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Management for proper range use



ESGPIP

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FOREWORD

This technical bulletin titled “*Management for proper range use* ” is the 25th 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.

The rangelands cover a substantial proportion of the land mass of Ethiopia. Livestock and people in these areas depend on the rangeland resources for their livelihoods. The management of these resources needs to be optimized to maximize benefits. Proper management of the vulnerable rangeland resources is a key to maintenance and utilization of the vast resource which otherwise can be devastated very easily.

The focus of this technical bulletin is the proper management of rangelands for sustainable use. The information contained in this bulletin is useful for development agents to advise pastoralists. It is also a useful reference for other producers raising sheep and goats and also other livestock under range situations..

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Chief of Party,
ESGPIP
June, 2009

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MANAGEMENT FOR PROPER RANGE USE IN ETHIOPIA

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1. Introduction

The rangelands of Ethiopia are home to many important plant species which contribute greatly to daily sustenance of local communities. These plants, which are diverse in nature, are primarily sources of fodder, fuel wood, resins, traditional medicines, etc., and in some cases, contribute significantly to food security in terms of wild food in marginal areas. Rainfall in these areas is erratic and highly variable. Pastures vary from place to place and from year to year. Therefore, herds are mobile to take advantage of this variability.

Pastoralists in Ethiopia depend on their animals through for milk, meat and exchanging livestock or their products for grains and other goods and services.

Pastoral areas in Ethiopia cover a little more than half of the land mass of the country and support 12–15% (10–12 million people) of the country's human population and a large number of livestock. These rangelands are located in the arid and semi-arid lowland areas in the East, North-East, West and South of the country.

The rangeland resources of the country need to be properly managed and utilized to optimize the benefits to the pastoral community and the country at large.

2. Major problems of the rangelands of Ethiopia

There are many factors that threaten the stability and viability of pastoralism and pastoral livelihood in Ethiopia including:

- Human and livestock population pressure that accelerate environmental degradation, the main consequences of which are soil loss and reduced bio-diversity
- Weak or absent economic and social infrastructure and services
- Lack of technological packages to support livestock production
- Mismanagement practices
 - Overstocking
 - Deforestation
- Cultivation of land not suited for arable farming
- Loss of grazing land to activities like crop cultivation
- Repeated drought which is a characteristics of the lowland pastoral production systems and inadequate early warning systems

- Cutting of bushes and trees for fuel wood, charcoal and construction purposes
- Bush encroachment by invasive plant species

E.g. Somali – *Opuntia spp*, *Parthenium hysterophorus*, *Lantana camara*, etc.

Afar – *Prosopis*, *Acacia mellifera*, etc.

Borena – *Acacia drepanolobium*, *Prosopis juliflora*, etc.

- Inadequate animal health services and supply of veterinary drugs
- Poorly developed livestock and livestock products market, road and communication networks
- Tribal and/or ethnic conflicts for resources



Encroachment with thorny species (Borana rangelands)



Encroachment by Commiphora species –Borana rangelands
Figure 1. Bush encroachment



Prosopis juliflora encroachment near Logia, Afar



Lantana camara ("Yewef kolo") encroachment (Fafen-Somali region)



Skin lesion from toxicity after overconsumption of *Lantana camara*

Figure 2. Encroachment with *Lantana camara* ("Yewef kolo") and its effects



Overgrazing removes complete
vegetal cover



Degraded rangeland around Bake
pond (Borana)



Overgrazing resulting in total loss of
vegetative cover

Figure 3. Consequences of overgrazing

3. Strategies for proper rangeland improvement and rehabilitation

3.1 Grazing management

Grazing management broadly speaking is the manipulation of grazing animals to achieve desired results. These results generally include maintenance or improvement of range productivity, efficient utilization of the forage resource and production of animal products from livestock.

The essentials of grazing management required to obtain the optimum utilization of the forage resource can be categorized into three: proper stocking, proper season of grazing, proper distribution of grazing.

3.1.1 Proper stocking

This is probably the single most important factor involved in grazing management. Most range plants are well-adapted to tolerate grazing, but they do have limits as to frequency, intensity and season of utilization. Overstocking is a common livestock production practice used in most parts of the rangelands of Ethiopia but it is a serious problem in the Afar and Somali rangelands creating imbalances in the use of natural resources. Overstocking is the result of pastoralists using grazing land communally without limiting livestock numbers. Other major reasons for overstocking include:

- Low productivity of animals. This forces pastoralists to keep a large number of stock in order to meet their subsistence requirements.

- Pastoralists inhabit in areas where rainfall is erratic and scarce. Therefore, drought is a recurrent phenomenon. This situation compels them to hold buffer stock above their subsistence requirement.
- Large numbers of stock also serve as a hedge against losses due to deaths from diseases, raids, etc.
- A large number of livestock also confers better status in the society

Therefore, proper stocking involves obtaining the proper ratio between animal numbers and grazing forage, such that the animals can meet their intake requirements and the plants can meet their requirements for growth and reproduction. The amount of grazable forage present on the range is the primary component determining the proper stocking rate.

3.1.2 Proper season of grazing

Some ranges are suitable for grazing during all seasons while others are accessible during certain seasons. Continuous grazing for consecutive years without resting the pasture results in deterioration of the range vegetation. Therefore, it is important to determine the seasonal suitability of the grazing land prior to developing the grazing management plan.

3.1.3 Proper distribution of grazing

Grazing distribution is always a factor in obtaining efficient utilization of available range resources. Animals never graze vegetation uniformly. The patterns of utilization which result may be classified as area selective and species selective grazing.

Animals' selective grazing behavior results from the preference of animals for grazing in certain areas as opposed to other areas. Many factors cause area selective grazing. This includes size and shape of pasture, location of water, salt, topography and other environmental factors. Livestock mobility and duration of grazing in a particular area is a key factor for proper utilization of available forage. Livestock mobility in this regard is a traditional form of pasture rotation grazing system, which discourages selective grazing and attempts to match the natural needs of the animals with the forage resource availability in different areas. However, its intensity depends on the animal concentration and grazing lands in a particular area.

The distribution of water points and the timing of their use have direct impacts on the condition and productivity of range plants. On the other hand, there are areas that are under utilized because of bad distribution or lack of adequate water for livestock, while areas around permanent water points can be heavily grazed

In general, mobility in a non-equilibrium environment is a necessary phenomenon to sustainable development in which livestock is an integral part of conservation and development.

3.2 Rangeland rehabilitation

Before starting a rangeland rehabilitation program, it is important to select the proper tools for range improvement method considering the following guidelines:

- Use only proven methods, first on small scale trial bases and later undertake on a large scale only where practical and economical procedures can be used
- Try to use available local resources, labor and equipment
- Determine the factors limiting animal production that can be improved by range improvement
- Analyze the expected cost benefit ratio (achievement of the goal)
- Concentrate on local range development in areas of greatest potential for increasing range productivity
- Plan to use livestock handling facilities that are beneficial to the rangeland and the range livestock
- Be flexible in planning

Based on the above guidelines, the following range rehabilitation methods can be implemented to improve degraded rangelands.

3.2.1 Reseeding program (Over sowing)

Over sowing or range seeding is the broadcasting of pasture seed on grazing areas without cultivation or fertilizer application. Over sowing is a useful method of increasing forage quality and production in existing pastures.

Range seeding is applicable only in selected localized situations. Sites which have been very badly degraded will not normally recover easily by natural means, even when good management and incorporating resting periods is introduced.

Areas where trampling and overgrazing have effectively removed a productive grass cover are suited to over sowing. Mostly bare areas would be more appropriate.

Over sowing is the simplest and lowest cost forage development strategy and involves no change in grazing management. Legumes are more suitable for over sowing than grasses. Generally, grasses have poor germination and are slow to establish on compacted soils. However, in some cases where rainfall and soil conditions are favorable, hardy grasses like:

- *Cenchrus ciliaris*
- *Panicum* spp.

- *Chloris gayana* and some other promising species can be sown.

The selected seeds should be sown very early in the rainy season. This is vital to give the species the best chance of survival. Sites with a loose soil surface should be chosen and the seeding rates should be low. Over sowing usually takes two or more years before the real benefits are seen. Suitable leguminous species used in Ethiopia are:

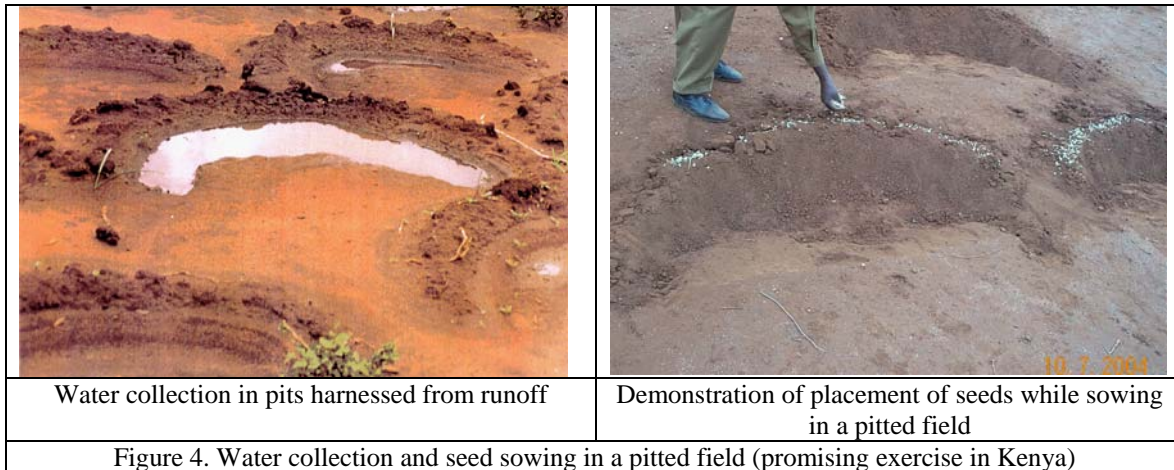
- *Verano Stylo*
- *Seca Stylo*
- *Siratro*

Where to promote over sowing:

- On poor soils
- In areas with light and loose soils
- Along road sides
- In pasture lands lacking a good legume content

Over sowing has a number of advantages:

- Very low cost
- Requires little labor
- Requires little or no management
- It improves forage production
- It increases soil fertility
- It improves forage quality



3.2.2 Control of bush encroachment

Bush encroachment is an increase in invasive woody plants with a general decline in forage productivity. Bush encroachment leads to reduced grazing potential. It poses a threat to the conservation of biodiversity.

Misconceptions of traditional resource management and the impact of fire ban have resulted in bush encroachment. One of the major threats of bush encroachment is reduction of grass production. Exotic and indigenous trees and shrubs are widely spread throughout semi-arid and arid zones of Ethiopia. Out of the exotic tree species *Prosopis juliflora* (Mesquite) is currently spreading and encroaching the grazing lands of Afar, Somali and Borana and is causing severe negative impacts on the production and productivity of pastoral areas. This species is spreading at an alarming rate into best grazing areas especially in the Afar rangelands. Other species such as *Acacia drepanolobium*, *Acacia seyal* and *Commiphora* species in Borana and *Opuntia* species, *Parthenium* species and *Lantana camara* are also causing serious problems by encroaching in dry and wet season grazing areas. Therefore, although there are a number of bush control methods that are practiced in different countries including mechanical, chemical, power (chaining) or bull-dozing, the simplest and most practical methods that can be used in Ethiopia are:

- **Burning:** Prescribed or controlled burning is a cheap and very useful method of bush control. The effectiveness of this method is mainly correlated to the following factors:
 - Favorable relative humidity
 - A one direction and continuous wind speed
 - Ideal temperatures

The usual method is to burn the perimeter of the area starting from the down- wind side moving towards the finish on the up-wind side. The nature of fire depends on the quantity of combustible material present on the ground. Therefore, an active burning is obtained when good ground cover dry matter is present on a reasonable bushed rangeland.

Previous protection of the area to be burnt is often necessary, and hence preparation of fire breaks prior to burning is essential to control unwanted damage.

Burning should be done in hot, dry weather near the beginning of the rainy season. The burnt area should not be grazed in the early growing season following the burn until an adequate cover has developed. The primary advantage of using burning as a method of bush control is low cost. However, fire is not selective; it can destroy beneficial plant species which may also contribute to land degradation.

The following table shows the advantages and disadvantages of using fire to manage natural pasture:

| Advantage | Disadvantage |
|--|---|
| Stimulates vegetative re-growth of grasses, shrubs and trees during the dry season | Loss of plant biomass resulting in a short-term decrease in available forage |
| In some cases increased plant biomass production in the following wet season | Increased danger of erosion |
| Rapidly mineralizes dead biomass, making the minerals which were fixed in it available for plant growth | Destruction of microorganisms near the soil surface because of increased soil temperature |
| Controls bush encroachment, favoring growth of the herbaceous layer, which is important for the nutrition of cattle, sheep and goats | Loss of nutrients |
| Favor desired species (depending on the plant community) | Suppresses desirable species (depending on the plant community) |
| Kills unwanted parasites such as ticks | Some soil microorganisms can be damaged |
| Decreases the risk of uncontrolled fires | |



Fire break construction Manually)

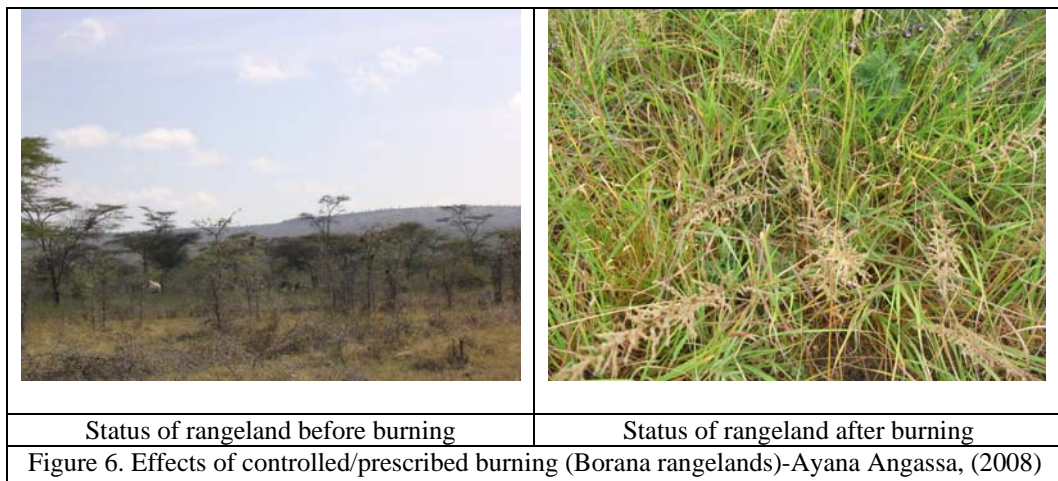


Fire break construction(use of heavy machinery



Prescribed or controlled burning

Figure 5. Use of fire in range improvement



- **Hand clearing:** Selective clearing of woody species by organized community groups removes unwanted encroaching bushes/trees and minimizes the competition between these and herbaceous plants for light, nutrients and water(Figure 7a). However, this method is only effective for selected small areas.



a. Hand clearing of bush

b. Use of browsing animals

Figure 7. Control of bush encroachment

- **Biological control:** There are two methods of biological control. The use of browsing animals (camels, goats and game animals) and the introduction of exotic insects which attack specific species of plants. However, the introduction of exotic insects is not recommended to avoid unforeseen consequences. Biological control using browsing animals (Figure 7b) can have a significant effect on bush control if the animal population is commensurate with the available browse vegetation.

3.2.2 Resting of pasture land/deferred grazing

Deferred grazing means delayed grazing. This is the simplest and most effective range improvement and rehabilitation method that can be practiced if the idea is accepted and the set regulations are properly implemented by the beneficiaries. The longer the beginning of grazing on a range is delayed, the better the opportunity exists for new plants to become established and for old plants to gain vigor.

If grazing can be deferred (rested) every few years, forage plants will have better opportunity to reproduce.

Therefore, **resting pasture land periodically** from 3 to 12 months depending on the magnitude of the spoiled area and then allowing controlled grazing can improve forage productivity. Hence, the resting period should extend throughout one complete wet and dry season grazing period every 4 or 5 years.



Figure 8. Pasture reserved for dry season grazing (rested)

The success of the range improvement activities can be monitored using the following indicators:

- Species composition or quality of grazable forage and vegetation biomass or amount of dry matter (DM) produced on a unit area;
- The effect on household food security can be measured in quantity of milk per cow and
- Number of livestock per house holds growth rate, annual calf mortality, etc. which are also indicators of the feed resource intervention outcome.

4 The importance of water in livestock production

4.1 Water as a tool for range management

Low and erratic rainfall is characteristic of pastoral areas in Ethiopia and pastoral production systems have always relied upon surface and ground water sources. Strategic water development interventions have significant impact in contributing to improving range utilization. Water is needed only where there is unutilized grass and then only in the quantities appropriate to optimal grazing use.

The capacity of water points that can provide drinking water for livestock in a given period of time have to be related to the estimated usable forage in a given area.

In arid and semi- arid zones factors affecting the appropriate density of water supplies are numerous and complex. Water points are important not only in terms of the grazing which they permit in their vicinity, but also as transit points for animals on migration from one grazing area to another. Such reliable transit water points can be extremely important in permitting the movement of livestock,

especially in terms of drought, from poor to good rangelands. In the absence of such water points herds can be cut off and suffer great losses.

4.2 Management of livestock watering points

Management of watering points varies from one pastoral area to another. For example in the Somali region Birca (Cistern) and Ella (Hand dug wells) are normally owned and managed by individuals, while ponds in Borana are usually owned by the community and managed by selected individuals for a certain period of time. Afar pastoralists normally do not have serious livestock water problems since there are permanent rivers in dry season grazing areas.



Pond in Melbana area



Deep well "Ella"



Degraded rangeland around Bake pond

Figure 9. Water sources (Borana) and consequences of overgrazing around water points

The distribution and type of water points and watering schedules are major determinants of range use. Mobility management or trans-humans management is thus seasonal movements of livestock between well-defined pasture lands. In general, mobility in a non-equilibrium environment is a necessary phenomenon to sustainable development in which livestock is an integral part of conservation and development.

5 Indigenous knowledge of pastoralists in management and use of rangeland resources

Indigenous or local knowledge can be defined as skills, practices and technologies that are an integral part of the production system in a specific culture. These are the area specific skills and practices concerning natural resource management, human and animal health, etc. developed by indigenous people over centuries. Therefore, it is important to take advantage of indigenous institutions, environmental knowledge and traditional management practices.

5.1 Livestock husbandry

Pastoralists are heavily dependent on livestock for their livelihood. In order to properly utilize the available forage resource; pastoralists have developed grazing practices and patterns according to the quality and availability of fodder and water. The use of grazing lands in rotation during the wet season reduces overgrazing. Therefore, during the wet season they travel to temporary water sources such as natural depressions and excavated ponds. When the temporary water sources dry up, the herds move on to dry season pastures where there are permanent water sources. Hence, traditional pastoralist communities are potentially the most reliable and knowledgeable practitioners of range management.

5.2 Exploitation of range resource

Development of pastoral production systems in Ethiopia, especially in the Somali and Afar rangelands is facing significant constraints. The major constraint is that rangelands are increasingly unable to support pastoralists and their livestock. This is primarily the result of rapidly growing pastoral populations made worse by the loss of high potential rangelands to other types of land use. However, pastoralists exploit the available natural resources in a systematic way. Movement between dry season and wet season pasture is a traditional form of pasture rotation, deferment (resting of pasture land) and sometimes a means of avoiding disease outbreaks. The rational strategies of pastoralists can be efficient and complex.

Such movement of livestock has the following benefits:

- Dry season pastures are allowed a period of rest and growth during the wet season which maintains and sometimes increases the plant biomass.
- Wet season pasture often has abundant natural ponds, thus reducing the need for labor to water animals at least for part of the year.
- Period of rest breaks the cycle of disease and parasites that tend to build up around dry season wells.

5.3 Mitigation of drought and other risk avoidance mechanisms:

Pastoral areas in Ethiopia are characterized by frequent drought and high livestock mortality that threaten the viability of pastoral livelihood and can lead to famine and human death. Apart from moving livestock to better grazing and watering areas during bad years, pastoralists also sell their livestock for grain and other needs as a coping mechanism during the onset of a drought.

The nature of rangeland vegetation is strongly affected by man-made mismanagement activities. However, it is possible to return vegetation to a desired state through proper range management techniques. The best methods are applying **proper stocking rate, resting of pasture land, over**

sowing of appropriate forage seeds on an open range and **use of watering points in a balanced way** (balance between water, livestock and the available pasture).

6 Role of development agents

- Identify the pastoral/agro-pastoral leaders and progressive community members and create a close working relationship.
- Learn their indigenous knowledge regarding animal production, use of natural pasture, general conditions of dry and wet season grazing areas, animal health etc. and record important points for future use.
- Record local names of valuable plant species in the area used as livestock feed and other purposes and have them identified scientifically (Addis Ababa University, Department of Biology, plant taxonomists, plant identification books and other possible reference sources) in order to know uses and potential problems from the literature.
- Identify major livestock problems of the area and discuss appropriate prevention or treatment measures with the community. Participate in the implementation of planned interventions.
- Inventory dry and wet season grazing area resources through discussions with community leaders and through visual assessment to determine potential production and 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 magnitude of problems and suggest appropriate actions.
- Mobilize the community through elders and progressive pastoralists to clear unwanted plant species at early stage (*Parthenium*, *Prosopis*, etc.) and participate during implementation.

7 Glossary of terms

Annual plants: A plant that completes its lifecycle within one year. Syn., annual

Arid zone: The arid zone agro-ecological zone has the greatest climatic risks in terms of low erratic rainfall. It receives 0-500mm of rainfall annually and less than 50 plant growth days.

Browse: Leaves and twigs growing on shrubs and trees available for animal consumption.

Bush: 1. 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', *Combretum* bush; 2. A low, well-branched shrub.

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

Carrying capacity: In its true sense, 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.

Controlled burning (prescribed burning): The use of fire for burning a predetermined area to accomplish some desired result, the fire to be confined to said area.

Deferred grazing: Discontinuance of grazing by livestock on an area for a specified period of time during the growing season to promote plant reproduction, establishment of new plants, or restoration of vigor by old plants

Deferred rotation grazing: Discontinuance of grazing on various parts of a range in succeeding years allowing each part to rest successfully during the growing season to permit seed production, establishment of seedlings or restoration of plant vigor

Dominant species: The major constituent of a plant or animal community.

Exotic: An organism which is not native to the region in which it is found. Commonly used to refer to a plant or other organism introduced from a foreign country. Opposite of **indigenous**

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.

Grazing: Consumption of range or artificial pasture forage by animals

Grazing management plan: A program of action designed to secure the best practicable use of range.

Growing season: Period (s) of the year during which water is available for plant growth and temperatures are favorable (not to high or low).

Native species: A species which is a part of the original fauna or flora of the area in question.

Natural pasture: See range.

Overgrazing: Continued over use creating an overgrazed range.

Overstocking: Placing a number of animals on a give area that will result in over use at the end of the plant grazing period. Not to be confused with overgrazing 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.

Overuse: Utilizing an excessive amount of the current year's growth which, if continued, will result in range deterioration or over grazing. Syn., overutilization

Pastoralism: A way of life for more or less wondering, animal-keeping peoples. Pastoralism strictly applies to a system of using land by moving animals from place to place with no permanent human settlement. In transhumance some form of permanent or semi permanent settlement exists.

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

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

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: Land that produces primarily native forage suitable for grazing by livestock; also forest land producing forage. Usually 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 improvement (Physical): Any structure or excavation to facilitate management of range or livestock. An increase in the grazing capacity of range improvement in range condition (**Biological**).

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.

Seasonal grazing: Grazing restricted to a specific season

Selective grazing: The grazing of certain plant species on the range to the exclusion of others.

Semi-arid zone: The semi-arid zone receives 500-1000mm of rainfall annually and has a plant growing season of 90-180 days. Land use systems involve pastoralism and agro-pastoralism. Irregular rainfall and low fertility of soils limit agriculture in this zone.

Shrub: A plant that has persistent, woody stems and a relatively low growing habit, and that generally produces several basal shoots instead of single bole. It differs from a tree by its low stature and non-arborescent form.

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