



Milking the data: Measuring milk off-take in extensive livestock systems. Experimental evidence from Niger



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ABSTRACT

Milk is an important source of cash and nutrients for many households in developing countries. Yet, our understanding of the role of dairy production in livelihoods and nutritional outcomes is hindered by the lack of decent quality household survey data. Data on milk off-take for human consumption are difficult to collect in household surveys for a number of reasons which make accurate recall challenging for the respondent (continuous production and seasonality among others), introducing possibly severe biases in the computation of full household incomes and farm sales, as well as in the estimation of the contribution of livestock (specifically dairy) production to agricultural value added and the livelihoods of rural households.

This paper presents results from a validation exercise implemented in Niger, where alternative survey instruments based on recall methods were administered to randomly selected households, and compared to a 12-month system of physical monitoring and recording of milk production. The results of the exercise show that reasonably accurate estimates via recall methods are possible, and provide a clear ranking of questionnaire design options that can inform future survey operations.

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Introduction and background

Despite the importance of the agricultural sector and its critical role in development policy and for poverty reduction, serious weaknesses in agricultural statistics persist throughout the developing world and are particularly pronounced in Africa. Of the 44 countries in Sub-Saharan Africa rated by the Food and Agriculture Organization, only two are considered to have high standards in data collection while standards in 21 countries remain low (Carletto, 2009).

Statistics on livestock stand out as an area in particular need for improvement. There are important technical reasons, besides institutional and political neglect, that explain why livestock data are particularly scarce or of dubious quality. Unlike crops, which are rooted in a specific tract of land and can be counted and measured, livestock are mobile, posing a challenge to enumeration even in sedentary livestock systems. The difficulties of collecting data on

livestock are exacerbated by peculiarities in the management of livestock assets, in the mobility of some population groups that are especially reliant on livestock for their livelihoods (e.g. pastoralists), and by the fact that livestock products tend not to have one or two specific harvests at predetermined points in time, but tend to be produced either continuously or irregularly throughout the year, often with seasonal patterns.

The need of addressing the current shortcomings in the quality and availability of livestock statistics is only made more urgent by the rapidly increasing importance of the livestock sector. In developing countries as a whole, milk consumption almost doubled, meat consumption tripled, and egg consumption increased by a factor of five in the past fifty years, in what has been dubbed a 'livestock revolution' (Delgado et al., 1999). During the same period consumption of cereals increased only slightly and that of root and tubers actually declined (Gerosa and Skoet, 2013).

It is not uncommon for shares in excess of 60–70% of rural households in African countries to hold some livestock and depend on it to some extent for generating income or accessing nutrient dense foods (Davis et al., 2010). In rural Niger 3 out of 4 households keep some livestock according to recent national household level data (Bocoum et al., 2013), and according to FAO Statistics for

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2010 (FAOSTAT, 2015) livestock contributes 28% of the net value of agricultural production in the African continent, with values substantially above average in several countries. In West Africa the share of livestock in agricultural production is consistently large, being 43% in Mali, 30% in Burkina Faso, and 38% in Niger, but other major countries also record sizeable shares, such as Ethiopia (35%).

Part of the neglect of livestock statistics materializes in underinvestment in actual data collection, but even when data are collected their quality is uncertain because of a lack of rigorous methodological work to assess the reliability of data collection practices. This paper aims to contribute to improving the practices for data collection on one specific item, milk, of major importance for livelihoods, income, food security and nutrition in many parts of Africa based on fieldwork in one of the African countries, Niger, where livestock constitutes the backbone of the rural economy.

Without reliable and timely livestock statistics it is hard to see how countries such as Niger can design, monitor and evaluate effective policies for promoting the role of livestock for poverty reduction and food security. The lack of high quality data on the dairy sector hinders both advocacy and policy analysis efforts aimed at informing actions to support livestock-based livelihoods. Household-level data and studies on the role of milk off-take for human nutrition and livelihoods are severely hampered by the difficulty of producing reliable estimates of milk off-take in small-scale livestock production systems.

Milk production offers an important source of cash income to many of the over 200 million poor livestock keepers estimated to reside in developing regions (Thornton et al., 2002; Pica-Ciamarra et al., 2015). For pastoral communities milk is often the sole source of calories and key nutrients, and a major source of cash income (Sadler et al., 2009). Some livestock products such as milk and eggs can help poorer households mitigate the effects of often large seasonal fluctuations in availability of cereals (Wilson et al., 2005). Hoddinott et al. (2015), using Ethiopian data, found empirical evidence to support the hypothesis that cow ownership in underdeveloped rural settings is a key driver of the milk consumption and linear growth of young children.

From a nutritional point of view, milk is a good source of dietary fat, energy, protein and other nutrients (Wijesinha-Bettoni and Burlingame, 2013) that brings “important nutritional benefits to large segments of the population of developing countries” (Muehlhoff et al., 2013: p. 5). In particular, milk can provide substantial amounts of nutrients such as calcium, magnesium, selenium, zinc, riboflavin, vitamin B12 and pantothenic acid (Weaver et al., 2013). Milk can help provide children of age 6–24 months that are not being breastfed adequate quantities of fat, which is crucial in their diets because it contains essential fatty acids, facilitates the absorption of fat soluble vitamins, and enhances dietary energy density and sensory qualities (Dewey, 2005).

Milk consumption has also been associated with secular growth in height whether in industrialized and developing countries (Japan, India) or in pastoral societies (Weaver et al., 2013; Hoppe et al., 2006). A review of the available evidence, laments that despite the observed increase in milk production and consumption world-wide, child undernutrition and micronutrient deficiencies that could be alleviated by increased intake of milk and other animal source foods remain highly prevalent. In developing countries, both milk and meat intake improve growth indicators, micronutrient status, and cognitive performance (Dror and Allen, 2011).

In general, it is hard to appreciate the role of milk and dairy production in household level livelihood studies in developing regions, because of the generally poor state of agricultural statistics in these countries, and because of the practical difficulties in measuring milk off-take in household surveys. Milk off-take is difficult to measure in household surveys because: (a) lactating females can be milked daily (often twice, mornings and evenings), but with

seasonal patterns; (b) milk production varies depending on the lactation stage; (c) milk can be left in the udder to feed suckling young; (d) reproductive and lactating females may be present but not necessarily being milked. These potential sources of measurement error combined make the valuation of milk off-take particularly challenging in household surveys, introducing possibly severe biases in the computation of full household incomes and farm sales.

This paper presents results from a validation exercise implemented in Niger, where two alternative survey instruments were administered to randomly selected households, and then compared with the results of a physical monitoring of milk off-take over a 12-month period. The immediate objective of this work is to draw lessons for questionnaire design by selecting the best performing options and identifying outstanding issues. The ultimate goal is to contribute to a better understanding of the role of animal production in livelihoods and nutrition, which can facilitate more effective policy and program design.

The focus in the paper is on one specific family of household surveys, the Living Standard Measurement Study (LSMS). This is one prominent type of household survey widely implemented in developing countries to monitor and analyze poverty and livelihoods. While this is just one example of a multi-topic household survey for livelihood analysis, we maintain that the lesson for questionnaire design assessed with this exercise can be applied beyond LSMS surveys. The paper is organized as follows. The next section outlines the overall design of the validation exercise and the survey instruments being tested. This is followed by two sections presenting the data and the results. The concluding section discusses the implications of this work for future data collection, and elaborates on ongoing next steps in furthering this line of work.

Testing alternative survey instruments

The context: survey validation work in developing countries

In their primer on methods for testing and evaluating survey questions, Presser et al. (2004a, p. 109) note how “pretesting’s universally acknowledged importance has been honored more in the breach than in the practice”. Even in countries with well-funded statistical systems, pretests are often limited to a rehearsal of survey interviews, usually on a fairly limited number of cases, which are then qualitatively evaluated by the survey teams so as to draw lessons on questions that seemed to pose problems to interviewers or respondents. Sometimes, this is complemented by a quantitative analysis of response frequencies and other simple statistics from the data collected during a pilot survey.

In most cases there is little that is systematic about these tests, despite the existence of techniques geared toward assessing the performance of survey instruments (see e.g. those reviewed in Presser et al., 2004b; Iarossi, 2006), and very little documentation is provided to users of the data on the contents of such tests. The evaluation of what ‘works’ is mostly left to the judgment and experience of the survey team.

More and more, however, survey practitioners are paying attention to pre-tests as means toward improving data quality. Also, specific methods are being developed, tested and codified and increasingly applied in survey practice (Presser et al., 2004b). While the use of such methods, and their documentation, is more commonly found in OECD country surveys, their application is gaining grounds in low income countries, including in Africa.

Despite the fact that the quality of the data should be of interest to researchers as much as the quantity, it is surprising how little attention the formal validation of household survey data collection

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