IDENTIFYING KEY POLICY OPTIONS FOR GROWTH AND GAINFUL EMPLOYMENT IN GHANA

RESEARCH PROPOSAL

Presented to

Partnership for Economic Policy (PEP)

By

Abdul Malik Iddrisu
Maliha Abubakari
&
Dede Woade Adzovi Gafa

Ghana

14/07/2018
Before you begin

Please make sure to carefully review and understand the following:

- **Webpage** – especially with regards to the PAGE priority themes and
- **Guidelines** – for designing a research project proposal (in scientific terms)
- **PEP requirements and strategy** for policy engagement and research communication

Please note that:

- This template is mandatory for proposals of projects submitted under the **PMMA** and **MPIA** groups, i.e. that do not involve data collection.
- Plagiarism is strictly forbidden – see note on “references and plagiarism” at the end of this document/template. PEP will be using a software program to detect cases of plagiarism.
- PEP encourages applicant research teams to submit proposals in English, but content (in text boxes below) may also be written in French or Spanish (and will be accepted given proper justification of language barrier).

There are three main areas/dimensions to all PEP-supported projects: capacity building, research and policy engagement. Each dimension must be considered with due care and attention, as they will be assessed individually and concurrently to determine the overall quality of a proposal.

The PEP proposal template is structured in five sections, as follows:

- Project overview and objectives
- Capacity building – team composition and experience
- Research – literature review, method and data
- Policy relevance and engagement strategy
- Other considerations

**SECTION I – PROJECT OVERVIEW & OBJECTIVES**

1.1. **Abstract** (max 100 to 250 words)

The abstract should state the main research question, the context and its relevance in terms of policy issues/needs in relation to PAGE priority issues. Complete with a brief description of the method and data that will be used.

Productivity-led growth in agricultural sector has been argued to fundamentally drive overall economic growth, employment generation, and reductions in poverty and inequality. However, the performance of Ghana’s agricultural sector has been less impressive in recent times, trailing growth
performances of the non-agricultural sectors of the economy. The yield gap of agricultural activities has been widening over time. This has been attributed to a number of factors including low accessibility or inadequate use of improved seeds and insufficient application of nutrient fertilizer. To address the farm input needs of farmers in Ghana, the Government of Ghana has rolled out the ‘Planting for Food and Jobs’ (PFJ) programme in April, 2018. This programme intends to provide farmers with improved access to farm inputs (improved seeds and fertilizer) with the goal of boosting agricultural sector productivity. In this study, we seek to examine the economy-wide impact of the PFJ programme in Ghana under different scenarios. Specifically, we would assess the effect of the improved seed and fertilizer subsidy programmes under the PFJ on growth, employment, poverty reduction and income inequality using a combination of a dynamic Computable General Equilibrium (CGE) and Micro-simulation models. Overall, this study seeks to provide important insights into the future direction of the PFJ programme as well as similar employment-centered growth policies in Ghana and beyond.

1.2. Main research questions and contributions (max 500 to 700 words)

Explain the focus (or key questions) of your research and its policy relevance. Explain why you think this is an interesting research question and what the potential usefulness and value added of your work might be - in terms of both (general) knowledge gaps and policy needs for evidence base.

The literature review shall be detailed under "Research" (section III), not in this section.

Development policy practitioners around the world have recently acknowledged the importance of an inclusive growth process in the fight against poverty and inequality. This broad concern, however, dwell largely on the pattern and sources of economic growth as well as on the nature in which the benefits of growth are shared. Given that agricultural activities in most parts of the developing world, including Ghana, are relatively more labour intensive (see Vargas et al., 2017, for example), we argue that an agricultural sector-led economic expansion will be more inclusive in terms of the distribution of the gains from economic growth. Over the period 1992 to 2012, the agricultural sector absorbed in excess of 58 percent of the Ghanaian labour force, on average, and about 44.7 percent of the labour force in 2012 (see Danquah & Iddrisu, 2016). This makes the sector the largest employer of the Ghanaian labour force, especially in rural areas of Ghana where almost three-quarters of rural
dwellers are engaged in agricultural activities (Ghana Statistical Service (GSS), 2014).

Productivity-led growth in agricultural sector has been argued to fundamentally drive overall economic growth and development given that the agricultural sector has the highest growth multiplier effects (Jorgenson, 1961; Kuznets, 1966; World Bank, 2007). However, the performance of Ghana’s agricultural sector has been less impressive in recent times, trailing growth performances of the non-agricultural sectors of the economy. With an average annual growth rate of 3.6 percent over the period 2010 – 2016, agricultural growth in Ghana has been less rapid compared to non-agricultural growth (see World Bank’s WDI dataset, 2018). The contribution of the agricultural sector to Ghana’s gross domestic product (GDP) has been on the decline in recent times; from a share of 42 percent of GDP during the 1990s, the agricultural sector’s contribution to GDP currently stands at around 18.5 percent in 2017 (see World Bank’s WDI dataset, 2018; Government of Ghana (GoG), 2018). Precisely, the contribution of the agricultural sector to GDP has declined by more than 37 percent in just seven years (between 2010 and 2017); see GoG (2018).

The sluggish performance of the Ghanaian agricultural sector can be attributed largely to low agricultural productivity as the yield gap (i.e. the exploitable difference between the actual and potential output) of agricultural activities – including the production of major food crops such as maize, rice and sorghum – has been widening over time (Ministry of Food and Agriculture (MoFA), 2017). This may have huge implications for food security in the country as majority of the nation’s demand for staple crops may be unmet by domestic production, especially, in the context of an increasing urban growth rate in Ghana which is expected to increase the demand for food while at the same time reduces the size of land available for agricultural activities. Low on-farm productivity of major staple crops in Ghana has been linked to a number of factors including low accessibility or inadequate use of improved seeds and insufficient application of nutrient fertilizer. To address these constraints, the Government of Ghana has recently launched the Planting for Food and Jobs (PFJ) programme in April 2018. The PFJ programme is expected to, among others, increase the availability and accessibility of farm inputs (improved seeds and fertilizers) to farmers, reduce their cost of production and ultimately allow farmers to apply the right quantities of fertilizer.

Given the huge social and economic benefits of agricultural sector-led economic expansion in a developing country like Ghana where majority of the inhabitants are rural dwellers with most of
whom engaged in agricultural activities, an examination of the economy wide impact of agricultural sector policies is necessary to understand the extent to which such policies impacts the wellbeing of the poor and vulnerable. Therefore, this study seeks to examine the economy-wide impact of the PFJ programme in Ghana. Specifically, the study examines:

- The effect of a 50% subsidy on the price of improve seeds for maize and rice cultivation on the use of improve seed varieties, agricultural sector productivity, overall growth, employment, poverty reduction and income inequality.
- The effect of a 50% subsidy on the price of fertilizer on agricultural sector productivity, overall growth, employment, poverty reduction and income inequality.
- The combined impacts of 50% subsidy on the price of improve seeds for maize and rice cultivation and 50% subsidy on the price of fertilizer on the use of improve seed varieties, agricultural sector productivity, overall growth, employment, poverty reduction and income inequality.
- The impact of an alternative strategy that grants a 100% subsidy on the price of improved seeds for maize and rice cultivation and fertilizer to only poor farmers while allowing non-poor farmers to pay 50% of the price of improved seeds and fertilizer on agricultural sector productivity, overall growth, employment, poverty reduction and income inequality.

In addressing these specific goals of the study, we seek to provide both national-level and locality disaggregated simulations of the underlying outcome variables. Overall, this study seeks to provide important insights into the future direction of the PFJ programme as well as similar employment-centered growth policies in Ghana and beyond.

SECTION II – CAPACITY BUILDING

2.1. Team composition and experience

For each research team member, please indicate (using the following tables – one per member):

1. **Age, sex, as well as relevant/prior training and experience** in the issues and research techniques involved (start with team/project leader).
   - Note that PEP favors gender-mixed teams, composed of a maximum of four (4) members, at least 50% female researchers, and at least two (2) junior researchers
(aged under 30), all contributing substantively to the research project. PEP also seeks gender balance in team leaders and thus positively encourages female-led research teams.

- Each listed member must post an up-to-date CV in their profile on the PEP website - refer to “How to submit a proposal” on the call’s webpage.

2. **Benchmark and expected capacity building:**

   - Describe the research capacities that each team member (and potentially her/his affiliated institutions) is expected to build through their participation in this project. This is an important aspect in the evaluation of proposals and should be presented in detail.

     - What techniques, literature, theories, tools, etc. will each team member and her/his institutions learn (acquire in practice) or deepen her/his knowledge of?
     - How will these skills help each team member in their career development?
     - What are the current state of knowledge of each team member in regard to the project you are proposing?

3. **Task and contributions to project:** Indicate the specific tasks each team member would carry out in executing the project.

   - Note that one of the team members must be clearly identified as responsible for coordinating and reporting on the design/implementation of the projects’ policy engagement and communication strategy (see section III below). To achieve a more balanced task distribution, PEP advises to select a member other than the project leader.

### Team leader

<table>
<thead>
<tr>
<th>Name</th>
<th>Age</th>
<th>Sex (M, F)</th>
<th>Highest degree/ diploma</th>
</tr>
</thead>
<tbody>
<tr>
<td>Abdul Malik Iddrisu</td>
<td>32</td>
<td>M</td>
<td>MPhil in Economics</td>
</tr>
</tbody>
</table>

**Training and experience**

- Currently a PhD candidate in Development Economics, University of Ghana

**Expected capacity building**

- Enhance the experience in team leadership and enrich his skills in the analysis of sectoral policies.

**Contribution to project**

- Team leader
- Coordinate the writing up of project etc.
- Coordinate the building of the CGE model

### Team member #2

<table>
<thead>
<tr>
<th>Name</th>
<th>Age</th>
<th>Sex (M, F)</th>
<th>Highest degree/ diploma</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maliha Abubakari</td>
<td>32</td>
<td>F</td>
<td>MPhil in Public Administration</td>
</tr>
</tbody>
</table>

**Training and experience**

- Currently a PhD candidate at the National Institute of Development Administration, Thailand
Expected capacity building | Enhance the experience on coordinating a project and the use of the CGE modelling technique in the evaluation of development policies and programmes.

Contribution to project | Coordinate and report on the design/implementation of the projects’ policy engagement and communication strategy.

#### Team member #3

<table>
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<tr>
<th>Name</th>
<th>Age</th>
<th>Sex (M, F)</th>
<th>Highest degree/diploma</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dede Woade Adzovi Gafa</td>
<td>29</td>
<td>F</td>
<td>Mphil in Economics</td>
</tr>
</tbody>
</table>

Training and experience | Currently a PhD candidate in Development Economics, University of Ghana

Expected capacity building | Enhance the experience in the use of the CGE modelling technique in the evaluation of development policies and programmes.

Contribution to project | Assists in building the CGE model and coordinates in writing the results of the empirical estimations.

#### Team member #4

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<tr>
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<th>Age</th>
<th>Sex (M, F)</th>
<th>Highest degree/diploma</th>
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</thead>
<tbody>
<tr>
<td>Name</td>
<td>Age</td>
<td>M/F</td>
<td>Highest degree</td>
</tr>
</tbody>
</table>

Training and experience | Insert your text here

Expected capacity building | Insert your text here

Contribution to project | Insert your text here

##### 2.2. List of past, current or pending (non-PEP) projects in related areas involving team members, including resulting publications (If any)

Name funding institution, title of project and related publications, list of team members involved.

<table>
<thead>
<tr>
<th>Name of funding institutions</th>
<th>Title of projects and related publications (link)</th>
<th>Team member(s) involved</th>
</tr>
</thead>
<tbody>
<tr>
<td>African Development Bank (AfDB)</td>
<td>Title: Ghana long run growth: Policy options for equity and sustainable growth</td>
<td>Abdul Malik Iddrisu</td>
</tr>
<tr>
<td></td>
<td>Publication (reference): N/A</td>
<td></td>
</tr>
<tr>
<td>Office for Research, Innovation and</td>
<td>Title: Rural financial intermediation and poverty reduction: Evidence from Ghana</td>
<td>Abdul Malik Iddrisu</td>
</tr>
</tbody>
</table>
### 2.3. List of past or current **PEP-supported** projects involving team members, including resulting publications

<table>
<thead>
<tr>
<th>Project code (e.g. PMMA-12345)</th>
<th>Title of project and related external (non-PEP) publications, if any</th>
<th>Team member(s) involved</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Title:</td>
<td>Abdul Malik Iddrisu</td>
</tr>
<tr>
<td></td>
<td>Publication (reference):</td>
<td></td>
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<td></td>
<td>Title:</td>
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<td></td>
<td>Publication (reference):</td>
<td></td>
</tr>
</tbody>
</table>

### Section III – Research

#### 3.1. Literature review (max 1000 to 1500 words)

Explain specific gaps in existing literature that your research aims to fill. You might want to explain whether or not this question has been addressed before in this context (including key references), and if so, what you wish to achieve (in addition) by examining the question again?

**Overview of Ghana’s agricultural sector performance in recent years**
Ghana has experienced sustained economic growth over the past few decades with recent growth performances comparing favourably to regional- and global-level average growth rates. Between 2009 and 2016, the Ghanaian economy registered an average annual growth rate of 6.9 percent (see GoG, 2018). Ghana became an oil producing nation in 2010 and the rebasing of its national accounts in 2010 propelled the country to the status of lower middle income country in 2010. Ghana has made great progress in poverty reduction during the last decade, attaining one of the highest levels in sub-Saharan Africa. However, inequality in the distribution of income continue to be on the rise.

Agriculture continues to play a key role in the economic landscape of Ghana. Even though the contribution of the agricultural sector to Ghana’s GDP has been declining in recent times, the sector continue to employ the majority (about 44 percent nationally and over 71 percent of rural dwellers) of the work force in Ghana (see Danquah & Iddrisu, 2016). In 2016, for instance, the contribution of the agricultural sector to GDP stood at 18.9 percent while that of industry and services sector accounted for 24.3 percent and 56.8 percent, respectively, thus making the agricultural sector the least contributor to Ghana’s GDP in 2016 (see GoG, 2018). Annual growth of the agricultural sector has been increasing in recent times and it stood at 3.0 percent in 2016; this however compares less favourably to the historical average growth rates experienced by the agricultural sector. In terms of the sub-sectoral growth performances, recent data suggest that agricultural sector growth is driven by growth in the fishing sub-sector, followed by the livestock sub-sector and then the crops and forestry and logging sub-sectors (see Table 1). This indicates that registered growth in the crops sub-sector which involves the cultivation of food crops such as maize, rice, sorghum, and millet have been lower than aggregate sectoral growth rates in agriculture.

**Table 1: Agriculture Growth Performance (Percent)**

<table>
<thead>
<tr>
<th></th>
<th>2015</th>
<th>2016</th>
</tr>
</thead>
<tbody>
<tr>
<td>Agriculture (Overall)</td>
<td>2.8</td>
<td>3.0</td>
</tr>
<tr>
<td>Crops</td>
<td>2.5</td>
<td>2.5</td>
</tr>
<tr>
<td>Livestock</td>
<td>5.3</td>
<td>5.3</td>
</tr>
<tr>
<td>Forestry and Logging</td>
<td>1.4</td>
<td>2.5</td>
</tr>
<tr>
<td>Fishing</td>
<td>4.3</td>
<td>5.7</td>
</tr>
</tbody>
</table>

Source: GoG (2018)
In addition, within the crops sub-sector, growth performances in production output of key food crops in Ghana, namely, maize, millet, rice and sorghum, have been broadly uneven over time. For instance, relative to the 2010 level of annual production volumes of maize, maize production in 2015 has declined by close to 10 percent while that of sorghum registered a drop of around 19 percent in 2015 (see Table 2). However, the total volume of rice produced over the same period has increased moderately. This observation correlates strongly with the fact that the yields of major food crops such as maize, rice and sorghum are still far below their potentials.

Table 2: Annual production of major food crops, (‘000Mt), 2010 – 2015

<table>
<thead>
<tr>
<th>Crop</th>
<th>2010</th>
<th>2011</th>
<th>2012</th>
<th>2013</th>
<th>2014</th>
<th>2015</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maize</td>
<td>1,872</td>
<td>1,683</td>
<td>1,950</td>
<td>1,764</td>
<td>1,769</td>
<td>1,692</td>
</tr>
<tr>
<td>Millet</td>
<td>219</td>
<td>183</td>
<td>180</td>
<td>155</td>
<td>155</td>
<td>157</td>
</tr>
<tr>
<td>Rice (paddy)</td>
<td>492</td>
<td>463</td>
<td>481</td>
<td>570</td>
<td>604</td>
<td>641</td>
</tr>
<tr>
<td>Sorghum</td>
<td>324</td>
<td>287</td>
<td>280</td>
<td>257</td>
<td>259</td>
<td>263</td>
</tr>
</tbody>
</table>

Source: Ministry of Food and Agriculture (MoFA) (2016)

From Table 3, it is shown that the average yield of on-farm production of most food crops in Ghana are far below their potential in 2015. Considering maize, rice and sorghum, for example, we observe that only 35 percent, 46 percent and 55 percent, respectively, of their potential yield were achieved in the 2015 planting season. Overall, the yield gap of agricultural production in Ghana ranges between 14 and 73 percent (MoFA, 2016). Thus, there remain a great potential for the uptake of improved agricultural technologies such as high-yielding varieties of seeds and fertilizers in Ghana so as to raise agricultural productivity.

Table 3: Average yield of selected food crops under rain-fed conditions, 2015

<table>
<thead>
<tr>
<th>Crop</th>
<th>Average Yield (On Farm) (Mt/Ha)</th>
<th>Potential Yield (Mt/Ha)</th>
<th>% Achieved</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maize</td>
<td>1.92</td>
<td>5.50</td>
<td>34.91</td>
</tr>
<tr>
<td>Rice (paddy)</td>
<td>2.75</td>
<td>6.00</td>
<td>45.83</td>
</tr>
<tr>
<td>Sorghum</td>
<td>1.10</td>
<td>2.00</td>
<td>55.00</td>
</tr>
<tr>
<td>Millet</td>
<td>1.00</td>
<td>2.00</td>
<td>50.00</td>
</tr>
</tbody>
</table>

Source: MoFA (2016)
It is worth noting, however, some of the salient features of Ghana’s agricultural sector that may potentially provide explanations to the observed performances of the agricultural sector over the years. Agricultural activities in Ghana is predominantly on a smallholder basis with majority of farm holdings being less than 2 hectares in size. However, there are some pockets of large farms and plantations for oil palm, rubber and coconut as well as maize, rice and pineapples, albeit, to a lesser extent. Traditional farming methods which involves the use of hoe and cutlass remains the predominant method of farming in Ghana while mechanised farming continue to be limited. Also, agriculture is heavily reliant on rainfall and irrigated farming is not widely used. Typical of most sub-Saharan African countries, Ghana’s agricultural output growth is not driven by productivity growth as recorded agricultural output expansion has been accompanied mostly by increases in the total area of land under cultivation over time. The level of adoption of modern technology such as improved seed varieties and fertilizer application in agricultural production is still very low.

In order to improve the productivity of the agricultural sector, the Government of Ghana, in April 2018, rolled an agricultural sector support programme dubbed the Planting for Food and Jobs programme. The programme aims at, among others, providing a 50% price subsidy on farm inputs, namely, improved seeds and fertilizer, to farmers so as to facilitate the application of improved farm inputs. The programme has a nationwide scope and will cover all the 216 districts in the country, where the prioritised food crops are grown. The programme currently targets farmers engaged in the cultivation of the following food crops and vegetables: maize, rice, sorghum, soya bean, tomato, onion, and chilli pepper.

**Brief review of related literature**

The development literature is not bereft of literature on how the benefits of growth may reach the poor with emphasis on the role of employment (World Bank, 1990; Squire, 1993; Lipton & Ravallion, 1995; Mckay, 1997). The main argument of this literature is that, economic growth that encourages the productive use of labour – the main asset of the poor – can yield significant reductions in poverty (see Squire, 1993). Mellor (1999) argues strongly that agricultural growth is more important for growth in employment and poverty reduction, even if the manufacturing sector contributes relatively more to overall growth. Similarly, Bourguignon & Morrisson (1998) observe that growth in agriculture is the most efficient way of reducing inequality and poverty. This lines up with evidence
from India which suggests that agricultural growth has a more important effect on poverty than manufacturing growth (see Ravallion & Datt, 1996).

A growing empirical literature utilising, in particular, the Computable General Equilibrium (CGE) modelling strategy, to examine the effects of macroeconomic policies on sectoral growth performance and on poverty reduction and inequality have emerged (see Vos and Jong, 2003; Annabi et al., 2005; Diao, Hazell, & Thurlow, 2010). Specifically, Diao, Hazell, & Thurlow (2010) used economy-wide simulation models including a CGE model for Kenya, Uganda and Zambia to examine the impact of alternative growth paths on overall economic growth and poverty reduction in six low-income African countries. The authors find that the structure of growth importantly influences total growth and that non-agricultural growth is less effective at reducing poverty compared to agricultural growth, on average.

Similarly, Dorosh & Thurlow (2016), Diao et al. (2012) and Arndt et al. (2010) have sought to disaggregate agriculture and non-agricultural sectors in order to compare the effects of sub-sectoral growth on poverty reduction. In particular, Dorosh and Thurlow’s (2016) study estimated poverty-growth elasticities for different non-agricultural sub-sectors within a dynamic computable general equilibrium model using data on five African countries (i.e. Malawi, Mozambique, Tanzania, Uganda, and Zambia). Their modelling strategy reflected a range of initial conditions including, for instance, the varying importance and composition of agriculture, industry and services sectors. The authors measured changes in poverty using microsimulation techniques. Closer to home, a handful of studies have employed a CGE modelling strategy to examine the poverty reducing effects of macroeconomic adjustments and sectoral growth performance (see Breisinger et al., 2008; Breisinger, Diao, & Thurlow, 2009). In particular, Breisinger et al. (2008) utilised a dynamic CGE model to examine the growth linkages of the cocoa sub-sector in Ghana and its contribution to Ghana’s ability to reach a middle income country status. The authors find that the poverty-growth elasticity in the cocoa sub-sector is low and thus further growth in the subsector is not likely to result in large reductions in poverty. Breisinger et al. (2009) examined the impact of a green revolution on overall growth and poverty reduction in Ghana using a dynamic general equilibrium model combined with a micro-simulation model. They observe that a green revolution type of economic expansion is strongly poverty reducing. Dissimilar to the earlier literature on the welfare effects of agricultural growth, this study intends to examine the impact of subsidies on farm inputs on agricultural productivity, overall
growth, employment, poverty reduction and inequality. This will be done using a dynamic CGE model together with a microsimulation model.

3.2. **Methodology** (max 1200 to 1600 words)

Presentation of the specific techniques that will be used to answer the research questions and how exactly they will be used to do so.

- Explain whether you will use a particular technique normally used in other contexts or whether you intend to extend a particular method and how you will do so.
- Explain if these methods have already been used in the context you are interested in (including key references).
- **For PMMA (microeconomic analysis) proposals only:** In case the proposed methodology aims to empirically estimate a causal relationship, explain potential sources of endogeneity in the context of your research, and how the proposed technique(s) would allow the identification of the relevant parameters.

**Empirical Approach and Model**

To examine the developmental effects (i.e. reductions in poverty and inequality as well as the generation of employment) of a productivity-led agricultural growth driven by the introduction of farm input price subsidies in Ghana, we would develop a dynamic CGE model combined with a micro-simulation model to link agriculture to other sectors of the Ghanaian economy and to connect income growth to changes in poverty and inequality.

A combination of the dynamic CGE model and the micro-simulation model is important for the analysis in this paper for the following reasons (see Vos & Jong, 2003; Savard, 2003): The CGE model allows us to disentangle the general equilibrium effects of the various sectoral policies on sector performance, employment, factor incomes and household consumption. The difficulty however is that the CGE model typically provides information of the distributional outcomes of such policies only at fairly aggregated levels while at the same time compromises on the number of households represented. The micro-simulation approach therefore offers an important opportunity to focus the distributional impacts of the policies on less aggregated samples (i.e. individuals and/or households). Further, the choice of a dynamic CGE model is motivated by the fact that unlike the static CGE models, the dynamic CGE model is able to account for growth effects and this renders them adequate for medium term analysis of the poverty impacts of economic policies (see Annabi, Cockburn, & Decaluwe, 2004).

In sum, we intend to build upon an existing CGE model (i.e. the PEP -1-t model) by disaggregating the economy into different agro-ecological zones and different income groups while at the same time allowing for the presence of unemployment in Ghanaian labor market, notably, with regard to skilled labor. This approach is important because it allows us to capture, more precisely, the significant
heterogeneity in agricultural production/productivity and consumption patterns across regions and household income groups as well as the huge developmental differences between the northern part of the Ghana and the rest of the country. We then link our CGE model to a micro-simulation model which contains the full sample of a nationally representative household survey data.

Using this model, the following simulations would be conducted based on the current agricultural sector policy and an alternative policy:

- A 50% subsidy on the price of improve seeds for maize and rice;
- A 50% subsidy on the price of fertilizer;
- A 50% subsidy on the price of improve seeds for maize and rice cultivation and 50% subsidy on the price of fertilizer;
- A 100% subsidy on the price of improved seeds for maize and rice cultivation and fertilizer to only poor farmers combined with a 50% subsidy on the price of improved seeds and fertilizer to non-poor farmers.

As mentioned earlier, the PFJ programme currently provides a 50% farm input (improved seeds and fertilizer) price subsidies to farmers engaged in the cultivation of the following major food crops and vegetables: maize, rice, sorghum, soya bean, tomato, onion, and chilli pepper. However, given that maize and rice are the major cereals produced in Ghana, we would focus our simulation on these two crops.

**The Dynamic CGE (DCGE) Model**

This study would employ a modified version of the PEP-1-t model, developed by Decaluwe et al. (2013). The PEP-1-t model has its origin in the PEP-1-1 model which is a static CGE model developed by Decaluwe et al. (2013). The PEP-1-t model is a one country, multi-sector, recursive dynamic CGE model and it distinguishes between several categories of workers and of capital. The model is also capable of incorporating a broad set of tax instruments, while at the same time allowing for all possible transfers between economic agents to be modeled. In the PEP-1-t model, each period is solved as a static equilibrium, subject to the variables inherited from the preceding period.

The standard PEP-1-t model, however, would be modified in order to reflect the peculiarities of the Ghanaian economy and to allow us to address the aforementioned research objectives of the study. Specifically, we would undertake the following modifications: First, we modify the structure of production in agriculture to allow for sub-national heterogeneity in agricultural production. As such, the supply side of the model would define agricultural production at the agro-ecological zonal level. Second, we would explicitly include modern agricultural inputs, i.e. improved seeds and fertilizer, in the model as part of composite land. The approach allows for the utilization of modern agricultural
inputs to play an explicit role in determining value added. We would allow the price of these inputs to determine their demand. However, we assume that the market supply of these inputs satisfies their demand and so we would not explicitly model the market supply chain of modern inputs. Third, we assume the presence of unemployment in the Ghanaian labour market, in particular, for skilled labour and for the non-agricultural sectors. These modification reflects the reality of the Ghanaian economy. On the basis of the above modifications, the structure of agricultural production is as presented in Figure 1.

**Figure 1: Structure of agricultural production**

Proposed approach to modelling the effect of subsidies on improved seeds and fertilizer

The application of improved seeds and fertilizer in farming activities is expected to improve land productivity and therefore may reduce the amount of land utilization for agricultural purposes. Subsidies on improved seeds and fertilizer purchases are anticipated to reduce the cost of agricultural activities and increase the utilization of modern agricultural inputs. Accordingly, we believe that subsidies on modern agricultural inputs will have two main effects. In the first instance, they may lower the cost of using agricultural capital, in particular, land and thus act as a subsidy for productive capital. Secondly, these subsidies are expected to increase the utilization of modern inputs and thus
raise agricultural productivity given that the use of modern agricultural inputs is expected to increase yields.

The Micro-simulation Model

As mentioned earlier the micro-simulation model allows us to provide an understanding of the impact of changes in macroeconomic indicators on household and individual welfare. To do this, we intend to link each respondent in a nationally representative household survey data set (i.e. the Ghana Living Standards Survey (GLSS)) to their corresponding representative group in the DCGE model. This approach ensures that changes in households’ consumption expenditures are passed down from the DCGE model to the micro-simulation model where per capita consumption and standard poverty measures are recalculated. By mapping endogenous changes in either consumption expenditure or sources of income for each representative household in the model to the consumption expenditure or income source of the corresponding households in the surveys, we are able to estimate the poverty reducing effects of sectoral growth performance. Following the work of Engida et al. (2017), we would employ the Foster-Greer-Thorbecke (FGT, 1984) measures of poverty. The FGT (1984) indices computes three main types of poverty measures: the poverty incidence measure, the poverty depth measure and the poverty severity measure.

The Data

The DCGE model would be calibrated to economic data reflecting the condition of the Ghanaian economy in 2013. This economic data is referred to as the Social Accounting Matrix (SAM) of Ghana and it takes stock of the economic conditions of the country. Specifically, we adapt the SAM for Ghana for the year 2013 which was prepared by the International Food Policy Research (IFPRI), the Institute for Statistical, Social and Economic Research (ISSER) and the Ghana Statistical Service (GSS); see GSS, ISSER, and IFPRI (2017). The Ghana SAM is an extension the Standard Nexus Structure and it consists of 55 activity sectors, 56 commodity sectors, three types of factors of production (i.e. labour (rural and urban disaggregated by level of education), land and capital (disaggregated by crops, livestock, mining and other sectors). The household sector is divided spatially into urban and rural households with rural households being further disaggregated into farm households (i.e. households that earn crop and/or livestock incomes) and non-farm households (i.e. households that do not earn incomes from crop and/or livestock incomes). Also, households are further disaggregated into per capita expenditure quintiles.

Using this, we simulate the welfare effects of subsidies on modern agricultural inputs. The micro-simulation model would be constructed using the expenditures of households in Ghana. We would utilize the latest wave of the Ghana Living Standards Survey conducted in 2016/17 by the Ghana Statistical Services. The GLSS is a nationally representative repeated cross-sectional survey of households in Ghana which is conducted by the Ghana Statistical Service with assistance from the World Bank and other agencies. To date, seven rounds of the GLSS data sets exists; the first round was conducted in 1987/88 while the second, third and fourth rounds were conducted in 1988/89,
1991/92 and 1998/99 respectively. The fifth and sixth rounds were carried out in 2005/06 and 2012/13 respectively. The seventh round was conducted in 2016/17 and it is yet to be released.

3.3. **Data requirements and sources** (max 400 to 700 words)

This is a critical part of the proposal. The key issue is to explain the reason for the choice of your particular databases. You must establish that they are ideal for the question you wish to address and that you have or will have access to these data before your project begins. Please consult the “Guide for designing a research project proposals” for more detail.

The study would rely extensively on data from the latest round of the Ghana Living Standards Survey (GLSS 7), the 2013 Social Accounting Matrix for Ghana. We hope to gain access to the GLSS 7 when it is released. We currently have access to the 2013 SAM for Ghana which is available online from the International Food Policy Research Institute.

**SECTION IV – POLICY ENGAGEMENT**

4.1. **Policy relevance**

4.1.1. Describe policy context and needs

Describe the specific policy issues or needs that your research aims to address; how your potential outcomes and findings may be used in policy making? Please be as precise as possible, indicating specific current or prospective policies and the specific contributions your research would make.

Also, justify timing of your research in terms of policy and socioeconomic needs and context – e.g. reference to existing, planned or potential policies at the national, regional or local level; specific political context; international examples of similar policy problems or solutions, etc.

In spite of improved macroeconomic performance in Ghana over the past few decades, unemployment, under-employment and economic vulnerability or poverty are still pervasive with the incidence of unemployment being disproportionately high among the youth. The ever increasing presence of unemployment, especially among the youth suggest broadly the presence of a weak employment elasticity of growth. Over the years, successive governments have prepared and implemented various development plans, all aiming at providing opportunities for job creation. For instance, the Ghana Shared Growth and Development Agenda (GSGDA), I and II, implemented over the periods 2010-2013 and 2014-2017 respectively were anchored, among others, on the acceleration
of employment creation and income generation for poverty reduction and shared growth. Similarly, the very recent government’s co-ordinated programme of economic and social development policies which was launched in April 2018 also puts job creation and the promotion of higher incomes at the core of government policy objectives.

In achieving this goal, the government has rolled out a number of programmes including its flagship programme dubbed “Planting for Food and Jobs” programme to be administered by the Ministry of Food and Agriculture. This programme is in spirit in line with government strategy to modernise agriculture through the implementation of the Food and Agriculture Sector Development Policy under the GSGDA I & II. Also, beginning in 2011, Ghana’s industrial sector saw the addition of a new sub-sector (i.e., an oil and gas sub-sector). There has been concerns about how the oil and gas sub-sector might influence developments in the traditional sectors of the economy. To ensure a full realisation of the benefits of the oil and gas sector, governments seeks to link the oil and gas sector with the other sectors of the economy by using revenues from the oil and gas sub-sector to undertake key investments in the national economy; specifically, the government prioritises expenditures on policies and programmes in agriculture, infrastructure, water and sanitation, health and education. On the basis of this backdrop, this study seeks to examine the current agricultural sector policy, in particular, the fertilizer and improved seed subsidy programmes on agricultural sector performance, overall growth, employment, poverty and inequality in Ghana.

The findings of this study would provide important insights into the future direction of the Planting for Food and Jobs programme as well as similar employment-centered growth policies in Ghana. Specifically, the results of this study will inform the current policy programme on job creation and improvement in the economic lives of the citizenry in the following ways:

- By examining the employment creation potential of the current government’s Planting for Food and Jobs programme implemented by the ministry of agriculture, the study will shape the future direction of the programme;
- By analysing the welfare effects of the Planting for Food and Jobs programme, the study will provide insights into the issue of how policy can influence household welfare, especially, for the poor.

4.1.2. Consultations to date
List the consultations that you have had with potential research users (e.g. policy makers or stakeholders) and that have helped define your research question, and/or informed you of the specific policy context described above.

For each institution consulted, please:
- List key (individual) representatives who participated in the consultation
- Describe the main outcome(s) of the consultation (feedback, inputs, etc.)

<table>
<thead>
<tr>
<th>Name of institution/organization #1</th>
<th>Ministry of Finance</th>
</tr>
</thead>
<tbody>
<tr>
<td>List the key representative involved in consultations (names and titles/positions)</td>
<td>Edward Abrokwa, Tax policy division</td>
</tr>
<tr>
<td>Describe main outcomes of consultation - feedback or inputs received</td>
<td>The team’s consultation with this person improved our understanding of the works of the ministry and how government projects are financed. Specifically, he gave us insights into government’s financing strategy for the Planting for Food and Jobs programme.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Name of institution/organization #2</th>
<th>Ministry of Food and Agriculture</th>
</tr>
</thead>
<tbody>
<tr>
<td>List the key representative involved in consultations (names and titles/positions)</td>
<td>Kamil Mohammed, Agricultural Officer</td>
</tr>
<tr>
<td>Describe main outcomes of consultation - feedback or inputs received</td>
<td>Our consultation with this person improved our understanding on the implementation strategy of the Planting for Food and Jobs programme and governments expected outcomes from the programme.</td>
</tr>
</tbody>
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<table>
<thead>
<tr>
<th>Name of institution/organization #3</th>
<th>Name of instit./org.</th>
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<tbody>
<tr>
<td>List the key representative involved in consultations (names and titles/positions)</td>
<td>Name, title/position</td>
</tr>
<tr>
<td>Describe main outcomes of consultation - feedback or inputs received</td>
<td>Insert your text here</td>
</tr>
</tbody>
</table>

4.2. Engagement strategy

4.2.1. Identify target audiences

Identify potential users of your research findings – institutions/organizations that may use your findings to inform, advise or influence policy or other relevant decision-making processes. Please explain why
you believe these institutions/organizations are the most important potential users of your research, to inform relevant development/policy decisions.

<table>
<thead>
<tr>
<th>Name of institution/organization #1</th>
<th>National Development Planning commission, Ghana</th>
</tr>
</thead>
<tbody>
<tr>
<td>Explain relevance of this user to inform key decisions</td>
<td>The findings of this study will help shape discussions on government policies in the various sectors of the economy.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Name of institution/organization #2</th>
<th>Ministry of Food and Agriculture</th>
</tr>
</thead>
<tbody>
<tr>
<td>Explain relevance of this user to inform key decisions</td>
<td>This findings of this study will create increased awareness about the role of the agricultural sector in Ghana’s overall growth, job creation and poverty reduction.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Name of institution/organization #3</th>
<th>Ministry of Finance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Explain relevance of this user to inform key decisions</td>
<td>The findings of this study will guide the ministry in their decisions regarding the allocation of funds to government programmes.</td>
</tr>
</tbody>
</table>

4.2.2. Define outreach and engagement strategy

How, from proposal design to the dissemination of your research results, will you consult and communicate with these users to both gather their inputs and keep them informed of your project, in order to increase chances of research uptake?

Insert your text here - max 150 words
The outcome of this study will be of interest to various stakeholders including government, multinational organisations, and academics. Specifically, this study will be useful to the formulation of employment-centered policies and programmes in Ghana and beyond. To ensure a quick uptake of the policy recommendations of the study, we plan to engage with the aforementioned government agencies at various stages of the project to ensure that we build interest in the study's outcome among key government policy support institutions. In particular, our policy engagement strategy will entail the following:

- Several policy briefs discussing the preliminary outcome from the study with the aforementioned state institutions will be carried out;
- The research results from the study will be discussed among academics and non-academics as well as civil society organisations through seminar presentations;
- A policy brief will be prepared and disseminated;
- We would also ensure that the output of this project is published in a reputable peer-reviewed academic journal.

### 4.2.3. Outline your preliminary dissemination strategy

Outline your preliminary dissemination strategy (channels, tools, events, audiences, etc.). Note that PEP expects grantees to disseminate information about their research work and (expected) outcomes throughout the project cycle, and not only after publication.

We would print policy briefs for dissemination to various stakeholders and the general public. Specifically, various channels including the electronic and print media would be used to make the findings of the project available to the general public.

### SECTION V - OTHER CONSIDERATIONS

#### 5.1. Describe any ethical, social, gender or environmental issues or risks that should be noted in relation to your proposed research project.

Insert your text here

#### 5.2. References and plagiarism:

Applicants should be very careful to avoid any appearance of plagiarism. Any text of five or more consecutive words that is borrowed from another source should be carefully contained between quotation marks with a reference to the source (including page number) immediately following the quotation. It is essential that we be able to distinguish what you have written yourself from what you have borrowed from elsewhere.

Note also that copying large extracts (such as several paragraphs) from other texts is not a good practice, and is usually unacceptable. For a fuller description of plagiarism, please refer, for example, to the following website:
PEP will be using a software program to detect cases of plagiarism.

References


