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Can Smallholders benefit from the new market opportunities from the extractive industry in Tanzania?

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Abstract

The recent discovery of huge oil and gas reserves in Tanzania has created a new opportunity for economic growth and development of the country. Tanzania is expected to be one of the leading producers and exporters of natural gas in the coming decade. However, 88 percent of poor Tanzanians live in rural areas and two-third of the labour force is engaged in agriculture. For the extractive industry to serve as a catalyst for economic growth and poverty reduction, it has to be integrated with the rest of the economy through forward and backward linkages. One such linkage is food supply from agriculture. The projected boom in the extractive industry will open up new market opportunities for farmers to supply food items for high value buyers such as caterers, restaurants, supermarkets and processors. However, to benefit from rapidly expanding high-end food markets, farmers need to have both the capacity and the incentives to supply their produce at the desired quantity and quality. Currently significant portion of the new demand is already being filled by imported goods. This report discusses the opportunities for and challenges of integrating farmers into high-end food markets.

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1 Introduction

The recent discovery of huge oil and gas reserves in Tanzania has created a new opportunity for economic growth and development of the country. Tanzania is expected to be one of the leading producers and exporters of natural gas in the coming decade. This has created high expectations for socio-economic development and poverty reduction. So huge are expectations that the construction of the gas pipeline from Mtwara to Dar es Salaam led to riots which among other ills resulted in several deaths in the region (Msuya and Bakari, 2013; British Broadcasting Corporation, 2013). However, high levels of natural resource extraction do not necessarily lead to high economic growth and general industrial growth (Kolstad and Kinyondo, 2017). For the extractive industry to serve as a catalyst for industrial and economic growth, it has to be integrated with the rest of the economy through forward and backward linkages. An extractive industry that functions as an enclave in the country's economy is not likely to bring economic growth and poverty reduction. The government of Tanzania is cognizant of this fact and seeks to leverage the boom in the extractive industry to increase employment and earning for Tanzanians through local content policy (Kinyondo and Villanger 2016).

Around 88 percent of the poor in Tanzania live in rural areas and two-thirds of the labour force in Tanzania is currently engaged in agriculture (National Bureau of Statistics, 2015; Osorio et al., 2014). A more broad-based growth from the extractive industry may be achieved if linkages are established with the agricultural sector. The projected boom in the extractive industry will open up new market opportunities for farmers to supply food items for high value food buyers such as caterers, restaurants, supermarkets and processors. However, farmers are not likely to benefit significantly from new market opportunities because of existing household, infrastructural and institutional constraints (Kinyondo and Magashi, 2017). For example, farmers lack the managerial and technical skills necessary to plan, produce and market for high-end buyers. Most farmers are subsistence farmers, do not have the experience to supply high-end buyers and typically do not keep their farm accounts separate from their personal income and expenses. While the potential for Tanzanian farmers to benefit from the new food demand from the extractive industry is substantial, some of this demand is already being filled by imported goods.

To benefit from rapidly expanding high-end food markets, farmers need to have both the capacity and the incentives to supply their crops at the desired quantity and quality. This report discusses the opportunities for and challenges of integrating farmers into high-end food markets. The next section provides background information which gives the economic context of the two regions the study has sampled. Thereafter, a conceptual discussion on integrating farmers into high-end food markets follows. Section four introduces the value-chain development project that seeks to achieve such linkages in Lindi and Mtwara. In section five we present the research design where we discuss both the methodology and the data to be used in the impact study. In section six we present descriptive statistics on production, income and agricultural practices of farmers in Lindi and Mtwara. We then conclude the report with a summary and reflections.

2 Background

The agricultural sector in Tanzania continues to play a major role both in terms of its contribution to GDP and employment creation. Indeed, while it contributed 28.8% to GDP in 2014, its contribution rose to 29% in 2015 (Deloitte, 2016). Meanwhile, the sector employs 66.3% of Tanzanians (National Bureau of Statistics, 2015). Since the sector employs the majority of Tanzanians, any efforts geared towards reducing poverty in Tanzania should necessarily involve its transformation.

The reason behind taking the agricultural sector in Tanzania more seriously is straight forward. Eighty eight percent of the poor in Tanzania live in rural areas, with around 40% of them living below the basic needs poverty line (Osorio et al., 2014). It should be noted that the main source of livelihood for these rural areas is in agriculture with about half of households' income generated from farm activities (Osorio et al., 2014).

Lindi and Mtwara are two of the least populated regions in Tanzania mainland with a current population of 864,652 and 1,270,854 respectively (United Republic of Tanzania, 2015). In fact, prior to Iringa being split into two regions, Iringa and Njombe, were the least populated regions in the mainland. Nevertheless, the two regions do not perform well in terms of the well-being of their residents. The two have consistently been among the poorest regions in Tanzania. Indeed, currently, while Mtwara is the eighth poorest region (with 33.9% of its populace considered poor), Lindi is ranked eleventh poorest (with 30% of its population considered poor) out of 26 regions in Tanzania mainland (National Bureau of Statistics, 2016).

The main source of income for Lindi and Mtwara residents is from agriculture, albeit mostly in small-scale. Cashew nuts and sesame production comprise the main sources of livelihoods in both Lindi and Mtwara (United Republic of Tanzania, 2014). These are usually complimented by small numbers of livestock, mainly goats and chickens for most of the residents. That said, a limited number of 'richer' households manage to add cattle to their livestock list (United Republic of Tanzania, 2014). There is severe scarcity of drinking water in both regions with only a few richer households managing to afford to buy clean water for food while poorer ones share water from rivers, smaller streams, and shallow wells, seasonal pools, unprotected wells and boreholes (during the wet season) and rivers, ponds unprotected wells and boreholes in the dry season with animals (ibid). This is the case because usually there is only one rainy season a year in the two regions which falls between December and April.

It should be noted that the level of wealth of many people in Lindi and Mtwara depends on the acres of cashew they individually own. This is not a surprise as the world price of cashew has been on the rise over the years for many reasons, including new discoveries such as its importance as a source of rare drugs. For instance, the price of cashew in Tanzania grew by 23.7% between 2015 and 2016 (National Bureau of Statistics, 2016).

Typically, very poor households cultivate at most 3 acres of cashew, poor ones cultivate 3-5 acres and better off ones cultivate between 10-20 acres of cashew (United Republic of Tanzania, 2014). Sold mostly between October and December, the cashew market is regulated by the Cashew Board and all sales are required by law to be made through local auctions managed by the board. In the past a farmer has been paid 60% of the value of his/her cashew upfront and the remaining 40% 3 to 4 months later following the sale of cashew on the local auction floors for export to India and Vietnam. This system is now changing, with the aim of greater transparency and more rapid payment directly into farmers' bank accounts. Planting of new cashew is being promoted by the government. Sesame follows in the order of lucrative crops cultivated in the two regions. It is mostly sold to buyers from Dar es Salaam between June and August although its destination is mostly India. Other crops cultivated in the two regions include maize, pigeon peas, sorghum and cassava. Horticultural crops are grown by some in lowlands which retain natural water in the dry season. Poultry production is largely traditional, with households keeping a few chickens for emergency cash flow.

Poorer households in Lindi and Mtwara survive through working as casual labourers in better-off households' farms (United Republic of Tanzania, 2014). In turn, richer households maximize their income by adding to their acreage of cashew and sesame and trading with bigger cities such as Dar es Salaam.

Agriculture in Lindi and Mtwara is not without challenges though. Indeed, crop diseases such as powdery mildew seriously affect cashew productivity as do army worms which affect maize and sorghum production (United Republic of Tanzania, 2014). Livestock diseases are also rampant in the two regions. Specifically, foot and mouth disease affect cattle keeping; Newcastle disease affects chickens; with contagious caprine pleuro-pneumonia (CCPP) affecting goat keeping especially during wet seasons (ibid). Malaria is also a major disease affecting the labour force participation in the two regions.

Fishing is another economic activity that is predominant in Lindi and Mtwara in districts bordering the coast. Unfortunately, most of the fishing is done at artisanal level and as a result marine resources in the two regions are generally under-fished (Wagner et al., 1998). Crude methods of fishing, however, such as the use of dynamite and seine nets have drastically reduced the stock of fish in shallow waters (Osorio et al., 2014). This has not only reduced the ability of the fishing industry to create more employment opportunities but also reduced the contribution of fishing to the two regions' GDP, to only one to two percent.

One thing is clear - that the employment creation potential of agriculture in Lindi and Mtwara remains to be fully harnessed. Most of the farming in the two regions is low intensity, with minimal use of inputs such as fertilizers and improved seeds. Irrigation systems are virtually non-existent. Since it is clear that improved agricultural productivity is critical to reducing rural poverty in the region, deliberate measures to redress the situation are warranted. The main

constraints faced by farmers in Lindi and Mtwara thus need to be addressed: access to more productive technology; durable, low-cost implements; extension service support; supply of inputs, including fertilizers and seeds; and provision of rural infrastructure, including transport and water resources as well as the ability to access market information and loans from banks (Kinyondo and Magashi, 2017).

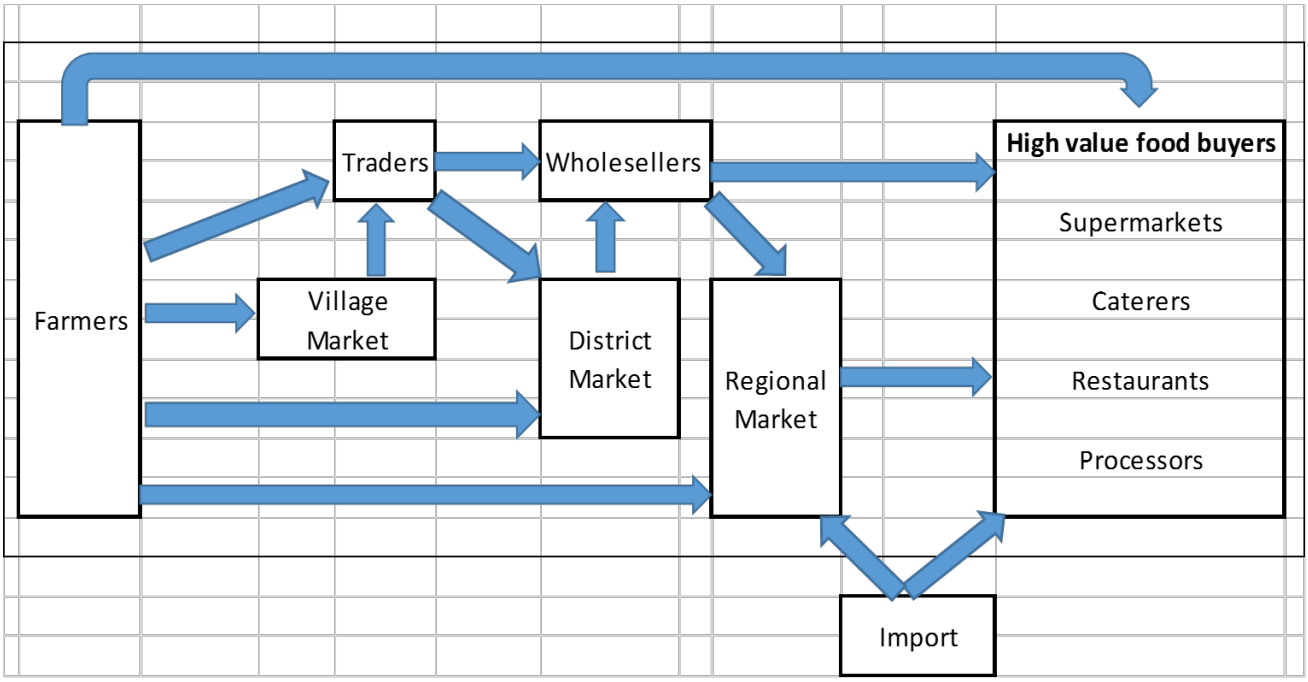
In addition, to improve earnings from agriculture by Lindi and Mtwara residents they can be helped to break into high-end food markets arising due to the discovery of a number of natural resources. In addition to off-shore gas, Lindi boasts gold deposits in Nachingwea, graphite deposits in Ruangwa and salt deposits along its coastline (Wagner et al., 1998). Meanwhile Mtwara is said to possess a wealth of minerals which include, Rhodolite, Sapphire, Amethyst and Red Garnets, Tourmaline, Graphite, Marble, Chrysoberyl, Alexandrite (ibid). Therefore, if better linked to the relevant value chains, the two regions could access the locally available high-end food markets from newcomers working in extractive industry and beyond. It is in this context that this study sets out to examine whether smallholder farmers in Lindi and Mtwara can take advantage of new (high-end food) market opportunities in Tanzania focusing on vegetables, pulses and poultry.

3 Linking agriculture with the extractive industry through food value chain: the benefits and challenges

Many smallholder farmers in Africa are not well integrated into the market (Barrett, 2008). Farmers are not likely to benefit from the larger economic growth and increased high value food demand without a stronger and beneficial market integration. Integrating into the larger regional market and particularly supplying directly or as closely as possible to high-end buyers of foods, such as supermarkets, caterers, restaurants, processors and exporters would be highly beneficial to farmers. As the figures below show, high end buyers may buy their food directly from farmers, from wholesalers, from regional markets or import them from outside of the region or Tanzania.

If farmers are able to sell their output directly to high end buyers, they will be able to receive higher prices for their products. The closer farmers can bring their produce to the market, the higher the price they can receive for their output. Farm gate prices are typically lower than market prices in urban areas. Part of this is connected to transportation cost but a significant portion of this price differential also goes to traders and wholesalers who bring the product from villages to high end buyers and urban consumers. Farmers may receive prices lower than the product deserves because of the weaker bargaining position of farmers, the timing of their supply (very high supply and few buyers immediately after harvest), lack of price information, etc. In this section we discuss the benefits of supplying to end buyers and the constraints farmers face that prohibit them from doing so.

Figure 1: From farmer to consumer:
chain of markets food crops may pass through before reaching end buyers



3.1 Benefits of linking with high end markets

There are many benefits to linking with high end markets. The first benefit of linking and directly supplying high end markets is the higher regional prices received by virtue of eliminating some of the trader and wholesaler margins. The second benefit is the possibility to produce profitable new crops or vegetables that have high returns but for which there are currently no local demand. For example, workers in the extractive industries and urban consumers may have high demand for certain types of vegetables which can be cheaply produced by farmers but typically are not produced because they are not consumed by rural residents. Third, farmers may receive a price premium for producing high quality items for which there may not be a reward in the village market. Finally, farmers may reduce market risk through contract farming for high end buyers. There have been several cases, including in Southern Tanzania, where new and improved technologies resulted in higher productivity and output, but farmers were unable to financially benefit from high production because of a sharp decline in price associated with sharp increase in supply. A contract farming deal to supply high value food buyers in regional or urban markets reduces this risk.

3.2 Constraints: supply side - why don't farmers sell to high value food buyers?

Farmers typically have some idea that urban buyers would pay higher prices than they are currently receiving from traders or private buyers in the village, although they may not know the exact margin. But they are typically unable or unwilling to supply to high value food buyers and consumers because of the constraints and risks they face. These include both household level constraints, such as lack of relevant assets and capital, as well as broader constraints such as local infrastructure (Barrett, 2008; Heltberg & Tarp, 2002).

3.2.1 Household level constraints

Lack of physical and financial asset: many farmers are constrained by lack of physical and financial assets and do not have the resources that will enable them to produce large enough quantities to supply the regional or urban market. Many farmers are in fact subsistence oriented and primarily produce for their own consumption and supply a small surplus in the village market. For example, studies show that those farmers who have big land holdings can produce large enough quantities to make regional market supply profitable while small-holders produce their own food and rely on cash crops or nonfarm income to cover their expenses (Barrett, 2008).

Lack of skill, especially technical and managerial skills to produce the right amount and quality: high value buyers require a higher quality product than the village market and expect a consistent supply of products. Many farmers lack the managerial skill to meet the stringent requirements from high value food buyers.

Increase in production risk: High value food buyers enable farmers to receive high prices for their product even when local production increases. However, when there are commitments with high end buyers, farmers have less flexibility to adjust their supply during less favorable production periods. Access to insurance services could potentially relax this constraint.

3.2.2 Village level constraints/public goods

Poor rural road infrastructure: poor rural infrastructure, particularly lack of serviceable roads increases transportation costs. The integration of a village to the regional and urban market is as much a function of the availability and type of road as it is of the physical distance from them.

Poor access to telecommunication and information: Poor access to means of communication and information isolates local market and local farmers from the regional market and buyers. Many rural areas in Tanzania have very limited telecommunication and information services. However, recent expansion of mobile services has the potential to bring farmers closer to market information and connection.

Limitations in factor market: As in many developing countries, the factor market in rural Tanzania is imperfectly functioning. Availability of inputs, such as seed, at the required quantity, quality and consistency is particularly important for integrating with regional high value food markets.

3.3 Demand side challenges

While a relaxation of supply side constraints would enable farmers to supply the regional market, establishing a direct trade between farmers and high value food buyers is not only a matter of farmers supply. From the perspective of high value food buyers (such as supermarkets, caterers, restaurants), direct purchase from the farmers has its limitations. First, direct purchase from smallholder farmers increases the transaction cost compared to buying from wholesalers or large-scale farmers. Secondly, high value buyers need a consistent supply of products at the required quantity and quality which small farmers may be unable to honor. Different farmers may produce and supply different quality crops that vary with the type of input they have access to and their knowledge on product management. Moreover, the farmers may reduce their supply in response to changing prices and demand from other buyers, including from the village market. While the high value food buyers may go into contract with farmers to ensure a consistent quality and quantity of food products, contract enforcement is also a challenge when many dispersed suppliers are involved.

3.4 Addressing challenges and constraints for farmers market integration

Many of the constraints discussed above are unlikely to be automatically resolved or addressed by the market. There is a need for a concerted effort by government or non-governmental agencies to address the constraints directly through programs, and indirectly by influencing the market incentives. Some of these interventions are discussed below:
Training for farmers: providing training to farmers on farm management, input use, soil management, and good agricultural practices, may result in an increase in total production, productivity and quality of products. This will in turn increase farmers' motivation and capacity to supply directly to end buyers, or demand higher prices from traders. In addition, programs can introduce 'new' crops and vegetables that are not commonly consumed in the village but are demanded by high value food buyers.

Increasing access to finance: farmers access to finance may be improved by establishing microfinance institutes or strengthening existing ones to increase availability of credit for farm input purchase and investment during plantation and facilitate saving during harvest.

Mobilize and facilitate the supply of quality inputs in the village: As it may not be profitable for large input suppliers to open distribution centers in small villages, one approach to increase access to quality inputs could be to facilitate the establishment of agro-dealers in the village (eg.

existing store owners doubling as ago-dealers) who are trained by input suppliers to distribute inputs in the village.

Establish farmers' cooperatives: If properly run, farmer cooperatives can play significant roles in relaxing many constraints farmers face. Farmer cooperatives can facilitate training and information dissemination; facilitate contracts with large buyers and increase bargaining power; reduce the transaction cost by transporting inputs and outputs in bulk and allow farmers to own and utilize collective assets such as tractors, combine harvesters, etc.

4 Local Content policy and agricultural development

4.1 Agricultural sector development as local content

The Tanzanian Government has developed several local content policies in order to use the newly discovered natural gas resources to create jobs for Tanzanians and to stimulate local business development, including small and medium enterprises (Kinyondo and Villanger 2016). In addition to the Government's own efforts, several donors are developing new skills-enhancing programs and related interventions in order to support these goals.

One such program is funded under the Skills for Oil and Gas in Africa (SOGA), which was initiated by the German Federal Ministry for Economic Cooperation and Development (BMZ) and UK's Department for International Development (DFID) as a response to the emerging opportunities in the petroleum sector in several East African countries. The overall aim is to reduce the skills gaps in the petroleum and associated sectors and to assist partner governments in preparing their workforce for upcoming opportunities in the private sector. The program is implemented by Deutsche Gesellschaft für Internationale Zusammenarbeit GmbH (GIZ) and funded by the German Federal Ministry for Economic Cooperation and Development (BMZ), the UK's Department for International Development (DFID), the Norwegian Agency for Development Cooperation (Norad) and Shell.

The approach to developing the skills and knowledge of the local population and to including them in more rewarding value chains (or more rewarding parts of the value chain) is both a popular and appealing approach in developing countries such as Tanzania. Often, large profitable opportunities have been identified and the issue is then how to remove the obstacles preventing the local population from reaping the benefits. Moreover, when the import cost is high, or local produce is preferred or gets preferential treatment, then there is also a likely comparative advantage in local production.

Despite the popularity and the appealing logic, very little is known about the impacts of programs aiming to increase the local participation in more rewarding value chains. Our aim is to evaluate

an intervention that is designed to develop the capacity of smallholder farmers to engage in high value food chains in Southern Tanzania.

During our scoping missions to Tanzania, we identified the Aga Khan Foundation's (AKF) project "Food Value Chain Development for Gas and Mining Industry in Southern Tanzania" as a very promising candidate for the impact evaluation. A key criterion for the selection of the project for the evaluation is that it should be a promising approach where the participants have a high likelihood of benefiting and that can be scaled up also in other countries. In addition, the intervention components must be suitable for a scientifically sound evaluation involving rigorous methods. We aim to produce much-needed high quality empirical evidence on the causal impacts of programs and projects aiming to improve local participation in production and supply of high value crops.

4.2 Food Value Chain Development intervention in Lindi and Mtwara:

The food value chain development project of the AKF targets three types of food items that are projected to have high demand from the extractive industry and which currently have high demand from other local markets such as restaurants, hotels, regional markets and exporters, but are not being supplied by local producers in the required quantity and quality. These targeted food items are vegetables, poultry, and pulses. The project involves several complementary activities that can be grouped into four components:

1. Facilitate the establishment of producer businesses (PBs) and provide training, mentorship and market linkage to the members and leaders of the PBs;
2. Establish/strengthen Micro, Small and Medium Enterprises (MSMEs) that are linked to the supported food value chains;
3. Facilitate and strengthen quality input suppliers in the project area; and
4. Support post-harvest investment, such as collection facility infrastructure and communal abattoirs.

The impact evaluation will focus on the project's impact on farm production, income, profit and job creation. Since the project is still in the implementation stage, we cannot yet analyze the impact. However, in section 6, we will report preliminary baseline statistics on earnings from the crops in the food value chain.

5 Research Design

This impact evaluation will be primarily based on a rigorous quantitative analysis of data collected from the project areas and comparison areas. This is complemented with qualitative analysis for a more in depth understanding of the mechanisms and to cover the project aspects that do not lend themselves to quantitative analysis.

5.1 Quantitative analysis

The aim of the quantitative analysis is to establish causal links between project interventions and selected outcome indicators for the beneficiaries. The main challenge in impact evaluation of any project is the fact that one needs to identify the counterfactual in order to make any causal claims of project impacts. A comparison of before and after outcome indicators for the targeted beneficiaries is not considered a valid impact measure because we cannot know how these beneficiaries would have fared over time in the absence of the intervention. In this case, we need to know what would have happened to the farmers' outcomes in the absence of the FVC project. However, the main challenge to all such impact assessments is that the counterfactual is not observable. Hence, impact evaluations typically involve identifying a comparison (control) group that serves as a counterfactual for the project participants. Impact is then identified as the difference in outcome between the control and treatment groups.

There are different impact evaluation methods using various designs for developing a good counterfactual (selecting an adequate comparison group). The appropriateness of each method will depend on the project design and the actual selection bias associated with the project participants' decision to participate in the project and eligibility criteria (and the project's selection of participants). The method of analysis we suggest in this impact evaluation is the Double Difference (DD), also called Difference-in Difference. This method aims to compare changes in the outcome of farmers/producers in project-villages with changes in the outcomes among similar farmers/producers in comparison-villages. If the farmers/producers that are chosen in project and comparison villages are similar, then such a comparison is valid, and identifies the true causal impact of the program. What we mean when we say that the farmers/producers in project and comparison villages are "similar", is that in the absence of the intervention they would have followed close to identical development trajectories along the indicators measured (e.g., without the FVC project, the two groups would on average have increased/decreased their income and employment to the same extent between the baseline and endline).

Given the project's design in terms of beneficiary selection and project rollout plan, we believe that a DD-design is the most appropriate approach,[2] interfering least with project implementation. The DD approach is, as explained above based on data on pre-intervention baseline and post-intervention repeat survey for both the treatment and control groups. DD identifies the impact of an intervention by comparing the changes in outcome for the treatment and comparison groups.

[2] It was not possible to use RCT for impact evaluation. The project implementing agency CAKFI was unwilling to randomize intervention as a matter of policy.

5.2 Qualitative analysis

The quantitative analysis will be complemented with an in-depth qualitative case study approach. We will assess possible gaps in the market system to see if there are any support services not currently included in the project that could improve the value chain. While the quantitative analysis is restricted to measure the progress of the actual project activities, it is often *not suited* for assessments of what should be improved in order to have stronger impacts. For example, if some services are not working in accordance with intentions –or if they can be improved through the experiences of the participants, then a qualitative study could reveal such potential and create value added to the quantitative study.

Another shortcoming of the quantitative study is that for more complex projects, it is not feasible to distinguish between the project components in contributing to the measured effect. In this project for example, it is not easy to quantitatively identify to what extent the increase in production is associated with the farmers forming a producer business group, improved input availability or support from the MSMEs. Hence, the impact estimates are valid for the overall project, but we would not know if any sub-component is contributing more or less than the others. Perhaps the results are driven by a smaller subset of activities? If that is the case, then one could design more efficient (more value for money) projects by focusing on those activities. This point derives from the interest in assessing the mechanisms behind any successes that may be achieved – does any particular activity play a lead role in unleashing the potential in value chain development? Are there any binding constraints, or project activities that must be included in order for the project to be effective?

The qualitative approach is also well-suited for assessing project impacts where there are a small number of beneficiaries, such as individual successful entrepreneurs that have been able to grow fast, or MSMEs where the number is too few to be included in quantification (such as those focusing on niche markets or other outliers in terms of business area). Moreover, this methodology is also suited to discuss whether there are some specific mechanisms believed to be important for the results. One issue raised at the concept stage was to assess how securing market demand by creating links with private sector companies may change the producers' behavior along dimensions such as commitment, quality, business thinking etc.

The qualitative assessment will be carried out later in the project cycle, after the results are starting to emerge. The qualitative work will consist of key informant interviews and focus group discussions and will seek to reach out broadly to collect the views of relevant stakeholders. Participants will hence be drawn from a wider range of stakeholders than the quantitative survey. Moreover, it could also include high-end market agents that the project has not reached and traders in other markets than those currently served.

5.3 Data

We conducted a quantitative survey in June 2017 in the regions of Lindi and Mtwara. In this section we describe the survey, particularly the details on sample size and sample selection.

5.3.1 Sample size

The quantitative analysis will primarily be based on data from this survey. We collected survey data in two consecutive phases. In phase I we collected data for impact analysis from approximately 500 beneficiaries and 600 control farmers. The villages selected for this part of the survey are pulse producing villages, but the farmers may also produce poultry and vegetables. The treatment villages in this phase were in the same three districts as the control areas. The main quantitative impact analysis will be based on data from phase I. In phase II we collected data on an additional 400 farmers from treatment villages in an additional five districts in which the project is being implemented. The second phase data collection was conducted to include samples from villages targeted for vegetable and poultry production and to capture data that was representative of the whole project implementation area. The additional data is important to obtain a broader picture of current production levels for the three key food items targeted by the food value chain development project, however impact evaluation will be based on only the data from Phase I.

5.3.2 Sample selection

Phase I survey: Sample for impact analysis

As discussed above, the key to any credible impact analysis is to establish a comparison group that is not systematically different from the treatment group. The FVC project targets villages and offers training to all farmers who are currently producing or have the capacity and interest to produce one or more of the targeted food items: vegetables, poultry and pulses. As a result, we had to select control groups from other villages. We did not select non-participants in the project villages because of possible selection bias. In addition, the project has a high likelihood of creating positive spillover effects for non-participants in a project village due to, for example, learning, copying and demand and price effects. These effects could also affect neighboring villages. We therefore selected control groups from villages that are not adjoining the project villages but that closely resemble the target villages in terms of economic potential, agro-climatic condition, infrastructure and market integration. For this reason, we identified control villages by matching at ward level (ward is higher administrative level covering several adjoining villages).

Because of seasonality and high dispersion of income from vegetables and poultry, we decided to focus on pulse producers for the phase I survey. We selected seven project wards from the pulse producing areas and included all the farmers in these wards that are listed as (potential) beneficiaries by AKF. This constituted our treatment sample. These seven project wards were

matched with seven similar wards that are not covered by the intervention and are not likely to suffer from any spillover. These matched wards became control areas. We prepared a sampling frame in the control wards and recruited control farmers using a similar procedure as AKF uses to recruit actual beneficiaries. We used random sampling to select sample farmers from the sampling frame. If there were less eligible farmers than the desired sample size[3] for that village, all of them were surveyed. Tables 1 and 2 provide the list of districts and wards covered by the survey in Phase I.

TABLE 1: Survey area for treatment (beneficiary) sample (phase I) - Treatment sample

District	Ward	Number of village	Number of farmers (households) sampled
Nanyumbu	Mikangaula	1	42
Tandahimba	Mkwiti	3	91
Ruangwa	Chienjele	3	124
Ruangwa	Likujna	4	89
Ruangwa	Makanjiro	2	48
Ruangwa	Mbekenyera	2	17
Ruangwa	Nandagala	3	82
Total		18	493

TABLE 2: Survey area for control sample (phase I) - Control sample

District	**Ward**	**Number of village**	**Number of farmers (households) sampled**
Nanyumbu	Sengenya	1	41
Tandahimba	Chaume	3	91
Ruangwa	Chunyu	3	98
Ruangwa	Matambarare	3	86
Ruangwa	Mandarawe	3	91
Ruangwa	Narungombe	2	88
Ruangwa	Namichiga	3	101
Total		**18**	**596**

[3] The pre-determined target sample size for the control area is calculated to obtain the same number of farmers in the matched wards (and villages) as in the treatment area. In few cases the control wards have fewer number of farmers engaged in the three value chain crops than. After the survey we found out that the higher number of beneficiaries in the treatment Wards in these and other cases is partly because for some households more than one person is registered in the beneficiary list. In the end, we have in fact more control farm household than treatment households in phase I.

Phase II survey: Additional sample from poultry and vegetable intervention areas

In phase II we surveyed additional wards to cover intervention areas that are selected for their production potential in poultry and vegetables. This part of the data is primarily for monitoring purposes and to provide broader baseline information on current production capacity and market participation of beneficiary farmers in all three key food value chains (pulses, vegetables and poultry). The sample in phase II included only treatment farmers and covered five districts. From each district, three villages were selected from three wards. Trainee farmers from these villages were selected using random sampling. If there were less eligible farmers than the pre-determined sample, all of them were surveyed. Table 3 shows a list of survey areas.

TABLE 3: Survey area and sample in phase II (all beneficiary)

District	Ward	Village	Number of farmers (households) sampled
Masasi	Chiungutwa	Misechela	36
	Msikisi	Msikisi	36
	Lukuledi	Mikolopola	28
Nachingwea	Ruponda	Ruponda	30
	Marando	Litula	35
	Mitumbati	Mitumbati A	37
Newala	Kitangale	Mitema	17
	Manyambe	Majembe juu	28
	Mahumbika	Kikuyu	21
Lindi urban	Jamhuri	Mitumbati	42
Lindi rural	Mnara	Ntene	71
	Mnolela	Namunda	24
Total			**405**

6 Baseline statistics

The Food Value Chain development project runs from late 2016 to early 2019. Here we provide some statistics on the baseline figures based on the survey conducted in June-July 2017. In this section we report data from both phase I and phase II surveys. The items that are targeted for food value chain development by AKF are: vegetables, pulses and poultry.

6.1 Profile of farm households in the sample

Table 4 shows gender disaggregated sample sizes in the control and treatment areas. Over all, female headed farm households account only 21% of all households. But we also see that proportionately more female-headed households are observed in the beneficiary sample (26%) than the control sample (16%). This may be because the project targeted women in the intervention areas, particularly for the poultry production[4].

TABLE 4: Sample size – Beneficiary and control areas, by gender

Gender of household head	Control	Beneficiary	Total
Female (0)	93	220	313
Male (1)	498	683	1181
Total	591	903	1494

Table 5 shows the sample disaggregated by age of the farmer. The majority of the farm households are headed by adult males 35 years or older. This is typical in Southern Tanzania. The national agricultural census report shows that the mean age of household heads in Mtwara was 46 in 2007/2008. There are proportionately more households with younger household heads in the beneficiary sample. This is also in line with the targeting of the FVC project, particularly for the poultry and horticulture production where the treatment is extended to the youth and female who are interested to start production, regardless of whether they are currently engaged in such activity.

TABLE 5: Sample size – Beneficiary and control areas, by age of farmer (household head)

Age of household head	Control	Beneficiary	Total
age up to 24 (1)	6	31	37
age 25-35 (2)	76	155	231
age >35 (3)	509	717	1226
Total	591	903	1494

[4] This is not however a particularly high proportion of female-headed households. According to the Tanzanian Agricultural Census, the share of female-headed household in Mtwara is 28% (NBE, 2012)

In the presence of imperfect input supply markets, household asset endowment is expected to influence farmers' production and market participation decisions. Several studies document this in the African market context (Barrett, 2008; Dillon & Barrett, 2017; Mather, Boughton, & Jayne, 2013). In Table 6 we report the main endowments of sample farm households including other sources of income. Household head in both the treatment and control areas have close to 7 years of education. Farmers in the control sample seem to have more resources than those in the treatment areas. It is thus reasonable to expect control farmers to have a higher production (perhaps even productivity) than the treatment farmers as factor market failures in rural areas imply that farmers own labor and asset influence production decisions (Binswanger & Rosenzweig, 1986). One-fifth of treatment and control farmers are engaged in other non-farm business or self-employment.

TABLE 6: Key asset endowment for treatment and control sample

Endowment	Treatment		Control	
	Mean	%	Mean	%
Adult labor	2.3		2.5	
Household head education (yrs.)	6.9		6.7	
Average years of education by other members	4.8		5.7	
Current land holding (acre)	6.8		8.7	
Head engaged in nonfarm-business/self-employment		20.8		20.3
Household owns a phone		68.1		77.3

Higher initial endowment among farmers in control villages will not be a problem for the impact analysis. As indicated earlier, the impact of the intervention is analyzed based on the difference in the level of changes observed in the project period between the treatment group and control group. What would have been a concern is divergence in trajectories of income growth between the treatment and control villages. We do not know at this stage whether this is the case. However, in Phase I of the survey, which is the basis for the impact analysis, the data was collected from selected control villages which are similar to treatment villages in terms of access to market and infrastructure, institutions, weather patterns and other sources of dynamics.

6.2 Production of value chain crops

Table 7 reports the number of farmers who are engaged in the production of the three value chain crops and Table 8 reports producers as a percentage of all (sample) farmers. As we selected study areas where there is a value chain production, it is no wonder that 94% of our sample has produced at least one of the food value crops in the year before the survey (2016). The

overwhelming majority of the farmers are producers of pulses in both the treatment and control areas. Relatively few farmers produced poultry and vegetables in 2016. This is in spite of the fact that the study areas are selected based on their potential to produce these three food crops.

TABLE 7: Number of farmers producing the three food value chain items: Pulses, Poultry and Vegetables

Value chain producer	Number of farmers
Pulses	1372
Poultry	465
Vegetables	285
Any value chain	1407
Sample size	1494

TABLE 8: Share (%) of farmers who are value chain producers (produced at least one of the value chain products in 2016), by their status as a treatment or control sample

Value chain producer	Treatment	Control	Total
Pulses	89	96	92
Poultry	32	29	31
Vegetables	23	12	19
Any value chain	**93**	**97**	**94**

Table 9 and 10 show the percentage of farmers producing each type of food value chain crop disaggregated by gender and age. Compared to male-headed households, proportionately fewer female-headed households produced FVC crops in both the treatment and control areas and in all the three FVC crops produced in 2016. In terms of pulse and poultry production the difference across age groups is not significant given the sample size in each group. But for vegetable production proportionately more farmers[5] in the age group 25-35 produce vegetables than in the other age groups. A detailed crop level production activity is provided in the appendix (Table A1).

[5] Farmers in the descriptive statistics refers to the head of the farm household.

TABLE 9: Farm households producing the three types of food value chain crops (based on the 2016 production year) - disaggregated by gender of household head

Value chain crop	Treatment (%)			Control (%)		
	Female	Male	Total	Female	Male	Total
Pulses	85	90	89	94	97	96
Poultry	28	34	32	18	31	29
Vegetables	15	26	23	6	13	12
Total number of farmers (sample)	**220**	**683**	**903**	**93**	**498**	**591**

TABLE 10: Farm households producing the three types of food value chain crops (based on the 2016 production year) - disaggregated by age of household head

Value chain crop	Treatment (%)				Control (%)			
	Age <24	Age 25-35	Age >35	Total	Age <24	Age 25-35	Age >35	Total
Pulses	87	91	88	89	100	99	96	96
Poultry	26	32	33	32	0	41	28	29
Vegetables	16	34	21	23	0	14	12	12
Total number of farmers (sample)	**31**	**155**	**717**	**903**	**6**	**76**	**509**	**591**

6.3 Income from value chain crops

Main findings

- *The median income from the food value chain crops is 0.2 million TZS, but there is significant dispersion in income earned*

Table 11 reports income from all farming activities and further disaggregated income from production of food items targeted by the food value chain project. The farm income here refers to the monetary value of all crops produced (whether consumed, sold or given as in-kind payment) after production expenditure are deducted. The median farm income is less than half of the mean income (0.2 million TZS), with interquartile range of 1.8 million TZS. This indicates a skewed distribution of farm income in Lindi and Mtwara.

TABLE 11: Farm income, in total and disaggregated by value chain food item, in Lindi and Mtwara (2016)

Net income (Total) in '000 TZS	MEAN	MEDIAN	Interquartile range (p75 -p25)	SD
All farm income	1803	897	1826	3996
Income from value chain production	459	229	415	1909
Income from pulses	289	171	304	461
Income from vegetables	141	0	0	1821
Income from poultry	29	0	25	135

1-All farm income refers to income from FVC crops, other crops and livestock income.

- *Overall, farmers in Southern Tanzania earn little from vegetables and poultry production*

Both the average income earned from each food type, reported above, and the share of income attributable to each of the food value chain items, given below, show that vegetable and poultry production is not yet an important source of income to the majority of farmers in Southern Tanzania.

TABLE 12: Share of income from value chain production (2016)

Net income (As share of total income)	Mean	Median	Interquartile range (p75 -p25)	SD
Share of income from value chain production	0.43	0.32	0.61	0.564
Share of income from pulses	0.34	0.21	0.47	0.465
Share of income from vegetables	0.05	0.00	0.00	0.297
Share of income from poultry	0.04	0.00	0.02	0.149

- *However, among producers of food value chain crops, average sales revenue from vegetables is higher than average sales revenue from pulses*

Table 13 reports average income, when the analysis is restricted only to producers of the respective food value chain crops. We see that in both the beneficiary and control areas, income from vegetables is higher than earnings from pulses, which are produced by many more farmers.

TABLE 13: Income from value chain crops (only for farmers who produced the respective crop in 2016) – In '000 TZS

Value chain crop	Beneficiary				Control			
	Mean	Median	SD	N	Mean	Median	SD	N
Pulse producers	300	185	530	802	331	205	369	570
Vegetable producers	789	223	4643	214	562	194	1763	75
Poultry producers	92	48	275	293	95	56	121	172

6.4 Use of input and services and Good Agricultural Practices

As indicated in the conceptual framework section, input/factor market constraints including lack of access to quality agricultural inputs and financial resources are serious hurdles that can prohibit small holder farmers from producing high value food crops. Another constraint that we discussed in section three is lack of technical and managerial skills that are needed to supply quality crops for high end buyers. In this section we present the pre-intervention level of targeted farmers' use of critical farm inputs and services as well as the extent the farmers adopt good agricultural practices.

6.4.1 Use of farm input and services

This project aims to improve access to the inputs and services that farmers require to produce quality outputs. The project aims to identify existing and new input suppliers for seeds, fertilizer, herbicides, pesticides, vaccines, poultry feed, irrigation equipment and other farming equipment in the selected value chains. More particularly the project plans to build on an existing AKF-facilitated network of 130 Village-Based Agro-dealers (VBAs), who are already profitably distributing product in rural villages in Lindi and Mtwara.

Table 14 shows the number of farmers who are currently utilizing critical farm inputs and services. We see that almost 71% of the farmers use at least one of the critical agricultural inputs or services. This seems promising, however, further disaggregation given in the next table shows that the majority of this is from the use of pesticides/herbicides. Farmers in fact use very little of other farm inputs and services.

TABLE 14: Number of beneficiary farmers using at least one of the critical inputs and services

Critical support use	Beneficiary/treatment sample	
	Freq.	Percent
Farmers use at least one type of critical input or service for FVC	640	70.9
Farmers use financial services (loan, saving)	183	20.3
Sample size (observation)	***903***	***100***

Similarly, the majority of the farmers do not use financial services. Only 20% of farmers have either a bank account or borrowed money from any financial institution (including savings groups). This suggests that currently the input and services in rural Tanzania are not in place to enable farmers to produce high quality foods and crops in these three food value chains.

TABLE 15: The proportion of beneficiary farmers using critical inputs and services, disaggregated by type of input or service

	Gender of household head		
	Female (%)	Male (%)	All
Seeds	30	40	38
Fertilizer	15	24	22
Pesticides/herbicides	45	64	60
Brooders	0	0	0
Service: Rented tractor	8	15	13
Service: Vaccination	4	8	7
Service: Rice miller	2	1	1
Service: Irrigation equipment rent	1	1	1
Service: Incubators	0	0	0
Service: Abattoirs	0	0	0
Service: Storage	0	0	0
Financial institution (saving/borrowing)	19	21	20
Borrowing from financial institution	13	8	9
Saving in financial institution	10	16	15
Sample size (observation)	***220***	***683***	***903***

The gender disaggregated report shows that proportionately fewer female headed households use critical agricultural inputs and services. This indicates that female farmers either have more restricted access to the critical agricultural inputs or are less informed than male farmers on the benefits of important agricultural inputs. On the other hand, male and female farmers have an equivalent use of financial services. However, proportionately more male headed households saved while proportionately more female households borrowed.

6.4.2 Good Agricultural Practices

As indicated earlier, the FVC project seeks to promote good agricultural practices (GAP) across pulses, poultry and vegetable producers. Our data from the baseline study shows that in general farmers are lacking in terms of using agricultural practices that are important to achieve hiqh quality products and high productivity. However, there is significant variation in adoption across specific GAPs and specific products. Below we discuss the GAP adoption rate among producers of the FVC products. The statistics reported below show overall adoption rate for project beneficiary farmers based on their practices in 2016. Detailed statistics, disaggregated by gender are provided in the appendix.

GAP for vegetables

Table 16 shows adoption of good agricultural practices for horticulture. Data is collected for Tomato, Onion and Okra. The majority of onion farmers do not adopt any of the GAPs; Tomato and Okra farmers adopt good practices in terms of spacing and pest and disease control but not in the use of raised beds. Other GAP adoption depends on the type of crop.

TABLE 16: Good agricultural practices adopted by **Vegetable** farmers (based on practice in 2016)

	Vegetables		
GAP Practices	**Tomato (n=137)**	**Onion (n=67)**	**Okra (n=64)**
Practice 1: Improved seeds	53 %	36 %	20 %
Practice 2: Nursery soil prep.: Sterilizing nursery soil	36 %	42 %	n/a
Practice 3: Land prep: Raised beds	42 %	36 %	19 %
Practice 4a: Land prep: Spacing	74 %	46 %	55 %
Practice 4b: Land prep: Transplanting	31 %	34 %	n/a
Practice 5: Fertilization	66 %	49 %	45 %
Practice 6: Pest & Disease	63 %	43 %	53 %

GAP for pulses

Table 17 shows adoption of good agricultural practices for pulses. Data is collected for Pigeon peas, Cowpea and Green gram, which are targeted for improvement through the FVC project. The main findings are: for all types of pulses, the majority of farmers are not using improved seed in their production. Pulse farmers adopt good practices in terms of threshing and drying but for other practices adoption of GAP depends on the type of crop.

TABLE 17: Good agricultural practices adopted by **Pulse** farmers (based on practice in 2016)

	Pulses GAP adopters		
GAP Practices	**Pigeon pea (n=697)**	**Cow pea (n=258)**	**Green gram (n=112)**
Practice 1: Improved seeds	1 %	3 %	1 %
Practice 2: Intercropping	39 %	n/a	n/a
Practice 3: Land prep: Spacing	54 %	56 %	46 %
Practice 4: Pest & Disease: at flowering	6 %	65 %	67 %
Practice 5: Threshing & Drying	96 %	94 %	97 %

GAP for Poultry

The majority of poultry farmers do not adopt GAP in their production and management. For each of the agricultural practices, the percentage of people who used the recommended practices are less than 50%.

TABLE 18: Good agricultural practices adopted by **Poultry** farmers (based on practice in 2016)

GAP Practices	**Poultry GAP adopters (%) (n=599)**
Practice 1a: Natural Brooding	6 %
Practice 1b: Artificial Brooding	1 %
Practice 2a: Vaccination of adult chickens	21 %
Practice 2b: Vaccination of chicks	21 %
Practice 3: Feed supplement	40 %
Practice 4: Record keeping (all practices)	0 %
Practice 4: Record keeping (4/6 practices)	0%

7 Concluding remarks

Tanzania is at a turning point. Although extraction and use of the recently discovered oil and gas resources is moving at a slower rate than most expected, Tanzania is poised to be a leading producer and exporter of natural gas in the coming decade. This has created high expectations for socio-economic development and poverty reduction.

Although the government is actively seeking to leverage this discovery to increase employment and earning for Tanzanians through local content policy, the policy does not directly address the agricultural sector where two-thirds of the labour force is engaged. This study discusses the opportunities and challenges of linking farmers to the extractive industry and associated businesses through the production and sale of high value food crops. After introducing the value chain development project in Southern Tanzania, this report provides baseline statistics on current potential of pulses, poultry and vegetables in the intervention areas - Lindi and Mtwara. This baseline report is part of an impact study that aims to evaluate the impact of such an intervention in light of the theoretical possibilities and challenges.

We found that there is significant market participation by pulse farmers in Southern Tanzania but much less in poultry and vegetables, which are identified as potentially attracting high demand from the extractive industry such as through caterers, restaurants, etc. We also found that many farmers need training in adopting good agricultural practices. Some farmers adopt some of the GAP, but many don't. This is particularly true for poultry producers. Poultry production is low, but we found that the majority of poultry farmers are not adopting any of the good agricultural practices recommended for poultry production. We also found that the only critical inputs that are used by many farmers are improved seed, fertilizers and pesticides. Farmers are not using the other critical inputs and services that are needed for producing a consistently high-quality food and crops.

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Appendix A

Table A 1 Share of farmers producing the value chain crops –reported as percentage of all farmers in the sample (disaggregated by gender and beneficiary status)

Pulses	Beneficiary/Treatment			Control		
	Female	Male	Total	Female	Male	Total
Beans	0.0	0.1	0.1	0.0	0.4	0.3
Cowpeas	22.7	27.4	26.2	55.9	66.7	65.0
Green gram	9.5	12.9	12.1	8.6	6.8	7.1
Chickpeas	0.0	0.1	0.1	0.0	0.0	0.0
Field peas	0.0	0.0	0.0	0.0	0.0	0.0
Groundnut	5.9	8.3	7.8	7.5	10.2	9.8
Soybeans	0.0	0.0	0.0	0.0	0.0	0.0
Caster seed	0.0	0.0	0.0	0.0	0.0	0.0
Pigeon peas	76.8	85.2	83.2	91.4	88.2	88.7
Others	2.7	1.5	1.8	8.6	10.2	10.0
% of farmers producing Any pulse	85	90	89	94	97	96
Total number of farmers (sample)	*220*	*683*	*903*	*93*	*498*	*591*

Poultry	Beneficiary/Treatment			Control		
	Female	Male	Total	Female	Male	Total
Local Chicken	23.6	29.1	27.8	15.1	27.3	25.4
Broiler Chicken	0.0	0.0	0.0	0.0	0.0	0.0
Cocks	8.2	12.3	11.3	6.5	10.2	9.6
Eggs	0.0	1.5	1.1	1.1	0.2	0.3
Chicks	0.5	0.0	0.1	1.1	0.2	0.3
Sasso & kuroiler	0.0	0.0	0.0	0.0	0.0	0.0
Layers	0.0	0.0	0.0	0.0	0.0	0.0
% of farmers producing Any Poultry	28	34	32	18	31	29
Total number of farmers (sample)	*220*	*683*	*903*	*93*	*498*	*591*

Vegetables	Beneficiary/Treatment			Control		
	Female	Male	Total	Female	Male	Total
Tomatoes	4.5	16.7	13.7	4.3	10.8	9.8
Green peppers	0.0	0.7	0.6	0.0	0.2	0.2
Chinese cabbage	1.8	5.0	4.2	0.0	0.6	0.5
Amaranthus	5.0	7.3	6.8	3.2	4.6	4.4
Okra	2.7	6.4	5.5	2.2	3.6	3.4
Onion	5.9	7.5	7.1	1.1	1.8	1.7
Other	2.3	4.0	3.5	3.2	2.4	2.5
% of farmers producing Any Vegetable	15.0	26.2	23.5	6.5	13.5	12.4
Total number of farmers (sample)	*220*	*683*	*903*	*93*	*498*	*591*

Table A 3 Agricultural practices of vegetable and pulse producers by crop type, disaggregated by gender

Tomatoes						
GAP Practices	**Total**		**Female**		**Male**	
	Number	As % of producers	Number	As % of producers	Number	As % of producers
Practice 1: Improved seeds	73	53 %	4	33 %	69	55 %
Practice 2: Nursery soil prep.: Sterilizing nursery soil	49	36 %	6	50 %	43	34 %
Practice 3: Land prep: Raised beds	57	42 %	8	67 %	49	39 %
Practice 4a: Land prep: Spacing	102	74 %	8	67 %	94	75 %
Practice 4b: Land prep: Transplanting	42	31 %	1	8 %	41	33 %
Practice 5: Fertilization	90	66 %	10	83 %	80	64 %
Practice 6: Pest & Disease	86	63 %	9	75 %	77	62 %
# of tomato farmers	**137**		**12**		**125**	

Onions						
GAP Practices	**Total**		**Female**		**Male**	
	Number	As % of producers	Number	As % of producers	Number	As % of producers
Practice 1: Improved seeds	24	36 %	5	33 %	19	37 %
Practice 2: Nursery soil prep.: Sterilizing nursery soil	28	42 %	9	60 %	19	37 %
Practice 3: Land prep: Raised beds	24	36 %	3	20 %	21	40 %
Practice 4a: Land prep: Spacing	31	46 %	8	53 %	23	44 %
Practice 4b: Land prep: Transplanting	23	34 %	3	20 %	20	38 %
Practice 5: Fertilization	33	49 %	6	40 %	27	52 %
Practice 6: Pest & Disease	29	43 %	7	47 %	22	42 %
# of onion farmers	**67**		**15**		**52**	

Okra						
GAP Practices	**Total**		**Female**		**Male**	
	Number	As % of producers	Number	As % of producers	Number	As % of producers
Practice 1: Improved seeds	13	20 %	0	0 %	13	23 %
Practice 2: Nursery soil prep.:Sterilizing nursery soil	n/a	n/a	n/a	n/a	n/a	n/a
Practice 3: Land prep: Raised beds	12	19 %	1	14 %	11	19 %
Practice 4a: Land prep: Spacing	35	55 %	2	29 %	33	58 %
Practice 4b: Land prep: Transplanting	n/a	n/a	n/a	n/a	n/a	n/a
Practice 5: Fertilization	29	45 %	3	43 %	26	46 %
Practice 6: Pest & Disease	34	53 %	4	57 %	30	53 %
# of okra farmers	**64**		**7**		**57**	

Pigeon Pea						
GAP Practices	**Total**		**Female**		**Male**	
	Number	As % of producers	Number	As % of producers	Number	As % of producers
Practice 1: Improved seeds	4	1 %	1	1 %	3	1 %
Practice 2: Intercropping	269	39 %	62	36 %	207	39 %
Practice 3: Land prep: Spacing	373	54 %	81	48 %	292	55 %
Practice 4: Pest & Disease: at flowering	45	6 %	9	5 %	36	7 %
Practice 5: Threshing & Drying	666	96 %	157	92 %	509	97 %
# of pigeon pea farmers	**697**		**170**		**527**	

Cow Pea						
GAP Practices	Total		Female		Male	
	Number	As % of producers	Number	As % of producers	Number	As % of producers
Practice 1: Improved seeds	9	3 %	0	0 %	9	4 %
Practice 2: Intercropping	n/a	n/a	n/a	n/a	n/a	n/a
Practice 3: Land prep: Spacing	144	56 %	29	52 %	115	57 %
Practice 4: Pest & Disease: at flowering	167	65 %	35	63 %	132	65 %
Practice 5: Threshing & Drying	242	94 %	54	96 %	188	93 %
# of cow pea farmers	**258**		**56**		**202**	

Green Gram						
GAP Practices	**Total**		**Female**		**Male**	
	Number	As % of producers	Number	As % of producers	Number	As % of producers
Practice 1: Improved seeds	1	1 %	1	4 %	0	0 %
Practice 2: Intercropping	n/a	n/a	n/a	n/a	n/a	n/a
Practice 3: Land prep: Spacing	52	46 %	10	43 %	42	47 %
Practice 4: Pest & Disease: at flowering	75	67 %	14	61 %	61	69 %
Practice 5: Threshing & Drying	109	97 %	22	96 %	87	98 %
# of green gram farmers	**112**		**23**		**89**	

Table A 4 Agricultural practices of Poultry by product type, disaggregated by gender

Poultry						
GAP Practices	**Total**		**Female**		**Male**	
	Number	As % of producers	Number	As % of producers	Number	As % of producers
Practice 1a: Natural Brooding*	33	6 %	7	5 %	26	6 %
Practice 1b: Artificial Brooding*	3	1 %	0	0 %	3	1 %
Practice 2a: Vaccination of adult chickens**	128	21 %	19	14 %	109	24 %
Practice 2a: Vaccination of chicks**	125	21 %	19	14 %	106	23 %
Practice 3: Feed supplement	238	40 %	51	37 %	187	40 %
Practice 4: Record keeping (all practices)***	0	0 %	0	0 %	0	0 %
Practice 4: Record keeping (4/6 practices)***	0	0 %	0	0 %	0	0 %
# of poultry farmers	**599**		**137**		**462**	

*28 farmers answered, "Never kept chicks below 1 month in 2016".
** No farmer vaccinated against all diseases mentioned in the gap requirements (Newcastle, IBD, Fowl Pox, Mareks). Thus, the real GAP statistic is 0 for this category. The numbers/percentages provided here are the number/percentage of farmers who vaccinated their adult chickens and chicks 1 or 2 times in 2016.
*** Only 15 poultry farmers kept records, out of which 7 recorded 1 of the listed items, 6 recorded 2 of the listed items, 1 recorded 3 of the listed items, and 1 recorded a non-listed item (category "other").

Appendix B

Definition of good agricultural practice adopted by AKF for the FVC project.

Good agriculture practices (gaps)-fvc project

A. HORTICULTURE

1. Improved seed

Definition/GAP: improved seeds for all the selected crops are;

- *Newly obtained from shops/Agro dealers shops in the 2016 dry season*

2. Nursery soil preparation

Definition/GAP:

- *Nursery sterilization must be done using slash and burn (which is the common one) or polythene cover*

3. Raised beds making

Definition/GAP:

- *Raised beds for tomatoes should be 15cm or more*
- *Raised beds for Onions should be 10cm or more*
- *Raised beds for Okra should be 15cm or more*

4. Recommended spacing

Definition: The use of correct spacing depending on each selected crops

GAPS

- *Tomato short varieties; 30cm plant to plant and 50-60cm row to row*
- *Tomato tall variety; 45cm plant to plant and 75cm row to row*
- *Onion; 08-10 cm plant to plant and 15cm row to row*
- *Okra; 30cm plant to plant and 60cm row to row*

Transplanting

Definition/GAP

- *Tomato should take 14-21 days before transplanting*
- *Onion should take 28-40 days before transplanting*

5. Fertilization program

- Use of correct fertilizers (mostly NPK), correct application methods and use at a correct crop growing stage.
- Tomato shorty varieties; After transplanting, at least 3 more times after every 21 day
- Tomato tall variety; After transplanting, at least 5 more times after every 21 days
- Onion; at least 3 times
- Okra; at least 3 times

GAP: application of fertilizers - 3 or more times for (tomato short variety, onion and okra) and 5 or more times (tomato tall variety)

6. Spraying Program

Use of the recommended right chemicals in pests and diseases control focusing on the IPM (integrated Pests Management) methods

- For tomatoes and onions crops spraying, must be done 3 times (at germination, within 5- 7 days after transplanting and at flowering stages)
- For okra crops spraying, must be done 2 times at germination and at flowering stages

GAP: at least 3 pesticide applications for tomato and onion and at least 2 pesticide applications for okra

B. <u>PULSES</u>

1. The use of Improved Seeds (seed selection and sorting before planting)

The use of improved seeds before planting

GAPS

- *Newly obtained from recommended agriculture institutions (e.g Naliendele, Ilonga, ASA etc.) or through agricultural district staff*
- *OR Newly obtained the certified seed from VBAs in 2016*

2. Intercropping

In pulses, intercropping is only for pigeon peas which will help in increasing the income per unit area and food security

GAPs

- *Intercrop with only one crop - either Maize or sunflower*

3. Spacing

Definition: The use of correct spacing depending on each selected crop

GAPS

- *Pigeon Peas; 60cm plant to plant and 80-100cm row to row*
- *Cowpeas; 20-45cm plant to plant and 60cm row to row*
- *Green gram; 30cm plant to plant and 60cm row to row*

4. Spraying program (spraying during flowering)

Spraying especial during the flowering stage to protect the crop against pod weevils and fruit flies which lays their eggs insides the pods during the flowering stage.

- Use of pesticide at germination (10-15 days after the emergence of crop)
- Use of pesticides at flowering (this is the crucial stage)

GAP: The recommended GAP is to use pesticide at flowering stage at least. Can use at other times too.

5. Threshing & drying

During the threshing and drying the use of protected materials which will prevent admixing with chaffs and external materials

- The bare ground
- Cement floor
- Plastic sheet
- Canvas sheet
- Woven or bamboo mat

GAP

Is to use any of the mentioned above when threshing

C. <u>POULTRY</u>

1. Brooding

(The use of controlled brooding method of raising chicks for one month) this will help to reduce the chick's death rate which likely happen through accidents, predators, harsh weather etc.)

GAPS

- *For natural system: Have a separate area/room where the hen stay with its chicks for more than one month and provide the food and water everyday*
- *For Artificial system: Have a separate area/room where the chicks stay alone for more than one month with provision of heat, food and water every day*

2. Vaccination

- the use of vaccination program against infectious diseases ND, IBD, FP and De-worming

GAP

- *for chicken, at least once in a year and twice in a year for chicks*

3. Feed Supplement;

Providing feed supplement with a balance diet nutrient for chicks and chicken

- The required feed is those bought from VBAs, Maize/rice bran from millers plus home made

GAP

- *A farmer should provide any additional food supplement to chicken at least 4-7 days per week*

4. Record Keeping

Poultry keepers are encouraged to have a specific document/book for record keeping of their chicken. This will help a farmer to know all the expenses, time interval and production volume. It should consider the following information;

- feeding
- vaccination
- mortality
- egg production
- selling records
- de worming

GAP

All the mention information is required; hence the GAP will be for those with at least 4/6 mentioned.

The recent discovery of huge oil and gas reserves in Tanzania has created a new opportunity for economic growth and development of the country. Tanzania is expected to be one of the leading producers and exporters of natural gas in the coming decade. However, 88 percent of poor Tanzanians live in rural areas and two-third of the labour force is engaged in agriculture. For the extractive industry to serve as a catalyst for economic growth and poverty reduction, it has to be integrated with the rest of the economy through forward and backward linkages. One such linkage is food supply from agriculture. The projected boom in the extractive industry will open up new market opportunities for farmers to supply food items for high value buyers such as caterers, restaurants, supermarkets and processors. However, to benefit from rapidly expanding high-end food markets, farmers need to have both the capacity and the incentives to supply their produce at the desired quantity and quality. Currently significant portion of the new demand is already being filled by imported goods. This report discusses the opportunities for and challenges of integrating farmers into high-end food markets.

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