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**TECHNICAL BULLETIN No.26**  
***Rangeland resource monitoring and  
vegetation condition scoring***



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## FOREWORD

This technical bulletin titled “*Rangeland resource monitoring and vegetation condition scoring*” is the 26<sup>th</sup> in a series produced by the Ethiopia Sheep and Goat Productivity Improvement Program (ESGPIP). The ESGPIP is a USAID funded Project with the objective of improving the productivity of sheep and goats in Ethiopia.

Vegetation, livestock, wildlife and their products are major rangeland resources in Ethiopia. Understanding of how the various environmental factors affect rangeland vegetation is crucial to successful rangeland management. The environment is the basic determinant of the nature and productivity of rangeland eco-systems. Physical environmental factors, which include climate, topography and soil, determine the potential of rangeland to support certain types and levels of land use. Within the limits set by this potential, the influence of fire and biological environmental factors (grazing, tree cutting and shifting cultivation) results in different types of vegetations and levels of productivity.

This technical bulletin deals with resource inventory/monitoring and also vegetation condition scoring. The information contained in this bulletin is believed to be useful for development agents to evaluate range condition and advise pastoralists on appropriate measures.

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# Rangeland resource monitoring and vegetation condition scoring

## 1. Introduction

The environment is the basic determinant of the nature and productivity of rangeland eco-systems. Physical environmental factors, which include climate, topography and soil, determine the potential of rangeland to support certain types and levels of land use. Within the limits set by this potential, the influence of fire and biological environmental factors (grazing, tree cutting and shifting cultivation) results in different types of vegetations and levels of productivity. Therefore, understanding of how the various environmental factors affect rangeland vegetation is crucial to successful rangeland management. However, it should be noted that the influence of climate and soils, have important effects for potential rangeland production and the management of rangeland resources.

Medicinal plants also have a significant value in the indigenous knowledge of the pastoralists

### 1.1. The rangeland resources

Vegetation, livestock, wildlife and their products are major rangeland resources in Ethiopia. Products such as livestock meat and milk, game animals in terms of tourism attraction and timber for construction, along with other products generate considerable economic revenue. Pastoralists, using knowledge gained through generations of livestock production, usually practice wise use of existing natural resources since their survival is dependent on continued use of these resources.

Cattle and sheep production is highest where palatable and nutritious perennial bunch grasses dominate, but low where the land is highly eroded, or where access is difficult, such as in dense woody vegetation. Camels and goats, on the other hand, are primarily browsers but utilize herbaceous forages during the absence of choices. However, due to several factors of which environmental degradation caused by human and livestock population pressures is the most important, the available forage resources in many rangelands of Somali and Afar are insufficient for livestock production.

### Characteristics of main pastoral areas in Ethiopia

Pastoral area	Area** (Km <sup>2</sup> )	Human pop. (millions)*	Livestock (mill)*	Annual rainfall (mm)	Temp. (c°)	Altitude (masl)
Oromia - Borana one	78,314	1.66	1.73	440-700	15-35	1000-1500
Somali Region	282,300	3.69	0.90	100-700	20-45	300-1700
Afar	95,970	1.22	1.10	200-600	30-50	-100-1000
<b>Total</b>	456,584	6.56	373	...	...	...

Source: \* Central Statistics Agency (CSA)

\*\* World Food Program (WFP) estimates

Note: Area shown under Borana is only for the six pastoral woredas

## 2. Rangeland inventory and monitoring

### 2.1. Resource inventory and monitoring

Range resource inventories are made for a number of reasons. They may be extensive or general, intensive or detailed or to a specific range area. The purpose of the ecological work is to describe changes which affect the environment, and especially the primary productivity, as a result of human activity.

The indirect consequences of changes in rangelands utilization are well known and fall into two main categories: plant cover, and the composition of the plant communities. The appearance or disappearance of indicator species is often a more sensitive observation than the description of total plant cover, because it reflects a longer-term trend. A substitution of plant species indicates a serious change in the ecosystem.

Therefore, rangeland monitoring is the process of periodically recording the condition of the natural resources, mainly vegetation, water, and soil.. During the monitoring process positive and/or negative change in the pasture composition and consequently general land condition can be assessed. This information can assist in making proper land management decisions to ensure sustainable land-use.

- The traditional method of rangeland monitoring and evaluation follows changes in indicators of environmental health enabling herders to adjust their forage management and conservation strategies to the long and short term availabilities of resources. The parameters used vary and may include milk yield, grass and browse availability and the presence of specific desirable plant species. (Grasses such as *Chrysopogon spp.*, *Themeda triandra*, *Brachiaria spp.*, and browses like *Acacia bussie*, *A. senegale*, and *A. tortilis* are among the desirable species).
- The modern method of range monitoring and evaluation measures and interprets changes in vegetation and soil characteristics which are likely to influence the long term productivity of the range resource for pastoral purposes. This includes vegetation classification and mapping, vegetation attributes important to range management and methods of sampling and measuring these attributes. It also deals with remote sensing methods of data gathering, using aerial photography and satellite imagery, as well as the storage, analysis and presentation of data using computerized geographic information systems (GIS) data bases. In order to implement rangeland activities in a proper way, the range manager should have good knowledge of the range vegetation resources, especially the common and botanical names of key plants, their , behavior and abundance and other related information.

If all the necessary arrangements are made, a pasture monitoring program using a simple technique can be carried out by transects and quadrates to check and record condition of pastures, trees and soil and estimate sustainable production rates which will also help to provide early warning of problems. This is quite different from the monitoring of short term changes in carrying capacity resulting from seasonal variation. In the long run, rangeland productivity is a function of range condition in the ecological sense while current carrying

capacity is largely a seasonal variable although ecological range condition and short term weather patterns will interact to determine it.

Following either of the above range monitoring and evaluation methods, the range condition expresses the rangeland situation at the time of the survey. It is therefore possible to interpret the result as indicative of a negative or positive trend. However, range trend monitoring as carried out in some other east African countries requires a relatively high level of precision.

Modern techniques of range monitoring and evaluation method require highly qualified, skilled manpower, the training of whom is beyond the scope of this bulletin. However, traditional monitoring and evaluation methods are very valuable as long as they are implemented together with the community.

## **2.2. Vegetation condition scoring**

Effective range management practices require good knowledge of the existing rangeland resources which will assist in making a successful inventory. The most important factor deciding animal output is the amount and quality of green pasture eaten per unit area. Mismanagement practices or inappropriate human activities (overstocking, understocking, bush/tree cutting for different purposes, etc.) are usually major causes for the increase and decrease of grass species. Grass species can be categorized in the following ways:

- Decreasers (palatable grasses)

These are desirable grass species which are likely to be reduced by continuous heavy grazing. Some of the decreasing species are *Themeda triandra*, *Crysopogon spp.*, *Panicum spp.*, etc.

- Increasesers (moderately palatable spp.)

These species are less desirable grasses which will initially replace decreaseers that disappear by heavy grazing. Some of the increasing species are, *Bothriocloa spp.*, *Eleusine jagri*, *Cymbopogon validus*, etc.

- Invaders or pioneers (indicates a bad range condition)

These are less desirable plant species that replace increaseers. These grasses and weedy forbs are unpalatable and have no grazing value whatsoever.

To objectively define the percentage contribution of each grass species to the grazing potential, a visual assessment of the species proportions is made within a 10 meter radius of selected points. The described system has been repeatedly tested in other countries and has been found to give a satisfactory level of accuracy. It is quick since no process of individual counting is required. However, knowledge of species value and names in any language is very necessary.

The score system for grass species composition is built according to the table shown below.

<b>Grass species composition guide</b>	<b>Description of evaluated site</b>	<b>Points</b>
Excellent	75-100% of the total coverage consists of decreaser species.	9-10
Good	50-75% of the coverage is decreaser species	7-8
Fair	30-50% of the coverage consists of decreasers, or up to 60% increasers or invaders	5-6
Poor	Over 70% of the coverage consists of increasers or invaders	3-4
Very poor	Below 5% of the coverage consists of decreasers	1-2

### **3. Role of development agents**

- Identify pastoral/agro-pastoral leaders and progressive community members and create a close working linkage with them;
- Discuss their indigenous knowledge regarding animal production, use of natural pasture, general conditions of dry and wet season grazing areas, animal health, etc., and record the points for future use.
- Learn how they use their indigenous knowledge on monitoring and evaluating rangeland resources and discuss other methods with them. However, the improved ideas should be convincing and easily acceptable.
- Record the local names of valuable plant species used for livestock feed and other purposes. Have these species identified scientifically (Addis Ababa University, Department of Biology, Plant Taxonomists; plant Identification books, research documents and other possible sources) in order to know uses of and potential problems associated with these plant species by referring to texts and related documents.
- Identify major livestock problems of the area and discuss appropriate measures for improvement with village leaders. Then participate during implementation to gain their confidence.
- Inventory dry and wet season grazing area resources, by holding repeated discussions with community representatives and by visual assessment to determine the potential productivity and its problems.. Give emphasis to the following components.
  - Livestock water sources by type (Birca, bore holes, hand dug wells, ponds, rivers, etc.)
  - Status of grazing and browsing resources.
  - Problems regarding resource use.
- Based on the rough assessment of the three components namely, livestock number, amount of water and available forage, identify the major problems for appropriate action.

- Mobilize the community through elders and progressive pastoralists to clear unwanted plant species at early stage (e.g., *Parthenium*, *Prosopis*, etc.) and participate during the implementation.

#### 4. Glossary of terms

**Agro-pastoral system:** A land-use system in which crops and livestock (but not trees) are the only components.

**Browse:** Leaves, small twigs, and shoots of shrub, seedling and sapling trees available for forage for livestock and wildlife.

**Browsing:** The feeding on the above-ground parts of trees and shrubs (buds, shoots and leaves) by livestock or wild animals

**Bush:** A general term for low tree-high grass vegetation occurring in semi-arid or seasonally arid regions. Can be further described by the dominant species present, for example, 'acacia bush'.

**Bush land:** An open stand of bushes, 3-7 m high, with a canopy cover >40%.

**Carrying capacity:** The maximum number of individual animals that can survive the greatest period of stress each year on a given land area. It does not refer to sustained production. In range management the term has become erroneously synonymous with grazing capacity.

**Decreaser plant species:** Plant species of the original vegetation that will decrease in relative amount with continued over use. Often termed decreaseers

**Desirable plant species:** Species of moderate to high palatability preferred by animals. Also, species that are beneficial with respect to soil and water conservation.

**Ecology:** The study of the totality or patterns of relations between organisms and their environment

**Ecosystem:** The entire system of life and its environmental and geographical factors that influence all life including the plants, the animals and the environmental factors.

**Forage:** All browse and herbaceous food that is available to livestock or game animals. It may with be used for grazing or harvested for feeding. Act of consuming forage.

**Grass land:** Any land in which grasses dominate. Also land originally dominated by grasses. Woody plants may be present, but if so they do not cover more than 10% of the ground.

**Increaser plant species:** Plant species of the original vegetation that increase in relative amount, at least for a time, under over use. Commonly termed increasers

**Invader plant species:** Plant species that were absent in undisturbed portion of the original vegetation and will invade under disturbance or continued overuse. Commonly termed invaders

**Overgrazing:** Continued over use creating an over grazed range.

**Overstocking:** Placing a number of animals on a given area that will result in over use at the end of the plant grazing period. Not to be confused with over grazing because an area may be overstocked for a short period, but the animals may be removed before the area is over utilized. However, continued overstocking will lead to overgrazing.

**Palatability:** The relish that an animal shows for a particular species, plant or plant part.

**Pasture:** Grass or other growing plants used as feed by grazing animals.

**Perennial:** A plant that does not die after flowering but lives from years to year.

**Permanent water:** A place which supplies water at all times throughout the year or grazing season.

**Proper grazing:** The act of continuously obtaining proper use.

**Proper stocking:** Placing a number of animals on a given area that will result in proper use at the end of the planned grazing period. Continued proper stocking will lead to proper grazing.

**Range:** Relatively extensive areas of land suitable for grazing but not for cultivation, especially in arid, semi-arid or forested regions.

**Rangeland:** Land suitable for grazing by domestic livestock. The vegetation consists mostly of native grasses, grass like plants, forbs and shrubs.

**Range condition:** The state and health of the range based on what that range is naturally capable of producing.

**Range condition trend:** The direction of change in range condition and soil. Syn., range trend, in range condition and trend

**Range inventory:** An itemized list of resources of a management area such as range sites, estimated proper stocking rate, physical developments and natural conditions such as water, barriers, etc.

**Range management:** The art and science of planning and directing range use to obtain sustained maximum animal production, consistent with perpetuation of the natural resources.

**Shrub:** A plant that has persistent, woody stems and a relatively low growing habit, and that generally produces several basal shoots. Generally up to 2 meters tall.

**Shrub land:** Any land on which shrubs dominate the vegetation.

**Species composition:** The relative proportions of various plant species in the total cover in a given area. It may be expressed in terms of cover, density, weight, etc.

**Stocking rate:** Actual number of animals expressed in either animal units or animal unit months, on a specific area at a specific time

**Understocking:** Placing a number of animals on a given areas that will result in underuse at the end of the planned grazing period.

**Unpalatable species:** Species that are not readily eaten by animals.

**Vegetation:** Vascular plants in general, or a particular aggregation of vascular plants, especially in relation to the communities they form, but never solely taxonomically as in floristic.

## References

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