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Nairobi, Kenya ... The contribution of the agricultural sector to overall economic growth and food security in Kenya cannot be overemphasized. The sector is a key driver of economic growth and is the economic pillar of the Kenya Vision 2030. Currently, the sector contributes about 27% of the Gross Domestic Product (GDP) and about 80% of farmers in the country are smallholders. In Kenya, smallholder farmers account for about 75% of agricultural production. The main challenges affecting their production are climate change and variability, increasing land constraints, limited access & high costs of key inputs, poor access to agricultural information and other services, changing service delivery structure occasioned by devolution among others.

To address the challenges facing smallholder farmers occasioned by policy gaps in the agriculture sector, Tegemeo Institute continues to conduct research to provide evidence-based options to inform policy formulation. Currently, the government has launched a number of interventions to address existing and new challenges and transform smallholder agriculture, such as: input subsidy programs, large scale irrigation e.g. Galana Kulalu food security project, climate smart agriculture programmes, innovations e.g. the e-Extension programme, land reforms & policy e.g. the minimum and maximum land holding law among others. Our latest research findings, which we are releasing today, give evidence on the effects of some of these programs on smallholder agriculture. They address the issues of **Land Scarcity, Climate Change, Input Intensification, Crop Insurance, Subsidy Programs, Extension services** and **Devolution** and aim to address:

Firstly, on **devolution of agricultural services to county governments**, we carried out our study covering 16 counties in four regions; Western, Rift Valley, Central and Eastern regions. We collected qualitative data through key informant interviews to CECs, COs and CDAs, using a semi-structured checklist. We also obtained quantitative data from secondary sources and the Institute's TAPRA Survey, 2014. Our major objectives were to establish how the sector has adjusted after devolution of majority of the services to county governments, draw lessons by documenting best practices in counties, identify the challenges and opportunities facing the sector, and evaluate the level of financing by county governments. Our study finds that devolving majority of the functions to county governments provided a

great opportunity to transform smallholder agriculture. Smallholder farmers have an opportunity to participate in planning and identify priorities that are centered in respective counties. We find that county governments had taken up a number of projects from the national government, put in place planning and budgeting processes and overall allocated more funds to the sector at the county level than was previously allocated in the decentralized system. However, county governments face key challenges: (1) The transition process was mismanaged leading to current confusion on mandates between the two levels of government (2) the planning and budgetary processes are weak. (3) There is poor coordination between county and national governments and among county governments. (4) There are human resource challenges ranging from understaffing to poor motivation. (5) The level of funding is unlikely to be adequate given the increased mandate for the sector at the county level. In addition, the level of participation in planning among smallholder farmers is low. We, therefore, recommend: (i) Need to clarify functions that have been devolved, and prepare county governments to take over functions that are yet to be fully devolved; (ii) Improve coordination btw county and national governments and among county governments; improving communication channels and operationalize institutions charged with coordination between the two levels of government; (iii) Strengthening planning & budget making processes at the county level; (iv) Build and develop capacity at the counties for effective discharge of functions; (v) Address the human resource challenges at the county level; (vi) Increased funding to the sector at the county to cater for increased functions at the county level; and (vii) there is need to county governments to purposely target improving smallholder farmers participation in planning.

Secondly, **Climate Variability and Change** have adversely affected this sector and it's expected to worsen in the future. We estimate the effect of climate variability and change on crop production and on maize and tea separately. Findings show that crop revenue including that from tea and maize are significantly affected negatively by persistent climate variability and change. However, long-term effects of climate change on crop yields are larger than short-term effects, thus farmers need to adapt effectively to reduce the latter effects to build their resilience. Additionally, findings also show that in Kenya, temperature as a contributor to global warming has higher effects on crop production than rainfall. Climate change will adversely affect agriculture in 2020, 2030 and 2040, with greater effects in Kenyan tea sector if nothing is done. Therefore, it is necessary to rethink about the likely harmful effects of climate change in the future and integrate it into agricultural and environmental policy formulation processes in the country. Given that human activities are the major drivers of climate change; it is necessary to invest in adaptation measures at national, county and farm level, especially in the tea growing regions as a way of building farmers' resilience.

Thirdly, on **Crop Insurance**, risk and uncertainty are integral components of agricultural production in Kenya since majority of farmers depend on rain-fed farming systems. This implies that weather conditions will have direct influence on agriculture productivity and overall performance. Mitigation of these risks is, therefore, becoming a priority in reducing income loss and enhancing smallholders' well-being. With growing concerns about impact of climate change, crop insurance – though not a new concept – has gained recognition and

support from public and private institutions as an important risk management tool. This research presents crop insurance experience with Kenyan farmers with a view of contributing to the body of knowledge on ways of making crop insurance work for smallholder producers. Results suggest that awareness and training on crop insurance, density of automated weather stations and ownership of savings account are integral factors in enhancing its uptake

Fourthly, **Irrigation Development** is one strategy the government can use to improve food security in Kenya. Lessons from irrigated maize production studies show that it is profitable and that Galana Kulalu food security project has the potential to produce about half of the country's food requirement, contribute significantly to household food security and incomes and the GDP through the incomes earned. However, high costs due to inefficient use of fertilizer, water and land are the major cost factors that have caused doubts and low level engagement in irrigated maize production. Political economy issues such as irrigation governance conflicts between the county and national government, procurement flaws, changing project costs and non-inclusive investment prioritization also contributed to low yields and high investment costs. To increase food production for food security and improved household welfare, we recommend increased research to develop highly productive technology, farmer training to enhance their ability to adopt and use the new technology efficiently, empowerment of water user associations, participatory investment prioritization and harmonization of the roles of the county and national government in irrigation development.

Fifth, Kenya joined the ranks of sub-Saharan African (SSA) countries implementing a targeted input subsidy program for inorganic fertilizer and improved seed in 2007 with the establishment of the **National Accelerated Agricultural Inputs Access Program's "Kilimo Plus" initiative**. Implemented from 2007/08, Kilimo Plus aimed to provide 100 kg of fertilizer and 10 kg of improved maize seed to resource poor smallholder farmers with the goals of increasing access to inputs, raising yields and incomes, improving food security, and reducing poverty. But did the program achieve its goals, and what are the lessons learned from Kilimo Plus and other targeted input subsidy programs (ISPs) in SSA for the design and implementation of future county-level input policies and programs in Kenya? Results suggest that, despite replacing what would have been commercial fertilizer purchases by farmers, Kilimo Plus did substantially increase maize production and reduce poverty gap and severity of recipient households. Moreover, the program's positive effects are somewhat larger than those of targeted ISPs in Malawi and Zambia. Much of Kilimo Plus's relative success vis-à-vis the Malawi and Zambia programs is likely due to its effective targeting of relatively resource-poor farmers and its implementation through vouchers redeemable at private agro-dealer shops. Given that ISP design and implementation have significant implications for program impacts, it is important to ensure that official and effective (in practice) targeting match in order to maximize impacts. Prioritizing use of existing private-sector input distribution mechanisms will encourage private sector participation and reduce distortionary effects of subsidy on private fertilizer market. Also, the country needs to have a more holistic approach to improving production and sustainable intensification by increasing complementary public/private investments in improving soil health and in

research, extension, irrigation, transport infrastructure, information, as well as affordable and appropriate innovations and technology. Findings from this study can provide useful lessons for design and implementation of other programs such as the County-run farm input support programmes.

Sixth, we conducted a study to identify **the Role of the Off-farm Sector** as a way out of poverty in rural development strategies. Rural households diversify to off-farm sector either because of push or pull factors. The study found generally high off-farm work shares of 31 to 67% in total household income across all types of households. OFW is also increasing overtime and across income groups. Households engaged in OFW have significantly higher total household incomes and lower crop shares. In general, households engaged in OFW have relatively low use of fertilizer on three crops (maize, tea and vegetables). The effect on fertilizer use differs by crop with negative effects observed in maize and vegetables and positive ones in tea. Accounting for timing of OFW however, the effects on fertilizer use on maize are positive and complementary, alluding to a possible reinvestment of off-farm earnings in fertilizer use by maize farmers. The high OFW shares in low agricultural potential areas may be a possible sign of structural transformation in these rural economies. It also implies a possible entry point in reaching these disadvantaged households. It is therefore important to factor OFW in the overall strategies of transforming smallholder agriculture and reducing rural poverty considering the interactions between the farm and off-farm sectors. Such include a need for investments in growth of rural economies.

Seven, how can the agricultural sector achieve this transformation in the face of the **Increasing Land Constraints**? Part of the studies conducted by the Institute indicate that since most agricultural production is by smallholder farmers, a smallholder-led strategy holds the best prospects for economic development in Africa. However declining arable land per household in agriculture in the context of unsustainable intensification has serious implications for smallholder led agricultural transformation. Given the different rural-urban-rural migration dynamics in Africa and consequent phenomenon of 'emergent' farmers, the Asian model may not be replicable in Africa. Unlike in the Asian green revolution model, a one-way directional farm to off-farm employment may not generally apply in Africa. In choosing appropriate land policies, production efficiency while relevant, should not be the only factor in guiding agricultural and land policies. Other aspects like scale with the largest multiplier and employment effects, scale with the highest marginal propensity to consume are important considerations. It is also important to assess how supportive the land allocation and agricultural policies are to smallholders.

Eight, **Agricultural Extension** is an important tool for disseminating information to farmers, and has been highlighted as critical agent for transforming subsistence farming to modern and commercial agriculture, thereby improving household food security, incomes, and reducing poverty. However, prolonged underinvestment in agricultural extension has led to very low coverage, especially after the government, which was the main service provider, scaled down its involvement in national economies. This has therefore given rise to coexistence of multiple extension service providers to fill the gap. This study sought to examine the level at which farmers are accessing extension information from the available

sources, the factors influencing farmers' preference of particular information sources, and the effect of these choices on farm productivity. We use a cross-sectional household survey data collected in 2014 by Tegemeo Institute in collaboration with Michigan State University (MSU) under the Tegemeo Agricultural Policy Research and Analysis (TAPRA) II project, where a total of 6,512 households from 38 counties were interviewed.

Our results show that the three major sources of agricultural information in Kenya are; Public (Government extension agents, Research organizations), Private nonprofit (Non-governmental Organizations, Farmer Organizations, Community based organizations, other farmer) and private for-profit (Private firms, processing and marketing enterprises among others). However, farmers' preference of any source is significantly influenced by a number of socio-economic characteristics. Moreover, despite the existence of multiple information sources, only about 21% of the sampled households are accessing agricultural information in Kenya. This is relatively low considering the large number of farmers in need of such information. In addition, although the public extension system has overly been criticized for its inefficiency, our findings indicate that this is dependent on the enterprise in question. Efficient delivery of quality and relevant extension services can be realized through increased investment in extension and strengthening the modalities for coordination between public and private ESPs. Moreover, adoption of effective dissemination channels is necessary to increase coverage.

These studies use the following datasets: TAPRA Panel Survey Data, TAPRA Household survey 2014, additional/specific data, value chain analysis, cost of production/profitability and other secondary information.

For further assistance, or if you would like to conduct further interviews with any of the authors, please contact: Judy Kimani, 0720 96 33 48, jkimani@tegemeo.org.

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