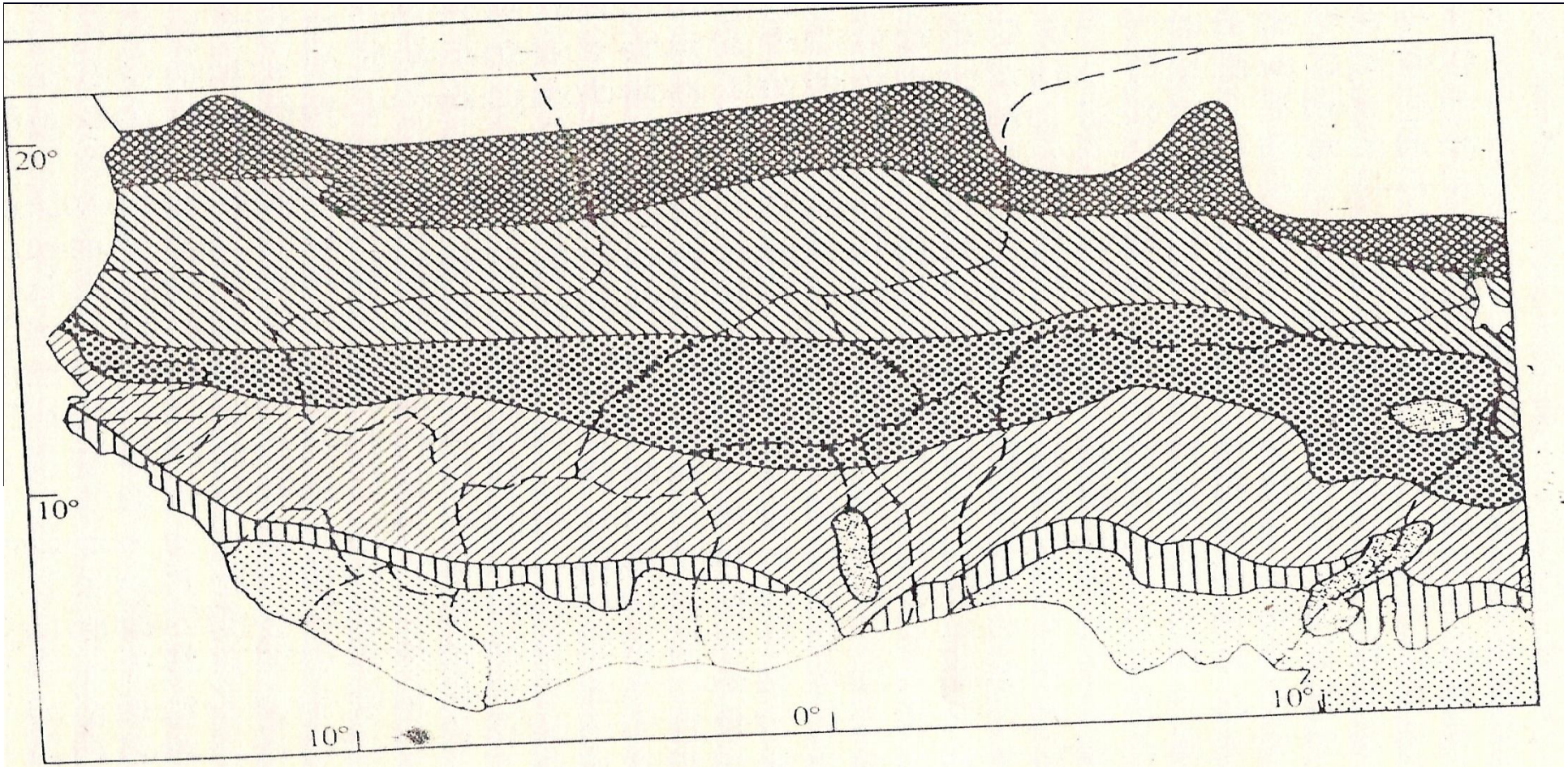
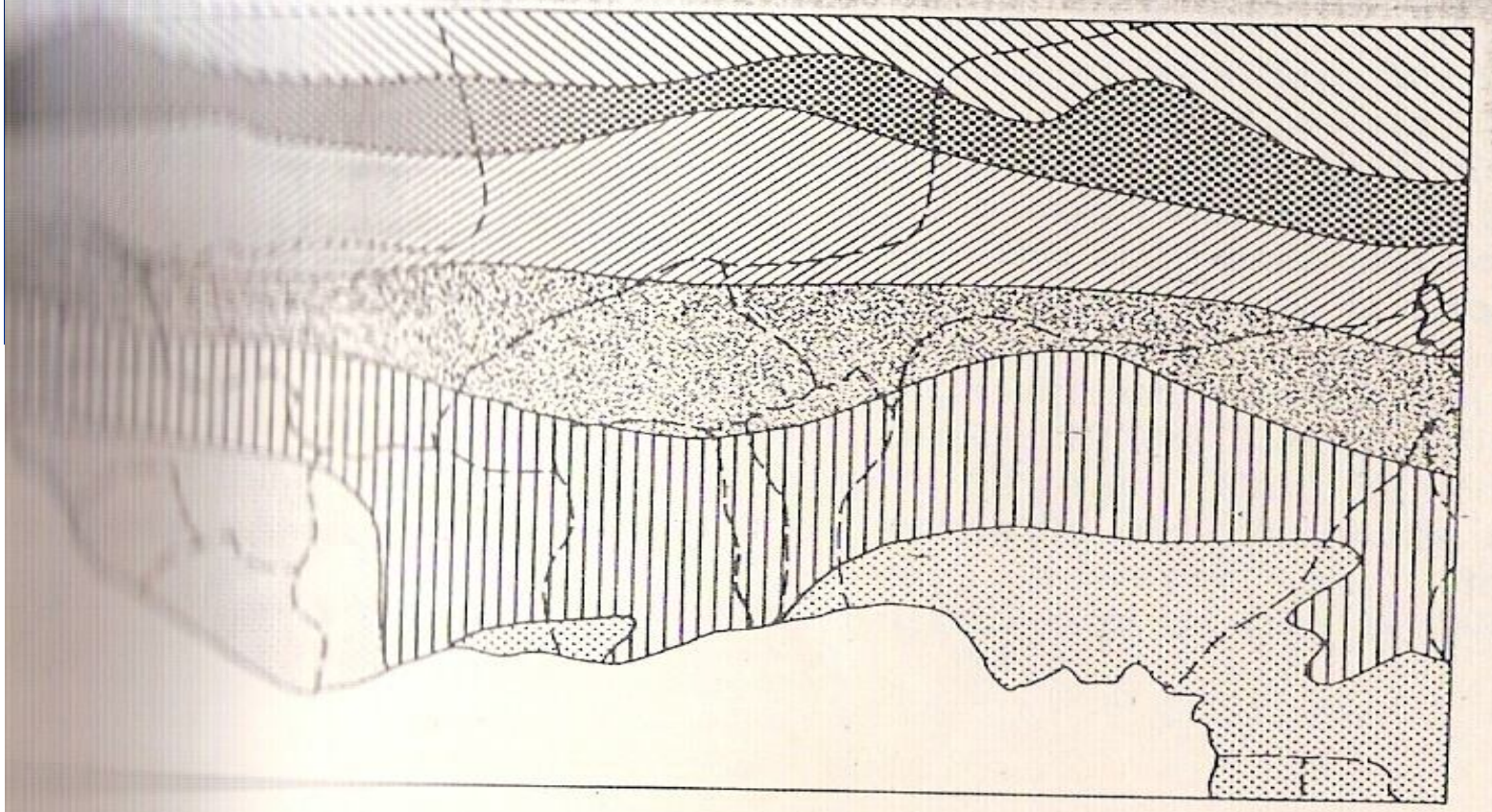


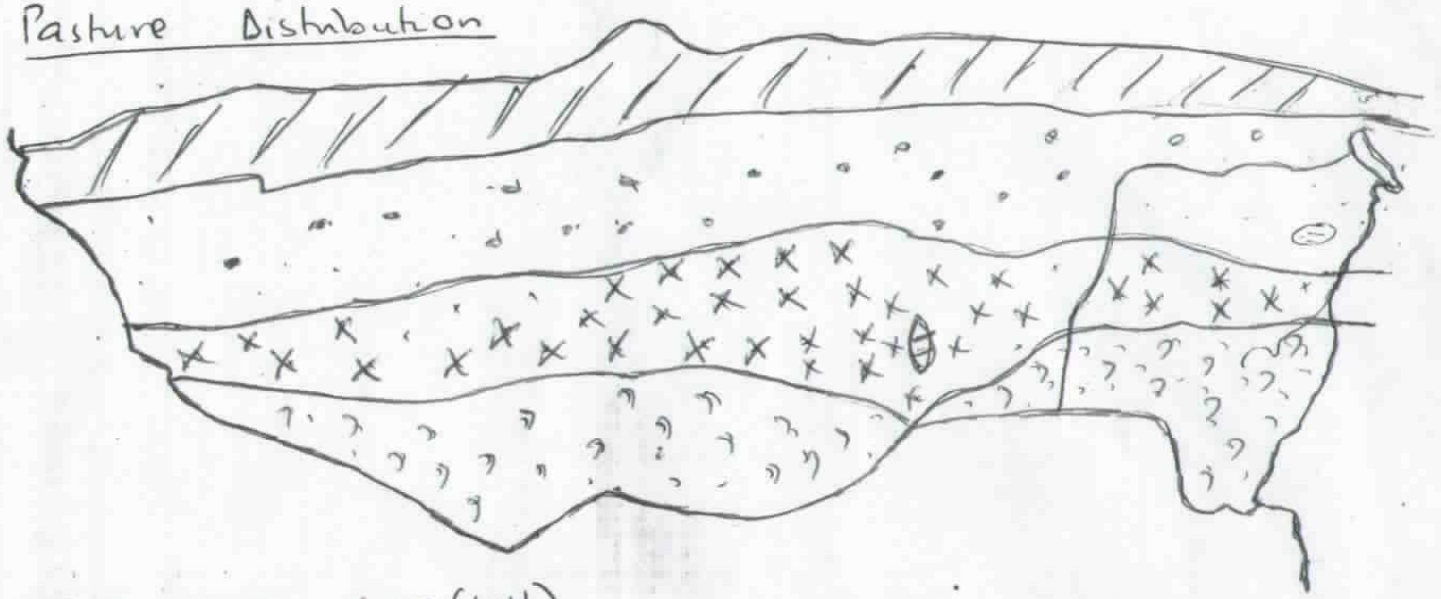
Fig. 1.2 Vegetational zones of West Africa (Keay, 1959): (1)

map (Fig. 1.2) and the rainfall map (Fig. 1.3) o



distribution (mm/year) in West Africa (Thompson, 1965).

Pasture Distribution



- Pennisetum type (belt)
- Hyparrhenia type
- Andropogon type
- Aristidia type

Rainfall distribution (mm/year) in West African(Thompson,1965) in West African, four of the main vegetational zones are commonly called savannas and are recognized as climatic regions representing different agricultural interest. Their boundaries are in part related to those delineated by the type of genera of the grass distribution, namely

1. *Pennisetum* type- lowland forest and derived savanna
2. *Hyparrhenia* type- Southern Guinea savanna
3. *Andropogon* type- Sahel and part of Sudan savanna
4. *Aristidia* type- Sub-Saharan

Near the coast there is no distinguishable dry period and the region is classified tropical rainforest and swamps. Over much of the zone, two peaks of rainfall alternate with two dry seasons. A layer drought period prevails from October or November to March or April and a shorter one occurs in July or August.

The forests are broken vertically with 2 or 3 layers of trees, the tallest storey emerging at more than 30m. Tall coarse grasses appear in the more open lands of the forests. A semi deciduous forest exists of the trees has been cleared for cultivated and where the dry season ranges from 3-5months.

The derived savanna merges into two woodland savannas' which are separated on the basis of moisture and vegetational core. The 'humid savanna' (Guinea savanna) is characterized by 5-7 months of dry season, usually continuous.

Rainfall varies from about 1,000 to just less than 1,500mm the area is largely woodland with fire-resistant, broadleaved deciduous trees. The canopy may be full or open at 15-20m. Tall perennial tufted grasses grow up to 3m beneath the scattered trees and up to 5m open places.

Since, the cattle population is relatively sparse, a heavy growth of grass accumulates by the end of the rainy season. Always widespread fires rage beyond control.

The ‘dry woodland savanna’ (Sudan) receives from 500-800mm annual rainfall with 7-9 months having 100mm total. The region is wooded but many single trees occur and display wide, spreading crowns and small leaves. The trees grow from 10-15m height and shorter than in the humid savanna, there are many leaves growing shrubs and bushes in the southern areas.

Thorn bushes are prevalent in the northern part of the dry savanna. Grass cover is shorter than in the humid savanna, from 1.5m to just over 3.0m in height when matured, less tufted, more feathering with finer leaves and stems, and fewer perennials. Much of the area is burned annually, but fire is less severe than in the derived savanna.

In the ‘wooded steppe’ (sahel savanna) a water deficit exists for most of the year and many areas receive less than 200mm 0f rainfall. The rain occurs in down pours scattered over a 2-3 month period.

The original climax was probably thorn woodland. This has opened up with scattered dwarfed trees and of 5-10m height. Thorn shrubs of 2-3m height with short conical bases and divided stems are common.
Grasses are short, discontinuous, wiry and tufted. Less serious fires than further south.

The southern Sahara is fringed with a ‘sub’ desert steppe. In some places dispersed, permanent vegetation prevails, being composed of small shrubby plants and bushes, with acacias, other trees and shrubs. This area receives about 150mm/year and are extremely unreliable.

After rains, annual grasses and herbs appear and soon mature. Altitude modifies the vegetation due to increased humidity and cloudiness, lower temperature and less evaporation.

Relative humidity has a marked effect on the vegetation association in the different regions. The coastal areas have a mean monthly relative humid of 95% at 06.00 may drop to 60% at noon in the driest months. In the north, the moving relative humidity climbs up to 90% during the rainy season. In the dry season it seldom reaches 30% but drops to less than 10% before noon.

- A temperature gradient extends from the coastal forest zones to the Sahara. Temperature lines run east and west, as do the vegetational zones. The gradient effects on vegetational associations are less visible than those of the rainfall. A gentle rise in elevation occurs from south to north. This also causes a change in temperature and has some influence on vegetation type.

Soil-plant-animal interrelationship

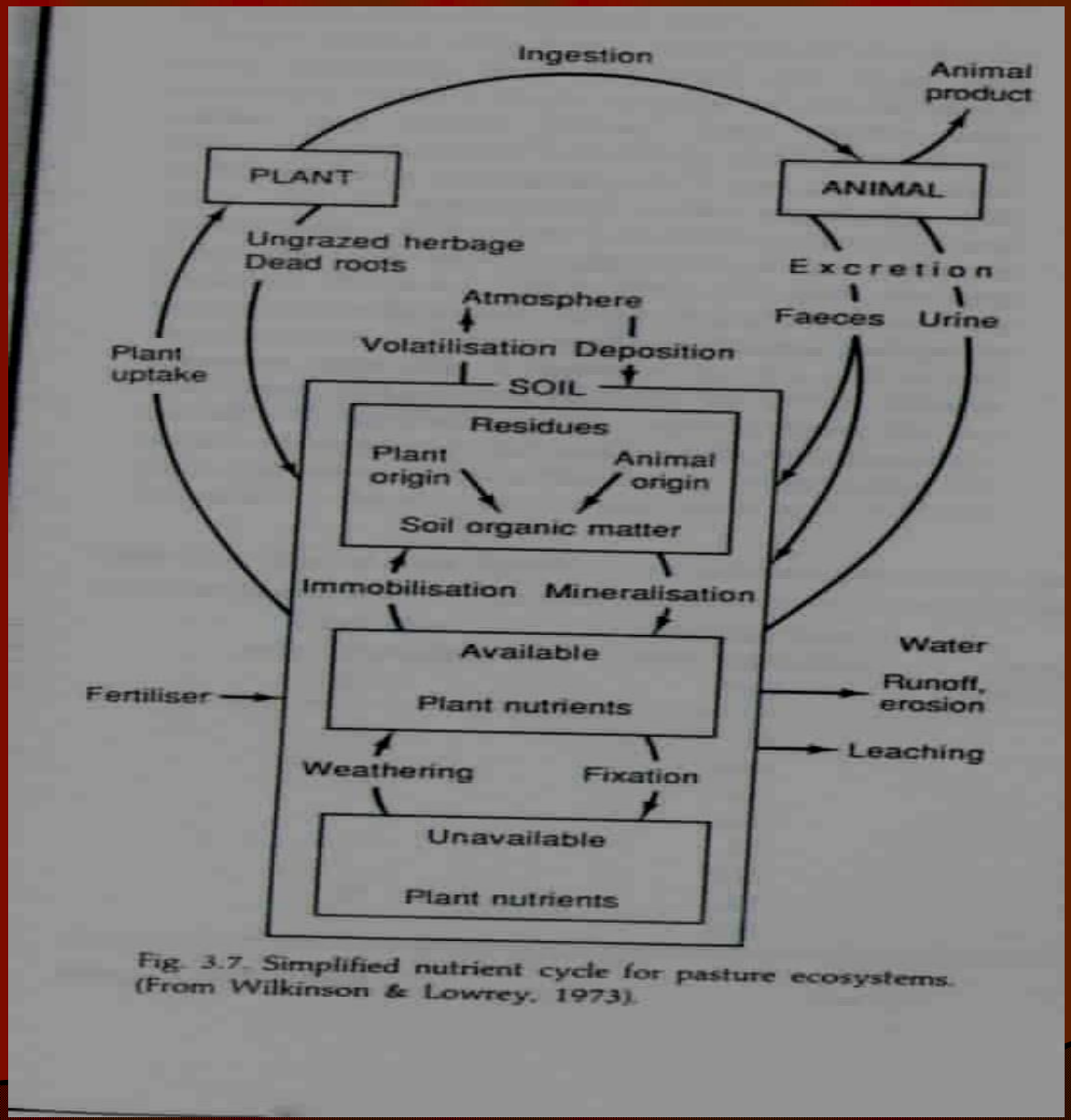


Fig. 3.7. Simplified nutrient cycle for pasture ecosystems. (From Wilkinson & Lowrey, 1973).

Fig. 1.3. Environmental and plant factors that dominate grassland pattern and species cycling in a grassland comprised of Townsville stylo and annual grasses in the wet-and-dry tropics. The factors exert quantitative effects on yield and species composition; the plant factors germination, establishment, competition and seed production may be seen as a series of filters through which individual plants attempt to pass. (From Torssell, 1973.)

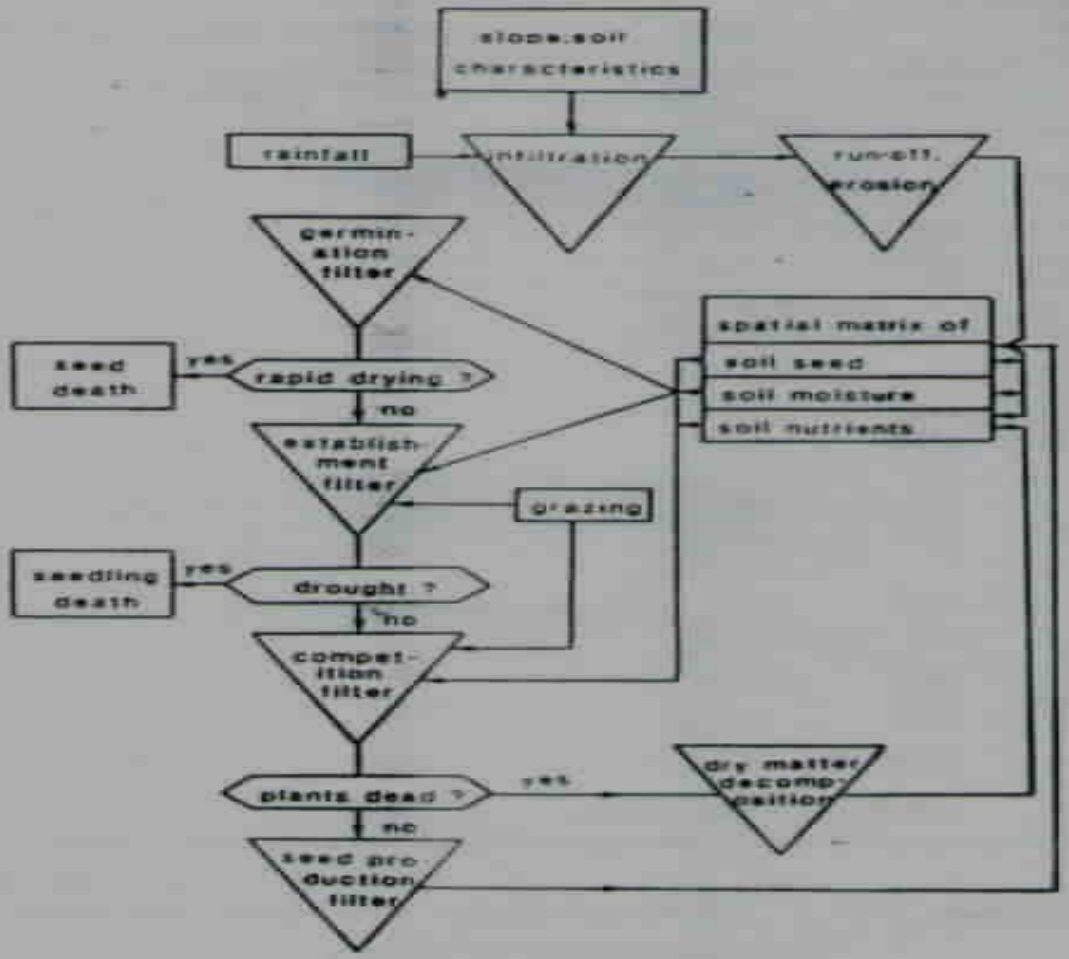
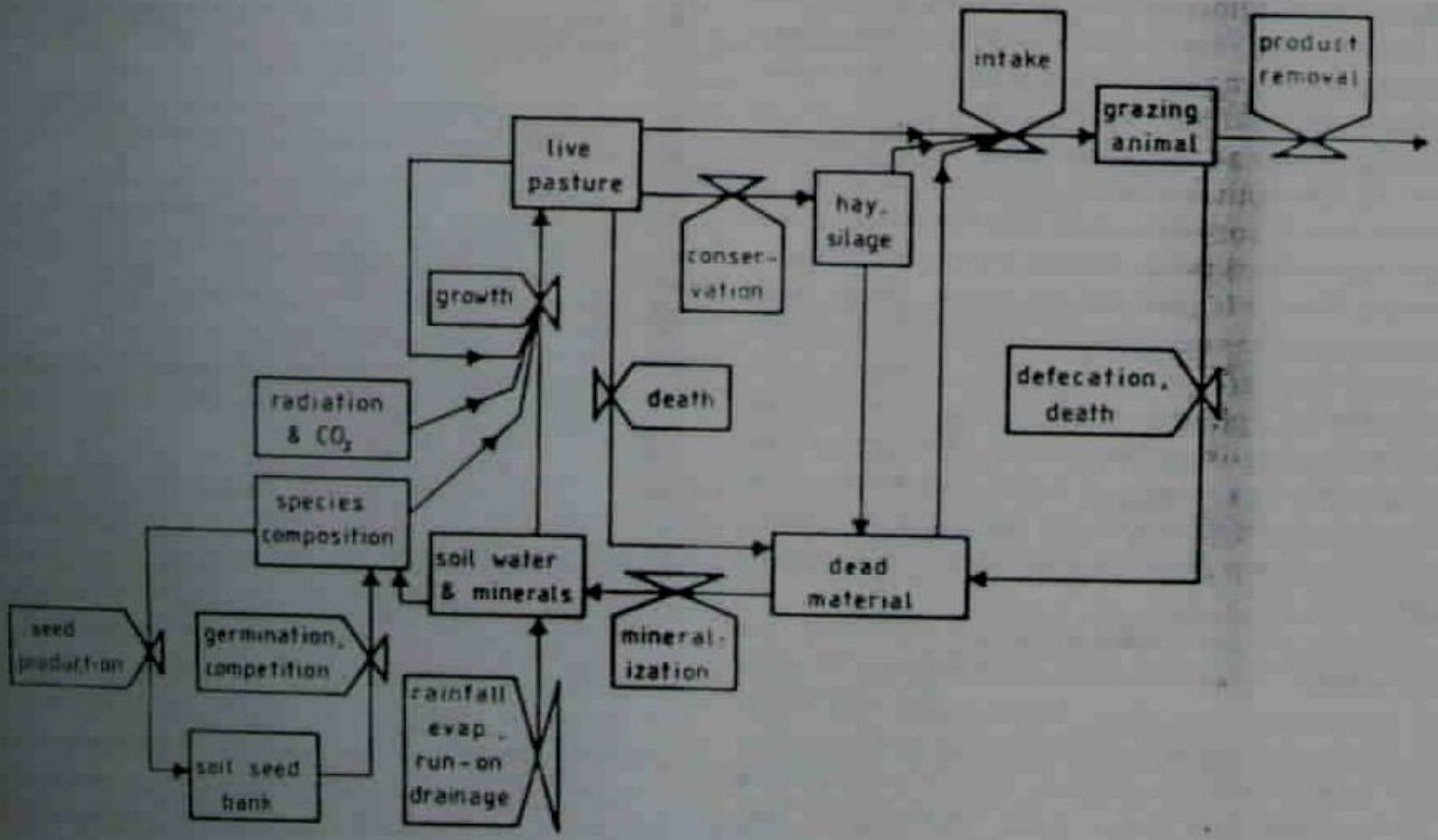


Fig. 1.2. The main biological components in the function and management of grassland systems. A grassland system is dynamic: various pools or state variables (□) are linked by flows of material, e.g. seed, leaf (arrows) and governed by rate variables ( ).



Herbage quality:

The suitability of a particular pasture plants depends on the production objectives, considering the environment for pasture establishments, the aims of pasture (e.g the type of animal production, the importance of pasture-crop integration or the necessity for watershed stability) will decide the importance of various pasture qualities (e.g nutritive value, ease of eradication, or ground cover.) Pasture qualities are usually judged in terms of their nutritive value, ease of establishment, and persistence. The value of a pasture must be determined by the output of animal products.

Nutritive value: Is the chemical composition, digestibility and the content of proteins, minerals and vitamins, and the absence of toxins. Nutritive value is being affected by acceptability, presence of undesirables substances, rate of passage and availabilities of forage because they influence the amount of forage consumed.

Chemical composition: This indicates the constituents in the forage and attempt had been made by early nutritionist to determine the chemical composition of a given feed stuff.

The weende’s proximate analytical scheme resolves a given feed stuff into five fractions: Crude protein (CP) through determination of kjeldhal nitrogen and multiplying N value by 6.25; fat or ether extract (EE) through extraction with anhydrous ether; Crude fibre (CF) determined by extractions with ether, sulphuric acid and sodium hydroxide; ash content using muffle furnace and nitrogen-free extract (NFE) determined by subtraction of CP, EE, CF and ash contents from sample weight.

The above is with the belief that CF is totally indigestible while NFE is totally digestible but this is not true. Crampton and Maynard (1938) resolved carbohydrate into lignin, cellulose and other carbohydrates to predict the feeding value. Van Soest (1966) proposed that forages are made up of two basic dietary fractions namely: Cell content (CC) and cell wall content (CWC).

		Nutritional availability	
Class	Fraction	Ruminant	Non-ruminant
Category A			
(Cellular contents)	Sugars, soluble carbohydrates,		
	Starch	Complete	Complete
	Pectin	Complete	High
	Non-protein N	High	High
	Protein	High	High
	Lipids	High	High
	Other soluble	High	High
Category B			
(Cell wall contents)	Hemicellulose	Partial	Low
	Cellulose	Partial	Low
	Heat-damaged		
	Protein	Indigestible	Indigestible
	Lignin	Indigestible	Indigestible
	Keratin	Indigestible	Indigestible
	Silica	Indigestible	Indigestible

Classification of forage fractions according to nutritive characteristics (from Van Soest, 1966 and 1967)

Fig. 2.2: Various systems of partitioning the dry matter of forage (Harris, 1970) taken from Crowder and Chedda, 1982)

DRY MATTER						
ORGANIC MATTER					ASH	ORGANIC MATTER SYSTEM
CRUDE FIBRE	NITROGEN FREE EXTRACT		ETHER EXTRACT	CRUDE PROTEIN	ASH	WEENDE'S OR PROXIMATE SYSTEM
CELL WALLS (NEUTRAL DETERGENT FIBRE)			CELL CONTENTS (NEUTRAL DETERGENT SOLUBLES)			VAN SOEST SYSTEM
CELL WALLS (FONNESBECK & HARRIS)			CELL CONTENTS			
NON-NUTRITIVE MATTER	PARTIALLY NUTRITIVE MATTER		NUTRITIVE MATTER			
LIGNIN & ACID INSOLUBLE ASH	CELLULOSE	HEMICELLULOSE	SOLUBLE CARBOHYDRATE, PROTEIN, ETHER EXTRACT, SOLUBLE ASH			