Environmental Responsiveness towards Desertification and Land Degradation: A Review of Literature on Restoration Strategies in Dryland Communities in Africa

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*Abstract*—Desertification and land degradation have remained a huge challenge to the actualization of the United Nations Sustainable Development Goal 15 in Africa. Given the proposed “Decade on Ecosystem Restoration” (2021-2030), this study examines the restoration approaches and strategies employed to tackle desertification and land degradation, determine the impacts of the strategies employed, examine the factors responsible for unsustainable land restoration, and identify sustainable land restoration approaches in dry land communications in Africa. The study adopted a semi-systematic review of extant literature on land restoration from academic journals, reports, and newsletters from 2000 to 2023. The results show a preponderance of participatory approaches and ILK of land restoration activities in dryland communities in Africa, whereas science-based methods are scarce. Most restoration practices involved biological, surveillance, mechanical, water conservation, climate-smart agriculture, soil fertility restoration strategies and income generating techniques, but advocacy measure was low. Various restoration projects yielded substantial benefits, including regenerated vegetation, improved nutrition and income generation among community groups. However, lack of funding, insecure land tenure system, poor coordination and monitoring of projects constitute huge barrier to land restoration efforts in Africa. We conclude that people centered projects, social incentives, income generating venture and mass advocacy are drivers of sustainable land restoration practices in Africa.)

Keywords— Africa, Environmentally Responsible Behaviour, Desertification, Dryland, Land Degradation, Land Restoration, Indigenous and Local Knowledge, Sustainable Development

# Introduction

and is an essential resource to humanity. Thus, desertification and land degradation are serious threats to mankind. United Nations Convention to Combat Desertification (UNCCD) [1] describes desertification as land degradation in arid, semi-arid, and dry sub-humid areas resulting from many factors, including climatic variations and human activities. Land degradation reflects persistent deterioration or diminution of land vitality, productivity, or value. The far-reaching effects of land degradation on humanity include environmental deterioration (loss of habitat and biodiversity, species endangerment, reduced groundwater recharge, increased soil erosion, dust storms, flash floods, and sand encroachment [2-5], low agricultural productivity due to diminished soil fertility, loss of biodiversity and water scarcity, socioeconomic challenges (poverty, marginalization, decreased social and economic resilience, population movements), public health challenges such as malnutrition and hunger, water-borne diseases, respiratory problems and other epidemics [6], insecurity (resource-driven competition, forced migration, conflict over land and water resources, and wars) [2, 7]. The greatest burden is borne by poor populations particularly in agriculture-dependent environments [8]. Moreover, the impacts transcend beyond the areas directly affected to national, regional, and global echelon.

Climate variability and anthropogenic activities are observed causes of land degradation. Unprecedented natural climate variability and human-induced climate change resulting from atmospheric pollution by carbon dioxide and Greenhouse Gases (GHG) cause persistent extreme heat, decreased precipitation, high weather temperatures, hurricanes, drought, rising sea levels, flood, evapotranspiration of bare unvegetated soils, water and wind erosion, and biodiversity loss. These climatic stresses trigger land degradation. Hence, restoration actions contribute to climate change mitigation and adaptation.

On the contrary, anthropogenic activities are human actions such as increased pressure on land due to population growth, expansion of croplands, overgrazing, deforestation, poor agricultural practices, and unsustainable land management systems that propel land degradation [8]. Some of these human activities are difficult to control. Hence, they remain persistent drivers of land degradation.

About 24 billion tons of fertile land are lost per annum, affecting 3.2 billion people across the globe [9]. At the same pace, about one billion hectares of productive land will be degraded by 2030, and 95 percent of the landmass on earth could be degraded by 2050 if sustainable land restoration projects are not implemented[9]. The problem is particularly severe in drylands- arid, semi-arid, and sub-humid zones often found in Asia and Africa [10].

Drylands account for 40% of African landscape (one billion hectares), 27% of the drylands on earth, and 11% of the human-inhabited dryland regions [3, 11]. More so, the content accounts for more than one-third (715 million ha) of degraded land globally [12-13]. Africa loses four million hectares of forest per annum [3-4], including 65% of arable land and 30% of grazing land [13], contributing to a three percent loss of the continent's GDP [3]. Yet these degraded lands have the potential for restoration [4,12].

Africa remains the most vulnerable to land degradation since the majority of the population depends on agriculture for livelihood. An effective land restoration and management system is essential for the long-term productivity of arable lands in Africa. Unfortunately, various remedial actions to recover and maintain the affected landscapes by national and regional governments, global aid agencies, international and community-based organizations and individuals, have not yielded much success due to the worsening climate variability and unsustainable restoration practices. Therefore, understanding land restoration actions and the effectiveness of specific responses is crucial for planning and sustainable project implementation. However, the land restoration approaches and strategies in Africa's dryland communities have received little attention from researchers. Based on this backdrop, this study sought to;

1. identify the restorations approaches and strategies employed to tackle desertification and land degradation in dryland communications in Africa.

2. determine the impacts of land restorations in Africa.

3. examine the barriers to sustainable land restoration in Africa.

4. Identify sustainable land restoration approaches in dryland communities in Africa.

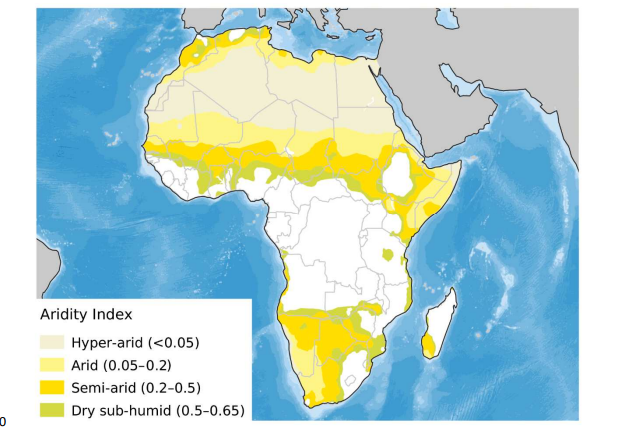
## 2. Literature Review

## 2.1 Drylands, Desertification and Land Degradation)

Drylands are arid and semi-arid regions where the annual evapotranspiration surpasses rainfall. Thus, drylands are characterized by lower precipitation, irregular rainfall, recurrent drought, water scarcity, and inadequate soil water retention capacity, but with prospects for livestock breeding and periodic agriculture [10, 14].

Africa has the highest dryland landscape in the world (see Figure 1).

Figure 1: Map of Africa Showing the drylands



Source: Wei et al., [11]

Two-thirds of Africa's topography consist of dryland, including three-fifths of agricultural land and two-fifths of homelands to African population [15]. These regions experience twice the global average warmth and often associated with desertification and land degradation.

Desertification was first used by European and American scientists to describe increase in sand movement, desiccation, desert and Sahara encroachment [16]. This definition was misconstrued to mean desert advancement. However, the United Nations Convention to Combat Desertification (UNCCD) describes the concept as land degradation in arid, semi-arid and dry sub-humid areas resulting from climate variability and anthropogenic activities [17]. It encompasses all types and degrees of land degradation occurring in drylands and is not restricted to permanent forms of land deterioration or synonymous with desert expansion [8].

The UNCCD further defines “land degradation” as “the reduction or loss, in arid, semi-arid and dry sub-humid areas, of the biological or economic productivity and complexity of rainfed cropland, irrigated cropland, or range, pasture, forest and woodlands resulting from land uses or processes caused by human activities and habitation patterns, such as: i) soil erosion caused by wind and/or water; ii) deterioration of the physical, chemical and biological or economic properties of soil; and iii) long-term loss of natural vegetation” [17]. These definitions imply that desertification and land degradation are twin environmental hazards which may be discussed in isolation.

## 2.2 Combating Land Degradation for Sustainable Development

Desertification and land degradation directly impact the lives of people residing in the affected regions. Wherever the phenomena exist, the impacts crisscross all aspects of human lives; socioeconomic, health, food security and nutrition, safety and security. Hence, they remain a huge challenge to sustainable development. Thus, concerted efforts at combating desertification and land degradation would have multiple advantages towards the attainment of the Sustainable Development Goals (SDGs) by 2030.

Recognizing the urgent need to address the extensive problems of desertification and land degradation, the United Nations General Assembly established the UNCCD in June 1994 (but started operation in 1996) as a legal framework to address the problem by creating and implementing action plans in those regions and countries (particularly in Africa) facing severe land degradation. More so, the UNCCD designated June 17 every year as the “World Day to Combat Desertification” for advocacy about land degradation to secure the participation of citizens, local communities, and NGOs in reclaiming the affected landscape.

More so, SDG 15.3 aims at combating desertification, restoring degraded land and soil, including land affected by desertification, drought and floods, and striving to achieve a land degradation-neutral world, and 2021–2030 has been declared the “Decade on Ecosystem Restoration” with the aim of achieving Land Degradation Neutrality, wherein the amount and quality of land ecosystems remains stable and do not decrease further [18-19]. Thus, restoration of degraded land is significant for achieving sustainable development particularly in Africa’s drylands.

## 2.3 Land Restoration Approaches and Strategies

Most degraded landscapes require human assistance for recovery. Therefore, land restoration is essential for reversing the degraded ecosystem and restoring its health [20], using simple, inexpensive, and accessible methods [21]. Land restoration benefits include the removal of carbon from the atmosphere, ecosystem vitality, food availability, improved livestock breeding, income generation, and contribution to climate change adaptation and mitigation co-benefits (8, 21].

Restoration efforts assume various forms based on the locale [22]. Restoration could be wide-scale (involving landscapes with less than ten inhabitants per kilometer and the potential for a closed forest), mosaic (landscape with moderate human pressure), and remote (unpopulated landscapes far from human settlements) [23]. Also, it may require biologically assisted natural regeneration by tree planting or grass breeding in one location and mechanical measures such as wind hedge construction in another. For this reason, restoration options are tailored to the biophysical and socio-economic conditions of the affected landscape [20].

Restoration actions could involve the scientific method or the Indigenous and Local Knowledge (ILK) approach. The ILK remedial actions are context and time-specific traditional agroecological practices among populations directly affected by land degradation (8, 24 - 26]. Based on the long-term experience of indigenous people and local communities in dealing with the challenges of land degradation, ILK informs effective restoration practices due to economic, cultural, and social ties [27], but the scientific techniques provide the framework and quantitative metrics for monitoring and evaluation [27]. To achieve a balance, Filho, et al., [28] advocate for a combination of traditional and scientific knowledge where each system complements the other.

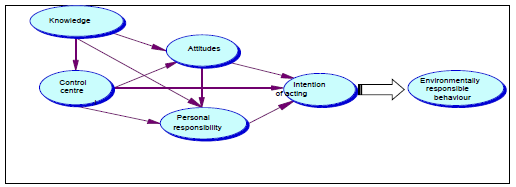
In addition, there are “top-down” and “bottom-up” participatory approaches to land restoration. The “top-down” approach is where experts initiate and implement national and regional land restoration projects, defining objectives, activities, and expected outputs. Critics faulted this approach for failing to incorporate the perspectives, perceptions, and capacities of the local people. Consequently, the UNCCD stresses the adoption of a “bottom-up” approach, recognizing the importance of local knowledge, pragmatism, and the ingenuity of dryland communities in decision-making, project implementation, monitoring, and evaluating projects based on the assumption that shared ownership would ensure safety and sustainability of ecological recovered landscapes [25, 29-30]. Most participatory land restoration projects are initiated by the government and international and community-based organizations, corporate institutions and individuals. However, they are often labor-intensive and time-consuming, and faulted for being centralized, gender bias and poor coordination [31], and lack of definite guidelines on the nature of participation required [32].

Generally, inadequate funding, lack of sustainability of programs, inaccessible and unaffordable technology empowerment, land fragmentation system, inadequate information, and the difficulties encountered in accessing and sharing information hamper land restoration in Africa [33].

*2.4* *Theoretical framework*

Various theoretical assumptions attempt to explain why people engage in environmentally responsive behaviours. However, the supposition that lend credence to this paper is Environmentally Responsible Behaviour (ERB) model represented in Figure 2.

Figure 2: Environmentally Responsible Behaviour model

 Source: Akintunde [34]

The ERB model as propounded by Hines et al., [35] depicts that individual behavior towards solving environmental problems depend on the interaction between individual knowledge, attitude, sense of personal responsibility, and a sense of personal control over the issue and intention to take action. Intention of acting is driven by a combination of factors, while intention alone could lead to environmentally responsible behaviour. ERB is a multidimensional process including persuasive, physical, legal, financial, educational and civic actions [36], eco-friendly, green and conservation behaviours [37] and environmental activism [38].

Environmentally responsible behavior in terms of land degradation refers to land restoration efforts. This model reflects that engagement in land restoration practices is multifaceted. Knowledge of land degradation alone is insufficient to trigger land restoration actions. Likewise, positive attitude, personal responsibility and control may not stimulate intention. However, intention is the major factor driving engagement in land restoration behaviours.

3. Materials and Methods

*3.1 Research Design*

This study explored environmental responsiveness towards desertification and land degradation in Africa's dryland communities, using secondary data from extant literature. The study adopted a semi-systematic literature review method. This method is applicable where it is hard to evaluate all materials that appears to be pertinent to the subject matter of inquiry due to extensive literature. It generally aims at retrieving and synthesizing all conceivably evidence on the subject under investigation. Thus, the semi-systematic review in this study followed a carefully planned and flexible technique for executing a literature search to gather answers to research problems.

*3.2 Literature Search*

Data for this study were gathered from academic literature in Google Scholar digital repository and government publications, policy documents, reports and periodicals online. We used search terms “Land Restoration and Africa” Or “Degraded Land Restoration and Africa” OR “Degraded Land Restoration and Africa’s Dry Lands” Or “Restoration of Desertification Affected Lands and Africa, “Land Restoration Approaches and Africa” Or “Land Restoration Strategies and Africa” Or “Land Restoration Strategies and Africa’s Drylands”.

*3.3 Inclusion and exclusion criteria*

The inclusion criteria are; full-text original articles/reports written in English, published from 2000 to 2023, and focus on one of the research questions at least, whereas the exclusion criteria include, articles written in other languages, published before 2000, do not discuss land restoration in Africa, or cannot be accessed in full text. Thus, review and theory based articles were excluded from the assessment. The first search yielded 71,200 articles. These papers were checked for duplicates using the titles and abstracts of the articles.

*3.4 Merging and Removal of Duplicates*

This stage involved the compilation of results and removal of duplicates. A total of 27 duplicates were detected and removed. Titles and abstracts of the remaining articles (71, 273) were analyzed to verify how relevant they are to the study topic, with the exclusion criteria. Articles with causal mention of desertification, land restoration and land restoration or had a different focus other than the research objective were excluded at this stage. A total of 65 articles were shortlisted articles, and used for backward and forward search, of which two more articles were found. The full text of the 67 articles was subsequently evaluated for applicability to the research questions using the inclusion and exclusion parameters. Lastly, 32 articles were used as the final corpus for analysis.

4. RESULTS

*4.1 Land Restorations Approaches in Africa*

The results show a preponderance of participatory approaches, and ILK of land restoration activities in dryland communities in Africa but science-based methods are scarce in the literature.

Participatory-Based Restoration

Most of the government, international, and community-based organizations that assisted land restoration initiatives in Africa employ the bottom-up participatory approach integrating indigenous knowledge and scientific innovations. Some of the government and international organizations’ initiated projects include the African Union’s Great Green Wall of Africa (GGWA) launched in 2007 to restore degraded landscapes across North Africa, the Sahel, and the Horn of Africa and involving twenty-one including Nigeria, with the initial plan of planting a 6,000-km-long wall of trees. The GGWA focus later involved a mixed vegetation, trees, and bushes and solar electricity to reduce the use of fossil fuel [39-40]. Even though some experts perceived the project as impractical, it has recorded some progress. The Rehabilitation of Arid Environments (RAE), a charitable trust, aimed at using indigenous grass species to restore the degraded ecosystem in Kenya, and construction of fences to safeguard them. Also, income-generating activities such as baling hay, harvesting and selling the grass seed, beekeeping, leasing fields, selling milk, and thatching grass. Through this initiative, about 1,700 hectares were reclaimed, in addition to increased biodiversity and reduction of soil erosion [41]. Action Against Desertification was launched and implemented in six African countries (Burkina Faso, Ethiopia, The Gambia, Niger, Nigeria, and Senegal) by FAO and partners in 2014, to restore degraded land and to manage fragile ecosystems [42] Regreening Africa, a five-year programme (2017–22) funded by the EU addressed land degradation and aimed to contribute to the livelihoods of 500,000 smallholder farmers in eight African countries (Ethiopia, Ghana, Kenya, Mali, Niger, Rwanda, Senegal, and Somalia, through a tree-based value chain [13]. Also, the FAO BRIDGES project was a farmer-assisted natural regeneration, soil fertility management through tree planting, shrubs and fodder grasses breeding, and water conservation [43]. More so, AFR100 (African Forest Landscape Restoration Initiative) is a continental commitment to restore 100 million hectares of land in 34 African countries by 2030 [22, 44].

The community-based organization's projects include The Green Belt Movement which organized various women-led community organizations to grow 50 million trees for soil erosion control, in addition to providing food and fuel for community residents in Kenya [22]. Also, the Albertine Rift Conservation Society (ARCOS) was founded by Dr. Sam Kanyamibwa, to restore eroded and degraded landscapes in partnership with smallholder farmers. The non-profit trains farmers in more sustainable practices such as building terraces and planting trees on farmlands to prevent erosion and restore soil fertility in Rwanda [22].

ILK-Based Restoration

In Niger for instance, ILK land restoration approaches include encampment contracts with livestock herders to provide excreta of cattle and leftover fodder, the use of household wastes to enrich degraded arable lands for agricultural purposes [47], hand-made wind hedges using willow branches, stone bunds or wheat straw by stacking or pilling them to create sufficient windbreak (48-49]. More so, restoration strategies vary among households, communities, and countries based on income, social norms, training, and access to credit. However, locally-led restoration projects have the potential to achieve more long-term success as well as economic benefits to local communities [44]. Hence, ILK-managed landscapes account for a greater part of the ecosystem with less degradation and less deforestation [27]. However, Mathai [22] posits the investment in ILK’s financing and monitoring remains low, despite its considerable success rate. The results show a preponderance of participatory approaches, and ILK of land restoration activities in dryland communities in Africa but science-based methods are scarce in literature.

*4.2 Land Restoration Strategies in Africa*

The findings show that land restoration strategies documented in the literature include a preponderance of biological, surveillance, mechanical, water conservation, climate-smart agriculture and soil fertility management techniques, but advocacy measure was low.

i. Biological Measures

The method of assisted natural regeneration of arable land known as afforestation, reforestation or agronomic/biological conservation using tree planting and perennial breeding of grasses and broadleaves. Various studies show that both ILK, science-based and participatory land restoration initiatives aimed at planting long lasting, economic and drought-resistant indigenous plant species to naturally regenerate vegetation in drylands (20, 39, 45, 48-52]. Tree based restoration projects are cheaper and easy to track [53], and have helped various communities in Africa to cushion the effects of desertification in Ghana, Kenya, Malawi, Mali, Nigeria, Senegal, Tanzania, Uganda and South Africa (45, 48, 54-55]. Fruit trees vegetation regeneration was initiated by women in Awgu community in Nigeria [55]. Agroforestry (integration of trees and shrubs into crop and animal farming) were employed in diverse places including Kenya and Ethiopia (45-46).

ii. Surveillance measures

The results show that traditional tree surveillance brigades are engaged in some African communities to monitor trees planted in degraded areas to prevent illegal wood cutting and enforce the laws against offenders [55]. Likewise, tree adoption is implemented in Ugandan [56], and a tree is planted for every baby born in the village of Futa in northern Senegal, under the “Un nouveau né, un abre” initiative to ensure proper surveillance for trees planted [57]. Other control measures include the establishment of Environmental Protection Agencies and pest control [50].

iii. Mechanical measures

Mechanical tactic is another measure undertaken to combat desertification and land degradation in various communities Africa. The tactic involves wind hedge construction to control surface sand movement and preserve the surface soil [48-49], use of sandbags, contour budding and terrace construction for erosion control [49, 58-59] and fence construction to safeguard grasslands, crops and vegetables [39, 42].

iv. Water conservation

Availability of water has a significant impact in combating desertification and land degradation. Hence, water conservation and harvesting technologies are employed to provide more access to water supply for crops and livestock. Water conservation structures such as dams, well and trenches (retention basins), reservoirs as well as rainwater harvesting and various irrigation methods are employed to ensure constant availability of water (4, 9, 20, 45, 49, 60-61).

v. Climate-Smart Agriculture and Soil Fertility Management

Soil fertility management techniques such as manure-compost, frequent ploughing, and terracing, are employed to boost soil fertility and agricultural productivity [62]. Also, leguminous hedges control the velocity of running water and reduce wash off [52]. Climate-smart agriculture and crop engineering

vi. Income-generation

Besides environmental restoration, economic trees and grasses generate income for community residents particularly farmers and pastoralists. For instance, farmers received carbon credits payment for reducing emissions through agroforestry plantation in Koné Béri, Niger, Mali, and Senegal (9,46]. In addition, Arabic gum produced by the Acacia Senegal trees yielded some income to farmers [46]. Also, animal fodder grasses, solar salt production in Guinea-Bissau’s generate, and Neem oil extraction in local communities in Northern Cameroon generate income for farmers, particularly women [63]. Other income generating restoration strategies include bee keeping, milk and honey harvesting, and thatching grasses [41].

vii. Land Restoration Advocacy

This study found that advocacy for land restoration are sparsely documented in literature even though the UN has marked the “World Day to Combat Desertification” for advocacy during the study period. “Walking The Talk” in Kenya’s Mukogodo Region aimed at creating awareness about the TRI, forest restoration and tree planting programme and mobilize local support for the initiative [63].

4.3 *Impacts of land restoration actions in Africa*

The benefits of restoration efforts vary according to strategies use and the location where the actions are implemented. Thousands of hectares of degraded lands have been regenerated in Burkina Faso, Mali, Niger, Kenya, Ethiopia and Senegal between 2000 and 2023 through massive tree planting projects [20, 22, 44, 45, 50, 57, 58, 64]. Community-based afforestation or reforestation regenerate degraded ecosystem and generate income for local communities. The concept has given birth to “treepreneurs” who engage in collection of seeds, commercial growing of economic tree seedlings for sale, tree planting and tree maintenance enterprises. Tree-based business provides employment and income to those who invest in it [65], resulting in poverty reduction, improved nutrition and health among community groups who engage in tree-based restoration projects.

More so, the land related conflicts significantly decreased [9]. Water conservation projects increased the capacity of communal water facilities for livestock and reduced drought-induced livestock deaths (45, 49], as well as water for dry season farming and improved agricultural productivity [42].

*4.4 Barriers to Sustainable Land restoration in Africa*

Despite the considerable gains and expectations for huge gains from land restoration investments, the results show that land restoration efforts in Africa remain low. Most capital and labour intensive restoration projects have suffered setbacks due to financial challenges resulting from failed promises and delays of funds [66] and unstable foreign aid policies [47]. Persistence of land degradation drivers such as hyper population growth, poor land management techniques, insecure land tenure system, and persistence of climate variability continue to threaten the survival of planted trees and grasses [8,12]. Property rights in Africa restrain the inclusion of women in restoration efforts and the management of natural resources, as many farmers and communities lack legal ownership of land, trees, fruits, and other products (3, 13, 67]. Likewise, some land restoration policies are undermined by poor coordination [68], and efforts in one sector undermine those in another [13]. Land restoration activities take a long time to yield the desired results [8], and monitoring is complicated [53]. Other factors that hinder land restoration efforts include violent conflicts [8] and language and literacy level [28].

*4.5* *Approaches for Sustainable Land Restoration Practices in Africa*

This study has found that most participatory land restoration efforts have been implemented in Africa’s dryland communities, using biological and mechanical measures as the major strategies for reclaiming degraded and impoverished landscapes. Despite the gains recorded so far, some projects have suffered some setbacks. Hence, some sustainable land restoration practices observed in the literature are highlighted in this section.

People-centered projects

Restoration interventions are people-oriented projects than they are about changing the environment [13]. We observed that participatory land restoration projects co-designed and implemented with farmers, women organizations, and pastoralists yield better outcomes. The benefits include the re-activation of agricultural activities in affected areas, improved crop yield, job opportunities, and improved income for participants [69].

Social incentives

Poverty is evident in many communities affected by desertification and land degradation. Therefore, short-term economic gains such as food subsidies, preferential tax policies, discounted loans, and rights to use reserved regenerated lands could facilitate further participation in land restoration projects. Community-based agricultural insurance schemes are another innovative measure that guarantees risk reduction for community members who engage in land restoration practices. A pilot project in Malawi shows that drought insurance schemes for vulnerable populations are a viable and feasible mechanism for reclaiming degraded landscapes in local communities [69]. Lastly, granting the right of ownership for economic trees planted in ancestral lands will motivate more people to bequeath their land for such projects. These short-term benefits will facilitate investment in long-term restoration practices.

Income generating trees/allied projects

Integration of economic trees, fruit, fodders, and legumes serves multiple purposes- regeneration of degraded landscapes, income generation, and food for participating households. Carbon offsetting projects, for instance, serve as a viable income stream for participant communities (9,13, 51). Participants who generate income would most likely safeguard investments in land restoration efforts. Thus, investment in economic trees such as cocoa, oil palm, cashew, coffee, coconut, citrus, mango, shea, date palm, acacia, neem, etc. would yield a lot of benefits.

Mass Advocacy

Vulnerable population's awareness of the land degradation associated risks is vital for sustainable land restoration practices. Environmental risk communication focusing on innovative approaches to land restoration would improve knowledge and build confidence for community self-help ILK projects. Indigenous languages and locally accessible and acceptable communication channels including, storytelling, short films, infographics, farmer-to-farmer training, drama, and street demonstrations (in addition to the mass media), are valuable communication tools for land restoration advocacy. New discoveries on land restoration demands strategic two-way communication for better understanding [70]. Also, promoting less expensive local resources and skills could inspire more ILK-based responsiveness to land degradation.

5. CONCLUSION

This study reviewed literature on land restoration practices in dryland communities in Africa. The results show a preponderance of participatory and ILK-based land restoration activities in dryland communities in Africa, but science-based methods are scarce. Most restoration practices involved biological, surveillance, mechanical, water conservation, climate-smart agriculture, soil fertility restoration strategies, and income-generating techniques, but advocacy measure is low. Various restoration projects yielded substantial benefits including, regenerated vegetation, improved nutrition, and income generation among community groups. However, lack of funding, an insecure land tenure system, and poor coordination and monitoring of projects constitute huge barriers to land restoration efforts in Africa. Hence, people-centered projects, social incentives, income generating ventures, and mass advocacy drive sustainable land restoration practices in Africa.

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