

Agricultural Policy Reforms in Sub Saharan Africa: A CGE Analysis¹

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1. Introduction

Most countries in the world adopt policies in support of their agricultural sectors that generate significant trade, market and price distortions. While a lot of research has been conducted on the agricultural subsidies and other forms of policy transfers in the developed countries, there is scarce literature on those provided by the developing countries. This is largely because of the challenges in data collection and availability. Following a first experiment by Krueger, Schiff and Valdes (1988), Anderson and Valenzuela (2008) followed by Anderson and Nelgen (2010) bridged this gap in the literature by estimating these distortions to agricultural incentives in developing countries.

Concerted efforts by the Monitoring and Analyzing Food and Agricultural Policies (MAFAP) team at the FAO have resulted in the updating of this kind of a dataset covering the period 2005-2013. The MAFAP programme is implemented by FAO and seeks to establish country-owned and sustainable systems to monitor, analyze, and reform food and agricultural policies to enable more effective, efficient and inclusive policy frameworks in a growing number of developing and emerging economies.

Exploiting this dataset from MAFAP, we extend the standard GTAP Data Base (version 9, year 2011) to include domestic support, export subsidies, export restrictions as well as detailed transaction costs in a few commodity-specific value chains or the agricultural sector as whole for a dozen of the developing countries. The countries currently covered by MAFAP include Bangladesh, Burkina Faso, Benin, Burundi, Ethiopia, Ghana, Kenya, Malawi, Mali, Mozambique, Nigeria, Rwanda, Senegal, South Sudan, Tanzania, and Uganda. We employ the Altermat tool (Malcolm, 1998) in the GTAP framework for this purpose.

As a further attempt to fill a major gap in the policy literature, in this paper, we perform several real-world policy simulations involving the agricultural sectors of these selected developing countries. Most of these MAFAP countries have adopted agricultural or trade policies or budgetary transfers to stimulate agricultural production and productivity growth in an attempt to achieve food self-sufficiency, rather, self-food reliance in particular, in the wake of the high food price crises of 2007/08 and 2010/11. These policy decisions include a wide range of policy measures from highly distortive administered producer or consumer prices, to border protection or export restrictions, to slightly less distortive inputs subsidies, and

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more WTO compatible types of direct or indirect transfers to agents or groups of economic agents to support marketing, research, extension, infrastructures (feeder roads, storage facilities, etc.).

In this paper, we first introduce the main policy questions and the derived policy simulations. In a second part, we present the MAFAP dataset, then how this data has been incorporated in GTAP to design the selected policy simulations. In a subsequent part, we present the results of the simulations. We finally propose a discussion of these results, deriving policy implications and recommendations in the last and concluding part.

This paper is organized in the following way: section 2 describes the dataset developed and used, section 3 summarizes the methods used to incorporate MAFAP into GTAP, section 4 explains the policy simulations undertaken, section 5 shows the results and section 6 concludes.

2. Data Sources and Methodology

MAFAP methodology includes computation of indicators for price incentive analysis and public expenditure analysis. The data requirement and sources are described hereafter for the two methodology components.

MAFAP's price incentives analysis is commodity and country specific. The MAFAP methodology on price incentives produces five commodity-specific indicators: (i) price gap; (ii) nominal rate of protection (NRP); (iii) effective rate of protection (ERP); (iv) nominal rate of assistance (NRA) and (v) the market development gap (MDG). The first two are calculated at three points along the value chain: (i) retail; (ii) wholesale and (iii) farm gate, while the other three are only calculated at farm gate level. All indicators are calculated using two different types of data: (i) observed and (ii) adjusted. Observed indicators include all direct taxation over the specific commodity, while the adjusted indicators account for all indirect taxation and market inefficiencies as well. The market development gap summarizes the gap between observed and adjusted measures.

The MAFAP database currently includes thirteen Sub-Saharan countries although only data for the first ten countries covered by MAFAP are available in early 2015. Similarly, the effective rate of protection and the nominal rate of protection at retail level are not released because the required information is not available for all commodity and countries yet.

Indicators are computed on an annual basis from 2005 onwards and updated regularly. Commodities to be analyzed are selected on the basis of their contribution to the country's food security, import bill and export revenue. Products with high potential in promising or emerging value chains are also taken into account.

All indicators are publicly available and data elements are available upon request (see table 1). Table 2 gives an overview of countries and commodities covered during the MAFAP phase I. Most of these value chains were analyzed up to 2013. The Phase II will also cover commodities in Burundi, Rwanda and Senegal.

Table 1

Publicly available			Available upon request
Price gaps			Benchmark prices
Nominal	rates of	protection	Access costs Output prices
Nominal	rates of	assistance	Input Prices Quantities
Effective	rates of	protection	
Market	development gaps		

Table 2: Country coverage

Burkina Faso	Ghana	Ethiopia	Kenya	Malawi	Mali	Mozambique	Tanzania	Uganda
Live Cattle	Cassava	Barley	Cassava	Cotton	Cattle	Cashew nuts (processed)	Cashew Nuts	Cattle
Cotton	Maize	Coffee	Cotton	Groundnuts	Cotton	Cashew nuts (raw)	Coffee	Cassava
Maize	Palm Oil	Haricot Beans	Dry Beans	Maize	Groundnuts	Cassava	Maize	Coffee
Onion	Rice	Lentils	French Beans	Sugar	Maize	Cotton	Rice	Cotton
Rice	Yam	Live Cattle	Maize	Tea	Milk	Maize		Cow milk
Sesame		Maize	Potatoes	Tobacco	Milk	Rice		Maize
Sorgho		Sorgho	Rice		Rice			Rice
		Teff	Sorgho		Sorgho			Sugar

	m	cane
Wheat	Sugar cane	Tea
Sesame	Tea	Wheat
	Wheat	

In its current second phase, MAFAP is planning to conduct pilot study in two countries (Ethiopia, and Tanzania) to test new, cost-efficient data collection tools and methodology, which minimize the time lag between collection and publishing. The purpose is to compute frequent, timely and reliable market prices indicators for staple foods and to make this data available to the general public and the decision-makers to support evidence based policies.

The price data is usually collected in rural, wholesale markets in each country by national authorities. MAFAP does not collect primary data itself and rely on national institutions to do so. However, the MAFAP team promotes consultations and exchanges of experiences among participating countries to adopt common approaches for commodity and market selection. All data entered in the MAFAP database is subject to automatic and manual robustness and consistency checks before it is published. After validation, data is published in the MAFAP website with profile webpages for each MAFAP country that display the data in various graphs and tables for users. The data displayed is comparable and consistent across countries. The data inputs required for the analysis of each commodity and potential sources are provided below and are generally listed by order of preference.

The benchmark prices are annual nominal prices of the commodity at the country's border, where the commodity is imported or exported. When higher frequency data are available (e.g. quarterly, monthly, daily) the annual average is computed. For a net import, the benchmark price is the CIF (cost of insurance and freight) price. For a net export, the benchmark price is the FOB (free on board) price. The sources usually include the UN Comtrade database, or the FAOSTAT trade database or national sources (e.g. ministry of trade or statistics).

The exchange rate is the annual average of the nominal exchange rates between the local currency and USD. The main sources are the International Monetary Fund database and the World Bank World Development Indicators (WDI) database.

Domestic prices at the wholesale, the farm gate or retail levels are annual nominal prices. When higher frequency data are available (e.g. quarterly, monthly, daily) the annual average is computed. The point in the value chain where the domestic product competes with the internationally traded product is called the point of competition. For a net export, this may be the price at the international auction or the price at the border. For a net import, the price at the point of competition may be the price at the main wholesale market where the product is traded. The nominal producer price is sought at the commodity's main production area. Usually the main source of data comes from the national level (e.g. commodity boards; producer organizations; ministry of agriculture, statistics bureau, planning or trade). MAFAP also used occasionally the FAO GIEWS database as well as the CountrySTAT database

Input Costs and Quantities at farm level are necessary to measure the effective rate of protection which is based on value added. The MAFAP teams use data from annual crop budgets of representative farmers in the main producing areas of the relevant value chains. Prices and applied quantities of the main tradable inputs such as seeds, fertilizers and energy are taken into consideration as well as production and harvested area.

Access Costs from the Border to the Point of Competition, from the Farm Gate to the Point of Competition and from the Point of Competition to Retail are also very important data requirement to compute MAFAP indicators. Marketing costs include border clearance costs, storage and handling, inland transport, government taxes and fees, bribes, marketing margins of traders and/or processors, etc. The main sources of data include national sources (e.g. commodity boards; producer organizations; ministry of agriculture, statistics, planning or trade); private companies (i.e. processors, estates, etc.); value chain and marketing studies/publications but also the Doing Business database for port costs. Data are usually collected with annual frequency even if in some cases this is not possible and therefore they are inferred using the available information on previous years.

Average quantity and quality conversion ratios are used to render products comparable at levels stages of the value chain. The quantity conversion ratio relates to the volume of a given commodity generated from one unit of raw inputs of the same commodity. This information is only relevant for those commodities that undergo processing between the farm gate and the point of competition or between the border and point of competition. For example, the conversion ratio for rice is equal to the volume (tonnes) of milled rice produced per one unit (tonne) of paddy rice inputs. Similarly, the quality conversion ratio accounts for quality differences between the domestic product and the internationally traded product.

Indeed, in order to compare like with like between the internationally and domestically produced commodities, a conversion accounting for the quality difference needs to be made. For example if most domestic milled rice is 30% broken and milled rice imports are 100% whole, the quality conversion ratio would be 0.7. Thus, the import price for milled rice would be multiplied by .70 to make it comparable to the price for domestic milled rice. To obtain both the quantity and quality conversion ratios, the national sources (e.g. commodity boards; producer organizations; ministry of agriculture, statistics, planning or trade) including private companies (i.e. processors, estates, etc.) are usually favored.

Finally, the MAFAP methodology enables the incorporation of data obtained in the analysis of public expenditure into the price incentives analysis to construct an indicator that captures public spending, in addition to policy and market performance already captured by the NRP. Combining price and budget information, the nominal rate of assistance provides a more complete picture of incentives, particularly in cases where budgetary payments may be compensating for disincentives to producers. Data on input subsidies (in nominal, unit prices) for producers of the commodities selected for analysis are obtained through the MAFAP public expenditure analysis (see below).

MAFAP's Public Expenditure Analysis is conducted at aggregated and disaggregated levels. Regarding the aggregated level, MAFAP seeks information on overall national public expenditure, budgeted and actual allocations. MAFAP public expenditure analysis is disaggregated at programme and project level, includes budgeted and actual, accounts for spending done at central and decentralized level, regardless of the implementing agency/ministry, and incorporates both donor and government outlays on-budget and off-budget. This data is obtained for the period starting with the fiscal year 2005/06 onwards.

Under MAFAP, public expenditures for agriculture to be considered are:

- Expenditures to individual agricultural agents (e.g. input subsidies), or to the sector as a whole (e.g. agricultural research). This type of expenditure is referred to as agriculture-specific expenditure. Agricultural agents, or the sector as a whole, must be the only, or the principal recipient of the transfers generated by expenditure measures in this category.
- Expenditures in support of rural development, such as rural infrastructure, rural education and rural health, as these also have an important role in indirectly supporting agricultural sector development. These expenditures are referred to as agriculture-supportive expenditures.

All the measures that comply with these criteria are considered, regardless of their nature, objectives or perceived economic impacts.

Furthermore, general public expenditure measures available throughout the entire economy are not considered, even if they generate monetary transfers to the agricultural sector. Private expenditure is not considered.

MAFAP public expenditure analysis also requires qualitative information on budgetary process in the country: institutional architecture, if possible with a diagram, together with a detailed explanation of the functioning of the budget. Moreover, a thorough description of all policy project/programmes that will be considered in the analysis is sought: objectives, activities, status of implementation of activities, commodities targeted and level of government implementing the project. Each measure needs to be well documented to facilitate MAFAP classification and this for the last 7 years before the period of analysis.

The sources of information include the Ministry of Finance, Ministry of Agriculture, and Ministry of Planning. Moreover when possible, MAFAP also seeks to obtain data from donors for off-budget expenditures as well as data from other Ministries/agencies for expenditures not recorded on the Ministry of Finance or Ministry of Agriculture's budget (Presidential Initiatives, for instance).

3. Incorporating MAFAP into GTAP Data Base

In order to incorporate the MAFAP-based taxes/subsidies data into GTAP, we employ the widely used Altax tool. This entails changing the taxes and subsidies in the dataset, without affecting the balance and other parts of the data base. The closure and elasticity parameters are designed to suit this requirement of changing nothing else other than these taxes and subsidies. GTAP Data Base (Narayanan et al, 2015) is an assembly of trade, protection, input-output, consumption and macro-economic datasets from various established sources across the world. The reason why we incorporate MAFAP into GTAP is to enable us to work on simulations that reflect the real-world policies.

4. Policy Simulations

Analysis of the MAFAP dataset suggests that factors other than only trade and price policies explain the general pattern of production disincentives across commodities in Sub-Saharan Africa. We consider that most of the explanation for these frequent disincentives to production lies in the type and the mix of policy measures that have been adopted by governments. Indeed, border policies favorable to consumers are

often combined with excessive market access costs (transport, handling, storage, margins, etc.) that reveal important inefficiencies or even underdevelopment of the value chains (World Bank, 2009) which have tended to lower prices received by producers. However, there were offsetting mechanisms for producers resulting from other forms of support and primarily budgetary transfers such as input subsidies. Consistent with previous findings (Schultz, 1964; Bates, 1981; Demeke et al., 2008; Maetz et al., 2011), the main issue is the lack of policy coherence and transparency to improve market price signal transmission to farmers.

The aim of this paper is to shed some light on the likely impacts of a few policy reform scenarios through policy simulations. A number of specific policy issues are examined including (i) agricultural inputs subsidies, (ii) border protection through tariff and non-tariff measures and (iii) targeted investment in agricultural infrastructures in order to reduce market access and transaction costs. While the use of inputs by farmers is constrained by several factors including the lack of access to credit, high cost of inputs - generally imported- and price variability, high market and financial risks (Dorward and Chirwa, 2011, Demeke et al., 2015), it is recognized that input subsidies are costly for generally scarce national budgets, often not sustainable and generally not effective at improving productivity in the long run (Jayne et al., 2010).

Besides, this type of budgetary transfers from tax payers to farmers, governments often also use changes in tariffs and/or tax increase or exemptions to affect price levels for farmers. These policies have been typically analyzed using CGE models in order to account for cross-sector linkages and distributional effects. Taking into account market specific transaction costs as well as missing markets, we examine whether output taxation combined with fertilizer subsidies, as is usually the case in most MAFAP countries, is welfare-enhancing compared to a policy scenario where subsidies have been discontinued. Furthermore, considering that farmers, in MAFAP countries, have tended to receive lower prices than those prevailing in international markets, we test the potential welfare enhancing effect for both net food buyers and net sellers of a better international price transmission as a result of further trade liberalization. Finally, in accordance with the Maputo/Malabo commitment, we investigate the impact and fiscal implication of an increase in agricultural spending to 10 percent of the national budget with an exclusive focus on indirect support to the agricultural sector (e.g. on public goods such as agricultural research, feeder and rural roads, extension and training, etc.). These features are captured as reduction in transaction costs and/or rise in productivity in agricultural sectors owing to such developments.

5. Results

In progress

6. Conclusions

In progress