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A photograph of a person from behind, wearing a vibrant red dress with a traditional African print pattern. They are standing in a field of golden wheat under a warm, setting sun. The background shows a line of trees and a clear sky.

RENEWING AGRICULTURE IN KENYA: THE NEED FOR GREEN SOLUTIONS



BACKGROUND

In the Paris Agreement, a number of developing countries – including Kenya – highlighted agriculture as one of the key sectors for the realization of their transformation to climate-resilient development pathway.

The agriculture sector in Kenya (which comprises of crops, livestock, fisheries and agro-forestry) remains one of the main drivers of socio-economic development in the country, and offers great potential for growth and transformation.

At national level, the Ministry of Agriculture, Livestock, Fisheries and Cooperatives (MOALF&C) provides the

overall leadership for the agriculture sector in the country. Agriculture is currently a devolved ministry, and therefore no longer under the sole control of the national government, but also under a total of 47 counties.

County governments are responsible for the implementation of agriculture policies and their legal frameworks. In this regard the counties have established, at local level, institutional structures and systems to support the implementation of various sector policies and development plans.

Kenya's high-rainfall areas constitute about 10% of the country's arable

land, and produce 70% of the national commercial agricultural output.

Farmers in semi-arid regions produce about 20% of the output, while arid regions account for the remaining 10%. Kenya has a total area of 582,650 sq. km, with land covering 571,466 sq. km.

It has diverse climates, with a main annual rainfall ranging from less than 250 mm in arid and semi-arid areas (which cover over 80% of the country's landmass) to 2,000 mm in high-potential areas.

Agriculture is a pillar of the Kenyan economy, representing about 33% of the country's GDP

Moreover, the sector employs 70% of the rural population (which is more than 40% of the total population) and is dominated by smallholder, rain-fed production farming systems of between 0.2 and 3 hectares, which account for 78% of total agricultural production and for 70% of commercial production (Source: World Bank, 2015).

The country's major agricultural exports are tea, coffee, cut flowers, and vegetables. Kenya is the world's leading exporter of black tea and cut flowers.



MAIN CROPS IN KENYA

Main food crops include: cereals (maize, wheat, sorghum, rice, millet); pulses (beans, pigeon pea, cowpea, chickpea, green grams); and roots and tubers (sweet potato, Irish potato, cassava, arrow root and yam). Staple crops are: maize, rice, wheat, sorghum, potato, cassava, vegetables and beans.

The industrial crops mainly include: tea, coffee, sugar cane, cotton, sunflower, pyrethrum, barley, tobacco, sisal and coconut – all of which account for 55% of agricultural exports. According to data published by the Ministry of Agriculture, the crops which have shown an upward trend in the past decade are coconut (+46.9%), sugarcane (+27.7%), barley (+15%), sisal (+9.2%) and sunflower seeds (+3.64%). Crops whose production declined in the past decade include pyrethrum (-93.9%), tobacco

(-35.9%), cotton lint (-30.4%) and coffee (-20.5%). Tea production has contributed and will continue to contribute significantly to the Kenyan economy, as tea remains one of the leading foreign exchange earners in the country.

The horticulture crops include: cut flowers, vegetables, fruits, nuts, herbs and spices. Horticulture is the third leading agricultural subsector in Kenya (after dairy and tea) with a growing market. Vegetable production largely comes from smallholders, with the average farm less than two hectares. The most common horticulture crops grown in Kenya are tomatoes, onions, garlic, cabbage, Kale (Sukuma wiki), spinach, passion fruit (which is one of the country's main fruit exports), mangoes, bananas, lettuce and coriander (locally known as dhania).



WATER RESOURCES

Kenya is classified as a water-scarce country. The natural endowment of renewable freshwater is currently about 21 BCM (billion cubic meters), or 650 m³ per capita per annum; however, Kenya is projected to have by 2025 a renewable freshwater supply of only 235 m³ per capita per annum.

Increasing the productivity of agricultural water use in Kenya is a national priority, given the country's low water endowment, growing population, and changing climate. About 40% of the renewable freshwater has potential for development: expanding the use of modern irrigation technology – such as drip

and sprinkler systems – remains central to boost water productivity and yields related to water withdrawals.

Agriculture is the main source of GHG emissions in Kenya. The sector accounts for 62.8% of total emissions, excluding the ones from land-use change and forestry (LUCF) sector. The crops sub-sector represents about 10% of all emissions from the agricultural sector, and the major greenhouse gases emitted are CO₂, CH₄ and N₂O. Poor agricultural practices – such as inappropriate tillage, flooding of paddy rice fields, burning of agricultural residues, clearing of trees in farmlands and inappropriate use of

fertilizers – contribute to GHG emissions; livestock emissions are mainly associated with enteric fermentation and manure management, and there is also a high usage of diesel vessels. There has been a growing need for automation agriculture in Kenya, especially during the pandemic.

There is a crucial need for the incorporation of sustainable solutions and best practices in the water sector



According to the Ministry of Agriculture of Kenya and as depicted in Figure 1, the farming systems in the country are primarily rain-fed and small-scale, where farmers own land averaging from 0.3 to 3 hectares in size and contributing to around 75% of the total agricultural output produced on agricultural lands. These farming systems can be categorized as:

1. Small scale integrated crop-livestock/fish-tree farming systems
2. Crop-tree systems
3. Crop-livestock tree systems
4. Rice-fish integrated systems
5. Fish poultry systems

Livestock is kept under smallholder zero-grazing systems, an intensive livestock production system involving the “cut-and-carry” method of feed management. This system is characterized by ownership of one-to-two dairy livestock units, and is found in many parts of medium-to-high agro-ecological potential areas and by the growing of coffee, tea or potatoes. The smallholder mixed crop-livestock system, with maize-based dairy production with or without cash crops, extends across 30-to-35% of the country’s land area and is characterized by drought-tolerant and fast-maturing livestock (beef, small ruminants) and crops (pigeon peas, cowpeas, dolicos, sorghum, millet, cassava and sweet potatoes).

Landscapes/ farming systems	Description and agro-ecological zones	Geographical location
Highland perennial farming system	Involves growing of crops and raising of livestock in small pieces of land for maximum yield per unit area, through use of high levels of labour and capital by application of modern farming technologies. The crops grown include maize/ coffee/ tea/ pyrethrum, livestock and trees	Central, Kisii, western, eastern and Uasin Gishu and Kericho Counties
Maize mixed farming system	Maize, beans, cowpeas, pigeon peas cotton, sunflower, soybean, groundnuts, livestock (dairy)	Central, Coast and semi-arid areas
Root crop farming system	Mostly in the most humid and sub-humid agro-ecological zones Maize/ sorghum, trees	Eastern Kenya, Western and coast regions of Kenya
Intensive farming system/ mono-cropping	Involves the commercial production of large quantities of crops and livestock on large farm	Eastern Kenya, Kericho, central
Large commercial farming system	Farming system which involves growing of crops and rearing of animals on large piece of land applying modern farming technologies.	Kiambu, Narok, Laikipia, Kericho, Taita-Taveta
Irrigated farming system	It cover sub-humid to semi-arid zones. In majority of the cases, irrigated cropping is often complemented by rain-fed or animal husbandry. Control of water may either be full or partial.	Eastern and coastal areas in Kenya
Rice-tree crop farming system	Humid and sub-humid agro-ecological zones) coffee and banana is completely complemented by rice, cassava, maize, and legumes and low cattle numbers	Eastern Kenya, Western regions of Kenya
Pastoral farming system or extensive system:	Extensive system:- located in the arid and semi-arid zones; Examples of this include: raising sheep for wool, dairy farming, and raising beef cattle	Northern Kenya, Southern Kenya and parts of coastal Kenya

Fig. 1 - Kenya's agricultural landscape. Source: report "Situational Analysis of the Agriculture sector" by the Ministry of Agriculture, Livestock and Fisheries (July 2020)



The large-scale mixed crop-livestock-tree farming system – which covers over 80% of the country’s land area – takes two forms, with the first one being private or government-owned ranches that are commercially well-equipped and use modern technology.

Improved dairy herds grazed on improved pastures are common in this system in Kenya, with 27 fodder conservation and supplementary feeds used to varying degrees; pasture legume mixtures, hay and purchased feed are commonly used as well.

The second form includes extensive livestock production systems where crops are grown along the river valleys and livestock herd sizes are large due to communal grazing systems, and there is low use of purchased inputs such as feed, drugs and artificial insemination.

Food security is one of the country’s ‘big four’ agendas

Food security is one of the country’s ‘big four’ agendas, together with affordable housing, manufacturing and universal health care. In the realm of food security, the reduction of post-harvest losses has been identified as a way of boosting production, in addition to expanding irrigation and increasing the use of yield-enhancing inputs.

The Ministry for Agriculture estimates perennial post-harvest losses at 30-40% before reaching the market; farmers lose a third of their product, while consumers waste food by buying more than they need – especially during the Covid-19 pandemic, which has encouraged food hoarding.

SWOT ANALYSIS

Strengths

- The agriculture sector is a growing market, and adopting renewable energy solutions in the processes contributes to the country's and world's agenda of a cleaner environment
- Efficient use of natural resources
- The sector contributes to about a third of the country's GDP and employs almost half of the population, and is therefore a pillar of the Kenyan economy

Weaknesses

- Lack of technical skills to implement and maintain solutions/equipment
- Lack or poor access to education/awareness of need for renewable energy practices in their processes
- Lack of awareness or poor access to modern and affordable energy services on farms, especially electricity
- Post-harvest crop losses
- Inadequate infrastructure and old equipment
- Weak implementation of the legal and regulatory frameworks

Opportunities

- Education of farmers and companies in the sector on the impact that the introduction of renewable energy solutions and practices can have on the environmental, economic and social dimension, through the use of public extension services, associations and Saccos and cooperatives
- Training on renewable energy practices, process, equipment and maintenance
- Need for solar-powered storage solutions to reduce post-harvest losses before market/wholesaler distribution
- Need for solar-powered water pumps, as the majority of farmers still uses diesel engine pumps, which are expensive and release greenhouse gases. Solar-powered pumps are more reliable, do not produce any harmful gases, and offer a reliable solution in a country where electricity is unreliable
- Clean energy, battery-powered tractors and trucks (for harvesting, ploughing, harrowing, etc.), which offer an alternative to fuel-powered trucks emitting GHG
- Need to shift from pesticides and seed treatments, harmful to farmers and the environment, to eco-friendly treatment solutions
- More productivity will lead to increase in exports for the country
- The introduction of renewable energy solutions, like water-efficient drip lines or solar-powered storage facilities, will lead to a reduction in pre and post-harvest losses and an increase in crop yield and profits, thereby improving livelihood of the farmers

Threats

- Cost of the renewable energy solutions
- Resistance to change and green solutions from the farmers or companies in the field
- Competition from counterfeit products, a problem in the sector of Kenya
- Frequent extreme weather events (droughts and floods)

KEY ACTORS IN THE AGRICULTURAL SECTOR OF KENYA

Ministry of Agriculture, Livestock, Fisheries and Co-operatives (MALF) - kilimo.go.ke

The government sector charged with producing food in the nation. The Ministry envisions a secure and wealthy nation anchored by an innovative, commercially-oriented and competitive agricultural sector.

Kenya Institute of Organic Farming (KIOF) - www.kiof.net

Non-profit, non-governmental organization operating in Kenya and the Eastern Africa region promoting rural development and education in organic agriculture and related marketing services.

Kenya Organic Agriculture Network (KOAN) - www.koan.co.ke

The National Coordinating body for Organic Agricultural activities in Kenya with a mission to coordinate, facilitate and provide leadership and professional services to all members and other stakeholders in the organic agriculture industry in Kenya.

[Organic Agriculture Centre for Kenya \(OACK\) - oack.or.ke](http://oack.or.ke)

Non-governmental organization focusing on creating sustainable livelihoods and landscapes for the small scale farmers in Murang'a county, Kenya. OACK is equipping farmers with knowledge and skills through training and disseminating information related to ecological farming and sustainable, organic agricultural production while conducting on-farm trials to validate best practices as a way for effective know-how exchange.

[Agrochemicals Association of Kenya \(AAK\) - agrochem.co.ke](http://agrochem.co.ke)

The umbrella organization for manufacturers, importers, formulators, distributors and users of pesticides in Kenya. AAK is also known as Croplife Kenya, the national representative of the international agrochemicals industry. Their mission is to facilitate responsible management of pest-control solutions for improved agricultural production, public health and environmental protection.

[Horticultural Crops Directorate - www.agricultureauthority.go.ke](http://www.agricultureauthority.go.ke)

The statutory objective of the Directorate is to promote, develop and coordinate the production and marketing of horticultural product. At the time of its establishment, the horticultural sub-sector was seen as a viable solution for the country's need for cash crop diversification, enhanced food nutrition, income generation, employment creation and foreign exchange earning, in addition to providing raw material for agro-processing industries.

[Fresh Produce Exporters Association of Kenya \(FPEAK\) - fpeak.org](http://fpeak.org)

Formed in 1975, FPEAK has grown to become Kenya's premier trade association representing growers, exporters and service providers in the horticulture industry. Today it provides a focal and coordination point for the sector exports, with members of the Association involved in growing and/or exporting fresh cut flowers, fruits, and vegetables.

CONCLUSION

Agriculture remains the most dominant industrial sector in Kenya in terms of workforce and contribution to the country's GDP. In addition, the ever-increasing need to achieve food security in Africa continues to be a major priority on the agenda of governments in countries like Kenya. Therefore, curbing pre- and post-harvest losses will be key in attaining the food security goal.

The sector is still facing the several abovementioned challenges, which also pose opportunities for partnerships and business collaborations. Implementing the innovative solutions and sustainable best practices in the field is crucial, as the agro-industry plays a vital role in the road to climate change as well as in accelerating Inclusive and Sustainable Industrial Development.

To learn more about Kenya, and discover business and investment opportunities in the country, please visit the FIPEE website (www.unido.it/FIPEE) or contact UNIDO ITPO Italy at itpo.rome@unido.org.



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