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SOUTHMOD – simulating tax and benefit policies for development

Feasibility study: simulating the impacts of farm subsidies on poverty and inequality in African countries

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Abstract: Agricultural subsidies may have significant productive and distributional consequences, and policy-makers need to be able to assess these impacts as a part of the overall tax and benefit policy. Microsimulation models offer a tool for such analysis also in developing countries, but their coverage and modelling of agricultural input subsidies have been limited. This note reviews the relevant literature on the impacts of input subsidies, considers ways in which they could be modelled in the African SOUTHMOD models, and maps the relevant policies in these countries and data requirements. The note also provides recommendations for further work.

Key words: agricultural subsidies, taxation, social protection, microsimulation

JEL classification: H22, O12, Q12

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1 Introduction

Poverty and extreme poverty are to a large extent a rural phenomenon (Castañeda et al. 2018), and the extreme poor in particular are often dependent on agriculture (FAO 2019). Over the past two decades, social protection instruments for the poorest—in particular cash transfers—have taken root in Africa, and impact evaluations have shown promising results of their impacts on households, including effects on agricultural production and investment in agriculture (Daidone et al. 2019, Correa et al. 2021). At the same time, the importance of agricultural productivity has been recognized as a major contributor to reducing poverty in the region (Christiaensen and Martin 2018). The use of modern agricultural inputs such as fertilizers and improved seed is usually perceived to be low among smallholders in Africa, which together with other factors contributes to low productivity of agriculture (Goyal and Nash 2017; Sheahan and Barrett 2017) and subsequently poverty.

Stronger coherence between agriculture and social protection is required to support the most vulnerable populations and to provide a sustainable way out of poverty (FAO 2016a). Cash transfers can relieve liquidity and credit constraints and improve risk management, allowing more investment in agriculture, but in many instances they would be optimally complemented with productive support to generate stronger and more sustainable effects. In practical terms this can mean, for example, targeting of social protection and agricultural interventions to the same households or aligning different programmes so that there are no gaps in coverage. However, suitable analytical tools are needed to support the design of such coherent interventions, including analysis of their targeting, and of the consequences for poverty and income distribution and government budgets. Such tools should also enable the analysis of interactions (or joint effects) of social and agricultural policies. These may include the possibility that the same households benefit from both set of policies and the productive impacts of cash transfers and benefit from the complementarities created.

Historically, there have been varying trends of policies aimed to increase the use of modern inputs and to improve yields in sub-Saharan Africa. After abolishing universal subsidies in the 1980s, a second generation of subsidy programmes with design features ('smart subsidies') and targeting have been widely re-introduced since the early 2000s (Jayne et al. 2018). These policies include direct subsidy packages at a reduced price that may be distributed through government structures or by using other organizations, and more recently, voucher schemes that allow farmers to purchase the inputs of their choice by using (often electronic) vouchers. A different approach to reducing the effective prices faced by farmers are interventions aiming at changing the farm gate price of inputs by exploiting the economies of scale through procurement of large quantities or by streamlining the supply chain. These programmes are not subsidies in the traditional sense, but they have aims resembling those of direct subsidies.

The aim of this study is to describe how input subsidies could be incorporated in SOUTHMOD microsimulation models and how such augmented tools can be used to examine policy-relevant research questions for selected African economies.[1] SOUTHMOD models are built on representative household data and contain the relevant tax and benefit calculation rules. The models allow calculation of aggregate indicators such as poverty, income distribution, and tax revenue with different policy parameter values, such as eligibility rules for benefits or tax or subsidy

[1] For more information, please see https://www.wider.unu.edu/project/southmod-simulating-tax-and-benefit-policies-development-phase-2.

rates. The policy rules can be easily modified, or new rules created, which enable a wide range of different ex ante evaluations and comparisons of counterfactual reforms.

The SOUTHMOD models already incorporate direct taxes and transfers and the main indirect tax instruments (the value-added tax and excises), but to date their coverage of farm subsidies has been limited or non-existent. With extended models, the comprehensive distributional consequences of farm input subsidy programmes can be examined. The distributional implications of input subsidies can be compared with those of other social protection policies, and the analysis can be conducted also by taking into account behavioural responses to different policies. Since the models include the financing side as well, the distributional impacts of different financing modalities can also be examined, along with the analysis of revenue-neutral policy packages.

This study aims to map the existing agricultural policies intended for improving access to fertilizer and in some instances other inputs for smallholder households in African SOUTHMOD countries: Ethiopia, Ghana, Mozambique, United Republic of Tanzania, Uganda, and Zambia. Farming inputs overall include fertilizer, seed, other agricultural chemicals as well as tools, technology, and training. In this study the main focus is on fertilizers and, to some extent, seed which are typically provided in input subsidy packages. Using different modern inputs simultaneously, such as inorganic fertilizer with improved seed or with pesticide, is known to produce better yields, but nevertheless their use is not necessarily strongly correlated (Sheahan and Barrett 2017). Furthermore, the study outlines the feasible modelling methodologies of incorporating these policies into the models by using the available data and provides a recommendation of SOUTHMOD countries in which modelling such policies could be piloted.

2 Theory of farm subsidies and literature review of existing research

2.1 Features of input subsidies

Farming subsidies are needed and used to help especially poor farmers to increase farming output.[2] Low-income farmers may not simply have enough savings to be able to purchase adequate amounts of fertilizers, pesticides, better seeds, and other farming inputs when they are needed, before the season. They may also be credit constrained and not have access to loans to purchase these inputs and then pay the loans back after harvesting. Furthermore, soil acidity and land degradation can reduce profitability of fertilizer use, making it commercially unviable (Holden 2019; Jayne et al. 2018). In such instances, fertilizers should be combined with other natural resource management practices, and subsidies can potentially play a role in incentivizing them (Holden 2019).

Another motivation is related to the need to guide farmers' decisions about the input mix. If farmers have insufficient information about the benefits of fertilizers, they may not use them to the optimal extent even if they were not financially constrained. They may also in principle understand the benefits of fertilizers, but because of behavioural reasons they may fail to save sufficient funds to purchase them when needed (Duflo et al. 2011). Effectiveness of fertilizers is dependent on matching the right fertilizer with the prevailing biophysical conditions, and hence their profitability also hinges on the availability and price of the right type of fertilizer. Offering input subsidy packages may be done to mitigate supply-side constraints in their availability but at the same time, for maximum impact, such packages need to reflect the needs of farmers vis-à-vis

[2] For an overview of farming subsidies principles, see for instance Morris et al. 2007 or Timmer et al. 2009.

their acro-ecological zones. Such motivations are arguments for tailored in-kind support for farmers instead of just providing them with more cash resources.

As discussed in Section 3 below, agricultural subsidies are given in two main formats in SOUTHMOD countries. The first policy is a price-based instrument, a procedure to lower the user price of fertilizers, for example. In its most unrestricted form, this subsidy could be available to all who use fertilizers, and owners of larger farms would benefit more in monetary terms, since they use more fertilizers. The benefit as a proportion of income may, however, be fairly uniform across farmers (if fertilizer use is proportional to farming land). A second common method is to offer for certain eligible farmers a package of fertilizers against a (highly subsidized) lump-sum payment. The set of eligible farmers may be restricted to certain farmers on the basis of proxies such as the acreage of agricultural land. The distributional impacts of such subsidies may well be very different—more progressive—to those of price-based instruments.

2.2 Options for simulating subsidies in tax-benefit microsimulation models

In this subsection we consider how input subsidies can be incorporated into a tax-benefit microsimulation model. We first consider static simulation of these subsidies. Next, we present how behavioural changes (the reaction in input use and the following farm income response) can be taken into account in the analysis.

In what follows we present an example related to fertilizer use. Similar reasoning could be used for subsidizing other inputs as well. It is useful to consider a stylized model of farmer behaviour. Consider a farming household with utility function $u(c,l)$, where c is a consumption aggregate and l denotes labour supply. The budget constraint of the household is

$$c+(1-s)z=Y+v+T+f(z,l) \quad (1)$$

where s depicts a price-based input subsidy, z is a farming input (such as a fertilizer), Y denotes any other income the household receives, v is the value of direct input subsidy package (net of any farmer's contribution), and T is any other direct transfer, such as an unconditional cash transfer. The farming production function f uses two inputs, fertilizers and labour.[3] The crop price is assumed to be unity.

The household can consume whatever is left out of its disposable income (the right-hand side of Equation 1) after paying for the subsidized input. Hence, household's consumption is given by

$$c=Y+v+T+f(z,l)-(1-s)z \quad (2)$$

Clearly, if there is an increase in the value of the direct package, v, or the price subsidy, s, both work towards increasing consumption. Note, however, that consumption can only increase up to the amount of fertilizer use cost. [4] This welfare metric is the so-called post-fiscal income or consumable income used in fiscal incidence analysis, also in SOUTHMOD microsimulation models (see Lustig 2018). However, only direct transfers, such as v, are captured in the concept of disposable income.

[3] Additional factors, such as land, could also be included in the modelling. A farming household may also have to pay taxes. These are also left out for simplicity but could be added.

[4] This can be modelled as an additional constraint within the relevant policy in the model.

In microsimulation, one often compares a reform scenario to a baseline case. The baseline typically represents the actual policies in place in a certain year, whereas the reform scenario captures the tax and benefit changes of a hypothetical reform. Consumable income for the baseline is simply

$$c^b=Y+v^b+T^b+f(z,l)-(1-s^b)z, \quad (2a)$$

where we have made the assumption that household behaviour, in particular its fertilizer use, does not change when taxes and benefits are altered. In a reform scenario, consumable income is

$$c^r=Y+v^r+T^r+f(z,l)-(1-s^r)z. \quad (2b)$$

The change in household consumption is therefore given by

$$〖dc=c〗^r-c^b-=(v^r-v^b)+〖(T〗^r-T^b)+(s^r-s^b)z, \quad (3)$$

i.e., it is equal to the increase in the direct transfers and the indirect subsidy times the use of fertilizers. In SOUTHMOD models, this change would be equal to so-called constant quantities assumption of modelling indirect taxes and subsidies, which draws on Decoster et al. (2014). SOUTHMOD models also simulate the impacts of indirect taxes and subsidies using the so-called constant budget shares approach, which guarantees that the household budget constraint is not violated when income changes. With the constant budget shares approach, any change in incomes is assumed to be spent on different commodities with fixed budget shares.

The discussion above was based on an assumption that the household does not adjust its behaviour when subsidies change. The second step is to incorporate behavioural changes. The optimized farming production can be written as $f[z(T,v,s),l(T,v,s),a]$, where a represents farming land, included here because it influences the fertilizer available per hectare. Assuming first that labour supply changes are negligible when there is a policy reform that changes v and s, the change in production is

$$df=\partial f/\partial z \ \partial z/\partial T \, dT+\partial f/\partial z \ \partial z/\partial v \, dv+\partial f/\partial z \ \partial z/\partial s \, ds. \quad (4)$$

This means one needs evidence on three behavioural elasticities: how much farming output reacts to changes in fertilizer use, and how much fertilizer use changes when household disposable income and fertilizer package are altered. This can take place either through a direct policy (v) or indirect price subsidies that alter (s). Note that even untied transfer may influence production via income effects. Alternatively, summary elasticities (measuring directly the impact on output and revenues) can be used. Impact analyses, surveys, and meta-analyses may be used to pin down plausible values for the parameters. If the evidence is rich enough, one could also separately examine the responses along the extensive margin—whether to use fertilizers or not—and the intensive margin—the quantity of fertilizer use conditional on using some fertilizer.

The actual simulation study would first present results without any behavioural effects (a static simulation). An additional behavioural simulation would be run with an amended input data set, where fertilizer use and farming revenue are changed according to chosen behavioural elasticities multiplied with the change in incentives.

One of the main concerns related to subsidizing farm inputs is the possibility of crowding out of private purchases. This is indirectly taken into account in the behavioural simulation via using estimated elasticities that measure the impact on total fertilizer use or revenue. For commercial farmers, one would also need to consider the impact of taxing output on farming income. As many

of the farmers benefiting from the programmes are smallholders, this link is probably of limited importance.

2.3 Brief overview of behavioural implications of agricultural subsidies

In this section we summarize some of the findings about the impacts of fertilizer subsidies and cash transfers on farming output. This evidence is needed to pin down the magnitude of the behavioural responses (to direct input subsidy packages, indirect price-based instrument, and cash transfers) that dynamic modeling requires.

Jayne et al. (2018) review the evidence on the impacts of agricultural subsidies in Africa. They note that while the evidence regarding the impacts on crop yields is still thin, it points to limited positive effects. In an earlier article, Jayne and Rashid (2013) summarize value-cost-ratios (VCRs) of agricultural subsidies. While the estimates vary, a substantial share of them point to fairly large VCRs (above 1.5).

A recent systematic review by Hemming et al. (2018) provides quantitative summary evidence on the impacts of farm input subsidies. The subsidies vary somewhat case by case, but they predominantly refer to fixed packages offered to eligible farmers. They find the average impact of these types of subsidies on yield per hectare to be 0.09 standardized mean differences (SMD) relative to the control group. Again, there are differences in the results, but all but one study reviewed find statistically significant positive impacts on yield. The effect on farm income is found to be greater (0.17 SMD), again in comparison to the mean of control group. The size of the subsidy is not associated with the impact size in a statistically significant way. The estimates above may be best interpreted as a mean impact of an overall package where subsidies are offered at reduced prices for a targeted group of recipients (i.e., they can be used to gauge the impact of v on farm income).[5]

Druilhe and Barreiro-Hurlé (2012) point out that in Malawi and Zambia, subsidies targeted to poorer households suffer less from crowding out, and the poorer farmers may in fact use the subsidies more efficiently. These observations underscore the benefits of targeting the subsidies to the less well-off participants.

In the countries selected for this scoping study, there are also country-specific impact evaluations. In the Zambian context, Mason et al. (2013) investigate the impacts of the Farmer Input Subsidy Programme (FISP) . They find the programme performing suboptimally, because of poor targeting and crowding out, and therefore the benefit/cost ratio remains below one. The maize yield and output elasticities among recipient farmers were, however, statistically significant and approximately 0.15-0.35. Mason and Tembo (2015) also find positive impacts on farm income: a 200-kg increase in FISP fertilizer raises real total household income by 8 per cent. Using Ethiopian data, Croppenstedt et al. (2003) estimate a double hurdle model of fertilizer demand and find an elasticity of -0.55. Rashid et al. (2013) estimate much smaller price elasticities, ranging between 0 and 0.2 in absolute values.

As discussed above, evidence related to how cash transfer influences farm output is also relevant for the analysis of input subsidies. The government can use both input subsidy programmes and the provision of cash transfers. Their relative impacts on agricultural impacts can be gauged using impact estimates obtained from research. There is a relatively large evidence base of impacts of cash transfers on agricultural production and household income generation; see for example

[5] This can be modelled as an additional constraint within the relevant policy in the model.

Daidone et al. (2019) for evidence on sub-Saharan Africa. Handa et al. (2018) evaluate the impacts of two Zambian cash transfer programmes on agricultural production. They find that over a three-year period, consumption increased 67 per cent more than the value of the transfer, and the increase was partly due to increased agricultural investments, although non-farm income also played a substantial role. Asfaw et al. (2017), who focus on household welfare, find that the cash transfer helped households cope with weather shocks and that the impacts were more positive among the poorest households.

Turning to the evidence on social protection policies in Ethiopia, Berhane et al. (2014) evaluate the impact of the Ethiopian safety net, the public works programme (PSNP), on agricultural production. They find that those households who had benefitted from the programme for many years and also received support from other food security interventions were able to increase their agricultural productivity substantially. The effect is due to the adoption of better farming practices, including a greater probability to use fertilizers. A positive impact on livestock holding is also found.

Finally, an interesting question is interaction between agricultural and social policies, for example because the households receives both types of benefits. Pace et al. (2018) examine this issue in the Malawian context. Their results suggest that the policies are complementary, enforcing their individual impacts. This can be taken into account in microsimulation analysis by altering the elasticities depending on whether the households receive only one benefit or both.

2.4 Earlier analysis on the distributional impacts of input subsidies

There are few earlier evaluations of the distributional impacts of input subsidies. Jonasson et al. (2014) build a behavioural simulation model to examine the distributional impacts of farming policies for six countries, including two in Africa (Ghana and Malawi). The model contains six different household types. Simulated policies include a 10 per cent reduction in farming input prices. The results suggest that the larger and better-off farms benefit more from such a policy.[6]

Our approach is quite different and complementary: while we use assumed behavioural elasticities and do not model behaviour ourselves, our approach is underpinned by a representative sample of all farming (and non-farm) households. In addition, we examine the distributional impacts of input subsidies as a part of the entire tax-benefit system.

3 Mapping of agricultural policies in SOUTHMOD countries

In this section we summarize the most recently implemented policies to promote the use of agricultural inputs in sub-Saharan African SOUTHMOD countries. For each country, we aim to describe the main current or most recent, relatively long-term policy instrument that is aimed at directly increasing input use among farmers by reducing or removing the cost of obtaining the inputs, though in most instances an own contribution towards the purchase is required. As such they may also have direct distributional impacts and second order effects as described in Section 2.

The policies described in this chapter mainly cover fertilizers and seed, with a few programmes including also other inputs. The availability and quality of such inputs are also dependent on the

[6] Filipski et al. (2015) examine the economy-wide impacts of cash transfer policies in Lesotho.

systems and value chains through which they are supplied to the end users. Whereas inorganic fertilizers are often imported, the availability and quality of available seed is dependent on seed systems, i.e., informal systems of retaining and selling seed from crops (recycling) and formal systems of seed production, distribution, quality control, and certification that are subject to government regulation. Productivity of seed is highly dependent on its quality: improved seed can significantly improve yields. Research on the impacts of input subsidies is more concentrated on the impacts of subsidized fertilizer or packages than seed (Mason and Smale 2013). Detailed discussion on the development of different types of seed and seed systems and their role in agricultural productivity as well as other inputs such as agrochemicals are beyond the scope of the paper.

Input subsidy policies, of course, are not necessarily stand-alone interventions, but constitute a part of overall agricultural policy. They are, to varying degrees, complemented with extension services, infrastructure investments, market access policies, support to mechanization, producer organizations, and price incentives. The list is not exhaustive as there may be projects and pilots run by different organizations, including international organizations and NGOs, that may include direct input provision. Other agricultural policies such as extension services, i.e., agricultural advisory services or support for producer organizations, may have implications for the return on input use and access to input subsidy programmes. Though not strictly included in the models, these are discussed in each of the cases, as relevant. The descriptions do not aim to be comprehensive and exhaustive for each country but focused on specific elements for the purpose of assessing feasibility of including such policies in the SOUTHMOD models.

3.1 Ethiopia

Ethiopian fertilizer market and policies have gone through a number of reforms over the last decades. Ethiopia eliminated direct subsidies on fertilizers to farmers in 1997–1998 (Spielman et al. 2012). Currently, fertilizer policies with regard to farming households are concentrated on improving fertilizer access at lower prices through government-managed imports of fertilizers that are supplied throughout the country from central warehouses. Since 2007, fertilizer imports have been controlled by the Agricultural Input Supplies Enterprise (AISE) and cooperative unions. Imports are managed by AISE through an international procurement tender, and the quantities purchased are based on a demand assessment and carry-over stocks. The prices are determined by regional bureaus. Marketing is carried out through cooperative unions to primary cooperatives or, in the absence of cooperative unions, directly to the primary cooperatives. Prices are determined based on the average import price and additional costs over the value chain in consultation between the Bureau of Agriculture and Rural Development (BoARD) and cooperative unions. The primary cooperatives sell the fertilizer predominantly in cash to smallholder farmers, though in some regions they can also receive fertilizer on credit against a 50 per cent down payment (Rashid et al. 2013.) Fertilizer prices in Ethiopia are generally lower than in the neighbouring countries. Rashid et al. (2013) indicate a difference of 10–30 per cent.

The policy has a direct impact on the price and hence on both adoption and application rate of fertilizer, following the logic presented in Section 2. There has been strong increase in the use of fertilizers and other modern inputs in Ethiopia, though it is linked to a multitude of factors rather than fertilizer prices alone. Bachewe et al. (2018) link the adoption of modern production technologies to factors such as education, remoteness, and extension services, all of which have also developed positively over the past 15 years, as Ethiopia has built up a large agricultural extension system, access to markets has improved, and illiteracy has reduced significantly. Access to credit is also significantly related to adoption of modern inputs. Nevertheless, the socioeconomic household survey (ESS) shows that a relatively large share of smallholder households is still not using and has never used chemical fertilizers (Legesse et al. 2019). To our

knowledge, other than the study by Rashid et al. (2013), there are no quantitative analyses of the implications of the fertilizer price policy specifically, and none at the household level. However, there is a large amount of research literature which aims to model fertilizer adoption and application rates and/or price elasticities and their impact on yields in Ethiopia, for example Croppenstedt et al. (2003), Larson and Zerfu (2010), Alem et al. (2010), just to mention a few. The methodologies typically include models that involve selection into using modern inputs and henceforth determination of the level of their use. Such models and their parameters could also provide a basis for simulating the behavioural impacts of policies intended to increase the use of agricultural inputs.

3.2 Ghana

Ghana has been running input subsidy programmes since 2008 to address declining soil fertility and climate change that affect the country's small-scale family farmers (Azumah and Zakaria 2019; Gubbels 2019).

The current input subsidy scheme is included in Planting for Food and Jobs (PFJ), which is a flagship agricultural campaign of the government launched in 2017. The programme aims, among other goals, to promote the adoption of certified seeds and fertilizers (MoFA 2019). The main pillars of the programme include seed and fertilizers as well as extension services, marketing support, and promotion of e-agriculture.[7]

The PFJ programme is targeted at smallholder farmers with 0.4–2 hectares (ha) of land, and there is a target for having at least 40 per cent woman farmers. The programme includes urban and peri-urban areas (MoFA 2019). The support package includes a 50 per cent subsidy of the cost of inputs (seeds and fertilizers) for maximum two hectares of cultivation. The total target number of beneficiaries in 2020 is 1.2 million (MoFA 2020).

The inputs are provided for different commodities. Focus commodities in 2019 included cereals, legumes, vegetables, and roots and tubers, including maize, rice, sorghum soybean, groundnut, cowpea tomato, onion, pepper, cabbage, cucumber, lettuce, carrot cassava, plantain, and orange flesh sweet potato. The inputs are distributed through approved sellers. According to the Ministry of Food and Agriculture (MoFA 2019), a vast majority of the land area cultivated in 2018 under PFJ was used for producing maize (58 per cent) and rice (28 per cent).

There are set farmer contribution rates payable by the farmer for fixed amounts of different types of inputs: inorganic and organic fertilizers and seeds. The guidelines of the programme also provide seeding and fertilizer application rates for each commodity (MoFA 2020).

A number of studies have explored the impact of the previous and current input subsidy schemes on different outcomes often by using specifically collected local surveys of farmers and intended for assessing the impact on growers of certain crops. For the current scheme, Tanko et al. (2019) finds an insignificant increase in income levels from rice production, but a significant reduction in

[7] Furthermore, other rolled-out programmes within the country's medium plan include : b) Rearing for Food and Jobs (RFJ); (c) Planting for Export and Rural Development (PERD); (d) One Village - One Dam (1V1D) i.e. irrigation and water management; (e) Agricultural Marketing and Post-Harvest Management including One District - One Warehouse (1D1W) and One District - One Factory (1D1F); (f) Greenhouse Villages; (g) Agriculture Mechanisation Services Centres (AMSECs); (h) West African Agricultural Transformation Programme (WAATP); (i) Ghana Commercial Agricultural Project (GCAP); (j) Ghana Agricultural Sector Investment Programme (GASIP); and (k) Savannah Agricultural Productivity Improvement Project (SAPIP).

farm expenditure, an increase in per capita monthly spending, and a decrease in income poverty of households as a result of PFJ.

The previous subsidy scheme was originally a universal price subsidy for chemical fertilizers implemented through a voucher scheme and later a waybill system. In 2013 the target group was narrowed to farmers cultivating under two hectares (Houssou et al. 2017). The selection was made by extension agents or agricultural advisors, which is also the case with the current scheme. Houssou et al. (2019) carried out an analysis of different targeting schemes and found that explicit poverty targeting by using a proxy means test would be more cost effective than the universal scheme. Azumah and Zakaria (2019) do no find significant positive production effects of the previous input subsidy scheme, whereas Wiredu et al. (2019) find improvements in food security as a result of fertilizer subsidy. Ragasa and Chapoto (2017) find that fertilizer use is profitable at both subsidized and market price but despite subsidized prices, the actual application rate for fertilizer adopters is below the optimal level.

3.3 Mozambique

As with other sub-Saharan African countries, the agricultural sector employs the majority of the labour force in Mozambique (over 70 per cent), and the sector is dominated by small-scale farmers with the average farm size of 1.2 ha, and low productivity and high poverty levels characterize the sector (AFAP and ADB 2019)

Production methods of smallholder farmers, including the use of modern inputs, have been stagnant in Mozambique over the past 15 years (De Vletter 2018), though some government initiatives have taken place to enhance input use (FAO 2016b). The government provided support to rice and maize producers during 2007 and 2008, via distribution of seeds, inorganic fertilizers, and pesticides. In 2009–2011 an Agricultural Input Subsidy Programme was piloted by the government with support from the European Union and implemented by the Food and Agriculture Organization (FAO) and the International Fertilizer Development Center (IFDC). The pilot targeted five provinces and 17 districts and benefited 25,000 rice and maize producers. The pilot was based on a voucher system, and by redeeming the vouchers the participating farmers received either a rice input pack (40 kg seed and two bags of fertilizer) or maize input pack (12.5 kg seed and two bags of fertilizer) (ACB 2019; FAO 2016b). Farmers' own contribution constituted 27 per cent of the total voucher value (Carter et al. 2013).

The pilot was evaluated by using a randomized design, and the impact evaluation showed that participation had measurable impacts (Carter et al. 2013, 2014; FAO 2016). The Government of Mozambique and FAO subsequently implemented a subsidy programme that was initially carried out as a paper voucher scheme but from season 2015/16 moved to an e-voucher implementation (FAO 2020).

The pilot included two different packages aimed at different target groups in 13 districts and four provinces. The two target groups for the programme were (FAO 2020):

- Smallholders holding more than 0.5 ha of land, with at least one economically active household member, including also widowed women heading households. The participants, including emergent farmers, needed to have the capacity to make their own financial contribution.

- Emergent farmers with more than 1 ha of land. They needed to have at least two economically active persons or be able to hire labour. These farmers generally had access

to markets but nevertheless limited investment capacity. Also, these farmers had to be able to make their own contribution towards the cost of the package.

Identification and selection of beneficiaries was made by local actors participating in local community committees, including producer association, extension service agents, and local authorities. The participants were required to be a resident and farmer for at least three agriculture seasons, and priority was given to those involved in an extension programme. Furthermore, they needed to have identification documents as well as willingness and ability to contribute to the input package and share knowledge (FAO 2020).

The beneficiaries were provided a list of inputs and were allowed to choose the inputs and quantities suited to their acro-ecological conditions. The packages for smallholders included seeds of selected crops and agricultural chemicals (inoculant, field, and post-harvest insecticide). The value of the package was MZN2000 (~US$35), and the farmer contribution was 25 per cent. The package for emergent farmers included similarly seed and chemicals, as well as urea and NPK, the total value being MZN7000 (~US$120), and the farmer's contribution was 43 per cent of the value.

The evaluation of the scheme (FAO 2020 showed positive results, and though the programme ended in 2019, FAO has continued the programme as emergency response through provision of similar packages to households who have been impacted by cyclone Idai.[8] The emergency response covered 50,200 beneficiaries affected by IDAI, providing access to agriculture inputs through the network of agro-dealers and retailers present in seven districts, and 1,000 fisherfolk affected by IDAI in three districts. The support packages are e-vouchers worth MZN2600 (US$42) and MZN12000 (US$195), respectively, where the farmer package allows purchase of seeds, farm tools, and fishing gear. There was no co-payment.

It was found that for the first pilot, the voucher led to MZN3,906 higher crop production or a 21.6 per cent increase with respect to the control group, which was also higher than the monetary value of the package (Carter et al. 2014), though take-up rate of the support packages was only 48.7 per cent. Similarly, the latter FAO input subsidy scheme increased the quantity of maize harvested by 469 kg and that of beans by 135 kg in 2017/18 agricultural season and led to an increase of MZN2,746 in per capita expenditures. There were, however, no detectable impacts on productivity as kg crop per hectare (FAO 2020; Santacroce 2019).

3.4 United Republic of Tanzania

As with many other sub-Saharan African countries, fertilizer use remains low in the United Republic of Tanzania, even by comparison to other African countries: Tanzanian farmers use about 8–10 kg of fertilizer per hectare whereas the average is 16 kg/ha for the Southern African Development Community (Ministry of Agriculture 2017). Both direct subsidized input packages and, more recently, policy aimed at reducing end-user price of fertilizer prices have been used to encourage the use of inputs. With the World Bank, the United Republic of Tanzania implemented a direct subsidy scheme, The National Agricultural Input Voucher Scheme (NAIVS), in 2007–2014 that provided vouchers for improved seed and inorganic fertilizer for full-time farmers with less than one hectare of land, selected by village committees. Furthermore, the farmers were required to co-finance the inputs and participate in extension and verify the use of the inputs (World Bank 2014).

[8] Source: personal correspondence with FAO Mozambique.

In the context of NAIVS, it became evident that poor farmers were not able to afford the co-payment (World Bank 2014). High prices are a significant factor in limiting fertilizer use in the United Republic of Tanzania and those high prices of inorganic fertilizer are largely due to build-up of costs, such as transaction costs and inefficiencies in different points of the value chain from port to end user (Cameron et al. 2017; Mwaijande 2019). It has also been pointed out that other factors, such as knowledge of crop/plot management practices and soil characteristics, contribute to low profitability of fertilizer use in Tanzanian agriculture (Mather et al. 2016).

The current Agricultural Sector Development Programme Phase II (ASDP II) mentions the possibility of introducing direct subsidies at a later date (Ministry of Agriculture 2017), but so far the main programme intended for increasing fertilizer use consists of a block procurement scheme introduced in 2017, which aims to reduce the inefficiencies in the fertilizer value chain. Such inefficiencies have been discussed for example by Cameron et al (2017) and Mwaijande (2019). The scheme consists of regulations concerning a bulk procurement scheme, whereby imports are carried out through a tender where one bidder purchases the fertilizer on behalf of others who have previously submitted their requirements. The system aims to reduce the farm gate price of fertilizer by reducing the import price by increasing the scale of purchase (Nkonya 2018). Furthermore, there is an indicative price set as the retail price of fertilizer to farmers, calculated by the Tanzania Fertilizer Regulatory Authority (TFRA).

To our knowledge there are no quantitative analysis of the impact of the block procurement scheme on fertilizer use or secondary impacts on farm production at the household level, neither ex post nor ex ante. The impacts would be likely dependent on factors such as knowledge of the correct use of fertilizers. However, there exists a number of studies on fertilizer use in the United Republic of Tanzania based on the national survey datasets and evaluations of the NAIVS scheme (Gine et al. 2015 and World Bank 2014). The estimates showed that the inputs did increase yields and revenues. The studies, however, conclude that there is heterogeneity in impacts and that only those farmers who attained high gains continue to use fertilizer after the end of the subsidy. Mather et al. (2016) show that there are positive response rates to nitrogen in maize yields, but the returns to fertilizer are heterogeneous.

3.5 Uganda

Modern input use is low in Uganda, for example fertilizer and improved seed use is modest even compared to other sub-Saharan African countries (World Bank 2018). Bold et al. (2017) show that the quality of inputs is also subject to high variability, reducing their efficiency in improving yields. The Government of Uganda's main agricultural input policy targeting households is called the Operation Wealth Creation (OWC), a successor programme to the former National Agricultural Advisory Services (NAADS). The aim of the programme is to attain a minimum income of 20 million UGS (US$5,400) per annum for participating households. It provides households free inputs, not only confined to seed and fertilizer but including also agricultural technology, breeding materials, and agrochemicals. The implementer of the OWC is the Ministry of Agriculture, Animal Industry and Fisheries (MAAIF) through the NAADS Secretariat.[9] The OWC procures the inputs and delivers them to smallholder farmers twice a year (BMAU 2017). In principle the programme targets all smallholders but it encourages targeting of vulnerable categories that are identified through community sensitization and community-based targeting. Reception of agricultural inputs

[9] In the new NAADS programme that started in 2014/15 to date, the National army, the Uganda Peoples Defence Forces (UPDF), is a collaborating institution to ensure efficiency and equity in the distribution and delivery of agricultural inputs to the beneficiary communities and households.

is subject to attending extension trainings. The programme is nationwide, covering all districts of Uganda (Vinci 2018). To our knowledge there are no quantitative evaluations of OWC.

Uganda has a number of other livelihoods programmes that intend to increase income generation among households. The Agricultural Cluster Development Project (ACDP) that is implemented in partnership of the MAAIF and the World Bank also includes input subsidies through an e-voucher system in 42 districts. Others with a wide coverage include Northern Uganda Social Action Fund and Development Initiative for Norther Uganda, both implemented under the Office of the Prime Minister (OPM) of Uganda.

Uganda as a country has also put in place a policy framework to tackle social protection issues and reduce social and economic inequality through partly reforming the agricultural sector. This framework derives from long-term development strategies and programmes embedded in Vision 2040 and National Development Plans (NPA 2016) that are implemented through sector investment plans, local government development plans, annual work plans, and budgets of ministries, departments, and agencies (UBOS 2016). A number of factors and policy interventions come into play to help a country in addressing policy inadequacies that exacerbate vulnerability. These can be in the form of resource endowment, population growth, poverty levels, economic activities, production metrics, supporting institutions and development partners, research and technology advancement, government policies, programmes, agenda, strategic and action plans aimed at enhancing social protection.

3.6 Zambia

According to the Rural Agricultural Livelihoods Survey (RALS), a representative survey of small- and medium-sized farmers, 63.2 per cent of farmers report using fertilizer, though there is a fair amount of regional variation (Chapoto and Subakanya 2020). The average application rate is 109.8 kg per hectare. In terms of improved seed, the overall rate of use is 66 per cent irrespective of the crops grown (Mulenga et al. 2019), though RALS also shows there is large inter-regional variation (Chapoto and Subakanya 2020).

Despite a downward trend, about half of Zambia's agricultural budget is still spent on two main programmes, Farmer Input Subsidy Scheme (FISP) and Food Reserve Agency (FRA), the budget for FISP being 1,111 million kwacha (ZMW), whereas the total agricultural budget was 3,972.2 million in 2020 (Mulenga et al. 2019). Out of these two programmes, FISP provides subsidized inputs for farmers whereas FRA purchases maize and rice from farmers at set prices.[10] Zambia has been implementing input subsidy programmes with varying targeting criteria and implementation modalities since 2002 (Mason et al. 2013). The current main input subsidy programme, FISP, is a well-established nationwide programme with a number of objectives. In addition, to facilitating access to agricultural inputs for small-scale farmers, the programme also has broader systemic objectives related to strengthening private sector involvement in supplying and distributing agricultural inputs and supporting rural institutions, in particular farmer organizations.

The earlier modalities, the Fertilizer Support Programme and the so-called 'traditional FISP', were implemented by direct distribution of inputs to eligible farmers, the input pack consisting of a combination of fertilizer and seed (Mason et al. 2013). During the recent years such direct distribution scheme has been replaced with an e-voucher scheme. The use of e-vouchers was first piloted in the agricultural season of 2015–2016. In the season 2017–2018 the e-voucher scheme

[10] FRA hence constitutes an output price subsidy, but these are beyond the scope of this note. FRA is described for example in Harman and Chapoto (2017).

was rolled out nationwide, but due to challenges encountered, for example due to connectivity issues, its coverage has since been reduced. The Electronic-FISP covered 60 per cent of the country in the 2018–2019 season and was further reduced to 40 per cent in the 2019–2020 season (Mulenga et al. 2019). For those districts not covered by the EFISP, FISP is implemented through a digital system that is linked to the Zambia Integrated Agriculture Management Information System (ZIAMIS) (Kuteya et al. 2018). Despite the digital implementation modality, it resembles traditional FISP more than the EFISP in the sense that farmers are only able to obtain a limited selection of inputs, namely fertilizer and four different types of seed (hybrid maize seed, sorghum, soya beans, and groundnuts).

Currently the eligibility criteria for both FISP and EFISP are as listed by the Ministry of Agriculture (2020a and 2020b):

- Be in the farmer registry and be actively practising conservation farming;
- Maximum acreage of cultivated land 5 ha;
- Ability to contribute at the required rate;
- Must not be a current beneficiary of the Food Security Pack Programme;
- Must not be a civil servant of the Government of the Republic of Zambia.

In addition, EFISP modality has a criterion of raising two to ten cattle or five to ten pigs or five to 30 goats or 20 to 100 chickens, or running one to two fishponds, and to possess a National Registration Card.

The package itself consists, for those districts covered by EFISP, of an e-voucher worth ZMW2100 where the farmer contribution is ZMW400. For traditional FISP the packages include a maize pack of 10 kg seed and four 50 kg bags of fertilizer and additional input packs for legumes and two 50 kg bags of basal fertilizer.

Despite the objective of crop diversification and the fact that EFISP in principle allows purchase of diverse inputs, an assessment of EFISP points out that maize is still over-represented among the inputs available (Kuteya et al. 2018), and an evaluation based on crop forecast surveys shows that EFISP did not significantly increase crop diversification (Mason et al. 2020).

In addition to the FISP, another support scheme intended for households and consisting of agricultural inputs is the Food Security Pack (FSP) that is intended for 'vulnerable but viable' households. A selection of input packages for different cropping systems is available. The primary eligibility criteria include access to land of size between 0.5 and two hectares. The household needs to have enough labour resources and lack other employment. In addition, the secondary criterion includes a number of household characteristics, identifying different categories of vulnerable households such as female or child-headed households. Selection of potential beneficiaries is done by the Community Welfare Assistance committee and community validated, and the list of final beneficiaries is based on the caseload allocated to each district (MCDSS 2019). In terms of the number of beneficiaries, FSP is significantly smaller than the FISP/EFISP programme.

There are a number of quantitative studies of different modalities of input subsidies, namely FISP and EFISP, and their impacts in Zambia over the years. The table below summarizes the most important evidence on impacts on yields and household income. Similar evidence does not exist for the FSP.

Table 1: Evidence on impacts on yields and household income in Zambia

Study	Modality of the scheme, and the element studied	Years and data	Result
Burke et al. (2012)	Study on average product of fertilizer in general	Household panel data, waves 2004 and 2008 (Food Security Research Project and the Central Statistical Office)	Depending on acreage, average product of 1 kg top dressing and basal fertilizer per ha varies 3.73–3.48 kg of maize
Mason et al. (2013)	Traditional FISP	Supplemental Survey (SS), household panel survey implemented in 2001, 2004, and 2008, including households cultivating less than 20 ha of land	Average elasticity of maize output with respect to subsidized fertilizer: For all 0.048 For those who received subsidy 0.37 Marginal impact: 1 kg of fertilizer increases maize output by 1.88 kg
Mason and Tembo (2015)	FSP, traditional FISP fertilizer	Supplemental Survey (SS), as above, and Rural Agricultural Livelihoods Survey (RALS) 2012	200-kg increase in FISP fertilizer: impact on total household income ZMK1,140,000 or 7.7% and impact on total income per adult equivalent by ZMK223,800 or 6.9% impact on poverty: 2.7 percentage points decrease in severity of poverty and 3.6 percentage points decrease of extreme poverty severity

Jayne et al. (2013)	FISP fertilizer, crowding out	Supplemental Survey, as above	Unconditional average partial effects (APEs) of a 1 kg increase in the quantity of subsidized fertilizer received by a household on the kilograms of commercial fertilizer purchased, not accounting for program diversion: −0.134 Low private sector fertilizer retailer activity zone (PSA): −0.070 High PSA: −0.228 Bottom 50% landholding: −0.110 Top 50% landholding: −0.210
Mason and Smale (2013)	Hybrid maize seed	Representative panel survey of smallholder farm households in 70 districts of Zambia, three waves 1999–2000, 2002–03, 2006–07	10 kg hybrid maize seed adds 106 kg of maize harvested, which is equal to 1.1% increase in income (average household income ZMK131,000)
Burke et al. (2019)	Response rates of fertilizer application in different acro-ecological conditions and profitability	Subset of RALS 2012	0–7 kg maize per kg fertilizer
Mason et al. (2020)	Impact of EFISP compared to traditional FISP	Crop forecast surveys 2013/14–2016/17	No significant impacts on crop diversity and no or negative effect on input use, likely due to implementation issues

Source: authors' compilation based on studies cited in the table.

4 Survey of relevant data: household and agricultural surveys in SOUTHMOD countries

In this section we describe the available agricultural and household datasets in SOUTHMOD countries with potential to be used for modelling agricultural policies. When the dataset underlying the respective country model is not adequate to simulate eligibility for fertilizer/input subsidies, in some instances other datasets may be used to complement the model through imputation, though in other cases agricultural surveys that are carried out separately from the main household expenditure survey would provide a better alternative for microsimulation exercises regarding agricultural production. Specifically, the focus is on the feasibility of simulating the main policies described in the previous section, or instruments with similar modalities for each country. Simulation can of course also be forward looking and intended for assessing the distributional impacts of a hypothetical scheme, hence we also try to provide more general commentary on whether typical schemes could be included in the models.

From the SOUTHMOD countries Ethiopia, United Republic of Tanzania, and Uganda, we have household datasets designed following the World Bank Living Standards Measurement Survey – Integrated Surveys on Agriculture (LSMS-ISA) approach, and hence have extensive modules on agricultural production, including the methods of production such as the use of inputs, how they have been obtained, and at which price. As described in Section 2, such data allow incorporating the implications of changes in effective input prices and following changes in the use of inputs.

However, out of these, only in the case of Ethiopia the LSMS-ISA survey is integrated into the SOUTHMOD country model. In addition, the household surveys underlying the SOUTHMOD models in Ghana, United Republic of Tanzania, and Zambia have fairly detailed questions regarding households' agricultural production, including the use of inputs, where they were purchased, and at what price, as well as crops produced and sold. They also typically, though not always, have details on cultivated land area, capturing some of the main eligibility criteria that are used for defining the target group in the context of direct input subsidies, with the exception of Zambia where cooperative membership is a criterion for accessing the inputs.

Many programmes that provide specific packages to eligible households actually or implicitly include additional criteria, such as being registered or having identification documents, participation in extension programmes, and furthermore criteria that are more challenging to simulate precisely, such as ability to pay one's own contribution or willingness to participate. Identification of beneficiaries is also often made with the assistance of local actors, such as extension officers which may leave scope for discretion.

In some instances, the data or an alternative dataset identify whether the household has received subsidized inputs. For example, in the case of Zambia, the eligibility criteria of being a cooperative or farmers' group member is not recorded in the SOUTHMOD dataset, though the question on the source of inputs allows a rough approximation of such variable in the case of direct distribution. However, the more recent changes in eligibility and implementation may have implications for the relevance of the question in later years, but an available additional dataset, the Rural Agricultural Livelihoods Survey, allows imputation of either beneficiary status or cooperative membership. [11]

There are significant differences in the datasets underlying the SOUTHMOD models between countries. Uganda and Mozambique have limited amount of information on agricultural activities, and the main household expenditure dataset underlying the SOUTHMOD models is focused on income sources and total expenditure. The *Inquérito sobre Orcamento Familiar* (IOF) household data for Mozambique previously included a section on agricultural production, but the wave currently underlying the model has instead a module on exposure to shocks. The household dataset underlying the Ugandan model is not specifically geared towards agricultural production and has limited information on it, but instead household incomes and consumption are documented in detail. In such cases simulation exercises might be better carried out as ad hoc simulations with more extensive agricultural surveys, in the case of Uganda the National Panel Survey and/or the Annual Agricultural Survey or in the case of Mozambique *Trabalho de Inquérito Agrícola/Inquérito Agrícola Integrado* (TIA/IAI).

[11] Imputation is based on matching households with the same characteristics in the two datasets that are used. This implies that one can examine the typical farming behaviour of certain types of households.

The information on the main datasets is summarized in Table 2.

Table 2: Availability of variables needed for simulating the main agricultural subsidy programmes in the underlying datasets of SOUTHMOD models.

Data	The main data, sample and year, sampling frame	Information on agricultural activities	Information on agricultural input use and price	Information on the source of inputs	Information on the eligibility variables of the main input programme
Ethiopia	Ethiopian Socio-Economic Survey 2013–14	Yes	Yes Urea, DAP, other inorganic, purchase quantity, and value Seed, traditional/improved/improved recycled, purchase quantity, and value Source indicated	Yes	n/a
Ghana	Ghana Living Standards Survey (GLSS7) 2017	Yes	Total value of inorganic fertilizer purchases Total value of seed and seedlings	Yes, source indicated, including MoFA, but the data precedes the current programme PJF	Yes, Smallholder farmers with 0.4–2 ha of land
Mozambique	*Inquérito ao Orçamento Familiar* 2014–15	In previous waves the data has covered agricultural activities, but in the 2014/15 wave the detailed questions on agriculture were replaced with questions on shocks	No	No Receipt of in-kind benefits from non-profit and religious institutions Community-level question on whether extension service/technical support is available	No, only the number of economically active persons and whether have been affected by natural disasters
United Republic of Tanzania	Tanzania Household Budget Survey 2017–2018	Yes	Yes For each crop: Quantity and value of inorganic fertilizer purchased Quantity and value of seed purchased Total value of inputs obtained on credit	No	n/a
Uganda	Uganda National Household Survey (UNHS) 2016–17	Only income from crop farming (cash and in kind), engagement in agricultural activities as employment, and estimated value of land possessed	No	No	n/a Availability of extension services in the community
Zambia	Living Conditions Monitoring Survey 2015	Yes	Total expenditure on inorganic fertilizer and seed and seedlings	Yes	Land area: yes, cultivated land Cooperative membership: no Registration: no Not concurrently benefiting from the Food Security Pack Programme: no Not employed by the Government of the Republic of Zambia (civil servant): yes Livestock: yes

Sources: authors' compilation based on CSA (2020), GSS (2018), INE (2015), MoFP-PED et al. (2020), UBOS (2018), CSO and World Bank (2015).

5 Mapping the feasibility of inclusion of agricultural policies in SOUTHMOD models

Overall, for most countries included in the study, there is some scope for simulating the existing input subsidy programmes, at bare minimum as expected increase in disposable income, subject to some, though not all, eligibility criteria. In some instances, however, it would be better to carry out the analysis by using alternative agricultural datasets. It can also be the case that alternative datasets are necessary for a reliable analysis. In case of incomplete take up, the SOUTHMOD models offer a functionality which allows making different assumptions about the take-up rates of policies.

In the case of Ethiopia, simulation of agricultural policies is possible, as there is information on prices and quantities, and there are no limitations to eligibility. For Ghana, given the large amount, of information in the household dataset, in principle eligibility can be simulated. The data has information on the current source of inputs, but the PJF programme was not yet operational in the year the data was collected. Though the broader eligibility criteria are included, it is not clear whether all eligible households are able to participate. Nevertheless, at least simulation of eligibility in principle is possible.

For Mozambique the most recent data does not include information on agricultural activities or use of inputs, though there are reasonable estimates of second order effects that such a scheme could provide. Given the small coverage of the scheme, simulating the scheme itself with a national-level dataset may not be particularly useful either, but simulation of a scale up of similar schemes would be of interest, though agricultural datasets such as TIA/IAI may be better suited to this purpose.

For the United Republic of Tanzania, subject to information on the impact of block procurement on prices, it is possible to simulate the policy. However, the main weakness of the data is that it does not include acreage of cultivated land, which limits the possibilities of taking into account second order effects, unless land is approximated from the outputs.

The household dataset underlying Uganda's country model is much more limited in terms of information on agriculture. The universal nature of the subsidy as such would allow broad simulation of overall eligibility simply by using information on land access and income generated from agriculture, but there are limited opportunities for exploring its impact other than at the level of disposable income. There is to our knowledge no fixed value for the input package or its contents, which makes it difficult to estimate the distributional impact, except through the intended minimum level of income generation.

In the case of Zambia, the microZAMOD model already includes a basic simulation of FISP. This simulation relies on approximation of likely cooperative membership by those households who actually obtained inputs from cooperatives in 2015 rather than fully modelling eligibility conditions and matching the total number of beneficiaries to figures obtained from administrative sources. Access to the programme or some of the eligibility criteria such as cooperative membership can be imputed by using an alternative dataset, namely the Rural Agricultural Livelihoods Survey (RALS). The large number of existing impact estimates also allows simulation of second order effects.

6 Recommendations

Agricultural subsidies may have important distributional consequences. In particular, different solutions in the operationalization of such subsidies can significantly influence their impacts across different socioeconomic groups of farmers. In addition, subsidy reforms, financed by different changes in tax policies, also differ in terms of their distributional impacts. Examining the joint influence of agricultural policies and other tax and benefit arrangements requires an integrated approach. Tax/benefit microsimulation models, augmented with agricultural policy modelling, provide a promising avenue forward to tackle such research objectives and open up a way to evidence-based decisions in these policy spheres.

The type of research which can be conducted using such tools includes examining the comprehensive distributional impacts of alternative ways of organizing agricultural policies. This analysis can also include examining potential ways of financing such reforms so that the entire package would be revenue neutral. In addition, the distributional impacts of scaling down regressive input subsidies and using the money to finance direct social benefits (with different targeting options) can be investigated. These questions can be examined in a static way (assuming no behavioural changes) or by incorporating changes in agricultural practices. This also implies that the impacts on agriculture of all tax and benefit policies may also be analysed. A coordinated approach between agricultural subsidies and social protection programmes might also help alleviate vulnerability to poverty which is tied to seasonality and unpredictability of weather conditions.

This scoping note reviewed the feasibility of integrating agricultural input subsidies into SOUTHMOD tax/benefit microsimulation models. We reviewed the existing agricultural practices in those African countries which are included in the SOUTHMOD project and the available datasets. We also discussed the conceptual bases for the modelling. Some crude simulation of agricultural policies is possible in all country models. On the basis of the availability of the required information in the data that underpin the models and the details of the relevant policies, it appears that the credibility of simulation is most promising for three countries: Ethiopia, Ghana, and Zambia. In all these countries, the underpinning dataset (together with imputation from auxiliary data) and the policy rules are such that comprehensive and reasonably accurate simulation is possible. We therefore recommend starting this research endeavour in some or all of these countries.

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