An Appraisal on Rangeland Resources and Its Current Status in Ethiopia: Challenges and Opportunities

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Abstract—Rangelands’ of Ethiopia consist of diverse composition of vegetation resources mainly natural grasslands, savannas, shrub lands, many deserts, tundra, alpine communities, marshes and wet meadows, a large number of economically important species and ecotypes, sustain millions of people and home's for biodiversity; and used as main feed sources of grazers and browsers. This appraisal has explored the rangeland resources and its current status, challenges and opportunities in Ethiopia. Currently, its status in danger, seriously degrading owing to natural and human-induced factors. Due to human population growth and rangeland fragmentation, global climate variability and changes, invasion of exotic species and bush encroachment, occurrence of unplanned fire, and overgrazing and recurrent drought; rangeland resources of Ethiopia is under shrinkage and degradation. Building resilience for its dynamics, conducting participatory and community-based management system, rehabilitating and managing invasive species, and sustainable and integrated rangeland management practices are some options for improvement from current degradation to rehabilitation of its potential. To conclude, this appraisal has indicative role in distinguishing various rangeland resources, its current status, and their challenges and opportunities that seem to have significant effects on the sustainable management of rangeland resources and its further monitoring and evaluation tasks. Types of rangeland resources, evaluation of its abundance, and appropriate conservation mechanism for wise uses and improvement should be focused for further investigations; for sustainable ecosystem in changing environment.

Keywords—Community-based management, Degradation, Ecosystem, Ethiopia, Rangeland resources, Sustainable development

I. INTRODUCTION

Rangeland is a type of land found predominantly in arid and semi-arid regions that is managed as a natural ecosystem supporting indigenous vegetation, predominately grasses, grass-like plants, forbs, or shrubs [1]. Rangelands of Ethiopia consist of mainly native pastures (grass, forbs and woody plant species); they are main feed sources of grazers and browsers [2].

It covers about 62% of total land area (78 million hectare) of Ethiopia, and most of them are found at an altitude below 1500m of elevation and generally classified as arid and semi-arid [3]; [4].

It can also encompass pastures of introduced grasses, such as crested wheatgrass, that are managed as rangelands. Rangelands are typically characterized by low precipitation, shallow soils and slow nutrient cycling [19]. They are usually dominated by grasses, forbs and shrubs efficient at water and nutrient utilization, so practices that are appropriate to temperate pastures, such as fertilization and plowing, are often inappropriate on rangelands [5].

Rangelands (i.e., grasslands, shrublands, savannas, hot and cold deserts, and tundra) occupy 51% of the terrestrial land surface, contain about 36% of the world’s total carbon in above and belowground biomass, include a large number of economically important species and ecotypes, and sustain millions of people. Rangeland resources also support approximately 50% of the world’s livestock and provide forage for both domestic and wildlife populations [3]; [6].

Hence, It would be crucial to explore the existing rangeland resources, its present status and challenges and opportunities of Ethiopian rangelands that enhances sustainable management of rangeland resources and its further monitoring and evaluation tasks to obtain more benefit from rangeland resources, sustained agro-ecosystem and protected biodiversity.

II. RANGELAND RESOURCES OF ETHIOPIA

Rangeland resources can be dry and wet season grazing reserves, water sources, forest boundaries, physical features (such as rivers, roads, paths), and other key resources such as fuel-wood and non-timber dryland products, botanical resources and minerals. Information on different grazing, water, forage and forest areas, and their condition/health [7]. They are incredibly dynamic ecosystems and species composition [8]. According to Desta [9], vegetation, livestock, wildlife and their products are major rangeland resources in Ethiopia.
Rangeland resources are also different in their types and identified through mapping of resources, seasonal calendars, rangeland species matrix, and rangeland condition/health historical trend analysis [7]. Rangeland resources are also include the indigenous vegetation (climax or natural potential) is predominantly grasses, grass-like plants, forbs or shrubs [9]. It also largely managed as a natural ecosystem. If plants are introduced, they are managed similarly. Furthermore, it includes natural grasslands, savannas, shrub lands, many deserts, tundra, alpine communities, marshes and wet meadows [10].

III. CURRENT STATUS OF ETHIOPIAN RANGELAND RESOURCES

Rangeland resources in Ethiopia are in danger of becoming seriously degrading owing to natural and human-induced factors [11]; [12]. They are under pressure by various drivers of change and there are considerable difficulties in assessing these changes and what they may mean for human use of rangeland resources [9]. In arid and semi-arid rangelands, heavy grazing pressure and climatic factor such as elevation can influence forage production and shift composition [2], soil erosion and rangeland degradation [13], increase bush density [14]. Such changes would influence the productivity, sustainable utilization and management of rangelands ecosystem [15]; [28].

The rangelands of Ethiopia are presently being extensively deteriorated both in quantity and quality [16]; [10]. Rangeland productivity hotspots’ need to be protected for pastoralists to ensure the viability and growth of the pastoral production system as a whole [7]; [28]. Because of global climate change and the intensive human activities, desertification/land degradation has become the most serious problem in the modern society, particularly in the ecologically sensitive arid and semi-arid areas [17].

Rangeland degradation implies a reduction in rank or status, which includes a loss of top-soil, a change to a simple floral/ fauna composition or a transition from one organic form to a lower organic form, and continuous reduction of productivity/biomass of the ecosystem [10]. In addition, on the view of ecology, degradation can be explained as retrogression of an ecosystem. Niguse and Gizachew [17] were generally indicated that, a lower biological diversity is supposed to occur in a degraded rangeland.

IV. CHALLENGES OF RANGELAND RESOURCES IN ETHIOPIAN CONTEXT

Rangeland resources in Ethiopia face both area reduction and degradation (productivity reduction). Drastic changes can be observed among seasons within a year and among years and decades. There are five major factors that cause rangelands to change over time of grazing, fire, invasive plants, weather and climate, and fragmentation due to human influences [9]. These factors change the plants and animals that inhabit rangeland sometimes in ways that land managers and users find desirable, and other times in ways that are considered adverse [7].

The finding by Abate and Abule [12] was also reflected that, due to several factors of environmental degradation caused by human and livestock grazing pressures is the most important, the available forage or rangeland resources in many rangelands of Somali and Afar in Ethiopia were insufficient for livestock production.

A. Population Growth and Rangeland Fragmentation

Today, competition over resources and land in pastoral areas of Ethiopia has grown. Populations have increased due to natural growth, as well as from an influx of settlers and commercial enterprises into pastoral areas; keen to acquire land in those areas where agricultural production is perceived to be viable. Invariably, areas of higher agricultural productivity are those pockets that are also ‘rangeland productivity hotspots’, the areas that provide essential grazing in times of drought and are therefore central to the health of pastoral production systems [7]. Fragmentation of rangelands is also another challenges in Ethiopia due to rapid population growth. An increase in rural subdivision has resulted in a drastic fragmentation of rangelands in many areas. Best rangelands are ploughed and converted to cropland, thereby destroying the protective plant cover. Soils become prone to erosion and within few years the land is abandoned, reverting back to poor rangeland. The same geographic features that make the land appealing to wildlife such as proximity to streams, gentle slopes, and timbered draws also makes the land appealing to developers and people wants to build [18]; [17].

B. Climate Variability and Change

Climate change and variability are likely to impact forests and rangelands in a variety of ways, with critical implications for local livelihoods as well as for areas and communities further afield which may dependent on them [19]; [18].
The report of Joel et al., [20] was indicated that increases in temperature are likely to result in changes to tree lines and phenology for certain species. In addition, the implications of, for example, increased temperatures for pests and pathogens affecting key species in both natural and plantation forests are a key area of concern [20].

Climate change is thus likely to change grass–tree interactions (not simply through increased carbon dioxide) thus altering the balance between forests and rangelands, albeit building on an already dynamic base [21]. Moderating effects occur, however, linked to an altered fire regime. A reduction in fire intensity may favour tree production, while an increase is likely to favour grass production. In focusing on encroachment by Acacia mellifera. Some studies in the World were reported that fire may act as the critical mediator of transitions from open savannah to thicket [22].

C. Invasion of Exotic Species and Bush Encroachment

One of the most serious threats to the health and sustainability of rangeland ecosystems is exotic invasive plants like parthenium (Kiliginoole) species and latana camara (in the rangeland of Ethiopian Somali region), prosopis juliflora (Woyane tree or Girawaa) in Afar rangeland [15]; [23]. Other identified impacts are bush encroachment [17] (Boran rangeland's of Oromia region, Ethiopia) in both rangeland and forest areas, as well as changes in tree-grass interactions, increased use of land for cultivation, ban on the use of fire and development of water ponds are the main challenges for Ethiopian rangeland resources [18]; [24].

D. Occurrence of Unplanned Fire

Fire rapidly converts dead and decadent plant into inorganic ash that allow nutrients and minerals for new plant growth. However, if fires are too frequent or intense, plant cover and organic matter at the soil surface can be reduced. Occurrence of unplanned fire almost always results in a loss of nutrients through volatilization, oxidation, ash transport, and erosion [18]; [8].

E. Overgrazing and Recurrent Drought

Overgrazing is the other factor of degradation; the most palatable species are not given enough rest to survive and invader plants are developing. Overgrazing, especially when combined with recurrent droughts, leads also to the decrease of perennial species [25]; [17].

All these phenomena are exacerbated by the changes in pastoral systems, as the decrease of mobility and introduction of mechanization to transport livestock, livestock feeds and water [26].

V. OPPORTUNITIES FOR RANGELAND RESOURCES IMPROVEMENT

A. Building Resilience for Rangeland Resource Dynamics

The report by Lee [5] was reflected that, building resilience in the rangelands would be critical to adapting to short-term and long-term changes such as seasonal conditions and climate change. It requires ongoing improvement in the knowledge of current land management practices and risks, of the drivers of change, and of rangeland managers’ capacity to change.

B. Participatory and Community-Based Management System

In addition, Lee [5] was also indicated that participatory approaches have no doubt allowing rural development and research workers to put farmers first in needs (situation) analysis and coming up with in point solutions. It encourage local innovation and participation of all concerned bodies so that to contribute to sustainable development of rangeland resources. Community-based management system is essential for the rangeland resources i.e. indigenous communities in the rangelands currently have full ownership and some management responsibilities for the rangelands. To gain a better understanding of the aspirations and inherent rights of traditional owner groups and to engage indigenous communities in the rangelands, it is highly appropriate to utilize existing natural resource management networks when drafting policies and strategies [27].

C. Rangeland Rehabilitations and Managing Invasive Species

On arid grasslands and rangelands of Ethiopia, technical interventions such as reseeding and fertilizer applications are constrained by risk of failure and expense, with limited potential financial returns [14]; [17]. In developing countries, policies are generally based on political considerations and economical benefits, so strengthening the political representation of local pastoral communities will also transfer the benefits of development projects to local pastoral people.
Managing and controlling the invasion of bush encroachment and other invasive species is highly a good options for rangeland resources improvement in the Ethiopian rangeland resources [24].

**D. Sustainable and Integrated Rangeland Management Practices**

According to the Society for Range Management, specific strategies for sustainable rangeland management like prescribed grazing on rangeland and developing a grazing management plan on rangeland resources [5]. The progress towards the achievement of sustainable rangeland management systems require an adaptive and integrated approach to decision making process [5]: [7].

Integrated rangeland management for improving and sustainably maintain the natural resource for fostering efficient and sustainable ecosystem dynamics and animal production systems. Integrated rangeland management promoting humans to work in group for collective actions and seeks to set the boundaries, and improving the legal and institutional systems for creating appropriate decision-making and promoting resource stewardships [28].

**VI. Conclusion**

Rangeland resources of Ethiopia consist of diverse vegetation composition mainly native pastures (grass, forbs and woody plant species) that are climax or natural potential, pastures of introduced grasses, such as crested wheatgrass. They are also include natural grasslands, savannas, shrub lands, many deserts, tundra, alpine communities, marshes and wet meadows, a large number of economically important species and ecotypes, sustain millions of people and home for biodiversity; and used as main feed sources for grazers and browsers.

Rangeland resources in Ethiopia are currently in danger of becoming seriously degrading owing to natural and human-induced factors. In arid and semi-arid rangelands, heavy grazing pressure and climatic factor such as erratic rainfall can influence forage production and change floral composition. Due to human population growth and rangeland fragmentation, global climate variability and changes, invasion of exotic species and bush encroachment, occurrence and practice of unplanned fire, and overgrazing and recurrent drought; rangeland resource of Ethiopia is under degradation (a reduction in rank or status).

Building resilience for rangeland resource dynamics, conducting participatory and community-based management system, rehabilitating rangeland resources and managing invasive species, and sustainable and integrated rangeland management practices are some options for improvement from current degradation to rehabilitation of rangeland resources to its potential. To conclude, this appraisal has facilitated the clarification of various rangeland resources, its current status, and challenges and opportunities for rangeland resources that seem to have significant effects on the sustainable management of rangeland resources and further monitoring and evaluation of rangeland resources.

**VII. Future Scope of Study**

Several research work remains to be done in the area of rangeland resources for their direct or indirect benefits like ecological, economical and social goods and services in Ethiopia. A detail conditions of rangeland resource biodiversity, floristic composition; and its conservation for improvement should receive attention. It also need to characterize types of rangeland resources, evaluation of its abundance, and appropriate conservation mechanism for wise use and improvement should be focused in further investigations for sustainable ecosystem in changing environment.

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**REFERENCES**


