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Assessing current and future meat and fish consumption in Sub-Sahara Africa: Learnings from FAO Food Balance Sheets and LSMS household survey data

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ABSTRACT

Driven by economic growth, the consumption of animal-based foods is expected to increase substantially in Sub-Sahara Africa (SSA). This study examined meat and fish consumption and its income elasticity in Ethiopia, Malawi, Mali, Niger, Nigeria, Tanzania and Uganda, using macro data from the FAO Food Balance Sheets and micro data from the World Bank's Living Standards Measurement Study (LSMS) household surveys. The convergence and divergence between the inferences drawn from these two datasets were assessed. FAO Food Balance Sheets data on meat consumption were in line with the estimates based on the LSMS household surveys, whereas figures on fish consumption were less consistent. Assuming that the seven countries in our study are representative for SSA, per capita meat and fish consumption is expected to increase by 54–69% if GDP of SSA doubles. Substantial variation exists between countries and across households within a country. Higher income elasticities for meat and fish consumption were found for poorer countries and poorer households. These estimates provide valuable inputs for future research with simulation models and for effective tailoring of agricultural and food policies for sustainable livestock production and consumption.

1. Introduction

Trends in meat and fish consumption have been studied extensively (Bodirsky et al., 2015; Delgado, 2003; Sans and Combris, 2015), owing to its important implications for human health, food security and the environment. Whilst meat and fish consumption is associated with an increased nutritional value of diets, the production of these animal-based foods remains controversial, given its impacts on climate change (Ripple et al., 2014; Wiebe et al., 2015), water footprint (Gerbens-Leenes et al., 2013), and land use through the increased demand for livestock feed (Gasparri et al., 2013; Thornton, 2010). Other issues of debate are the potential adverse health effects of excessive meat intake (Wolk, 2017) and the nutritional-toxicological conflict with respect to fish and seafood consumption (Jacobs et al., 2013).

Economic growth has led to a dramatic increase in consumption of animal-based foods in the last 50 years (Delgado, 2003; Sans and Combris, 2015). According to FAO statistics, global meat and fish consumption has increased from 23 kg per capita in 1961 to 42 kg per capita in recent years (Sans and Combris, 2015). While the consumption of animal-based foods in general tends to be inelastic to GDP or income growth in developed countries, income elasticities tend to be higher in low-income developing countries (Muhammad et al., 2011). Following Bennett's Law (Bennett, 1941), as poorer individuals become wealthier, they switch to a more diverse diet with a larger share of high-value and nutrient-rich foods such as meat or fish (Jensen and Miller, 2010; Valin et al., 2014).

Global growth rates of per capita consumption of animal-based products are expected to slow down. Meat and fish consumption has stabilized in developed countries (Smil, 2014). After increasing significantly in recent years in emerging economies such as Brazil and China, it reached a cap level that is unlikely to be exceeded. Meat consumption is even declining in some countries, a trend that is referred to as 'the second nutrition transition' (Vranken et al., 2014). Yet, most of the future growth in meat and fish consumption is likely to occur in low income countries, including Sub-Saharan Africa (SSA), where the current consumption levels are still very low (FAO, 2017; Herrero et al., 2014; Rosegrant et al., 2013). Meanwhile, strong population growth and urbanization in SSA reinforce growth in total demand of animal-based foods (FAO, 2017). In FAO's 'World Agriculture towards 2030/50' report, meat production in SSA is projected to increase by 2.7% per annum till 2030, which is high compared to the expected increase in global meat production of 1.4% (Alexandratos and Bruinsma, 2012).

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This outlook for the meat sector in SSA will have important spill-over effects on the agricultural sector, the environment, carbon emissions, international trade in animal products, animal health and the prevention of animal diseases.

Indeed, increased demand for (and consumption of) animal-based foods is expected to impact on agricultural production beyond the livestock sector (Herrero et al., 2014). Mottet et al. (2017) pointed at positive contributions such as the supply of macro- and micronutrients to human diets, the provision of manure as fertilizer, draught power, and income to livestock keepers. Yet, the animals' low efficiency in converting inputs, increased feed demand, potential large need for land conversion from food to feed production, the impact on food prices, and adverse environmental impacts of livestock production fuel the debate (Alexander et al., 2017; Mottet et al., 2017; Rosegrant et al., 2013). Undeniably, the expected increase in meat production provokes unease amongst policy makers and academics alike, resulting in a debate that merits to be better informed on meaningful parameters that can be used in future projections. Because an increase in the demand for meat and fish is partially attributed to income growth (Regmi and Meade, 2013; Valin et al., 2014; FAO, 2017), insight in income elasticities are of interest. In this respect, Valin et al. (2014) compared 10 global economic models that used different modelling approaches to estimate future demand for agricultural products. The models yielded wide and diverging ranges of future demand for animal-based calories; a finding the authors attribute to demand system specifications and highly variable income and price elasticities used in the models. Likewise, models that inform strategies for more sustainable future food production systems use this type of parameters. For example, the model developed by Muller et al. (2017) predicts that organic agriculture can manage to provide for the growing food demand by 2050, conditionally upon a reduction of animal feed rations and assuming substantially lower meat consumption. The validity of such an assumption merits at least further reflection.

FAO Food Balance Sheets fuel policy debates across the globe, since this is the main data source used by most comprehensive studies on trends in meat and fish production (Alexandratos and Bruinsma, 2012; Delgado, 2003; Kearney, 2010). FAO provides macro data on per capita meat and fish consumption for nearly all countries since 1961. However, FAO data do not cover the distribution of consumption within a country or between individuals, and the data quality is often questioned, particularly for SSA (Carletto et al., 2015; Desiere et al., 2016; Devarajan, 2013; FAO, 2001; Jerven, 2013).

Micro data have become increasingly accessible recently through, amongst others, the World Bank's Living Standards Measurement Study (LSMS). These nationally representative surveys use a similar methodology across countries to measure food consumption, including meat and fish consumption, using seven-day recall by the household head. LSMS survey data are considered to be of high quality (Carletto et al., 2015; Christiaensen, 2017; Gollin et al., 2014). A drawback of the (expensive) LSMS surveys is their frequency and geographical coverage, as they are neither conducted on a yearly base nor in all SSA countries. Still, LSMS surveys were recently performed in seven SSA countries (Ethiopia, Malawi, Mali, Niger, Nigeria, Tanzania and Uganda) which account for 45% of the population of SSA, thus providing a fairly representative picture of meat and fish consumption in SSA as a whole.

The availability of both macro- and micro-level data allows a comparative analysis of current and future meat and fish consumption in SSA by triangulating findings generated from both datasets. The objective of this study is, first, to examine the reliability of FAO data on meat and fish consumption in SSA. The standard FAO data of meat and fish consumption are triangulated with estimates based on the LSMS household surveys. Second, income elasticities of meat and fish consumption are estimated. Whereas FAO data can only provide an 'average' income elasticity for a macro region, LSMS data allow to estimate country-specific income elasticities. These country-specific estimates are compared with the single average income elasticity for SSA derived from FAO data in order to evaluate whether FAO data are suitable to study trends in meat and fish consumption patterns.

2. Data and methods

2.1. Datasets

2.1.1. FAO Food Balance Sheets

FAO estimates national consumption as the residual of production and imports minus exports and feed use adjusted for changes in stocks, which are annually provided by National Statistical Offices or imputed by FAO (FAO, 2001). Consumption per capita is obtained by dividing national consumption by population size. We restricted the sample to SSA countries and excluded South-Africa and Gabon, which are middle-income countries and consume much more animal-based products per capita. The resulting dataset contained 1869 observations from 43 countries.

FAO reports on per capita consumption of animal-based foods by type of meat (bovine, mutton and goat, pig, and other meat), offal, animal fats, eggs, milk and type of fish. When estimating income elasticity, we aggregated the consumption of meat and fish. We reasoned that households in coastal areas might increase fish consumption – rather than meat consumption – with increasing income. Therefore, income elasticities might be underestimated if fish is not included in the aggregates. Offal and animal fats are not included in the aggregate, since these products are not included in most of the food consumption modules in the LSMS surveys (the second dataset used in this study) and their consumption is very limited. Although smallholder dairy and egg sales may play an important role in poverty alleviation issues, demand for these products were not considered in this paper due to data constraints. In the LSMS surveys, eggs are typically measured in 'pieces' and its conversion to standard units requires additional assumption. Data on milk consumption suffer from, amongst other, recall bias (Zezza et al., 2016). Besides, milk and eggs are not necessarily substitutes for meat and fish, their exclusion will therefore not bias the estimates of the income elasticity for meat and fish.

FAO data are combined with data on GDP per capita (in constant 2005 US dollars) from the World Development Indicators (World Bank, 2016). This information is available for most SSA countries since 1961, although with some gaps for some countries. This reduced the sample size to 1633 observations from 36 countries. Ideally, GDP per capita should be expressed in purchasing power parity (PPP) value, but these data are only available since the 1990s. To test the robustness of our results, we also estimated income elasticities using GDP per capita in PPP rather than in constant 2005 US dollars. Results were similar and are not reported here.

2.1.2. LSMS-ISA surveys

The LSMS team of the World Bank conducts high quality, nationally representative household surveys in collaboration with National Statistical Offices in developing countries. Supported by the Bill and Melinda Gates Foundation, the LSMS-ISA (Living Standards Measurement Study – Integrated Surveys on Agriculture) initiative designed and implemented multi-topic panel household surveys in SSA with a focus on agriculture. Table 1 provides an overview of the seven household surveys used in this study. Though for most countries multiple survey waves have been implemented and are publicly available in the Central Microdata Catalog of the World Bank, we only considered the most recent wave for each country, publicly available at the time of data analysis. The surveys included were conducted between 2011 (Niger) and 2015 (Mali).

Although the questionnaires are not standardized across countries, their structure and focus are very similar. Household heads were asked to recall food consumption during the last seven days prior to the interview. A distinction was made between consumption from own production, food purchased, and gifts. The monetary value of consumption