Plant Succession and Community Composition in Range Ecosystem

Plant succession: It is the change of the range vegetation from earlier stage to more developed stage. Therefore, understanding of succession is basic to range management. Succession begins when an area is made partially or completely devoid of vegetation because of a disturbance. Some common mechanisms of disturbance are fires, wind storms, volcanic eruptions, logging, climate change, severe flooding, disease, and pest infestation. Succession stops when species composition changes, no longer occur with time, and this community is said to be a climax community.

Process involve in succession: Colonization, Establishment and Extinction.

Type of succession

Primary Succession: It is the establishment of plants on land that has not been previously vegetated. It begins with colonization and establishment of pioneer species. Succession in primary area such as newly formed dunes, deltas etc. It takes long period of time to attain the climax (autogenic succession).

Secondary Succession: It is the invasion of a habitat by plants on land that was previously vegetated. Removal of past vegetation may be caused by natural or human disturbances such as fire, logging, cultivation, storms and grazing etc. Succession after disturbance imposed on the path of primary succession (allogenic succession).

Progressive succession: It is a succession where the community becomes complex and contains more species and biomass over the time.

Retrogressive succession: It is a succession where the community becomes simplistic and contains fewer species and less biomass over the time. Some retrogressive successions are allogenic in nature. For example, the introduction of grazing animals results in degenerated rangeland.

Model in the Succession process

1. The Facilitation Model

- Pioneer species establish a presence on the site of a disturbance.
- It is modifying a site, for instance, by regenerating the soil with organic material making the area more attractive for invasion by other species.
- Eventually, new species move in, edging out the pioneers.
- This process may repeat itself several times, until the ecosystem reaches the climax stage.

2. The Tolerance Model

- All species involved in succession are equally capable of establishing themselves on a recently disturbed site.
- But those capable of reaching a large population size quickly are likely to become dominant.
- This model is more similar to natural selection

3. The inhibition Model

- All species have equal opportunity to establish population after a disturbance.
- Some of the early species actually make the site less suitable for the development of other species.
- An example of this is when plant secretes toxins in the soil, thus inhibiting the establishment and growth of other species.

Successional response of grazing

Desirable (Decreaser): Highly productive and palatable species that provide good environmental protection.

Less Desirable (Increaser): Species which are less productive and palatable than desirable species and which provides less environmental protection.

Undesirable (Invader): Species that yield very little, if any, forage that is not particularly palatable. They damage the ecosystem. They can also be noxious.

The terms decreaser, increaser and invader are used in the United States. Two types of succession are realized due to grazing:

1) Retrogressive succession

2) Progressive succession

Retrogression or degeneration is the replacement of a community of plants of higher ecological order with a community of lower ecological order. Disturbance of the stabilized climax through overgrazing or cultivation causes retrogression. Unsuitable grazing management are responsible for this. Too intensive grazing is marked by a disappearance of the preferred plants or those physiologically less resistant to grazing. Vegetation deterioration is followed by soil degradation. The latter begins with loss of organic matter and structure breakdown followed by erosion. If disturbance is rewarded or eliminated in time, succession moves back towards climax.

When the supply of desirable species becomes limited, the animals then turn to the next most palatable species, which are usually less productive and nourishing and less desirable in respect to soil and water conservation. While the desirable species are decreasing, these species increase to a point, but with continued overuse, they also weaken and die. These species are termed "increasers" or "less desirable". Only unpalatable species and grazing evasive species can survive such a system of overgrazing and eventually these will invade and they are termed "invaders" or "undesirable".

Progressive succession:

- Development of vegetation towards climax, if soil is not disturbed much by overgrazing

Grazing behaviour of livestock and wildlife

Grazing behaviour of animals differ from each other, some examples are given below.

- Goats: prefer browse woody plants then forbs.
- Sheep: prefer forbs then grasses
- Cattles: Prefer grasses
- Horse: selective grazers
- Buffalos: prefer long grass
- Zebra: feeds upper parts of the grasses
- Elephants: clumps of grass, barks, and branches of the tree etc.

Palatability and preference

Palatability is defined as a plant characteristic. Palatability can be defined as the relative attractiveness of plants to a feeding animal. The palatability of a plant is determined by a different of characteristics, such as fibre content, flavour, nutrient and chemical content, and morphological features such as roughness or spines. Different kinds of animals are differentially attracted by a particular species.

Preference refers to the selection of plants by animals. Relative preferences indicate proportional choice among two or more foods. Preference is a combination of learned and genetically programmed.

Palatability and preference have been used as synonyms. Palatability or preference measure in the percentage utilization observed at a particular time or place. 70% utilization of a species commonly is taken to mean both palatability and preference] (e.g. if the plant makes an animal sick, it learns to avoid it). Legumes, such as alfalfa, seem to maintaining their good taste. livestock will

always eat the wild white clover first (in between red clover and white clover). Many broadleaves are even more palatable.

Dandelions are extremely tasty and feel very pleasant in the mouth (trendy restaurants use them in salads). They remain palatable for longer periods than grasses or legumes. Younger, less fibrous leaves are preferred. However else can we use our knowledge of palatability and animal preferences to improve pasture management. Ryegrass is very tasty and has a pleasant feel in animal mouth during the early stages of maturity.

Preference Index

It is defined as a Utilization Percent/Represent percent. It is not clearly knowing why certain plants are selected over other. Some plants are eaten by one kind of animals while others plants may be eaten by more than one kind of animals. It depends on species, type of livestock.

Reasons for plant selectivity by animals depends on following factors: (a) Nutrients content: Protein (b) Taste: Salty, bitter, sour, sweet (c) Moisture content: (d)Mineral content: (e) Essential oil: (f) Fibre or lignin content (g) Texture

Factors that influence forage palatability

Animal Factors: The animal factors that influence palatability may be partitioned into five major categories: (a) Senses (b) Species or breeds, (c) Individual variations, (d) Previous experience or adaptation (e) Physiological condition.

Plant Factors: Among the many plant factors that may at times influence forage palatability to animals are: (a) Species (b) Intra specific variation (c) Chemical composition (d) Morphology or physical traits (e) maturation (f) Availability in non-controlled situations, and (g) Form of forage controlled by mechanization.

Environmental Factors: Natural and induced environmental factors frequently influence plant selection by ruminant animals. Among these are:

(1) Plant diseases: (presence or absence is environment dependent),
(2) Soil fertility
(3) Animal dung
(4) Feed flavours
(5) Climatic variation