Review of Sustainable Agriculture and Food Systems in Africa

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Abstract

Although Africa has the world's largest arable land; the farming system is dominated by smallholder farmers. Africa's agriculture performance is characterized by poor technological inputs, low production, a traditional farming system, inadequate credit services and facilities, poor infrastructure, and market instability. In addition to frequent hydro-meteorological and biological hazards, the encroachment of the rangeland by invasive species, and currently COVID-19 has become a serious challenge to African agriculture and its food system. Sustainable agriculture is considered a remedy for land degradation, water scarcity and pollution, market fluctuation, and food insecurity. Hence, African nations should introduce and promote sustainable agriculture to improve the performance of the sector and reduce its side effect on the environment. Therefore, Africa nations should implement various types of sustainable agriculture practices such as permaculture, biodynamic, hydroponics and aquaponics, urban agriculture, agroforestry, and food forests, natural pest management, etc depending on their ecological, economic, and social settings and minimize the application of synthetic chemicals to increase production.

Keywords: sustainable agriculture, permaculture, biodynamic, hydroponics, agroforestry, food system

Introduction

Agriculture remains the backbone of the African economy. It is the means of income for 60% of the population, contributes 23% of the continent's GDP (Africa Development Bank, 2020), which is a significant proportion of the regional and international trade and the dominant source of raw material for local industries. About 25% of the global suitable arable land is found in Africa while 60% of the continent's arable land is not cultivated and the sector is dominated by the traditional farming systems (Africa Development Bank, 2020; World Food Programme, 2020).

In-spite the advent of modern agricultural practices, initiatives, and inventions across the globe, its adoption, acceptance, and deployment in Africa, particularly in Sub-Saharan Africa is considerably low with a striking disparity level within the countries, as conventional agriculture continues to be the most practiced by rural communities. This obviously has significant impact on the continent's agricultural sector performance as it is perpetually victimized by several multi-dimensional and multifaceted factors including; the ever-increasing and alarming population growth, environmental degradation, hydro-meteorological hazards, biological hazards, political instability, lack of good governance, poverty, inappropriate policy, poor technological inputs, gender differences in input use, inadequate credit services and facilities, poor infrastructure, market volatility and irregularities. Besides, there are emerging thematic areas and indicators of progress in assessing sustainable agriculture and food systems in Africa (Olayide, 2021).

Generally, modern input use by Sub-Saharan African smallholder farmers is relatively low and overshadowed by heavy dependence and reliance on simple farm inputs and physical labor. Next to this also, is the overarching reliance and absolute dependence on natural ecosystem functions for farming purposes which often increases risks and makes farmers more vulnerable to climate change and its impact (IPCC, 2014; FAO, 2010). Recent concerns on the deployment of mechanized farming in Africa have been the multi- and trans-faceted theme of its sustainability. In other words, various issues have been raised to query, curtail and investigate the long-term ripple effects and consequences of the deployment of modern input intensification and total reliance of African agriculture operations and practices on mechanized farm machines: is it eco-friendly? Is it economically viable? Is it socially acceptable? What are the trades-offs involved?

Consequently, the above circumstance has paved way for the advancement and propagation of the gospel of sustainable agriculture: an inclusive attempt to move away from the conventional system towards a mechanized one while advancing and protecting the cause of sustainable development in its frame. Sustainable agriculture is opposite of convectional agriculture which promote bush burning practices, application of inorganic fertilizers, removal of topsoil via mechanized land clearing, over grazing, overcultivation, deforestation etc.

Unfortunately, African agriculture's inability to advance with the progression of these current agricultural modern trends in real-time continues to create a widening gap between the ideal and experienced reality. As a result, the sector has been unable to feed the ever-increasing and teeming population, as this is contributively supplemented by agricultural product and inputs imports and food aids. The food productivity growth rate of the continent is at a frustrating 0.06% while the population growth rate is at an increasing and disturbing 2.6% and annual food import at an increasing rate of 3.4%. A whooping and cumulative $45 to $50 billion (US dollars)-estimated figures, of the continent's annual budget spending is on food and agricultural products importation, yet the inherent African agriculture potential (rich and fertile soils, favorable climatic conditions and diverse weather amidst other natural resources) if fully tapped into, developed and optimized has been estimated at $1 trillion (US dollars) market value. The continent is home to almost half of the world's total cereal food aid (FAO, 2017).

Increasing food insecurity and extreme poverty particularly in sub-Saharan Africa have been aggravated by climate change, low agricultural productivity, undiversified livelihood, as well as incidence and recurrence of a natural disaster (often resulting in displacement and communal conflicts over available limited resources) beckons on the need for an improved, combined, and integrated system of production that leverages on existing innovation while developing new ones in a sustainable manner. Imperatively, this has led to the emergence, experiment, and development of modern concepts of agriculture including Sustainable Agriculture (SA), Climate-Smart Agriculture (CSA), Regenerative Agriculture (RA), Resilient Agriculture, Precision Agriculture, Sustainable Intensification (SI), Digital Farming and numerous Artificial Intelligence (AI) and Machine learning applications to agriculture. If all these developmental concepts are well harmonized, integrated, and properly developed at a large scale level and made available at an affordable price to facilitate usage by smallholder

farming communities, the future of African agriculture looks bright and promising.

African Agriculture and Food Security

Food and Agriculture continues to remain a solid premise and a major role player in the achievement of the global goals. At the core of achieving food security is the overarching and imperative need to not only invest innovatively and meaningfully in the sector (fishery, livestock, crops, aquaculture and fisheries) but more than that, to also explore comprehensive and participatory development mechanisms and approaches to sustainably manage natural resources while combating climate change and mitigating its impact on people, prosperity and the planet.

Global food productivity levels is sufficient enough to feed all planet inhabitants but the present food security narrative is far from this reality as almost about 9.3% of the world's population are still victims of sever food insecurity (FAO, 2017). Food security is multi-dimensional and hence, the food availability, accessibility and consumption are predominantly determined by biophysical, political, and technological factors. Poverty and food insecurity are deep-rooted in Africa. About 650 to 670 million of people in the continent are food insecure. Of which 250 million people are chronically foods insecure, about 25% of children are stunted, almost every country suffer from micronutrient deficiencies (Paris, Jayaram and Wamelen, 2020; FAO, 2017).

Sustainable Agriculture in Africa

Thought in Africa agriculture dominates the economy and livelihood of majority of people; still it is based on traditional and highly nature explosive and experienced production reduction. The political oriented and lack of demand driven application of agricultural inputs is also one of African agricultural feature. The sector is dominated by smallholder farmers, who are characteristically known with low productivity levels and perpetuities poverty conditions, as well as low rate of technological adoption. These, amidst several other conservative and obsolete farming practices necessitate the need for a structural transformation of African agriculture, food system and economy at large. Thus, investing in agricultural development and diffusion of new agricultural technologies to rural communities for ease of access by smallholder farmers becomes non-negotiable. Sustainable agriculture has become of one of such modern day approach to address the shortage of nutritious foods and environmental degradation that

characterizes intensive traditional farming, as well as keen considerations for the socio-economic component of food production, processing, distribution and consumption.

Sustainable agriculture is a means for the provision of sufficient food and other goods and services. It is economically efficient and profitable, socially responsible, and considers the sustainable improvement and quality service provision of the environment. This implies sustainable agriculture has multiple coexist benefits including environmental benefit, economic benefit, and social benefit (Alshaal and El-Ramady, 2017). However, the practical implementations of sustainable agriculture practices are context-specific and vary from ecological, economical, and social settings. Therefore, there is no single way of adopting a sustainable agriculture technology (Kyuma, 2005).

Sustainable agriculture focuses on producing long-term crops and livestock while having minimal effects on the environment. It tries to find a good balance between the need for food production and the conservation of the ecological system. Sustainable agriculture could also be defined as farming in sustainable ways i.e. meeting society's present food and textile needs, without compromising the ability for current or future generations to meet their needs. It can be based on an understanding of ecosystem services. The application of organic fertilizer such as crop residue and animal manure enhance the soil fertility while it has no negative effect on the natural soil formation process. The sustainable increment of agricultural production also could be achieved through agroforestry, zero grazing and enhancing biodiversity within the ecosystem. The collection of rainwater via channeling and then its utilization for irrigation is also a good example of sustainable farming practices. Rainwater harvesting could reduce soil erosion and increase the accessibility of water for domestic purposes.

Agriculture in most west and central African countries is highly related to physical labor than it is to a mechanized one. As a result, labour shortages (largely due to morbidity and rapid urban migration) is starting to impact producers, processors, traders and logistics companies in food supply chains particularly for food products that require workers. This also presents a new dynamics for digital and eco-friendly mechanized agriculture, which makes the food system less dependent on huge human labour while promoting youth agri-entrepreneurship, amidst other multiple wins element that is inherent in technological innovation deployment for agriculture.

Sustainable agricultural practices remain an integral component of the food system; as it has the potential of lifting population out of poverty and

hunger, ensure safe and nutritious foods, as well as promoting sound environmental management and sustainable use of biodiversity. This is important going forward, bearing in mind the impact and significant environmental cost of income growth and hunger reductions of the last few decades on our natural ecosystem resulting in biodiversity loss, land and water degradation and greenhouse gas (GHG) emissions, which continues to pose serious threat to 2030 agenda of ending hunger and poverty. Thus, the need for a resilient and sustainable food system that facilitates a more-efficient use of limited resources (land, water), protection and management of biodiversity which can significantly help reduce ecological footprint (World Bank, 2015).

Climate-Smart Agriculture as a modern farming approach can also help to advance sustainable agriculture and advocates the aggregation of investments, policies and technological adoption that are capable of delivering multiple outcomes within the food system (World Bank, 2015). Agriculture and land use accounts for one-fourth of total greenhouse gas emissions, making the sector the largest single contributor to CO_2 emissions. Climate Smart Agriculture offers a huge prospective for the sector be a pivotal component of the solution to reducing greenhouse gas emissions, especially with regards to the overall emissions across the entire agriculture sectors. It also presents sustainable approaches to reducing the intensity of emissions that exudes from the overall food system, including the supply, value and consumption chain. Beyond the possibilities of reducing greenhouse gases emissions, CSA also integrates a wide range of approaches that are supported by sound institutional policies and regulations that help deliver food security targets.

One of the core tenets of sustainable agriculture is to ensure a more climate-smart agriculture system with higher productivity, greater resilience and reduction of carbon footprints on farmlands, which are all important for all regions in Africa, particularly Sub-Saharan Africa. This will equally facilitate the availability of existing and new climate-smart technologies to poor farmers within the fragility of rural economies, which can help improve farmer's resilience while reducing yield gaps. Overall, the system of operation upon which sustainable agriculture works is premised on achieving balance between production, profitability, environmental protection and societal advancement (Scanes and Toukhsati, 2018).

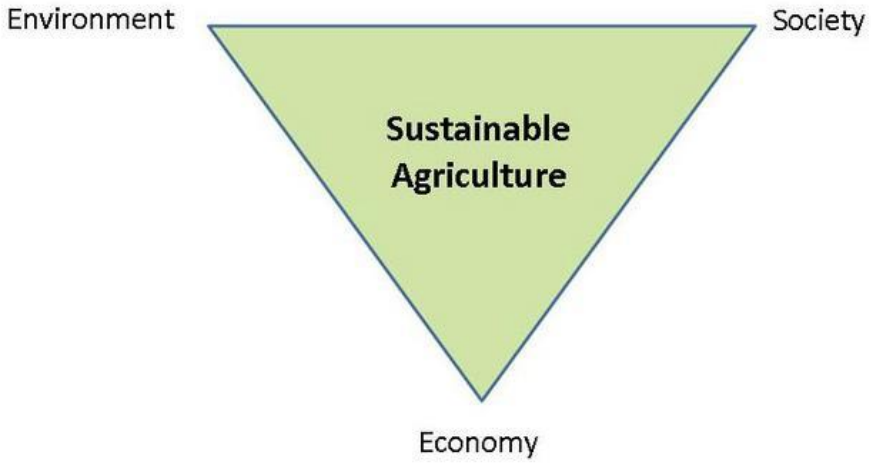

Figure 1. The pillars of sustainable agriculture
Source: Brodt *et al*. (2011). Sustainable agriculture. *Nature Education Knowledge 3(10):1*

Environmental Benefit: the wellbeing and development of human being is directly or indirectly depend on the quality of the environment (Shamsudin, Amir and Radam, 2010). Sustainable agriculture could maintain the equilibrium of nature through ecologically sound practices which promote natural cycles, recycling nutrients and water, avoiding excessive use of chemical inputs. Specifically, sustainable agriculture conserve and increase the service giving performance of the environment through reducing soil erosion, reduce water pollution, improve soil moisture content, create conducive environment for microorganism and enhance the recycling of nutrients, increase biodiversity, improve above and below carbon sequestration potentials and ensure quality agricultural production. Sustainable agriculture is capable of protecting water quality, establishing year-round soil cover, controlling invasive plants, and integrating crop and animal systems to maximize efficiencies, nutrients, and energy. The environmental benefit of sustainable agriculture summarized as:

a. Efficient use of available natural resources: the core principle of sustainable agriculture is to focus on the wise use of limited natural resources as it seeks to foster an accountability culture and responsible usage while drawing on preservative, conservative and circular principles of resource management. Environmental stewardship of soil, water, wildlife, forestry, aquaculture, and fisheries while ensuring the reduction of greenhouse gas emissions
b. Restoration and maintenance of diverse natural ecosystems (lakes, freshwater bodies, reclamation of agricultural lands, afforestation):

leaning on the principle and benefits of environmental stewardship, sustainable agriculture facilitates effective management and maintenance of natural ecosystems. Depleted ecosystems including dried-up lakes, contaminated water bodies, and degraded cultivated and grazing lands could be restored and reclaimed for productive uses with the deployment of sustainable agricultural practices and systems.

c. Climate resilience of food system activities: Sustainable Agriculture principles are core to the development and deployment of climate-smart and resilient practices that is a necessary foundation for the sustainability of the continents food system, including but not limited to: irrigation, vertical farming, greenhouse farming, hydroponics and precision agriculture. Inherent in climate-resilient practices is the need to strengthen and support resource biodiversity as well as sustainable management and use of scarce and geographically varied natural resources.
d. Protection and sustainable management of biodiversity: one of the major effects of climate change is the drastic loss of diversity and ecosystem disservice, largely responsible for by worsened climate variations and stimulated by uncontrolled use and inadequate management of natural diverse resources.

Economic Benefit: economic viability is a prerequisite condition for sustainable agriculture and food systems. The interdependence nature of the three pillars of sustainable agriculture could be explained by practices of sustainable agriculture e.g. agroforestry, crop rotation, crop diversification in the face of biophysical and demographic shocks. Agroforestry could help to reduce risks and improve soil and water quality, thus increase other environmental benefits and motivate social responsibility. Sustainable agriculture could play important role:

a. Efficiently organised and diverse food Value Chains – production to consumption – capable of meeting the diverse nutritional needs of different segments of society in an economically viable manner over time including an adequate provision of jobs and incomes.
b. Reduced cost of health maintenance: access to nutritive and safe foods in the longer term does not only meaninfully contribute to food security but equally ensures healthy nutrition that boosts the immune systems and facilitates the proper functioning of other body systems. This reduces the cost of healthcare services and charges associated with curative treatment and general maintenance of the body.

Social benefit: one of the core principles of sustainable agriculture is ensuring the social responsibility during short-term economic gain and long-term resource stewardship. Therefore, unlike conventional agriculture; sustainable agriculture takes in to account the needs of the farming community, working and living conditions of laborers, consumer health and safety both in the present and the future, effective and equitable gender-inclusive engagement of locally available human resources, social cohesion and security, freedom of choice, and identity values.

Options of sustainable agriculture in Africa

Permaculture: is a holistic land management approach applied to make agriculture more sustainable. It implemented with the intention to restore soil, conserve water, and redirect waste streams. Permaculture gives a particular emphasis on the use of perennial crops such as fruit trees, nut trees, and shrubs that all function together in a designed system that mimics how plants in a natural ecosystem would function.

Biodynamic: is a holistic approach integrates collective spiritual, ethical and ecological agricultural practice targeted to restore the ecology and produce quality crop in an organic system sustainably (Chalker-Scott, 2014; Mason, 2003; Diver, 1999). The ultimate goal of the biodynamic farming is create resilient ecosystem capable of supporting people and other living organisms. The farming community encouraged to maintain the health and fertility of the soil through the production and application of organic fertilizer. It involves specific activities such as compost making; cover cropping, crop rotation etc. Biodynamic practices can be applied to farms that grow variety of produce, gardens, vineyards, and other forms of agriculture. The higher the biodiversity the more will be resilient and productive ecosystem.

Hydroponics and aquaponics: These innovative farming techniques involve the growing of plants without soil, nourishing the plants through specialized nutrients that are added to water (Recirculating Farms Coalition, 2013). Hydroponic systems grow vegetables, herbs, some fruits and flowers in growth mediums such as coconut fibers or perlite. Aquaponics systems are hydroponic systems that include fish and plants in one system to provide a source of fertilizer to the system and, depending on the species of fish, are harvested as a source of protein.

Urban agriculture: is the agricultural practices encompasses horticulture, animal husbandry, aquaculture and other fresh food production carried out in urban and peri-urban areas. It could be performed at various scale including gardening in backyards, schools, public right-of-way and

boulevards; community gardens; urban farms; rooftop and balcony gardens; hydroponic, aquaculture, and vertical gardening; keeping micro livestock such as hens, rabbits, and bees; greenhouses; permaculture design in parks; edible landscaping; public orchards or food forests; and agricultural parks (Smit and Nasr, 1992).

Agroforestry and food forests: is a dynamic ecologically based natural resources management system through the integration of trees on farms and in the agricultural landscape, diversifies and sustains production for increased social, economic and environmental benefits for land users at all levels (Alao and Shuaibu, 2013). The system combines the practice of agriculture and forestry for making a more diverse, sustainable and productive farm. In agroforestry systems, trees create a favorable microclimate that maintains favorable temperature and soil humidity, while protecting crops from wind or heavy rain. Trees could stabilize soils, minimize nutrient erosion and leaching and improve soil structure. The system promotes healthy growth of food crops and maintaining soil fertility and hence, trees provide wood and fruits as an additional source of income for farmers.

Natural pest management: natural pest management involves a range of pest controlling methods to reduce or replace the application of synthetic pesticides (Pretty, Toulmin and Williams, 2011) that should suppress pest infestations and pathogens. The application of synthetic pesticides and other chemicals to control could be successful for short-term at the expense of nature. However, natural pest management system is effective and environmentally friendly. Beside, the natural pest management system could reduce costs to farmers and improves on- and off-farm sustainability.

Food systems

Food systems generally refers to the complex dynamics involved in the production of food, its distribution channels all the way down to the final consumer, covering the entire life cycle and end of life use. A food system describes all activities and operations that accompany land cultivation, management practices, harvesting, storage, value addition, branding and packaging, distribution, sales, consumption and disposal as well as the underlying political, economic, social, technological and cultural factors influences their dynamics (Van Berkum *et al.*, 2018). Thus, food system is an embodiment of all processes involved in the entire life cycle of food. It is crucially important to also note that any food system exists and operates in

the presence of a socio-ecological and political landscape, which influences the system's utility of available resources.

The term food system captures all the different activities that turn resources to food. It encompasses food production, transportation & distribution and food preparation and consumption. It also involves producers, consumers, agricultural and fishery inputs, processing and storage, transportation and marketing, etc. The food systems can be assessed through six components including: Labour farming and productivity, food supply, food demand, food prices, foreign financial flows, and domestic capital.

Consequently, the term food system is used frequently in academic discussions to explain the linkage between the environment, food production and processing, health, community economic development. Food systems are the sum of actors and interactions along the food value chain—from input supply and production of crops, livestock, fish, and other agricultural commodities to transportation, processing, retailing, wholesaling, and preparation of foods to consumption and disposal.

A sustainable food system is one in which healthy, nutritious and affordable food is incessantly and unceasingly produced, processed and distributed in an economically, socially and environmentally sustainable manner (Recirculating Farms Coalition, 2013). A sustainable food system is core to strengthening Africa's food system and meaningfully contributing to the achievement of the Sustainable Development Goal (SDGs) and more significantly, facilitates the need for transformative adaptations of Africa's agriculture to climate change. New tools and technologies are requisite for these transformative adaptations as well as a mix of multiple stakeholder collaboration to achieve success and ensure accessibility and affordability for smallholder farmers.

Africa's food system requires a multispectral approach to ensure food security for all at all times, everywhere guaranteeing safe and nutritious foods that also transcends into improved quality life, particularly in rural communities (World Bank, 2015). Inclusively, there is also the need for the adoption of differentiated approaches by African countries to effectively achieve a sustainable food system owing to the uniqueness and distinctiveness inherent within each geographical boundary. And one striking truth about the success of a sustainable food system is the potential it has to contribute immensely to shared prosperity for individual countries and the continent at large.

The African Continental Trade Area can be effectively leveraged on by the African community to strengthen and facilitate a sustainable food system that banishes hunger and malnutrition, which could also contribute to the dietary resilience of her people. The expansion of the market no doubts has its challenges but could the market linkages could also stimulate a sustainable food system if there is a synergy of intent by all stakeholders and players.

Most of the increase in world's food demand in the next decade will be from Africa with an estimated 60% increase out of the 20% global increase in food demands (FAO, Data). This is no surprise bearing in mind the population growth trajectory of continent but a clarion call to reinvent our food systems to one that can sustainably meet the food, nutrition and health needs of the population. This is particularly important and as a matter of urgency as climate change continues to reduce crop yields while the global food system still combats with extreme weather conditions and the recent fundamental shifts in seasonality (World Bank, 2015; IPCC, 2014). The rapid food demand in Africa coupled with urbanization make worst to achieve sustainable food system and food security in the years to come.

Climate change brings in much needed dynamics to transforming Africa's food system, as addressing this challenge can rapidly facilitate a resilient food system that can withstand the shocks of Africa's varying agro-climatic conditions while accommodating the market shifts and composition of food demand. Ensuring food security in Africa will also require strengthening smallholder production, as they are a dominant force to reckon with in food production, as well as promoting large scale commercial production to bring in the needed production mix and diversity. This becomes a major priority for Africa's policy makers and associated public-private investment that is needed to actualize, promote and support this production mix.

At the core of achieving food security is the need for a sustainable food system that ensures safe and nutritious diet, which is capable of preventing and reversing undernutrition, malnutrition and other significant dietary health challenges across the regions of the continent. In essence, while increasing food's availability at affordable prices remains primal, utmost priority must also be given to promoting nutrition sensitive agriculture that can help address Africa's dietary and health challenges.

The ongoing rapid economic transformation in Africa, has brought the continent to the limelight of sustainable development, especially with half of the world's ten fastest growing economies resident in sub-Saharan Africa.

Agriculture is no doubt, one of the major drivers of the region's economic growth and with this unprecedented growth are accompanying opportunities and challenges associated with development, with the shift in food demand, downstream modernisation of the food systems, and rising competition over African farmland, one of such major development trends.

The transformation of the African agriculture and food systems is debatably dependent on exogenous processes that are highly subjective to probability of occurrence: income growth and the potential prices of food in the future amidst needed policies and investment decisions across all stages of the agricultural value chain.

The present trajectory of food demand in the continent is one that beckons on a sustainable and more resilient food systems capable to weather through the storms of conflicts, displacement, poverty, disaster's, insecurity, unemployment and ever the increasing population growth rate.

The rapidly growing labour force in Africa can be effectively leveraged on to fill up the missing gaps that exists in the economy if they are provided with the right privileges, platforms and opportunities to not only explore their potentials but to develop and deploy it for the common benefit of all.
A data-driven food system become expedient for the African narrative to ensure a strong and resilient, informed equitable and inclusive system that's better able to handle shocks and uncertainties. Agriculture plays a key role in the livelihoods and means of sustenance of rural economies, yet the African food systems continues to be at the mercy of international crisis as the continent is still largely dependent on food imports.

Impact of Hydro-meteorological and Biological Hazard on Agriculture and Food System

The African agriculture is under hydro-metrological and biological stressors and hence, the ever increasing population and rapid urbanization. East African countries e.g. part of Ethiopia, Kenya and Somalia have been affecting by locust invasion since mid-2019 (FAO, 2020). Yet the locust outbreak is expected in the region. This region also severs affected by flood in 2020. The 2019 agricultural harvesting in Zimbabwe and northern Mozambique affected by erratic mainly low rainfall. Human induced hazard i.e. unrest in South Sudan, Northern Nigeria and the Sahel region pushed many to food insecurity. Some of Africa's major export crops, including cocoa and coffee, were already at historically low pricing levels coming into 2020—although signs of recovery were visible in late 2019 and early 2020

(Paris, Jayaram and Wamelen, 2020). Environmental degradation is widespread and responsible for the reduction of agricultural production.

COVID-19 has impacted mankind and expected to be felt hardest in Africa (Paintsil, 2020). The pandemic has a potential to adversely affect the agricultural sector and all dimensions of food security. Limited availability and access to food, restriction of labour, import and price fluctuations are manifestation of the virus impact on food system (WFP, 2020). The pandemic has adversely affected the intra and inter regional trade and slowed demand for agricultural export products, worsen job opportunity and livelihood security, hinder agricultural activity and input distribution check this statement again, your narrative never showed food system that is resilient. This is due to the fact that the 2019 harvesting year was good for most Africa countries. For instance, in south Africa 2020 maize production is projected to increase >30%, in East and West Africa major planning seasons had largely begun before COVID-19 escalated, and agricultural inputs had already been distributed. Agriculture in Africa is already affected by hydro-metrological and biological hazards.

Conclusion and Recommendations

African countries have been heavily dependent on rain-fed agriculture for their national development and livelihoods for generations. The multifaceted factors such as alarming population growth, biological hazards, land degradation, desertification, lack of appropriate technology, and policy made the sector less profitable and hence, undermine the sustainability of the food system. In addition to frequent drought, flood, locust invasion, the encroachment of the rangeland by invasive species, and currently COVID-19 has become a serious challenge to African agriculture and its food system. Sustainable agriculture has economic, social, and environmental benefits. It is considered a remedy for land degradation, water scarcity, pollution, market fluctuation, and food insecurity. In Africa there are ample local and national sustainable agricultural practices which could strengthen the food system. Therefore, nations should promote and adopt various types of sustainable agriculture practices such as permaculture, biodynamic, hydroponics and aquaponics, urban agriculture, agroforestry and food forests, natural pest management etc depending their ecological, economic and social settings and minimize the application of synthetic chemicals to increase production.

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