMs) responsible for livestock to allocate more time and resources to analyze NSOs' livestock data and statistics.

3.2. Data dissemination in spreadsheets with embedded statistical commands

A major challenge encountered in the process towards the design of evidence-based agricultural (livestock) policies and investments was the difficulty for staff in the Ministries responsible for livestock to analyze NSOs' datasets, and in particular the livestock section of both the Tanzania 2012/13 National Panel Survey (TZ-NPS) and the Uganda 2011/12 National Panel Survey (UGA-NPS). Breeding scientists, feed specialists, veterinarians, epidemiologists and the like are rarely trained to thoroughly analyse household and agricultural survey data.

a) A tabulation plan proved ineffective at driving a constructive policy discussion: each produced statistical table, in fact, while in itself useful, led to unplanned questions that resulted in the generation of an endless cascade of tables. For example, once a table was produced on milk yield per cow; stakeholders started demanding tables by type of breed; by herd size; by household's access to veterinary services; by household's membership in livestock association; by availability of a processing plant in the community; and other. In other words, decision-makers were not able, but for a key set of statistical tables, to clearly define the information content of all the tables they would have liked NSOs to generate out of the available livestock dataset; and

b) Training in using statistical software was also considered as a poor investment to facilitate the use of official livestock data. Most stakeholders use NSOs data and statistics occasionally, and training makes sense only if the trainees make regular use of the acquired skills. In addition, data users concurred that an explorative analysis of NSOs data was largely sufficient for policy purposes and, therefore, that there was no need to use statistical packages to generate summary statistics.

NBS and UBOS agreed therefore, in close consultation with the Ministries responsible for livestock, to experiment with disseminating NSOs' livestock data in a simple spreadsheet with embedded statistical commands. The dissemination of microdata was possible in both countries as the data had been already disseminated in both STATA and SPSS, i.e. NBS in Tanzania and UBOS in Uganda had already succesfully addressed all the legal and ethical issues associated with micro-data dissemination (Dupriez and Boyko, 2010). Eventually, NBS and UBOS disseminated the livestock microdata in *MS Excel*, and for two major reasons: first, it was found that the majority of stakeholders have *MS Excel* installed on their computer (fig. 7); second, with respect to other possible forms of micro-data dissemination (e.g. CVS, text), *MS Excel* has embedded statistical commands that allow users to generate summary statistics straightforwardly, including weighted statistics. Of course, any other popular data spreadsheet with embedded statistical commands would be as good as *MS Excel* to disseminate microdata to users and provide them with some statistical power. The following is the procedure taken on board by NBS and UBOS Team to come up with datasets in *MS Excel* for the stakeholders.

a) First, the Ministries responsible for livestock, identified a set of livestock-related variables out of the Tanzania and Uganda National Panel Surveys of particular relevance for policy making, from animal ownership through animal vaccination to the utilization of livestock-related services;

b) Second, NBS and UBOS generated targeted datasets around those variables, including one dataset on key socio-economic characteristics of livestock-keeping and non-livestock-keeping households; one dataset on animal ownership and basic production practices for all livestock-keeping households in the country; and detailed datasets on livestock ownership and production practices for indigenous cattle-, indigenous goat-, indigenous sheep-, local chicken-, and pig-keeping households. NBS and UBOS generated also livestock sub-datasets by rural and urban households, and included in all datasets a dummy poverty variable and an annual income variable; and

c) Third, NBS and UBOS provided the Ministries responsible for livestock with the developed livestock datasets in *MS Excel* spreadsheets: this was doable given the sample size of the National Panel Surveys: it comprised about 1,800 livestock-keeping households in Uganda and about 2,100 in Tanzania. The distributed *MS Excel* spreadsheets included *ad hoc* commands to calculate representative statistics at different levels of aggregation, notably the weighted average, the median and the standard deviation.[1]

Fig.7. *'Statistical-related' software installed on respondents' computers*

% of respondents with software installed on their computer
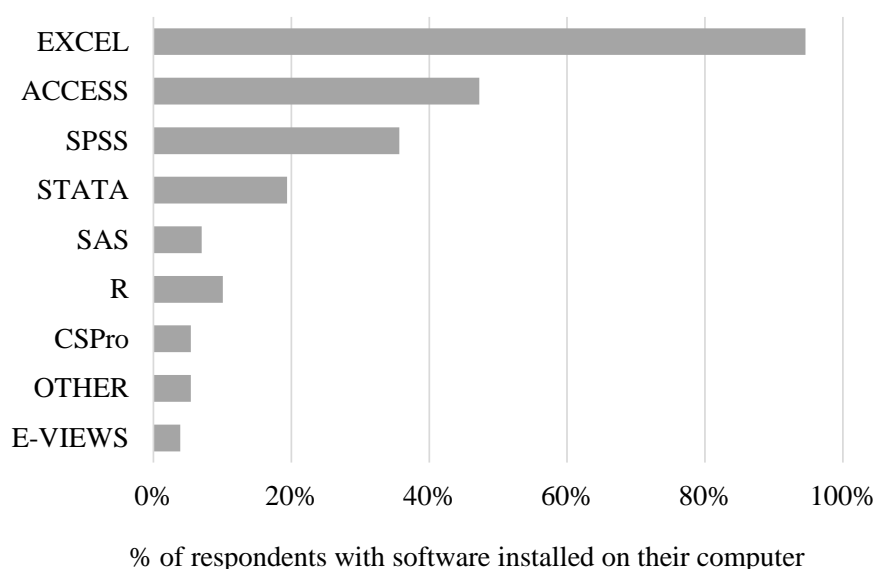
With livestock data available in *MS Excel* spreadsheets, the Ministries responsible for livestock could:

a) Correct few unambiguous data-entry errors, which could not be detected through standard statistical procedures (e.g. adjusting the weight of a live chicken from 13 to 1.3 kilos);

b) Generate additional variables to respond to specific policy questions (e.g. a dummy on household consumption of any type of animal protein); and

c) Perform an explorative analysis of the household-level livestock data, which is summarised in two reports on the Smallholder Livestock Sector in Tanzania and Uganda (MALF, 2016; MAAIF, 2016). It was one of the first times ever in which staff in the Ministries responsible for livestock generated representative statistics out of a NSO' dataset with no need of technical assistance or investments in capacity building.

Results from the 2016 survey implemented by NBS and UBOS on the utilization of agricultural data and statistics indicate that, disseminating datasets in spreadsheets with embedded

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[1] The main challenges in exporting the NPS livestock data in a statistically usable *MS Excel* spreadsheet were to give codes 0 and 1 to all dichotomous questions and to split multiple response questions into different columns with codes 0 and 1. See UBOS (2016) *NPS 2011/12: Section and Datasets on Livestock – Basic Information Document* or NBS (2016) *NPS 2012/13: Section and Datasets on Livestock – Basic Information Document* for codes and commands to calculate the representative average, median and standard deviation in *MS Excel.*

statistical commands (*MS Excel* in this case) widely facilitates and motivates the use of data for various purposes. Among the respondents that utilized the Tanzania 2012/13 National Panel Survey and the 2011/12 Uganda National Panel Survey, 98 percent developed some statistical tables on livestock, with statistics on marketing and food consumption ranking second and third (68% and 42% of respondents respectively) (Fig.8). The analysis of the NPS livestock datasets undertook by the national governments suggested that, in both countries, limited access to livestock services is a binding constraint to livestock development: both MAAIF and MALF are currently gathering and analyzing additional data and information for designing an effective policy to improve the systems of animal health services in Uganda and Tanzania respectively.

Fig. 8. *Utilization of the Tanzania 2012/13 National Panel Survey and the Uganda 2011/12 National Panel Survey by purpose*

main purpose of data use for respondents using
the TZ 2012/13 NPS and the UGA 2011/12 NPS
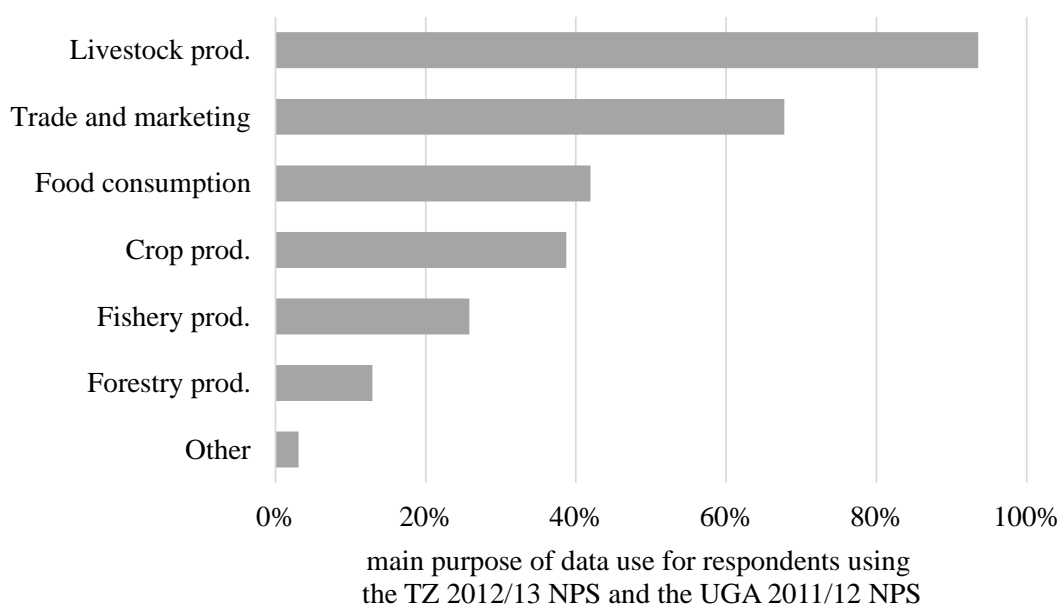
4. Conclusions

This paper analysed the extent to which public and private sector stakeholders in Tanzania and Uganda use official agricultural statistics as produced by the Tanzania National Bureau of Statistics and the Uganda Bureau of Statistics (respectively. It builds on data from an online survey implemented by NBS and UBOS in the first quarter of 2016. Results showed that stakeholders use only a minor share of the agricultural data collected by the NSOs, which promoted NBS and UBOS to innovate .

The paper presents two innovations to enhance the utilization of agricultural data and statistics, which have been tested and implemented using household level livestock data in Tanzania and Uganda. The first is to complement investments that improve the quantity and quality of official statistics with investments to collect the information needed for decision-makers to design and implement policies and investments on the ground. Collecting data to depict the situation on the ground, which is what official statistics largely do, is in fact not sufficient on its own to generate evidence to find effective ways to improve it. The second innovation is on data utilization: data can be disseminated not only in NSOs' reports and - when ethical and legal issues related to microdata dissemination are successfully addressed - as statistical software files, but also in simple spreadsheets with embedded statistical commands, which suit the need of stakeholders. This approach empowers stakeholders and is implementable with a more efficient allocation of NSOs' available resources. As the largest share of NSOs collected data currently remain unused, National

Statistics Offices could consider reducing the quantity of the data collected and allocate the saved resources to generate and disseminate targeted datasets, as demanded by stakeholders, in simple spreadsheets.

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