



Role of Disruptive Technologies in Enhancing Agricultural Productivity and Economic Performance in Kenya

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Background and context

Emergence of disruptive technologies has been associated with firm innovativeness, job creation and overall economic growth in various economies across the world. However, inability to adapt to disruptive technologies also leads to firm market exit resulting in job destruction, decline in incomes and or increased inequalities. Kenya has experienced major developments in technology innovations in the last 3 decades and various sectors in the economy have potential to benefit from adopting technology. Kenya is at the forefront of technological innovations and is often referred to as the ‘Silicon Savannah’ of

Africa. Disruptive technologies in Kenya are characterized by fast internet connectivity, ICT infrastructure investments, value added services, mobile money, and mobile banking services, among others. Kenya's ICT sector therefore remains a key enabler to economic growth, resilience and overall economic performance across Counties; and have the potential to help address socioeconomic inequalities across the Country. The study focused on the nature of disruptive technologies in Kenya with specific focus on agriculture and related ICTs; and their potential to support sustained economic performance. Disruptive technologies in agriculture consist of digital and technical innovations that enable farmers and agribusiness entrepreneurs to leap from current methods to increase their productivity, efficiency, and competitiveness, thereby facilitating access to markets, improving nutritional outcomes, and enhancing resilience to climate change while contributing to sustained economic growth.

The agriculture sector faces such challenges as inadequate ICT literacy skills which hinder uptake of disruptive technologies, inadequate ICT infrastructure, unreliable supply of electricity and poor network coverage (World Bank, 2020). Although the country has made substantial achievements in terms of technology in the ICT and financial sectors, more need to be done especially in the ICTs, agri-business and ICT skills enhancement sectors for enhanced uptake of disruptive technologies. In the past, the country attempted to implement several efficiency and productivity-enhancing technologies, programmes and projects at household level. Examples of such projects and programmes include: the Kenya Agricultural Productivity Project (KAPP), the National Agriculture and Livestock Extension Programme (NALEP), the Agriculture Sector Programme Support (ASPS) and the National Accelerated Agricultural Inputs Access Programme (NAAIAP). Despite this attempt the rate of technology adoption in agricultural sector still remains low (Republic of Kenya, 2007). Improved technology uptake will result into increased sector efficiency and productivity leading to the economic growth and increased opportunities.

Many African countries' economies largely are driven by agricultural development in a mutually reinforcing way. The agricultural sector provides 80 per cent of the livelihoods, creates employment to about 60 per cent of the people and 63 per cent of the rural households derive their incomes from agriculture (Medium Term Plan-MTP, II, 2012-2018). In addition, the sector accounts for 65 per cent of the export earnings. The sector is also the main driver of the non-agricultural economy including manufacturing, providing inputs and markets for non-agricultural operations such as building/construction, transportation, tourism, education and other social services¹. Further, smallholder production systems are heterogenous in terms of production systems and vulnerable to climate variability, land degradation soil erosion and a decline in soil fertility. This heterogeneity leads to distinct agro-ecological zones, with unique production techniques, challenges, and opportunities for investment.

1 <https://www.fao.org/kenya/fao-in-kenya/kenya-at-a-glance/en/>

Disruptive technologies constitute of innovations that significantly alter the way that consumers, industries, or businesses operate. A disruptive technology sweeps away the systems or habits it replaces because it has attributes that are recognizably superior (Downes, 2013). Examples of recent disruptive technologies include e-commerce, mobile money, online news sites, ride-sharing applications, blockchains and Geographical Positioning Systems (GPS), among others. Previously, automobile technologies, electricity service, and television constituted examples of disruptive technologies (Smith, 2020). With disruptive technologies, new firms may emerge as risk-taking companies recognizing the potential to innovate new products and risk-averse firms may adopt the emerging technologies; new jobs are created while contributing to job creation, better incomes, low poverty and expansion of economic activities. On the other hand, companies that totally fail to adopt to changing business environment may risk exiting the market while contributing to job destruction, decline in incomes and or increased inequalities and hence increased population requiring social safety nets.

Further, the Government of Kenya (GoK) has invested heavily in the broadband sector. There are currently four undersea fiber optic cables that land off the coast of Kenya, namely SEACOM, TEAMS, EASSY, and LION2, which are the core drivers of the heavy fixed internet penetration in the country making it one of the highest, fastest, and most reliable in the region. Kenya is a regional leader in terms of internet connectivity, general ICT infrastructure investments, value added services, mobile money and mobile banking services.

State of disruptive technologies in agriculture

The policy brief examined the disruptive technologies adaptation and economic performance in Kenya with focus on Agriculture and ICT sectors. The study used data from KNBS for the period 2000-2019. The study determined the effect of disruptive technologies on agricultural productivity and effect of ICT technology on economic growth. Findings from the study indicate that farm inputs such as fertilizer, certified seeds, chemicals/pesticide use, manufactured feeds and fuel power contributed to increase in agricultural productivity. With increased productivity in the agricultural sector, it is accompanied by the expansion of the sector hence leading to increased food nutrition and security as set out in the government Big 4 Agenda. Other important factors that increase farm productivity are use of irrigation techniques and on-farm training or extension services. Extension services enhances farm productivity through the expected improvement in farm operations and management practices; improved adoption to any new technology and innovation, better crop varieties, changing technologies, ecological and economic environment; and contributes to improving the quality of farm labour.

On assessing information communication technology (ICT) use, the volume of transactions by cards had a positive and significant influence on the growth of gross domestic product (GDP). This means that the more transactions are done in the country the more the GDP will increase leading to the general growth of the economy. Mobile phone was identified as the most common method of connecting to the internet. This is attributed to the high ownership of the mobile phones thus providing an easy connection method without the need of other additional devices. A spatial analysis shows that urban counties such as Nairobi, Mombasa, Kiambu, and Kajiado have a high correlation between the ownership of mobile phones and desktops. On the other hand, counties in the arid and semi-arid lands showed low correlation between the ownership of mobile phones and desktops.

Implications for policy

Government has made major strides in promoting the adoption of technology in the agricultural sector. Examples of such attempts include the introduction of programmes and projects such as Kenya Agricultural Productivity Project (KAPP), the Agriculture Sector Programme Support (ASPS), the National Agriculture and Livestock Extension Programme (NALEP) and the National Accelerated Agricultural Inputs Access Programme (NAAIAP). However, these programmes did not yield the expected results as the adoption and use of technology in the agriculture sector remain low. To realize success in the adoption of technology in the agricultural sector, it is important to pursue partnerships with private sector and non-state actors to mobilize long term ICT infrastructure development across all the Counties. Further digital sector investments should be matched with enhanced investments in training, digital literacy, building communities of learning and innovations. Policy measures for agribusiness transformation include affordable and reliable access to internet, digital technologies, mobile finance, internet-supported training, e-marketing and strong local ICT services that support innovations and transformative ecosystems. In particular, adaptation of disruptive technologies can be enhanced through the following interventions.

- (i) Given the fact that the vast land of Kenya is either arid and or semi-arid, the government through the ministry of agriculture, livestock and fisheries need to offer sustainable provision of extension services to the farmers and training on adoption of appropriate technology in agriculture related activities.
- (ii) Government through the ministry of agriculture, livestock and fisheries to ensure use of modern farming methods, key among them use of fertilizers at subsidized rates, certified seed and irrigation.

- (iii) Through collaboration between Ministry of Agriculture, livestock and fisheries and that of ICT, youths need to be trained and supported to come up with innovations promoting modern agricultural farming technologies.
- (iv) Government through the National Treasury and National planning and that of Agriculture, livestock and fisheries to give more credits to the farmers and business-persons so that it can support their farming activities and businesses.
- (v) The government will need to work towards creating awareness of farmers on the disruptive technologies in agriculture. This will have a huge impact on the economic growth and ensure food security.

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