

Towards Realization of Vision 2030

KENYA POLICY BRIEFS

January 2021

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ABOUT

The Kenya Policy Briefs presents translations of research results from universities and research institutes for a policymaker and media audience. It targets those who formulate or influence policy. The briefs seek to provide evidence-based, high quality, and practical policy recommendations directly addressing issues under each objective of Kenya's Vision 2030 Medium Term Plan III as shown in the table. In each issue, the briefs are categorized into five series each addressing one of the five core components of Vision 2030:

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Published twice times a year (January and June) by the University of Nairobi, **Kenya Policy Briefs**, provides a convenient platform for researchers worldwide carrying out research impacting on policy-formulation in Kenya to directly disseminate their research findings and policy recommendations to the right audience. Each issue shall be freely available in hard copy and online. Approximately 500 hard copies shall be printed and distributed across Government and to media houses.

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CONTACT

Kenya Policy Briefs
 Office of the Deputy Vice-Chancellor,
 Research, Innovation and Enterprise
 University of Nairobi
 P.O. Box 30197-00100, Nairobi, Kenya
 +254 (020) 33318262
kpb_submission@uonresearch.org

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Series 1 – Economic Pillar: Tourism

Impact of COVID-19 on Tourism in Kenya: Strategies for Recovery

Tom G Ondicho

Key Messages

The global spread of the coronavirus (COVID-19) has had a devastating effect on Kenya's tourism economy. The crisis calls for policy responses, comprehensive re-opening and recovery plans, and enforcement of all health protocols for safe travel. The future of Kenya's tourism looks bleak because of uncertainty on how long COVID-19 and its cascading impacts will last.

Context

Tourism in Kenya is a major contributor to the economy accounting for approximately 11% of GDP, 27% to foreign exchange, 19.2% of export earnings, and 12% of total wage employment (GoK, 2019). Because of its potentials, tourism has attracted massive direct government and foreign investments with multiplier effects in other sectors along its value chain, including hospitality, transport, hotel, accommodation, and auxiliary businesses (Ondicho, 2018, KIPPRA, 2019). Kenya has earmarked tourism as a key pillar for the achievement of Vision 2030 and Sustainable Development Goals (SDGs). In 2019, tourism earned Kenya Ksh.163.6 billion from 2.035 million international tourist arrivals and was projected to grow by more than 10% (KNBS, 2020). However, the outbreak of COVID-19 and its cascading impact on global travel has brought the industry to a virtual standstill (Iranu, 2020).

COVID-19 is a novel infectious disease that has rapidly spread across the world since December 2019 when it was first detected in Wuhan, China. The WHO has declared it a pandemic and Public Health Emergency of International Concern (PHEIC), and as of August 16, 2020, there were 21,613, 699 confirmed cases and 768,958 fatalities worldwide (WHO, 2020). Kenya reported its first case on 15th March 2020 on a traveller from the USA. Despite limited testing, as of August 16, 2020, infections had risen to 28,848 and deaths to 472 (MoH, 2020). Kenya has imposed an array of prevention measures, including a lockdown, ban on air travel, social distancing, hand hygiene, cessation of local travel, nationwide curfew, testing, contact tracing, quarantines, working remotely, closure of learning institutions, businesses, services, and public spaces.

Many tourists have cancelled their trips to Kenya in response to global travel restrictions due to COVID-19. Plummeting demand has triggered a crisis that is being felt throughout the entire tourism ecosystem. Most tourist activities and businesses have been closed and others are operating at a lower level, resulting in massive revenue and job losses. Whilst tourism has proven to be resilient to shocks, including terrorism, violence, natural disasters, economic recession, and pandemics, none of the disruptive events has ever had such a phenomenal impact on the world's economy, especially the tourism economy as COVID-19 (UNWTO, 2020).

The impact of COVID-19 will most likely last longer rendering the future bleak and the road to recovery is uncertain, but much will depend on appropriate policy stimulus to mitigate the effects of COVID-19 and kickstart a rebirth of Kenya's tourism industry.

Approach and Results

The study was conducted among dairy goat. This policy brief is based on a qualitative study conducted among Maasai communities around Amboseli national park in Kajiado County of Kenya. The study assessed the contribution of tourism to poverty alleviation (cf. Ondicho, 2016; 2018). Field data is complemented with current information from secondary sources, including journal articles, web sites, UNWTO statistics, government data, newspapers, and blogs.

Impact on Arrivals: The number of tourists has, since mid-March when the first case of COVID-19 was reported in Kenya, sharply declined due to restrictions on global air travel to reduce COVID-19's spread. Anecdotal forecasts suggest that Kenya will record negative growth in visitor arrivals in 2020, as its major source markets, including USA, UK, India, China, Germany, France, and Italy are among the most affected by COVID-19 and are still on lockdown, curtailing tourists from those countries and others from travelling to Kenya for holidays.

Impact on revenues: The drop in arrivals will have a negative effect in terms of declining income and rising unemployment in Kenya. Tourism generates direct revenues through taxes on incomes from tourism businesses and employment, departure taxes, and levies on tourists such as park entry fees and indirect revenues through taxes and duties levied on goods and services supplied to tourism, and multiplier effects on the industry's value chain. These streams of revenue have nosedived because tourists are no longer coming and domestic tourism has been curtailed due to COVID-19. Available data suggests that as of July 2020, Kenya had lost Ksh. 80 million in tourism receipts and will likely lose Ksh. 85 billion in 2020, if COVID-19 is not contained.

Impact on employment: The rapid growth of tourism in Kenya has generated a host of employment opportunities. In 2019, all tourism establishments directly employed 1.6 million and thousands of others in tourism's supply chain of goods and services. However, due to COVID-19 businesses have lost 60-80% of sales in tourism, forcing some to close or scale down. As a result, thousands of employees



in tourism have either been sacked or sent home on half-pay/unpaid leave due to COVID-19. The World Travel and Tourism Council (WTTC, 2020) projects that roughly 750,000 jobs in Kenya's tourism industry might be lost in 2020 due to COVID-19.

Impact on attractions: Kenya is a land of contrast with a multiplicity of tourist attractions including sand coastal beaches, rich biodiversity, beautiful scenery, interesting wildlife, and rich socio-cultural heritage of its people. However, 90% of tourists come to Kenya for the superb opportunities for wildlife viewing. Revenue from wildlife tourism is important in funding biodiversity conservation, wildlife security, livelihood programs, and employment for community members. Revenue sharing arrangements between KWS and local communities and dividends paid to landowners from tourism income garnered in community conservancies serve as important incentives for sustainable environmental practice. However, with wildlife tourism not generating any revenues, KWS has suspended revenue sharing, conservancies are unable to pay dividends, and local people have lost jobs leading to economic hardships. This is likely to lead to increased wildlife poaching, illegal grazing, unsustainable land-use patterns including charcoal burning, thus reversing the gains made in conservation over the past decades.

Impacts on hotel and accommodation sector: The KTB reports that hotel accommodation was 80% fully booked before the outbreak of COVID-19. However, the detection of the first cases in the country and subsequent imposition of stringent containment measures triggered many tourists to cancel their hotel bookings, forcing many hotel and accommodation establishments to either close or operate at lower levels. Hotels that have closed include the InterContinental Hotel, Norfolk Hotel, Weston Hotel, DusitD2 Hotel, Enashipai Resort Spa, Sopa Group of Lodges (Amboseli Sopa Lodge, Lake Nakuru Sopa Lodge and Maasai Mara Sopa Lodge), Ole Sereni, White Rhino in Nyeri, and Maiyani in Nanyuki and Serena Chain of Hotels (Mara Serena Lodge, Amboseli Serena Safari Lodge, Lake Elmentaita Serena Camps, Kilaguni Serena Safari Lodge, and Serena Mountain Lodge). This has triggered massive financial losses and over 90% of hotel employees have either been laid off or put on furlough closures because these establishments are not receiving income due to COVID-19. Hotels that have laid off staff include Villa Rosa Kempinski, Mayfair, Norfolk, InterContinental, and Serena Chain of hotels.

Impact on transport: No destination can survive without airlines, railways, and other means of transport to enable tourists to get there. The suspension of international air travel, forcing many tourists to cancel their flights, has pushed airlines into severe financial strain. Irandu (2020) reports that Kenya Airways will

handle 2.5 million fewer passengers in 2020, resulting in US\$ 0.54 million revenue loss, risking 137,965 jobs, and US\$ 1.1 billion contribution to the national economy. Kenya Airways reports that it is losing US\$ 8 million monthly and as a result, it is implementing cost-cutting strategies, including firing 40% of its staff to reduce losses.

Policy Recommendations

Short-Term

- The government needs to provide guidelines for re-opening, adapting, and accessing tourist markets; work with tourism operators to access liquidity supports; apply health and hygiene protocols for food safety, safe travel, and the safety of staff, clients and public; and enforce measures to prevent, manage, and mitigate the spread of COVID-19.
- The government can provide tax breaks and concessions on operational licenses to all tourism establishments, request commercial banks to freeze payment of loans and interest and, make access to credit easier for all investors in the tourism industry and its value chain.
- The government can consider an economic support package to compensate tourism operators for loss of revenues, to enable them to pay salaries, and retain their employees during the entire COVID-19 period, to enable tourism-related businesses to remain afloat.
- The government can list, feature and promote local tourism businesses social media and website channels of the Ministry of Tourism and Wildlife, Kenya Tourism Board, Kenya Wildlife Services and departments that relate to the tourism industry and its value chain.

Medium-Term

- The government needs to formulate friendly policies to support tourism's recovery, prepare comprehensive tourism recovery plans, rebuild destinations, promote partnerships, and coordinated collective approaches, encourage innovation and investment, and regularly monitor progress.
- Tourism operators need to show strong creative, innovation, and resilience skills by formulating new business models and entrepreneurial ideas for products and sales to help the sector mitigate the impact of COVID-19 and to rebuild a sustainable tourism industry.
- Restoring traveller confidence and stimulating demand with new safe and

clean labels for the sector and concerted promotion campaigns

- including discounted tours on social media, online and other channels for both international and domestic tourists.
- The government can waive all taxes and other statutory payments for two financial years (2020-2021) and provide tax breaks to tourism establishments in 2020/2021 season to allow them to rebound.

Acknowledgements

This policy brief is an offshoot of a previous study by Tom Ondicho in 2015 entitled: "The contribution of Tourism to Poverty Alleviation in Kenya", which was funded by the Deans Committee, the University of Nairobi in the 2014/2015 cycle

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Authors

Tom Gesora Ondicho
tondicho@uonbi.ac.ke
Institute of Anthropology, Gender and African Studies
University of Nairobi
P. O Box 30197, 00100, Nairobi, Kenya



Series 1 – Agriculture and Livestock – Innovative, Commercially- oriented and Modern Agriculture and Livestock Sector

Investment in Technologies: Key Strategy for Postharvest Loss Reduction

Esther Mujuka, Prof Jane Ambuko, Prof John Mburu and Prof Ackello Ogutu

Key Messages

The government is supporting smallholder producers to form commodity associations and producer business groups to facilitate production and marketing. Smallholder farmers lack access to requisite technologies to aggregate and process high-quality products that meet the target markets' standards. Investment in postharvest technologies is viable when many adopted by farmers or farmer groups and discount rates are low. There is a need to promote proven low-cost innovative postharvest technologies to ensure market access and reduce postharvest losses.

*Images Source: Authors
Tunnel Solar Dryer*

Context

The horticultural sector befits smallholder farmers due to low land and labour requirements. In Kenya, mango is one of the major fruits, second only to banana (HCDA, 2017). Kenya exports a paltry 2% and less than 10% is processed. The consistent increase in mango production has been coupled with an increase in postharvest losses (PHL) estimated at 40-50% (KARI, 2004). Concerted efforts and commitments to reduce PHL exist. Under the Sustainable Development Goal 12.3 and the African Union's Malabo Declaration of 2014, there is a commitment to halve postharvest losses from the 2015 levels by the year 2030 and 2025, respectively. Apart from increasing food reserves, elimination of PHL in fruits alone could raise domestic horticultural revenue by 17%, pitching the fruit sub-sector ahead of the vegetable and floriculture sub-sectors that are currently the highest revenue earners in the horticultural sector.

Historically, horticultural research has focused on increasing productivity. However, given the inelasticity of scarce resources, there is a consensus that the focus should shift to PHL reduction. The high postharvest losses occur due to poor postharvest handling, lack of storage technologies, lack of processing facilities, and poor market access. Developing cold chains is critical in PHL

reduction in horticulture. However, conventional cold storage facilities required for proper cold chains are expensive and not applicable in most rural areas due to lack of electricity. Most households (>80%) in rural Kenya have no access to electricity making it untenable and costly to invest in cold storage facilities (GoK, 2008; Shitanda et al., 2011).

Consequently, the lack of cold storage facilities to aggregate the perishable produce and negotiate for better prices predisposes the smallholders to exploitation by middlemen. Globally, applicable off-grid cold storage and processing technologies exist. However, their adoption in Kenya is limited due to a lack of awareness and demonstrated benefits. It is against this background, that the University of Nairobi's postharvest project, with support from the Rockefeller Foundation's YieldWise Initiative, sought to upgrade two fruit aggregation centres. Low-cost technologies including zero-energy brick coolers, evaporative charcoal coolers, and tunnel solar dryers were provided to create awareness and demonstrate their practical application. However, little is known about their economic impact in Kenya, hence this study.

Approach and Results

The return on investment (ROI) for the PH technologies was estimated using Cost-Benefit Analysis. The cost of implementation of the technology by



farmers was estimated from the cost of experiments that were set up in the study area. Embu County was purposively selected since an earlier project (YieldWise) had been implemented there to ensure proper agronomic practices to reduce preharvest losses. Extension activities enhance knowledge of the technologies among the farmers. The annual cost of extension was also estimated.

The economic surplus model was employed to estimate the potential benefits of investing in PH technologies to both producers and consumers. The economic surplus model measures the total gain in economic welfare (change in total surplus) and is a function of the gains to both producers and consumers due to the expected increase in supply owing to technological advancement. The total gain in economic welfare is a function of the elasticity of supply and demand, yield, price, cost of current postharvest management practices/interventions, expected yield increases, success rate, and the depreciation rate. The relevant data were collected from a household survey in Embu, secondary data, and expert opinion which was sought from researchers, scientists and extensionists.



Figure 1 - Mango fruits stored in a Charcoal Cooler



Figure 2 - Mango fruits stored in zero-energy brick cooler



Figure 3 - Mango fruits processed in a tunnel solar dryer

Results and Conclusions

Producers are willing to pay for postharvest technologies. Results revealed that 81%, 56%, and 51% of the farmers were willing to pay for charcoal coolers, brick coolers, and tunnel solar driers, respectively. Most respondents (80%) expressed a willingness to pay for more affordable charcoal coolers. About half of the respondents expressed willingness to pay for brick coolers, and tunnel solar driers.

Investing in postharvest technologies is worthwhile. The Net Present Value (NPV) of the research was US\$ 1.29 billion, with an Internal Rate of Return (IRR) of 28% and a Benefit-Cost Ratio (BCR) of 4:1. The positive NPV implies that the proposed investment has fairly attractive returns given the cautious assumption made on the annual 1% adoption rate and a maximum adoption rate of 10% in 10 years. The estimated IRR exceeded the market rate of 10% implying that investing in the PH technologies has the potential of yielding higher returns than investing the same capital on alternative investments. A BCR of 4:1 means that the investor can expect \$4 in benefits for every \$1 in cost. Producers are expected to gain from the higher marketable produce resulting from both the saved fruit and the existence of advanced postharvest technologies for storage and processing. Consumers are expected to gain from lower produce prices due to an increase in supply.

Policy Recommendations

Short-Term

- There is a need for concerted efforts to create awareness and promote low-cost cold storage and small-scale processing PH technologies. Returns to investment in PH technologies highly depend on adoption decisions by the farmers.
- The profitability of PH technologies is higher at lower interest rates. Thus there is a need to stabilize interest rates
- Short term price subsidies and/or tax exemption on fabrication materials are recommended for the zero energy brick coolers and tunnel solar driers that are more efficient but expensive and which fewer farmers were willing to pay for.

Medium-Term

- Enhance capacity building in postharvest management at all levels including farmers, traders, extension agents, agricultural training institutions
- Support adaptive research and innovation in locally feasible and

affordable postharvest management options

- Maintain the cost of capital at affordable rates
- Develop and implement policies that incentivize postharvest technology adoption by various value chain actors including farmers, transporters and traders
- Promote the consumption and export of dried fruit and vegetable products to create demand thereby increasing returns on investment in the technologies

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Authors

Esther Mujuka
esthermujuka@gmail.com
Department of Agricultural Economics

Prof Jane Ambuko
ambuko@yahoo.com
Department of Plant Science and Crop Protection

Prof John Mburu
john.mburu@yahoo.com

Prof Ackello Ogutu
chris.ackello@gmail.com
Department of Agricultural Economics
University of Nairobi, P.O. Box 29053 – 00625, Nairobi, Kenya.



Series 2 – Social Pillar: Environment, Water, Sanitation and Regional Development

Enhancing Our Care for the Urban Air We Breathe

Prof Nzioka J. Muthama

Key Messages

The harm caused by air pollution in Kenya's urban areas is estimated to be high but documentation is at infancy.

Air Quality Management (AQM), a pillar in green growth, is hindered by limited measurements. There is need to investment in AQM.

Coordinated systems thinking interventions are needed in AQM, institutional capacity strengthening, bolstering the legal and regulatory framework, climate change knowledge

Urban sustainability indicators are useful for policymakers to gauge the socio-economic and environmental impacts, including air quality, of policies and practices.

Context

Living in a city or a metropolitan area is a great promotion for human well-being, given its convenient mode of life and efficient way of working. This is so for Kenyan cities, Nairobi included. However, concerns are emerging from residents and scientists that the unprecedented development of cities has caused a range of environmental problems and exerts huge pressure on natural ecosystems that we rely on (UNEP, 2016; Asian Coalition for Housing Rights 2004; Muthama, 2019a). Several parts of Kenyan cities continue to experience overwhelming solid waste challenges and air pollution impacts among other environmental concerns.

The 2017 Kenya Economic Survey estimated that 19.9 million Kenyans, representing 38.3% of the population, suffered from respiratory ailments that are exacerbated by poor air quality. The 2019 Kenya Economic Survey estimated that 21.8 million Kenyan, representing 39.3% of Kenyans, suffered from the respiratory ailment, indicating a 1% increase of the ailments at the national level. This is a pointer that the air pollution problem may be increasing.

Current trends, including industrialization and urbanization, suggest that air quality in Kenya cities will worsen over time unless targeted interventions are adopted in the short, medium, and long term and the institutional and technical capacity of organizations responsible for Air Quality Management (AQM) is strengthened. The 2019 Kenya Economic Survey indicated that the total number of

environmental crimes reported to the Kenya National Environment Management Authority (NEMA) rose within the period 2014 to 2018. For example, 97 crimes were reported in 2017, rising to 156 in 2018. The increase in reporting may be attributed to the introduction of equipment for checking air quality. This further confirms the need for continuous monitoring of indoor and outdoor air pollution in Kenya.

However, the efforts by the national and county governments, to enforce existing regulations is hampered by a lack of high-quality and continuous air quality monitoring data (Muthama, 2019b). Without an understanding of the baseline air quality in Kenya and how it varies across the country as well as over time, the NEMA Standards and Regulations cannot be effectively enforced.

Study Approach and Results

The African Agenda 2063, Kenya's vision 2030 and the Sustainable Development Goal number 11 emphasises on the importance of paying closer attention to city's environmental dynamics for the well-being of its residents, the city of Nairobi included. The theoretical perspective taken for this study was based on systems theory. Systems theory states that there is a relationship between structure and behaviour. Cities are created by social systems and rely on complex networks of human-made systems to supply them. Also, this study used the approach of incorporating core concepts of urban metabolism in assessing urban system sustainability in the context of



energy and water use, with a focus on the City of Nairobi. The concept of metabolism mimics human metabolism: a process by which the human body converts what he/she eats and drinks into energy. Practically, the study of urban metabolism involved 'big picture' quantification of the inputs, outputs and storage of energy, water, nutrients, materials and wastes for an urban region.

Urban sustainability indicators were used. They are tools that allow city planners, city managers and policymakers to gauge the socio-economic and environmental impact of, for example, current urban designs, infrastructures, policies, waste disposal systems, pollution and access to services by citizens. They allow for the diagnosis of problems and pressures, and thus the identification of areas that would profit from being addressed through good governance and science-based responses. Understanding the relationship between resource consumption and the production of products and wastes is the key to understanding how urban ecosystems persist.

Satellite data is increasingly being employed to address problems arising from inadequate air-quality monitoring data. Satellite sensors such as MODIS (Moderate-resolution imaging spectroradiometer) and MISR (Multi-angle imaging spectroradiometer) can provide aerosol retrievals that are suitable for studying air pollution trends (Muthama, 2019a).

In this study, MODIS data were used. Satellite-based ariel averaged monthly data for four parameters, over Nairobi, as a case study, were downloaded from the MODIS website. Analyses and visualizations used in this study were produced with the Giovanni online data system, developed and maintained by the NASA GES DISC (Acker and Leptoukh, 2007). Sulfur dioxide (SO₂) surface mass concentration and carbon dioxide (CO₂) in free troposphere were obtained. Monthly data for the period January 1980 to July 2017, for the two parameters were collected and subjected to time series analysis.

Air pollutants that cause negative health and environmental impacts include Particulate Matter (PM), ozone (O₃), carbon monoxide (CO), nitrogen oxides (NO_x), sulfur oxides (SO_x), and volatile organic compounds (VOCs). The key pollutants analysed in this study, namely SO₂, is a by-product of burning fossil fuels such as crude oil, furnace oil, diesel, and coal. SO₂ can be transformed in the atmosphere into sulfates that appear as fine particles.

Data analysis revealed that the air quality over Nairobi has deteriorated in the period 1980 to 2017 as depicted by the temporal pattern of the SO₂. From around 1998 there is a marked increasing trend of SO₂. The annual increase is estimated at 0.08 micrograms per cubic meter (µg/m³) per year. There is a clear seasonal pattern with the December to February season

having the highest values and trend. The month of February has the highest trend of 1.09 µg/m³ per year. Apart from marked seasonality, there are also seasonal spikes which beg for further understanding as regards the well-being of the City residents. Kenya's air quality regulations (GoK, 2014) provide for an ambient tolerance limit of 50 µg/m³. This implies that in a couple of decades Nairobi will experience severe SO₂ pollution if business as usual continues. Energy waste over Nairobi in the form of SO₂ is increasing drastically. As the nation of Kenya industrialises in line with Kenya's vision 2030, the situation will only grow worse if concerted mitigating measures, by way of policy and practice, are not initiated and maintained. This calls for measures to ensure that AQM systems are operationalized across the country. Also, a systems-thinking approach in solving the problem will bear fruits (Muthama 2019b).

Analysis of CO₂, a greenhouse gas, showed an increasing trend from 1980 to 2017. The warming is likely caused by both urbanisation and human activities. This is in agreement with other studies in many cities around the world (Zhang 2013; Barnes 2009). This begs for further understanding of the sustainability of Kenyan cities under changing climate..

Policy Recommendations

Short-Term

- County Governments should make cities and urban areas more compact thus more energy efficient
- Green spaces should be created that help remove particulate matter
- Ministry of Environment and Forestry (MoE&F), together with county governments, should work towards improving urban waste management, including the capture of methane gas emitted from waste sites as an alternative to incineration
- National and County governments should create and maintain spaces for safe walking and cycling
- National and County governments and other key stakeholders should operationalize cost-effective air quality monitoring systems
- Public, Private partnership should be instituted to entrench citizen science in monitoring and reporting air quality
- Stakeholders should embrace and implement Systems thinking approach and Urban metabolisms concept in Air quality management and Governance

Medium-Term

- MoE&F should foster institutional collaboration among public officials,

researchers, private sector and civil society in advancing the use of lower-emission cookstoves and/or cleaner fuels in place of traditional household solid fuel including firewood

- Line ministries should promote the use of low-emissions fuels and renewable combustion-free power sources, such as solar, wind or hydropower
- MoE&F should strategising to move way completely from kerosene
- Line ministries and other stakeholders should improve the energy efficiency of homes and commercial buildings through insulation and passive design principles such as natural ventilation and lighting
- Set up robust Air quality monitoring systems for each urban area in Kenya
- Research institutions should pursue targeted studies to enhance our understanding and quantification of health effects of air pollution in Kenya under changing climate.

Acknowledgements

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Authors

Prof. Nzioka John Muthama
(Jmuthama@uonbi.ac.ke)
Wangari Maathai Institute for Peace and Environmental Studies,
University of Nairobi.



Series 2 – Social Pillar: Health – Equitable, Affordable and Quality Healthcare of the Highest Standards

Integration of Mental Health-Nutrition Counselling for Perinatal Women in Primary Care

Beatrice A. Madeghe, Wambui Kogi-Makau, Sophia Ngala and Manasi Kumar

Key Messages

Screening for maternal depression to be a component of service delivery during Antenatal Health Care visits and development of low-intensity mental health intervention by the Ministry of Health (MoH)

Nutritional-enhanced mental health counselling guidelines and materials for mental nutrition counselling should be developed by MOH.

Good nutrition for mental health and patients' awareness to be promoted by sensitized/rained Nutritionists in all health facilities.

Specific simple nutrition messages on leaflet/phones to be distributed (to all health facilities) to women living with maternal depression to enhance awareness

Context

Mood disorders affect women of child-bearing during pregnancy up to one year postpartum (Surkan et al. 2011). About 12.5 - 42% of pregnant women and 12 - 50% of mothers of newborns in Low and Middle-Income Countries (LMICs) screen positive for depression (WHO 2008). Simultaneously, many women in Sub-Saharan Africa suffer from chronic energy deficiencies during pregnancy due to insufficient food intake and high energy expenditure (Desyibelew 2019). High demands of nutrients during pregnancy, combined with the inadequate intake and lack of maternal recovery postpartum, leads to nutrient depletion (Bodnar & Wisner 2015).

Adequate nutrition is essential for proper physical and mental development and for the proper regulation of neurotransmitters (serotonin, dopamine, and norepinephrine) hence mood stabilization (Leung & Kaplan, 2009). Deficiencies, mainly Omega-3 fatty acids and certain micronutrients (folate, and B12, iron, zinc, magnesium, vitamin C, Vitamin A) have been linked to increased rates of depression. These nutrients are common in healthy diets that include dark green leafy, orange or red-coloured vegetables, whole-grains, nuts, organ meat, and seafood (Rechenberg & Humphries 2013). Epidemiological studies point to the link between the quality of diet and depression (Women & Delivery, 2012). Women consuming poor diet during pregnancy suffer nutritional deficiencies, increasing risks of maternal depression (Madeghe et al. 2020). Achieving good nutritional goals is fundamental in achieving Sustainable Development Goals (SDGs). Little is known about how poor nutrition affects women's mental health during pregnancy and postpartum.

Study Approach and Results

An intervention study was carried out to examine the nutritional factors associated with maternal depression among women in urban low-income Nairobi, Kenya: 33.6 % of pregnant women had maternal depression illness, and 32.1 % of the women had Body Mass Index (BMI) <22.8 kg/m², and 9.9% had Mid-Upper Arm Circumference (MUAC) >23cm. For

pregnant women (BMI) <22.8 kg/m², and (MUAC)>23cm indicates the risk of having low baby birth weight. There was a statistically significant association between poor nutrition as measured by MUAC and maternal depression (p<0.001). Also there was a statistically significant association between maternal depression and inadequate intake of brain food essential (p=0.002). Maternal depression was significantly associated with lower income (p< 0.001). Women in the second trimester (12-24 weeks)(p=0.02) and lower educational levels (P<0.004) were significantly associated with poor nutritional knowledge. Poor nutrition was the main predictor of maternal depression (p< 0.004). (See Figure 1-4).

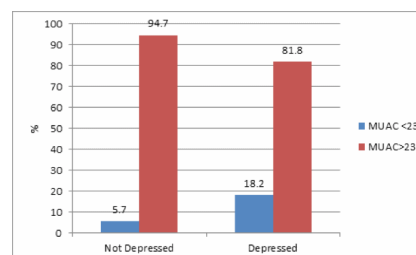


Figure 1-Nutrition status by Mid-Upper Arm Circumference (MUAC)

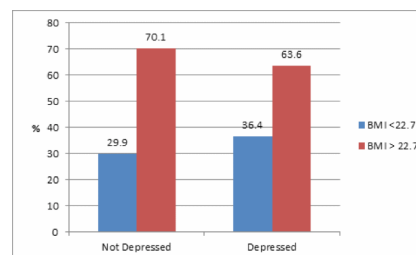


Figure 2-Nutrition status by Body Mass Index (BMI)

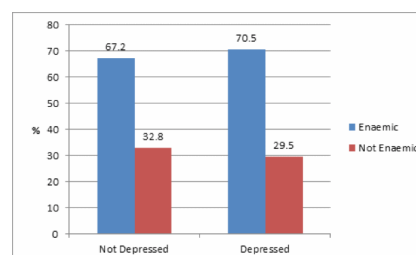


Figure 3-Nutrition status by Nutritional Anaemia

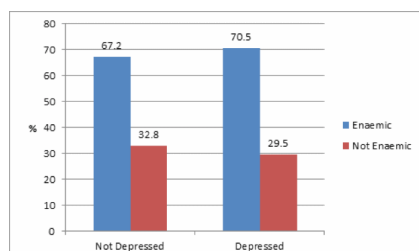


Figure 4-Nutrition status by brain food essential

Current Status of Nutrition Counselling for Pregnant Women with Maternal Depression

A generalized health talk covering various issues concerning pregnant women (including a general nutrition education) is given to all women who come for a check-up in the waiting room as a group as they wait for their turn to be attended to. There is no screening for maternal depression in our primary health care facilities nor dietary screening or individualized nutritional counselling for pregnant women. Only the extremely malnourished cases are referred to the nutritionist, therefore, missing the opportunity for early detection of other pregnant women who may be at high risk for depression and malnutrition (or have obesity, comorbid conditions) requiring timely dietary and nutritional management. The general nutritional counselling may not work for depressed women who need an integrated mental health nutrition counselling to stabilize their mood. A dietary and nutrition plan, combined with mental health counselling, would help prevent depression and malnutrition among pregnant women.

Policy Recommendations

Short-Term

- Include screening of maternal depression and development of low-intensity mental health intervention for women during prenatal visits at the Antenatal Health Clinics (ANC) as a component of care in all primary health

facilities by the Ministry of Health (MOH).

- Screening of dietary intake among pregnant women in resource-deprived areas to be included during the prenatal visit to identify women needing more intensive dietary monitoring and health interventions.
- MOH should focus on Maternal and Child Health (MCH) to develop an integrated nutritional enhanced mental health counselling and psychosocial support for women in distress because there is already existing scholarship, evidence, and expertise in Kenya to do so.
- Inclusion of education on adequate nutrition for mental health to all secondary schools. This will increase awareness and sensitivity from an Early age, by the Ministry of Education and MOH
- Production of pamphlets, leaflets, posters, and very brief messages, by MOH, developmental partners, and NGOs, informing all women attending antenatal clinics the signs of depression, nutritious diets, the importance of the antenatal clinic and when to seek medical help.

Medium-Term

- Develop a policy that advocates for screening and counselling of maternal depression and dietary intake during Antenatal Clinics by The Ministry of Health (MOH)
- Media campaigns on the increasing rates of maternal depression and create awareness on the association between nutrition and mental health, and promote good nutrition for mental health.
- Include in the curriculum of all health personnel, MSc Nutrition, Public health, Nursing students to keep them abreast of with most recent evidence-based nutrition information on mental health by MOH.
- Global funding networks to promote mental health and nutrition research and periodic impact assessment and establish nutrition mental health research grants by MOH, NGOs, Academia developmental partners, and friends from the diaspora.

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Authors

Beatrice A. Madeghe
bearecha@gmail.com
Wambui Kogi-Makau
wkoigi@uonbi.ac.ke
Sophia Ngala
sngala@uonbi.ac.ke
Department of Food Science, Nutrition and Technology
University of Nairobi, P.O Box 29053-00625
Manasi Kumar
m.kumar@ucl.ac.uk
Department of Psychiatry
College of Health Sciences
University of Nairobi, PO Box 47074- 00100



Series 2 – Social Pillar: Health – Equitable, Affordable and Quality Healthcare of the Highest Standards

Oxygen Access and Affordability in Health Facilities in Kenya

Prof Madara Ogot, Dr Richard Ayah, Rita Muriuki and Prof James Nyangaya

Key Messages

Medical oxygen should be available in all health facilities to reduce mortality arising from conditions that reduce the levels of oxygen in the blood.

New strategies should be put in place and new models employed to address the recurrent costs associated with the consistent continuous supply of oxygen.

Affordable subsidised supply of medical oxygen may increase its availability by providing a revenue stream in support of funding shortfalls in the public health system.

Context

Insufficient oxygen levels in the blood, referred to as *hypoxaemia*, is a potentially fatal complication of many causes of mortality. A topical example is the current COVID-19 pandemic, a result of the Coronavirus disease (COVID-19), a respiratory tract infection that started in Wuhan province, China, in December 2019, and has rapidly spread around the world. By February 2021, there were 112 million confirmed cases worldwide and 2.47 million deaths. During the same period, Kenya recorded 104 thousand cases and 1,827 deaths (Worldometers, 2021). Although most people develop only mild symptoms, approximately 19% develop severe to critical disease requiring hospitalisation. Of these, approximately 14% need oxygen support and 5% require admission to intensive care, often requiring ventilator support (WHO, 2020).

Medical Oxygen can represent a significant cost to hospitals in low- and middle- income countries (LMICs). Contributors to the high cost include logistical challenges in transporting oxygen that also leads to intermittent availability. The high oxygen cost to the patient can limit use or lead to early discharge. Even where oxygen is

subsidised or provided at no cost at government health facilities and hospitals, its high cost often leads to periods of unavailability. Oxygen concentrators are portable devices that remove nitrogen from the air and are able to produce oxygen at concentrations of 85%-95%. Although the use of concentrators could solve the supply chain problems of oxygen cylinders, concentrators come with their own host of challenges. These include the need for a continuous, reliable supply of electricity (often not available in LMICs), a robust system for monitoring, maintenance and repair, and a clinical staff trained in their use (Gray et al, 2017).

Study Approach and Results

An exploratory survey was carried out in Level 2 and Level 3 health facilities in 11 counties in Kenya in December 2020 to establish the availability and affordability of oxygen; and, where available, the challenges faced by the facilities with the oxygen delivery systems. Level 2 facilities include medical clinics, dispensary, and mobile clinics. Level 3A includes basic health centres, while Level 3B includes comprehensive health centres, medical centres, nursing homes, and cottage hospitals. The respondents were drawn from both public and private hospitals in

Oxygen Concentrator developed at the University of Nairobi in 2020



Kakamega, Kilifi, Kirinyaga, Kisii, Kisumu, Nairobi, Meru, Nyandarua, Mombasa, Taita-Taveta, and Uasin-Gichu Counties. A total of 285 hospitals were surveyed (193 public, 84 private, and 23 faith-based).

Availability of Oxygen. On availability of oxygen, 65% (192) facilities did not have any oxygen at all and 35% (103) did. Segregation by category revealed that 57% of private hospitals had oxygen, compared to 25% of public and the same percentage of faith-based hospitals. Where oxygen was available, it was delivered through one or a combination of the following: piped oxygen (PI), oxygen cylinders (CY), or oxygen concentrators (CO). The distribution of oxygen sources for the different hospital categories is presented in Figure 1 (faith-based hospitals have been combined with private.)

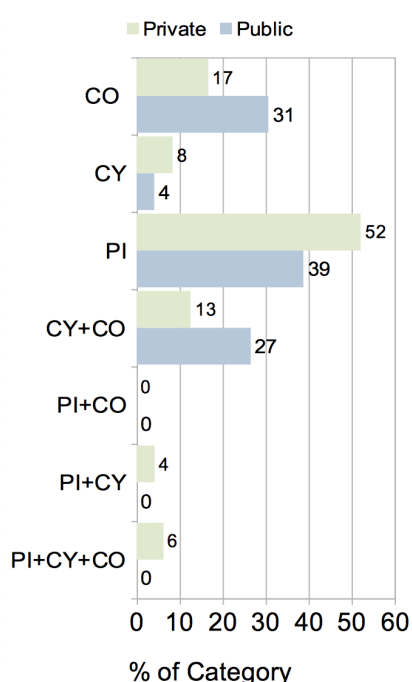


Figure 1-Oxygen source distribution

Patient Cost of Oxygen. Of the 103 hospitals with oxygen, 50 (49%) charged for the oxygen and 53 (51%) did not. Of those that did not charge, the majority were public hospitals. The patient cost varied widely among those who charged, ranging from as low as KES 500 (\$4.70) to over KES 34,000 (\$312) per day. The table below provides a summary of the patient cost distribution.

Table 1-Oxygen source distribution

Patient Cost (KES)	Number Hospitals
500-1000	9
1001-4000	7
4001-8000	9
8001-12000	6
12001-16000	2
16001-20000	3
20001-24000	8
>24,000	7
Total Respondents	51

Major Challenges Faced

The study also sought to determine the major challenges faced by hospitals that used either oxygen cylinders and/or oxygen concentrators. The literature suggests that these sources present the biggest challenges, yet they are the most available for smaller and rural hospitals who may not be able to afford installation of piped oxygen systems.

Oxygen Cylinders. The top four challenges faced by the hospitals on usage of oxygen cylinders were as follows:

1. **Access and availability** (22% of all respondents to this question cited this problem) Typical statements included, "long periods between refills" and "supply inefficiency".
 2. **Short duration of cylinder use** (22%) Typical statements included, "The oxygen runs out without notice and there is a patient in need".
 3. **Portability** (15%) Typical statements included, "they are too heavy to move from one place to another" and "difficult to carry".
 4. **Cost of oxygen cylinders** (11%) Typical statements included, "Sometimes the oxygen runs out and there are no funds to refill".
- Seventy-two hospitals responded to this question.

Oxygen Concentrators. The top four challenges faced by the hospitals on usage of oxygen cylinders were as follows:

1. **Maintenance Issues** (29%) Typical statements included, "fail to produce therapeutic levels of oxygen because of common problems: the air-intake system, malfunctioning sieve-control valves, and contaminated sieve materials".
2. **Loss of electricity** (29%) Typical statements included, "Moving them when electricity is off to where there is generator backup".
3. **Portability** (24%) Typical statements included, "In case of multiple patients in need of oxygen at the same time it will be difficult to administer because the facility has only one concentrator".
4. **Cost of concentrators** (8%) Typical statements included, "they are expensive".

Forty-nine hospitals responded to this question.

Policy Recommendations

Short-Term

- Where oxygen is available, non-financial challenges were found to outweigh financial and are not adequately addressed. New models, therefore, must be developed to enable hospital

staff to focus on the administration of oxygen therapy to their patients, and not on the oxygen delivery systems.

- For many medical conditions, lack of medical oxygen means certain death. The majority of Kenyans are in proximity to Level 2 and 3 health facilities most of which do not have oxygen. Efforts, therefore, must be made to ensure oxygen is available at all these facilities.
- Affordability remains a key barrier to access for patients who need oxygen. In many instances, where oxygen is not provided at no cost, charges far exceed the costs incurred by the facilities to administer the oxygen. Guidelines should be developed for reasonable patient costs and should be enforced in public health facilities, and private facilities encouraged to comply.

Medium-Term

- Though desirable to provide oxygen to patients at no cost, lack of sufficient funding in the public health system has resulted in the unavailability of oxygen in the majority public facilities. New models should be developed that offer oxygen at highly subsidised rates thus providing a secondary revenue stream to strengthen health facilities finances.

Acknowledgements

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Authors

Prof Madara Ogot
(madaraogot@uonbi.ac.ke)
Department of Mechanical Engineering
University of Nairobi

Dr Richard Ayah
(ayah@uonbi.ac.ke)
School of Public Health
University of Nairobi

Rita Muriuki
(rita.muriuki@uonbi.ac.ke),
University of Nairobi Enterprises and
Services Limited (UNES)

Prof James Nyangaya
(janyangaya@uonbi.ac.ke)
Department of Mechanical Engineering
University of Nairobi



Series 2 – Social Pillar: Education and Training – Globally competitive quality education, training and research for sustainable development

Transformational Leadership in Adopting Online Learning

Dr Naomi W. Gikonyo and Dr Anne W. Ndiritu

Key Messages

Effective training is a key determinant for adopting online learning in educational institutions.

Transformational leadership characteristics are important in managing change that is required in learning institutions during the COVID-19 pandemic and beyond.

Modelling the way is a necessity in university management of online teaching and learning through COVID-19 Season

Context

More than 1.725 billion learners across the globe are currently affected due to the closure of their learning institutions in response to the COVID-19 pandemic (UNICEF June 2020). Over 98% of the world's student population have found themselves out of school due to the COVID-19 outbreak. This population includes university students who were aspiring to complete their academic years. Schools and colleges are making every effort to ensure that teaching and learning are going on even during lockdown occasioned by COVID-19. Examples of postponed examinations include Cambridge International Examination and Kenya National Examinations. The closure of learning institutions has impacted not only the students but also the teachers and school leaders. In response to school closures, the use of online, e-learning and distance learning platforms have remained a key option available for the continuation of learning.

Until the COVID-19 pandemic threatened university education, adoption of distance education and in particular, online learning in public universities in Kenya, has been very slow. Online learning

provides access to higher education without physical contact in response to the COVID-19 crisis.

Distance education has experienced resistance and a lot of challenges especially in developing countries including Kenya. With the closure of schools and colleges leaders must, of necessity, change their leadership styles. Their traditional roles have to fit the ongoing emergency to ensure that the gains in the educational system thus far does not go to waste. Their roles have changed dramatically and unexpectedly without history from which to draw their experience. This kind of situation requires a new kind of leadership that will ensure that all the stakeholders are on board to carry out their normal teaching roles. Managers should adopt the transformational leadership characteristics for effective leadership that has been established through research and which puts staff member's needs first. Institutions' leaders, if well equipped with the necessary skills, will be able to address the desired change to ensure students' well-being and online teaching.

The Government of Kenya has continually urged universities to come up with innovative ways of delivering higher



education and meeting human resource needs in the country in support of the Vision 2030 Social Pillar. In the wake of the COVID-19 pandemic, this has taken on a sense of urgency as universities remain closed, at least for face-to-face teaching and learning. The management of universities have been putting measures in place in terms of necessary infrastructure and capacity building for faculty to embrace open, distance and e-learning as an innovative way to increase access and equity in higher education. Despite significant investment, this had not been taken up until COVID-19 struck which called for a paradigm shift. More university managers have been forced to lead the way to ensure learning and teaching activities in their respective academic institutions continue uninterrupted. The findings presented in this policy brief form part of earlier research conducted in selected universities and secondary schools in Kenya (Gikonyo, 2013; Ndiritu, 2013).

Study Approach and Results

The study was carried in the public universities in Kenya to investigate the extent to which managers' level of knowledge in distance education influenced their participation in distance education activities in public universities in Kenya. The sample consisted of 196 managers drawn from seven public universities. The results indicated that there was a significant positive correlation between the level of knowledge in distance education and university managers' participation in distance education activities. Training in distance education, which includes online learning and e-learning as well as training in computer application skills was found to be a major factor determining how well a manager participates in distance education activities (Gikonyo, 2012). Based on these findings, therefore, it is important to ensure that the managers are trained in distance education and its practice in adopting online learning and e-learning. With a transformational leadership approach and serving as a role model (embracing and understanding distance education), managers can ensure that no one is left behind in embracing the coveted change of online teaching and learning during this COVID-19 era and beyond. The application of the knowledge and skills gained will greatly improve access and equity in higher

education in support of county, national and international development agendas.

Research has shown that where managers adopt a transformational leadership style, the rest of the organization typically adopts the required changes. Serving as a model is one of the characteristics of transformational leadership where the leader displays the characteristic that he/she wants to see in his/her followers. For example, a study carried out with a target population of 72 principals in public schools and 139 principals in private schools indicated a positive correlation between modelling characteristic of transformational leadership and school performance (Ndiritu, 2012).

Policy Recommendations

Short-Term

- There is a need to provide in-service training periodically for all the lecturers in university management to update their skills in transformational leadership especially where there is a need for changes. This is evident during this COVID-19 pandemic where there is a need to train on the use of technology for online teaching and learning. The training should be conducted virtually or face to face. This training should take a standardized approach to the provision of leadership development. Choices of provision have to be made taking into consideration factors such as the current training and development opportunities, the availability of expertise, country governance arrangements and the current and anticipated quality and availability of leadership.
- Members should be encouraged to participate in training by giving them incentives.

Medium-Term

- There is a need to have a pool of trained personnel in transformational leadership as many leaders find themselves in leadership by default.
- There is a need therefore for succession planning in that university leaders are not elected when the positions fall vacant. These unplanned

reactions to events with little prior preparation before positions become vacant is what many ineffective leaders find themselves in. Planned succession not only propagates continuity but also brings freshness into leadership. Future leaders should be identified and trained in transformational leadership well in advance before positions fall vacant.

- There is a need to incorporate transformational leadership in all postgraduate courses. This is because most lecturers come from this cohort and therefore likely to find themselves in leadership.

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Authors

Dr Naomi Wairimu Gikonyo
nmwangi@uonbi.ac.ke
Dr Anne Wairimu Ndiritu
anne.ndiritu@uonbi.ac.ke
ODEL Campus
University of Nairobi



Series 2 – Environment, Water, Sanitation and Regional Development – Enhancing development in a clean safe environment and, access to water and sanitation services.

COVID-19 Impacts on Water Burden among Households in Turkana

Denis Ong'ech, Prof Daniel Olago, Dr Simeon Dulo, Dr Maggie Opondo, Dr Gilbert Ouma, Prof Albert Mumma, Prof. Robert Hope and Prof Katrina Charles

Key Messages

Effective training is a key determinant for adopting online learning in educational institutions.

Transformational leadership characteristics are important in managing change that is required in learning institutions during the COVID-19 pandemic and beyond.

Modelling the way is a necessity in university management of online teaching and learning through COVID-19 Season

Context

Following confirmation of the first case of the novel Coronavirus Disease (COVID-19) in Kenya in March 2020, the Government issued an advisory in ensuring high standards of hygiene through regular handwashing using soap and water. A national protocol on COVID-19 was launched, which among others, underscored handwashing and high levels of hygiene maintenance. These required an increased household water demand that caused elevated household water bills, leaving poor households vulnerable to water insecurity.

Accessing safe water is a challenge for pastoral communities living in arid and semi-arid regions such as Turkana (Balfour et al., 2020). This situation is worse for internally displaced persons in the county. There are 164,519 households with an average household size of 5.6 in Turkana (KPHC, 2019:25). Most have no access to piped water. As a result, the majority must walk long distances, averaging between 5-10 kms, in search of water. In some areas, such as Kibish and Lomelo, the distances can average 20 kms (KNBS, 2018). Further, vulnerable and poor households are forced to fetch water from riverbeds that lack potable water and are often dry, making water scarcity in the arid and semi-arid regions of Kenya a potentially devastating socio-economic challenge. These regions may suffer increased vulnerability from the pandemic.

The pandemic has severely modified the patterns and behaviour of the economy of water (Vammen and Guillen, 2020). Water service providers (WSPs) have also been adversely affected. The Lodwar Water and Sanitation Company (LOWASCO), for instance, finds it hard to effectively supply clean water due to decreased revenues from non-payment (LOWASCO official, pers. comm.). With the government's directive that WSPs should not disconnect water supply for 3 months (March-May 2020) including households in default, WSPs faced challenges in meeting some of their operational costs such as power bills and staff wages (Senkwe and Gakubia, 2020). The directive is far from adequate, largely temporary, and unsustainable (Senkwe and Gakubia, 2020).

Study Approach and Results

This research was carried out through household interviews in the water diaries study, key informant interviews involving a range of stakeholders involved in water, health, and sanitation sectors in the county, and secondary data from media, government institutions, and water sector development partners working in Turkana. It was complemented with results from the REACH Kenya Programme, based at the Institute for Climate Change and Adaptation. The study assessed respondent views on the impact of the pandemic on water security and its burden on households. It also established possible solutions to the risks faced by communities in Turkana. The REACH Programme implemented a household survey in Turkana Central in October 2017 and established that from 909 household heads, 25% were concerned that water is costly and 36% relied on river water as a secondary source.

The study further established that the number of poor households with non-piped water was three times more than the non-poor households with piped water connections. The majority of households, therefore, had to rely on water kiosks, boreholes with hand pumps, neighbours, and the dry riverbed-scooping as their main sources. Furthermore, the study established that the number of poor households using surface water as their main source was almost four times more than the non-poor ones. This means that such households are exposed to risks including waterborne diseases and water access issues. This situation is worsened by open defecation which is a major problem in the region and poses a threat to surface water quality.

The water, health, and sanitation situations have further been challenged by the COVID-19 pandemic which has likely increased household water demand as more frequent hand washing is advocated for. This increased demand increases the vulnerability of poor households in semi-arid urban and pastoral areas to water insecurity and health challenges. Therefore, the current pandemic is a critical wake-up call to all the stakeholders in the water sector to rethink strategies that protect vulnerable community members not only from the usual water-borne diseases but also from other deadly viral pandemics such as COVID-19. In Turkana, water points such as water kiosks, boreholes, hand pumps,

Figure 1: Water kiosk in Lodwar, Turkana County

Photo: Dennis Ong'ech



and riverbeds are considered meeting points. There are usually small crowds when people go to fetch water or take animals to drink. From observation, many of the water points are sometimes crowded, social distancing is not observed, and people do not wear masks. This complacency could be due to social relations among the locals, being unaware of threats and risks of COVID-19, and the unaffordability of masks. Therefore, besides community sensitization, there is a critical need for community water point management planning to reduce human traffic, the interaction between people at any given time, and to effect social distancing as required by government directives to reduce the infection rates at community level. The county is well placed to address this issue by advancing the installation of water Automated Teller Machines (ATMs) in the water kiosks to minimise the use of cash payment and further reduce the long queues as people can access water any time of the day, thus reducing human interaction.

Many WSPs are dependent on electricity which accounts for 30-40% of their total operational costs (WASREB, 2020). To ensure uninterrupted water services provision, the government gave a directive to the Kenya Power Lighting Company not to disconnect WSPs electricity which is a relief but continues to be a burden as the debts accumulate and will ultimately have to be paid (Senkwe et al., 2020). To address the issue of accumulated electricity bills and enhance institutional resilience towards unforeseen financial dilemmas which can compromise service delivery, WSPs need to carry out energy audits to reduce electricity consumption and enhance efficiency (Senkwe et al., 2020). Further, through water audits, they can generate datasets that can be very instrumental in achieving leakage reduction and enhancing pump efficiency. Water audits address this by comprehensively assessing infrastructural components, technical operations, financial management, and governance which helps in generating a broader understanding of the existing operations and maintenance practices and challenges. Alternative renewable energy supply is also important in supporting the cost of water delivery. Lodwar municipality has installed nine boreholes with solar pumps, which operate effectively for 8-10 hours a day. But, there is still a need to install more water boreholes with solar systems to help reduce the operational costs incurred by LOWASCO and the county government.

Policy Recommendations

Short-Term

- Through the county budget and emergency response funds supported

by the water sector trust funds, the County Government of Turkana should provide budget lines for water bowzers to ensure access to affordable and safe water to the local community and public institutions such as schools, hospitals, markets, and other social amenities. This arrangement will help in increasing the supply and reducing the costs of water thus reducing the water burden and health risks on women, households, internally displaced people, and the vulnerable community members who cannot afford piped water.

- The county government, through its water service provider, should ensure effective water supply through continued monitoring and evaluation of the existing supply system. This ensures continued and uninterrupted water supply irrespective of the changing demand.
- Commission a floods monitoring study and vulnerability assessment of the water supply systems to flash floods that have been frequent in Turkana and provide recommendations on how water supply systems can be protected from the impacts of such events. This will greatly help in addressing costly infrastructural destructions and water shortages resulting from flooding events thus ensuring uninterrupted water supply.

Medium-Term

- Enhance efficiency and institutional financial resilience through increased revenue collection by reducing leakages, addressing non-payment and enhancing pump efficiency. Further, reduce the operational costs incurred by LOWASCO on electricity bills by carrying out energy audits and installing alternative power systems such as solar power systems to help reduce electricity bills. Solar power systems are more sustainable and cost-effective. By reducing operational costs, the water services provider can provide water at a subsidised and affordable fee.
- Design a water relief project focusing on the provision of water at affordable rates to support vulnerable groups (IDPs, women, poor households, and homeless) through reduced costs. This can be supplemented by more sustainable approaches as well as regular and up to date payment of water bills by the national and county government.
- Train unsupported community management groups on community water point management and planning to reduce human traffic and interaction at any given time. This will greatly help in addressing the social distancing protocol of people being two metres apart to reduce the

infection rates at the community level. Many water sources in Turkana are managed through the unsupported community management model where the community organises themselves to manage and operate the water sources without a formal structure of governance (financial, technical or social) that guarantee the sustainability of the water source.

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Authors

- Dennis Ong'ech** (ongetch@yahoo.co.uk)
Prof Daniel Olago (dolago@uonbi.ac.ke)
Dr Simeon Dulo (sodullo@uonbi.ac.ke)
Dr Maggie Opondo (maggie@swiftkenya.com)
Dr Gilbert Ouma (gouma@uonbi.ac.ke) Institute of Climate Change and Adaptation, University of Nairobi
Prof Albert Mumma (amumma@amadvocates.com)
Prof Robert Hope (robert.hope@ouce.ox.ac.uk)
Prof Katrina Charles (katrina.charles@ouce.ox.ac.uk) University of Oxford



Series F – Foundations : Leveraging ICTs for Increased Competitiveness

Is Kenya ready to Leverage Blockchain Technology in Horticulture Traceability?

Christopher A. Moturi and Amos K. Kosgei

Key Messages

Formulate Blockchain Technology frameworks, standards and policies
Establish appropriate mechanisms for training and skill enhancement
Conduct an assessment of the existing infrastructure
Create and implement mechanisms to motivate innovation among the employees and users

Context

Blockchain technology (BCT) can offer traceability in the food supply chain thus guaranteeing food safety, efficient transactions and reduced food fraud. This study sought to investigate the existing traceability systems in Kenya's domestic horticultural supply chain to assess the level of stakeholders' readiness to leverage the huge prospects BCT offers. The quality and safety of food in the supply chain has been of greatest concern to producers, regulators, distributors and consumers (Aung & Chang, 2014). The need for adequate traceability systems in the agricultural sector is motivated by food falsification and adulteration which have led to huge economic losses, wide-spread loss of consumer trust, and have become a persistent problem to all stakeholders in the food supply chain.

The expansion of horticulture the sub-sector in Kenya has attracted the attention of international organizations and consumers as well as food safety standards and certifications in its supply chain management (Ouma, 2010). The World Economic Forum recommends that traceability in the supply chain builds on transformative technologies. The ISO 22005:2007 Standard on Traceability in the Feed and Food Chain defines traceability of food as the keeping track of food materials and other consumable substances information through the processes of production, distribution and final consumption. Traceability is considered a fundamental of modern food security and has therefore become critical in the food supply chain (Aung & Chang,

2014, Saberi et al., 2019). The 2019 Kenya Government task force on Blockchain and Emerging Technologies recommended the use of emerging technologies BCT to streamline the food supply chain and enhance food security. BCT is suitable to track food products in the supply chain to remove the opaqueness that makes it hard for consumers to identify the source and the path which the products moved through (Kshetri, 2018; Saberi et al. 2019; Kamilaris et al., 2019). Industry giants, such as IBM, have done pilots on verification and validation of food products using BCT (Kamath, 2018). However, the rate of use of BCT is still low, yet it has a strategic business value (Carson et al., 2018). The level of e-readiness, the degree of preparedness of an organization to use ICT in enhancing the quality of services, is an important element in linking and organization's goals to its objectives (Kashorda & Waema, 2011).

Approach and Results

The Network Readiness Index (NRI), an assessment tool widely used by World Economic Forum to rank how countries are doing in the digital world, was used to survey the use of traceability systems in the horticulture industry in Kenya. The respondents, comprising top management (18.9%), ICT workforce (26.4%), users (31.1%) and consumers (23.6%) were asked in January 2020, to respond on the four dimensions of NRI: Environment (regulatory and business environment that constitutes part of a conducive ecosystem of organizations to leverage on BCT), organizational readiness (technical, financial and expertise to assess how



ready the actors are for BCT), usage (capability of organizations and actors to efficiently use BCT in their daily processes and transactions), and impact. The readiness levels were determined by use of the 5-point e-readiness scale developed by Aydın & Tasci (2005) which identified a mean score of 3.41 as the expected level of readiness. Key documentation was reviewed to establish the available horticultural traceability systems in Kenya.

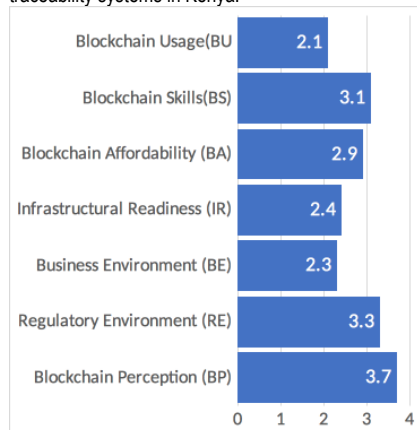


Figure 1: Summary of results on blockchain readiness

We report on the traceability technologies currently in use in domestic horticulture supply chain and the e-readiness status of the actors (policymakers, innovators, researchers, regulators and consumers) in relation to transition towards the implementation of BCT for full traceability in the horticultural sector. The study complements recommendations made by in the Blockchain and Emerging Technologies Taskforce Report and will contribute to the overall maturity of BCT in the horticulture industry in the East Africa region.

Horticultural Traceability Systems in Kenya.

The systems are still in their infancy, with only three main systems available to serve the needs of the sector (small-scale producers, value chain, food safety-minded consumers, governments and other interested stakeholders). **eProd** has been commercially available since 2015. The system allows tracking and tracing of produce from seed to the market through the creation of comprehensive farmer profiles, registration and monitoring of internal farm operations and productivity, management of credit systems for inputs and finances as well as compliance and impact measurement. The system seems best suited for large producers in the value chain. **Farmforce** is a mobile service used by organizations in large-scale contract farming arrangement with small farmers. The system allows tracking of produce from farm to market through registration of individual or groups of farmers, records of internal production practices, management of harvest and tracking of produce from farm to markets. Finally, the **National Horticulture Traceability System** aims to introduce increased transparency and visibility of horticulture supply chain activities through electronic registration of export horticulture growers and critical supply chain processes, from farm to distribution. The system enables stakeholders to rapidly record, retrieve and share information on the farm origin of products to enhance traceability. The NHTS system, though very

promising for uptake by the domestic sector has, however, not been implemented by value chain actors in the domestic market and its awareness level is low.

Level of Blockchain Readiness.

To establish the level of readiness in the sector, a mapping was done on each of the eight top-level indicators of NRI onto the scale used, ie, Stage 1: 1-2.6 (unprepared); Stage 2: 2.6-3.4 (not ready needs some work); Stage 3: 3.4-4.2 (ready but need improvement); Stage 4: 4.2-5.0 (prepared). The results (Figure 1) shows that on average, the stakeholders were; above stage 3.0 (perception, skills, regulatory environment), above stage 2.0 in (affordability, business usage, government usage, business environment, infrastructure) and below stage 2.0 in individual usage. BCT perception was ranked the highest indicating that the value of the technology was considered significant by actors. However, the infrastructure was inadequate, the business environment was not conducive and usage of the technology low. The study indicated that 7 of the 8 readiness factors were below stage 3.41 implying that the level of readiness of BCT in the horticultural sector in Kenya is low. The key gaps identified in the low acceptance of BCT in Kenya's horticultural sector are the lack of a regulatory and policy framework, deficiency of knowledge, and inadequate collaboration among actors. It was noted that the KS1758-2:2016 Code of Practice/Standard aims at providing rules for safe and sustainable production and supply of fruits and vegetables in Kenya for both export and domestic markets.

For *Perception of Blockchain in Horticulture*, the respondents had a unanimous agreement that the future value of the technology in the industry is significantly high. For *Regulations and Policies*, there exist no policies and regulations to guide the usage of BCT among the actors in the horticultural sector. This gap can be attributed to the lack of common agreement on policies and regulations between policymakers and technical experts on BCT. For *Business Environment*, the organizations had units for innovation, but there was disagreement on the existence of BCT-based innovations. Under *Infrastructure*, most of the organizations had infrastructure that was considered to be of low inter-operability for BCT. Considering *Blockchain Affordability*, actors could commit finances on the technology but spending on R&D of BCT was low. For *Blockchain Skills*, 53.8% of the actors had no BCT related skills. Among those who possess the skill, 64.2% were basic (ability to use), 21.6% intermediate (ability to support and maintain), and only 14.2% advance level (ability to develop and deploy). Finally, considering *Blockchain Usage Level*, usage of BCT by stakeholders for individual, business and transaction of government horticultural services were all low.

Policy Recommendations

Short-Term

- Formulation of BCT frameworks, standards and policies

- Establishment of appropriate mechanisms for training and skill enhancement
- Conducting an assessment of the existing infrastructure
- Creating and implementing mechanisms to motivate innovation among the employees and users

Medium to Long-Term

- Championing BCT use. Use cases in the agricultural sector have been identified by the Blockchain and Emerging Technologies Taskforce Report
- Actors in the region and beyond require to invest in traceability systems
- Consumers may soon source horticulture products only from suppliers whose produce they can trace. If such systems are not in place, disruption of business operation is likely to occur.
- Governments at various levels (county, national, regional) should facilitate the full implementation of the National Horticulture Traceability System.

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Author

Christopher Moturi

(moturi@uonbi.ac.ke)

Amos K. Kosgei

School of Computing and Informatics
University of Nairobi.

P. O. Box 30197-00100 Nairobi, Kenya.



Series F – Foundations : Ending Drought Emergencies – Planning for drought: An end to drought emergencies and food insecurity in Kenya.

Integrated Social Safety Nets: Building Community Resilience for Sustainable Food Security

Mark Ekiru, Dr Angeline Mulwa and Prof Dorothy Ndunge Kyalo

Key Messages

Cash transferred under social safety net programmes should be structured to include training and capacity building

Social safety net programmes should be linked with other long-term development initiatives

Social safety nets programmes should also consider bottom-up approaches in their design and management

Beneficiary involvement is crucial for understanding poor and vulnerable household needs rather than implementing blue-print programmes

Context

The release of the World Development Report in 1990 brought in the proposal of social safety nets as a way of protecting the vulnerable groups as well as helping countries achieve sustainable poverty reduction (Gross et al, 2008). By 2006, thirteen African countries had signed the Livingstone Call for Action which gives a platform for adoption of social protection and social transfers as some of the strategies to promote growth and reduce poverty among the most vulnerable groups. According to the New Partnership for Africa's Development (NEPAD), it is recognized that to achieve a reduction in hunger, production-based investments should be complemented by targeted safety nets.

In Kenya, several social safety net programmes have been initiated to support lives, livelihoods and to enhance resilience to shocks. The existing social safety net programmes in the Country include the Hunger Safety Net Programme, Orphans and Vulnerable Children Cash Transfer, Older Persons Cash Transfer Programme, People living with Severe Disabilities Cash Transfer Programme, and the Urban Food Subsidy Cash Transfer Programme (NGEC, 2014). These are per Article 21 of the Constitution of Kenya which puts forward that it is the responsibility of the State to ensure that the economic and social rights of citizens are met (Constitution of Kenya, 2010). Government ownership of social safety net initiatives has shown some hope for the implementation of the

programmes. However, the sustainability of the programmes is a major worry due to their dependence on donors funding and technical support (Barrientos and Hume, 2009). Despite the approval of the National Social Protection Policy in 2011, Kenya has continued to record a high incidence of poverty coupled with food insecurity and malnutrition, made worse by disasters and stresses (Ministry of State for Planning and National Development, 2012).

The purpose of this study, therefore, focused on the current social safety nets in Turkana County, primarily on the use of cash transfer programmes and its role in community resilience and food security. Turkana County is among the semi-arid lands of Kenya prone to drought and suffers from historical marginalization, struggling with weak infrastructure as well as high rates of illiteracy (OPM 2011). The County is among the four ASAL counties where the Hunger Safety Net Programme (HSNP) was piloted as a viable solution to the eradication of poverty, hunger and malnutrition in the longer term.

Approach and Results

This study explored the experiences of pastoralist households and the perceived impacts of social safety net programmes in Turkana County on their food security and diversification to non-pastoralist-based livelihoods. The Food security situation was analyzed using the four standard measurements of food security: food availability, food access, food utilization, and food stability. Major assessment tools used included the Food



Consumption Score as well as the Dietary Diversity Index.

Households in Turkana County are exposed to frequent droughts and other climate-related disasters that make daily life hard for households which are already poor. The Kenya National Drought Management Authority (NDMA, 2015) puts Turkana County Poverty index at 94.3% affecting 481,442 people. Pastoralism is the main source of livelihood in the study area, which is usually vulnerable to the impacts of drought. With the death of livestock from climate-related disasters, households have always relied on humanitarian aid. The area is located in the remote periphery of Kenyan border with Ethiopia and South Sudan and has low Government investments. This has added to create food security vulnerabilities in the area.

Coping strategies employed by households include relying on less preferred and less expensive food, borrowing food from relatives and friends, limiting portions at meals, restricting consumption by adults to allow small children to eat, and reducing the number of meals eaten in a day. These coping strategies employed by households have always been short-term. In most cases, households with no alternative sources of food ended up in hunger. Despite the existence of several social safety net programmes in Turkana County, only 14.4% of the respondents had enrolled in social safety net programmes. The main social safety initiatives included The Orphans and Vulnerable Children Cash Transfer Programme (CT-OVC), the Older Persons Cash Transfer Programme (OPCT), and People living with Severe Disabilities Cash Transfer Programme (PWSD). Those enrolled in these programmes felt that the amount of money disbursed was not sufficient to cater for all the household needs.

The study area experienced frequent failure of market systems due to frequent disasters and underdevelopment of infrastructure. The local markets were not fully functional and remained fragile and vulnerable to climate and economic shocks. The cash transfers often created a spike in prices due to demand outstripping supply. Other challenges included lack of fairness and transparency in the targeting process, physical accessibility challenges, frequent delays in disbursements as well as inclusion and exclusion errors. Regarding the link between social safety net programmes and food security, there was a weak positive correlation between social safety nets and performance of food security projects in Turkana County. Social safety nets explained only 17.6% of the variation of performance of food security projects. On average beneficiaries received Kshs. 4,900 (approximately \$50) after every two months. Coupled

with a high rate of inflation, the amount seems unsustainable for building resilient livelihoods. Studies have shown that the transfer helped households to purchase consumable goods but did not increase the ownership of productive assets (Merttens et al. 2013).

With a weak positive correlation between the amount of cash disbursed and performance of food security, there is a need to redesign the approach for the cash disbursed such that it serves as an incentive for households to get involved in other livelihoods to boost food security and not merely for smoothening food consumption. This would motivate households to engage in viable small-scale businesses to promote self-reliance hence building their resilience to frequent shocks such as droughts, floods and other common hazards.

This should be augmented by skills training on micro-enterprise and basic financial and business skills. Prevalent of the weak distorted market in the study area hence over-reliance on humanitarian food aid. The study proposed investments in infrastructure such as roads, electricity, water and modern market facilities to act as a catalyst for food market development through growth and expansion of trade.

Regular market assessments to determine the number of transfers is key to ensure commodity price stability as well as improve the livelihoods of the local people. Timeliness of the transfers needs to be strengthened and beneficiary targeting must be open, transparent and inclusive as much as possible. To promote ownership and effective grievance management system the study recommends bottom-up community based participatory planning approaches. This will help in the understanding of community and household unique challenges throughout the project cycle.

Policy Recommendations

Short-Term

- Development and implementation of a standard monitoring framework on the impact of social safety nets in addressing poverty and building community resilience, this will ensure proper readjustment of the programmes to achieve the desired goal of the initiative.
- Development and implementation of a structured information sharing among state

and non-state agencies implementing the social safety net programmes, this will aid in avoiding duplication hence the robustness of the programmes in reaching more vulnerable groups and addressing the grievances from the communities.

Medium to Long-Term

- Integration of the social safety nets with other long-term development initiatives such as infrastructure and human resource development, this will help in addressing market inadequacies especially in what used to be referred to as marginalized counties in the northern frontier of Kenya.
- Regular market assessments should be enhanced for determination of the amount of transfers to ensure commodity price stability as well as improve the livelihoods of the local people.
- Timeliness of the transfers needs to be strengthened and beneficiary targeting to be open, transparent and inclusive as much as possible.

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Author

Prof Dorothy Ndunge Kyalo

(dorothy.ndunge@uonbi.ac.ke)

Dr Angeline Mulwa

(asabina@uonbi.ac.ke)

School of Open and Distance Learning, ODeL

Campus, University of Nairobi,

P.O. Box 30197-00100, Nairobi, Ken



Series F – Land Reforms – Globally Competitive and Sustainable Land Management.

Managing Fragmentation of Agricultural Land for Livelihood Security in Kenya

Dr Fridah W Mugo, Prof Elijah Ndegwa and Prof Isaac K Mwangi

Key Messages

Rural agricultural land size is rapidly diminishing due to sub-division among heirs and is a threat to food and livelihood security.

Every farming system should have a minimum household land size based on ecological potential, type of enterprise and household needs.

Clustered (nucleated) and high-rise human settlements should be encouraged in rural areas to conserve agricultural land and reduce the cost of infrastructure.

Context

Agriculture provides the livelihood for 80% of Kenya's rural population. As the population increases, per capita land available for farming reduces as more land is used for homesteads. This threatens the livelihood of those who depend on agriculture. Kenya's population has increased from 10.9 million in 1969 to 47.6 million in 2019 (KNBS, 2019). As a result, arable land per person has reduced by 71.4% from 0.42 ha. (1.04 acres) in 1961 to 0.12 ha (0.30 acres) in 2016, and the trend is continuing (World Bank, 2020). The freehold land tenure system that allows landowners to utilize their land without user and use restriction, sub-division of land for inheritance among heirs, scattered patterns of rural settlement that rests on inefficient utilization of the land resource and unplanned agricultural production are worsening human problems from land fragmentation.

Overall, these are a threat to food and livelihood security. Fragmentation of agricultural land is associated with the decline of production in the sector. This study examined the relationship between the inter-generational subdivision of agricultural land and its impacts on food and livelihood security in fifteen rural farming sub-locations covering eight counties: Kisii, Kiambu, Kirinyaga, Embu, Transzoia, Nyandarua, Machakos and Makueni.

Approach and Results

A survey was conducted in fifteen rural sub-locations in Kenya in 2018 and 2019. The purpose of the study was to (a) establish the current rural household land size, (b) determine the existing land uses and the impacts they had on food and livelihood security, (c) identify factors contributing to the existing land size and use, (d) determine inter-generational land-size change, and (e) propose planning interventions for sustainable use of agricultural land. The target population was all farmers in the selected sub-locations and the relevant key informants including agricultural officers, physical planners, chiefs, assistant-chiefs, and community leaders. Data was collected through household interviews and focus group discussions. Field observations were also conducted to cross-check data from households and key informants.

The survey revealed that the average rural household land size varied from 0.97 to 6.70 acres with an average of 2.47 acres. The dominant land use was the growing of cash crops with no clear food, livestock and agroforestry strategy. Households with larger land sizes were more food secure and had higher incomes than those with small land sizes. Lack of affordable agricultural inputs and extension services and disorganized markets emerged as the key challenges. The most influential factor on household land size was the number of sons a household had as the land is sub-divided among the sons. Only a small fraction of daughters inherited land from their parents. Unmarried daughters shared the



land allocated to their parents or were only allocated living quarters on their parents' land.

Land use is mainly determined by agro-ecological potential and government policy in the case of irrigated agriculture. Household land size reduction from fathers (generation 1) to sons (generations 2) varied from 60% to 95% with an average rate of 77%. If the current fathers (generation 2) subdivide land among their sons (generation 3) equally, the average household land size shall reduce by 1.90 acres to 0.57 acres, a 70% reduction between generation 2 and 3. This has serious implications in further worsening household food and livelihood security for the rural farming populations.

Policy Recommendations

Short-Term

- Each county should, in collaboration with the national government, research institutes and universities, work out a minimum agricultural land size that can sustain an average rural household in different farming systems. The minimum land size should accommodate one key item each of food crop, cash crop, livestock and agroforestry enterprise and further subdivision prohibited.
- The government should initiate a long-term land banking programme in each county to acquire land for long-term leasing to persons 20 years or older with no land to farm, for a maximum of 55 years and farmers should retire from farming at the age of 75 years.
- Agricultural land should be zoned and designated for specific planned production with agro-industries for value addition and local and

external marketing strategies of the farm produce to optimize returns to value chain actors.

- Promote voluntary land pooling where family members can voluntarily agree to work on family land as a single production unit and each family member receives shares of returns based on their initial land sizes.
- Cooperatives should be strengthened to coordinate agricultural production, provision of enterprise-specific extension services for optimal yields, the supply of agricultural inputs, support processing of agricultural produce, provision of credit services and timely payment of the farmers for delivered produce.

Medium to Long-Term

- Promote voluntary land consolidation where siblings can voluntarily sell land to each other and neighbours to neighbours to promote attaining of the agreed minimum land size in the different farming systems.
- The county governments should purchase land in strategic market centres and promote cluster high-rise housing settlements with adequate social and physical infrastructure to ensure decent living for rural farmers, preservation of agricultural land, and accommodation of the expected rapid urbanization.
- Create a Rural Housing Fund to support farmers to purchase decent affordable houses in clustered high-rise nodal settlements. The repayment to be organized around farming enterprises and agricultural income cycles of the purchasers, be they monthly, seasonally or annually through their cooperatives.
- The government should create a Farmers' Pension Fund for farmers to which they can

contribute, monthly, seasonally or annually for support during retirement.

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Author

- Dr FridahW. Mugo**
(mugo@uonbi.ac.ke)
Department of Urban and Regional Planning
University of Nairobi
- Prof. Elijah Ndegwa**
(endegwa544@gmail.com)
P.O. Box 74505-00200, Nairobi, Kenya.
- Prof. Isaac K. Mwangi**
(imkaranja@uonbi.ac.ke)
Department of Urban and Regional Planning
University of Nairobi
P.O. Box 30197-00100, Nairobi, Kenya.



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