INTRODUCTION

- Demarcation of agricultural lands makes easy to identify lands for non-agricultural uses.

- For this soils play very significant role since crop production is mostly depend on the soil conditions.

- Therefore it is crucial to learn some important land characteristics and qualities land use planning.

Study of the following parameters are important for land use planning.

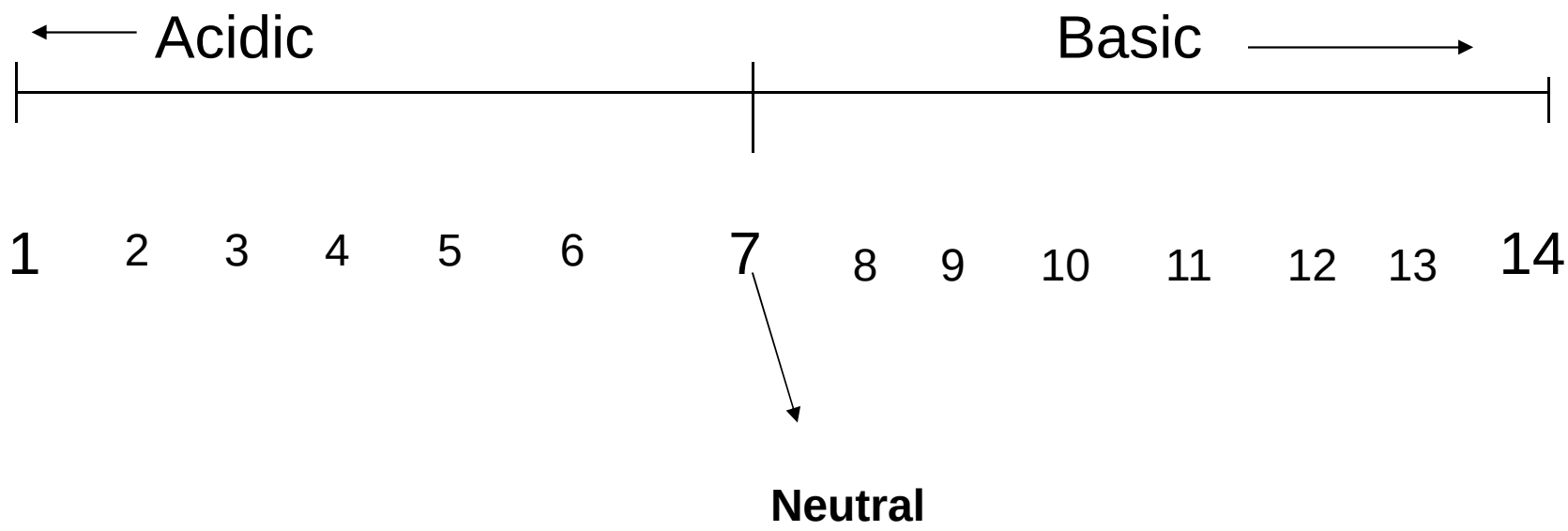
Characteristics	Quality
1. Slope	Erosion Hazard, Drainage, Workability
2. Rockiness	Workability
3. PH	Nutrient availability
4. Salinity	
5. Soil Type	Nutrient availability
6. Elevation	
7. Mean annual Rainfall	Water availability
8. Texture	Nutrient availability
9. Growing period	condition for ripening/plant growth
10. Soil depth	Rooting condition, Nutrient availability
11. Consistency	Workability

pH (Soil Reaction)

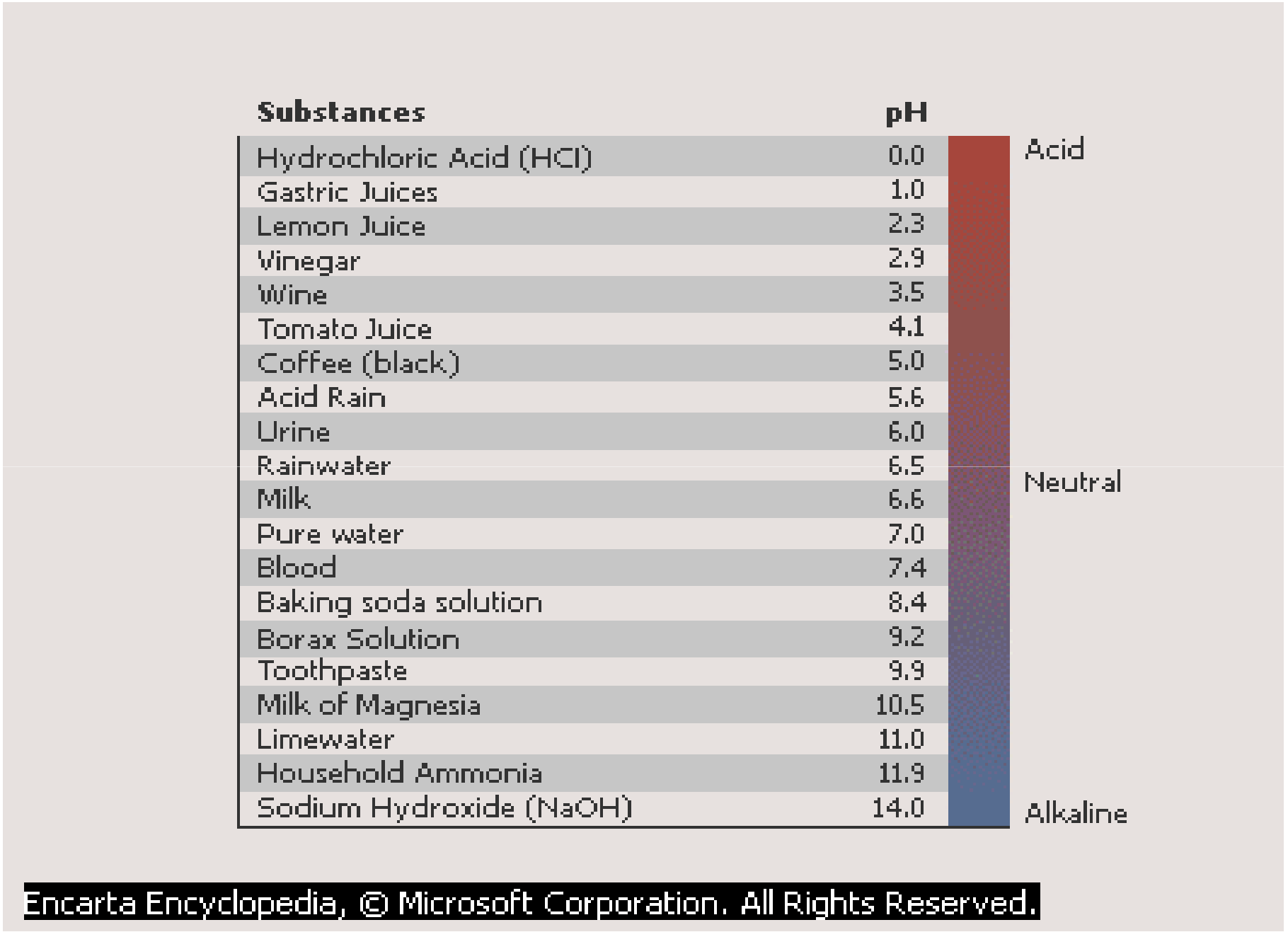
- pH indicates whether the soil is acidic or basic
- P = Power H = Concentration of Hydrogen ions

- More H^+ in soil solution $\rightarrow$ Acidic soil
- More OH^+ in soil solution $\rightarrow$ Basic soil
- Equal amount of H and OH $\rightarrow$ Neutral

PH Scale



Term	pH
Highly acidic w;sYh	<4.5
Strongly acidic mqn,	4.5-5.2
Moderately acidic	5.3-5.9
Slightly acidic	6-6.5
Neutral	6.6-7.2
Moderately basic	7.3-7.8
Basic	7.9-8.3
Strongly basic	>8.4



Substances	pH	
Hydrochloric Acid (HCl)	0.0	Acid
Gastric Juices	1.0	
Lemon Juice	2.3	
Vinegar	2.9	
Wine	3.5	
Tomato Juice	4.1	
Coffee (black)	5.0	
Acid Rain	5.6	
Urine	6.0	
Rainwater	6.5	
Milk	6.6	Neutral
Pure water	7.0	
Blood	7.4	
Baking soda solution	8.4	
Borax Solution	9.2	
Toothpaste	9.9	
Milk of Magnesia	10.5	
Limewater	11.0	
Household Ammonia	11.9	
Sodium Hydroxide (NaOH)	14.0	Alkaline

How soils become acidic?

1) Roots $\longrightarrow CO_2 \longrightarrow CO_2 + H_2O \longrightarrow H_2CO_3$

2) Sulfur from factories

Sulfur + Oxygen $\longrightarrow$ Sulfurdioxide

Sulfurdioxide + Water $\longrightarrow$ Sulfuric acid

3) N $\longrightarrow$ NO $\longrightarrow$ NO_2 $\longrightarrow$ HNO_3

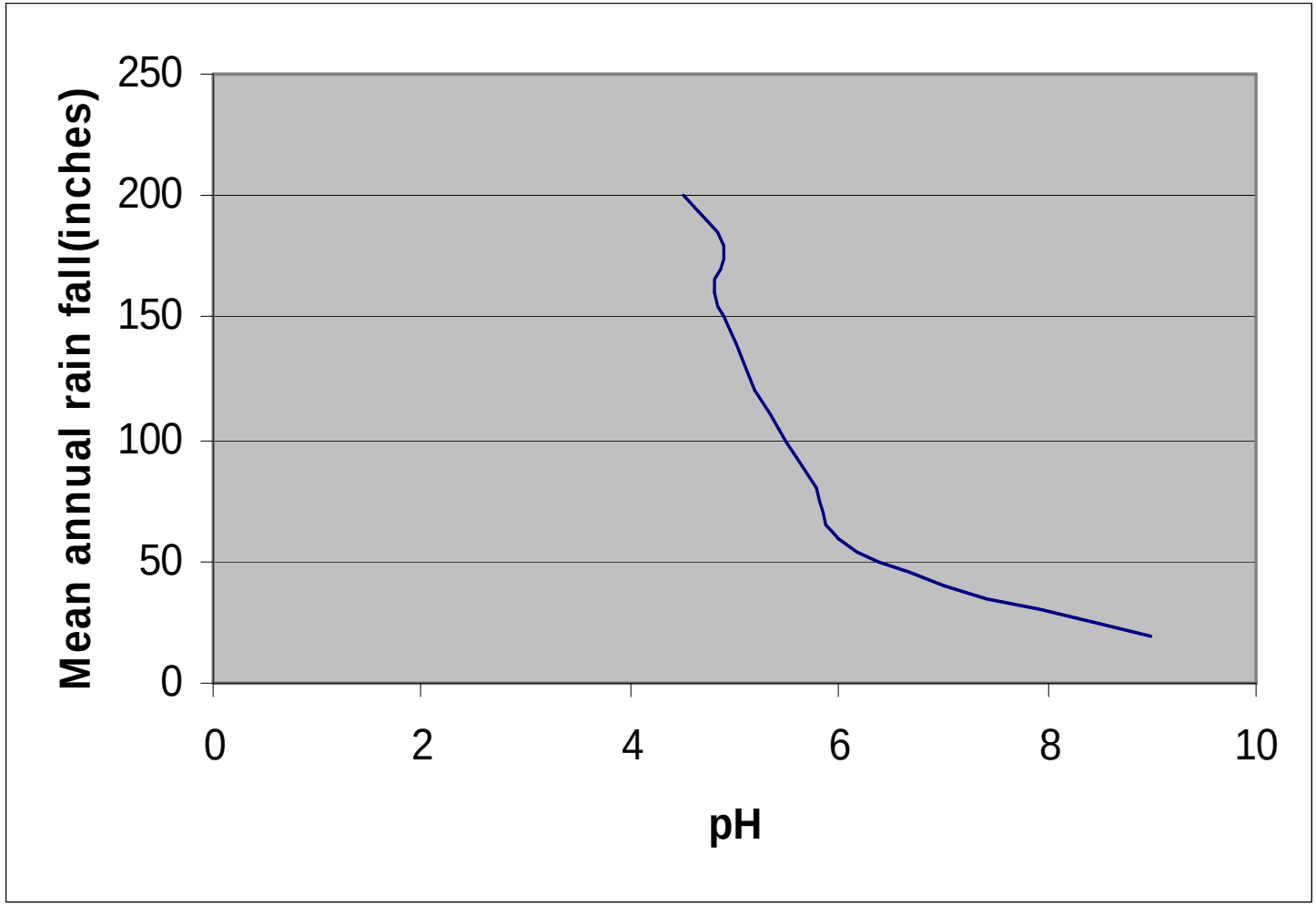
4) Decomposition of Organic Matter

5) Application of some fertilizers like Ammonium Sulphate


Encarta Encyclopedia, Oxford Scientific
Films/Steffen Hauser

More rains (wet zone) ⟶ Acid soils

Less rains (Dry zone) ⟶ Basic or Neutral



How to measure pH?

1) Laboratory Method

Mixing of soil with water (1 soil : 5 water or

1 soil : 2.5 water), shake well for 1 hr and stand for 30 min. and measure the pH of the clear solution using pH meter.

1) Field Method

by field pH meter

Using pH papers

Using litmus papers (not gives the value)

Significance of pH value

At low pH value

- Phosphate not readily available to the plants.
- All micronutrients except molybdenum become more available.
- Aluminum toxicity will occur.

At high pH value

- Phosphate (with calcium) ⟶ availability decrease.
- Phosphate (with sodium) ⟶ availability increase.
- Toxicity of Boron
- Decrease bacterial activity
- Availability of Micronutrients reduced (except Mo)

Crop	pH			
	S1	S2	S3	N
Tea	5-5.5	4.5-5	4-4.5	<4
		5.5-6	6-7	>7
Sugarcane	6-7	5.5-6	5-5.5	<5
		7-7.5	7.5-8.5	>8.5
Soybean	6-7	7-7.5	5-5.5	<5
		5.5-6	7.5-8	>8
Rubber(50cm)	5-6	4.5	4-4.5	<4
		6-6.5	6.5-7	>7
Rice	6-7	5-6	4.5-5	<4.5
		7-8	8-8.5	>8.5

Soil Salinity

Use Electrical conductivity (EC) to measure the salinity level.

Unit is ms per cm.

How to measure it ?

1) Laboratory Method

Same as pH . Use conductivity meter

2) Field Method

By Portable EC meters or

by electromagnetic induction soil conductivity sensors.

Soil salinity

- Widely occurring problem.
- Hydrology of the landscape and soils determine the movement and distribution of salts.
- Soil salinity is due to….

  - Natural factors

    High evaporation and transpiration

    Sea water intrusion

    Salt rich winds blowing over the land

  - Man-made factors (human induced salinity)

    Clearing of forest

    Use of poor quality irrigation water

A salinity affected land. Free salts visible on the surface

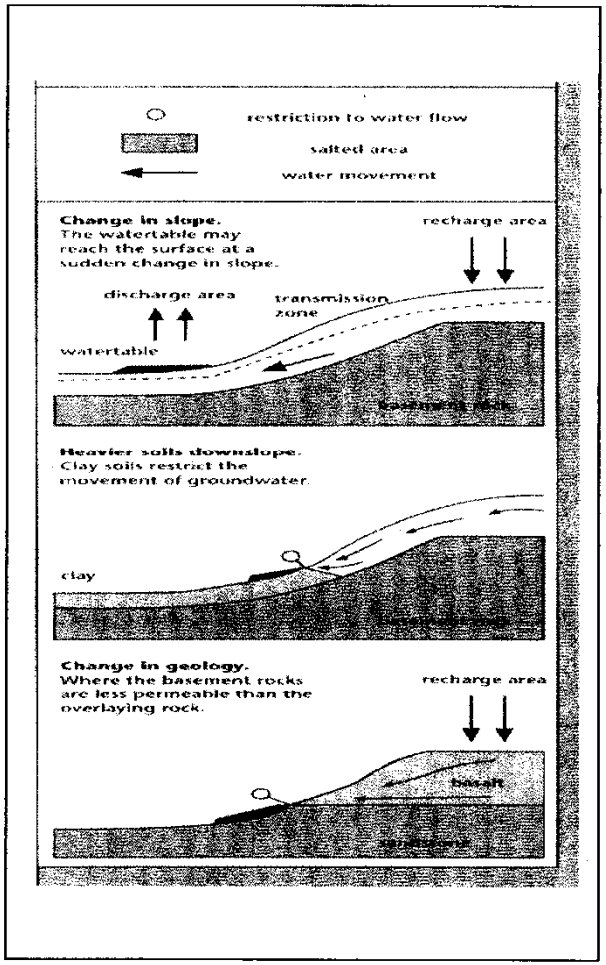
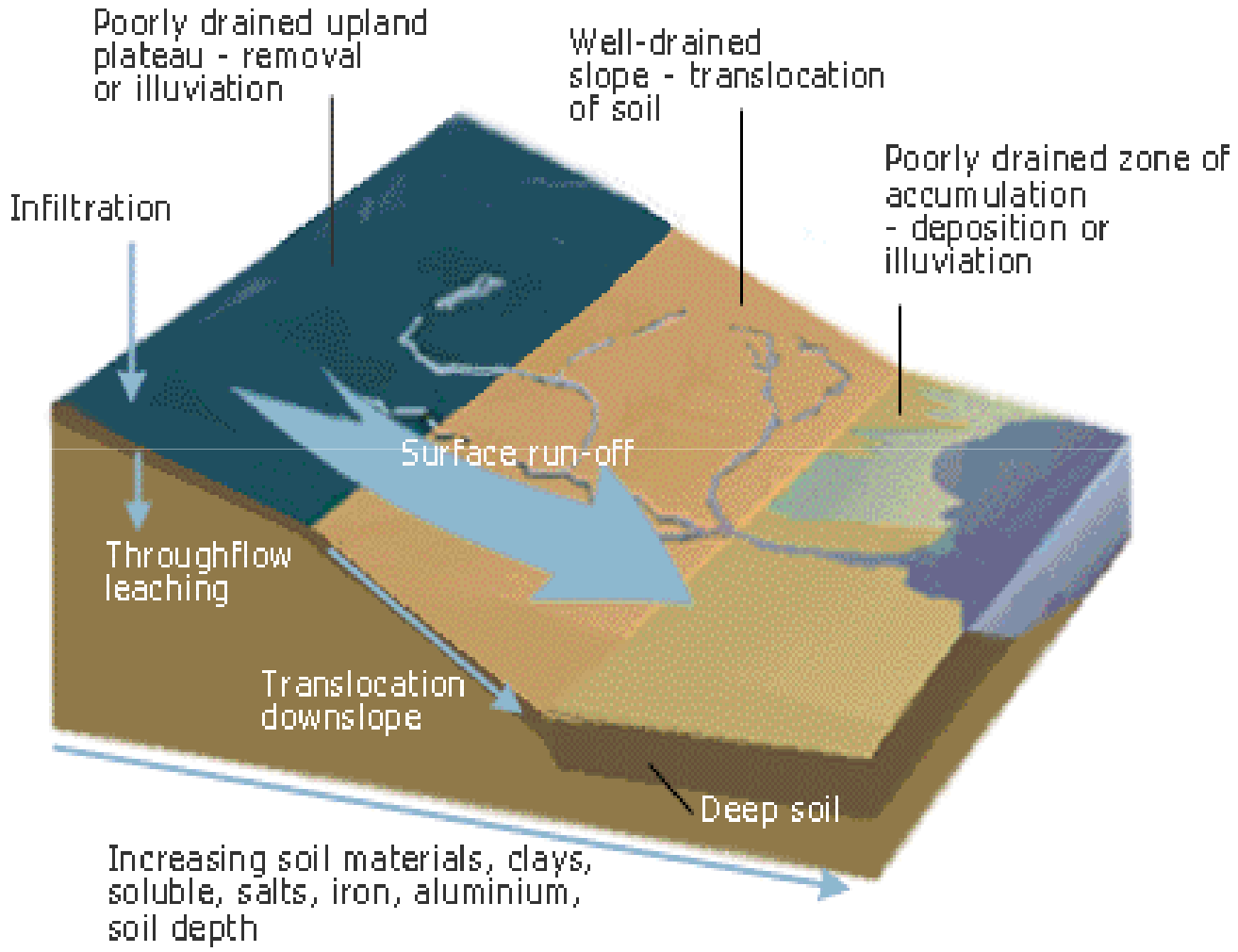


Fig. 2.3. The relationship between catchment features and groundwater flow in the development of saline discharge areas (Source: House et a., 1998).



USDA soil class	Term	ECe	Total salt content(%)
	Salt free	0-2	<0.15
	Slightly saline	4-8	0.15-0.35
	Mod. Saline	8-15	0.35-0.65
	Strongly saline	>15	>0.65

Source: Adapted FAO-Unesco(1973); and Shefield(1942) modified by Richards (1954)

High salt tolerance	Medium	Low
Date palm	Pomegranate	Lemon
	Grape	Avacado
Beet	Tomato	Radish
	Cabbage	Beans
Barley	Rice	
	Wheat	

Crop	ECe			
	S1	S2	S3	N
Cassava	<2	2-4	4-6	>6
Coconut	<4	4-8	8-12	>6
Cotton	<8	8-13	13-17	>17
Maize	<2	2-4	4-8	>8
Oil palm	<2	2-4	4-6	>6
Rice	<3	3-5	5-7	>7

Crop	Yield potential				
	100%	90%	75%	50%	no yield
	ECw				
Paddy	2	2.6	3.4	4.8	11.5

Soil Drainage

Classes:

1 – Excessively drained

2 – Well drained

3 – Moderately well drained – waterlogged for short period

4 – Poorly drained – waterlogged in the upper 50cm for at least half the year.

5 – Very poorly drained – waterlogged within 25cm of the surface for at least half the year and soil waterlogged within 50cm of the surface always.

	Distance to gray colour/ ash colour	Distance to mottles
Ex. Drained	no	no
W. Drained	no	>75cm
Mod.W. drained	>125	<75
	75-125	
P. Drained	20-75	
V.P. Drained	0-20	

Soil Texture:

Sand , Silt, Clay

Grittiness	smoothness	stickiness	Ball and worm formation	Texture
Not gritty	Not smooth	Ext. sticky	Long worm and can bend in to a ring	Clay
	Mod. smooth and soapy	Very sticky	do	Silty clay
		Mod. sticky	do	Silty clay loam
	Ext. sticky and soapy	v. Slightly sticky	Forms a ball but forms a worm with difficulty	silt


sand
loam
Encarta Encyclopedia, Corbis/Bob Rowan/Progressive Image

Soil Depth

Term	Depth to impeding layer	Depth to B.rock
Very deep	>120 cm	>150
Deep	90-120	120-150
Mod. Deep	60-90	90-120
Mod. shallow	30-60	60-90
Shallow	<30	<60

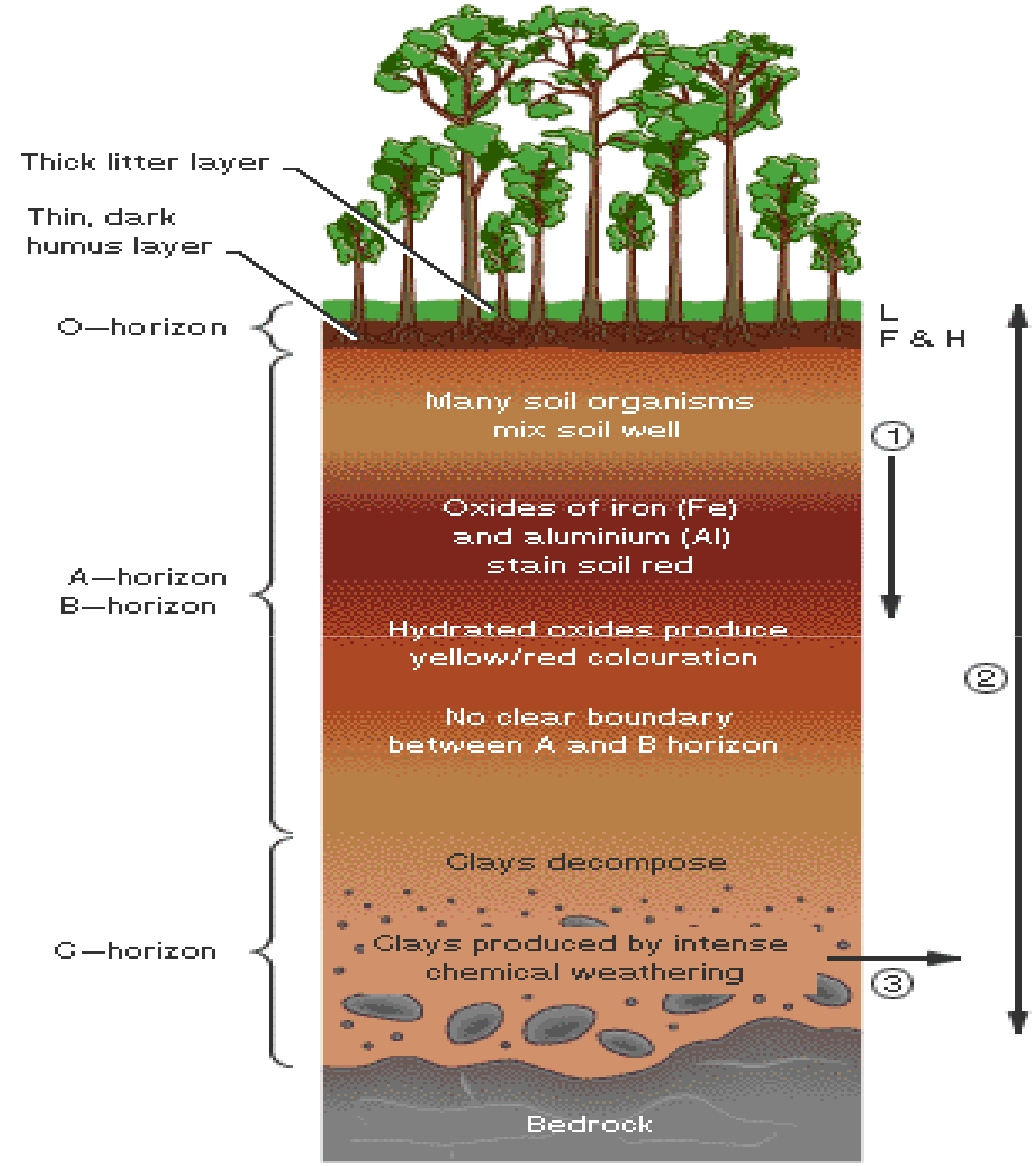
Soil Type

- Soils with same kind of horizons and similar arrangements of layers in the soil profile are grouped as one soil unit.

- Sri Lanka soils classified at great soil group level. Some areas (Jaffna, and some irrigation projects) mapping has been done at a series level.

- Soil Map (Reconnaissance) has 34 map units

  29 soil map units and 5 land form units



1 Heavy leaching of silica and bases due to high precipitation

2 Soils deep, reach 30 m (100 ft)

3 Outflow of soil water leads to loss of nutrients

Typical Latosol profile in tropical rainforest