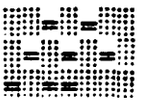
CHAPTER - II

BASES OF LAND CAPABILITY



2.1 Soil types

2.2 Land units

2.3 Soil texture

2.4 Soil depth

2.5 Relief

2.6 Slope

2.7 Soil erosion

2.8 Soil gravels

2.9 Soil drainage

2.10 Soil wetness

2.11 Soil permeability

2.12 Available moisture capacity

2.13 Summary

- References



2.1 SOIL TYPES :

Colour of soil is probably the first soil property for the human perception. Even today soil is described by its colour, such as yellow brown, red brown, light brown, light gray white, gray black and dark brown soil. The colour of soil is mostly due to the iron and maganese compounds and the organic matter in soil (Narayana and Shah 1966).

In some soils viz. dark brown gray soils and a few others colour depends with increase of moistness. Dark brown gray colour becomes greyish under dry conditions. For precise description, therefore, it is necessary to record soil colour on air dry soil and soil at field capacity.

The colour of soil has some relevance to soil constituents, viz. organic matter and oxides of iron. Black colour of organic and pit soils is due to organic matter. Black soils are rather low in organic matter and the black colour, rather dark gray colour, is due to a combination of base status (Na,Ca), humus, and montmorillonic clay mineral. Iron oxides occur in several hydrated and coloured forms which may impart red to yellow colour to soil.

(Fig.2.1) shows the areal distribution of soils of different colour in the Kotavade circle. Yellow brown soil occurs in the villages of Malgund, Marathwadi, Nivedi, Talepatwadi, Bhagavatinagar, Rahataghar and Bhandarwada covering an

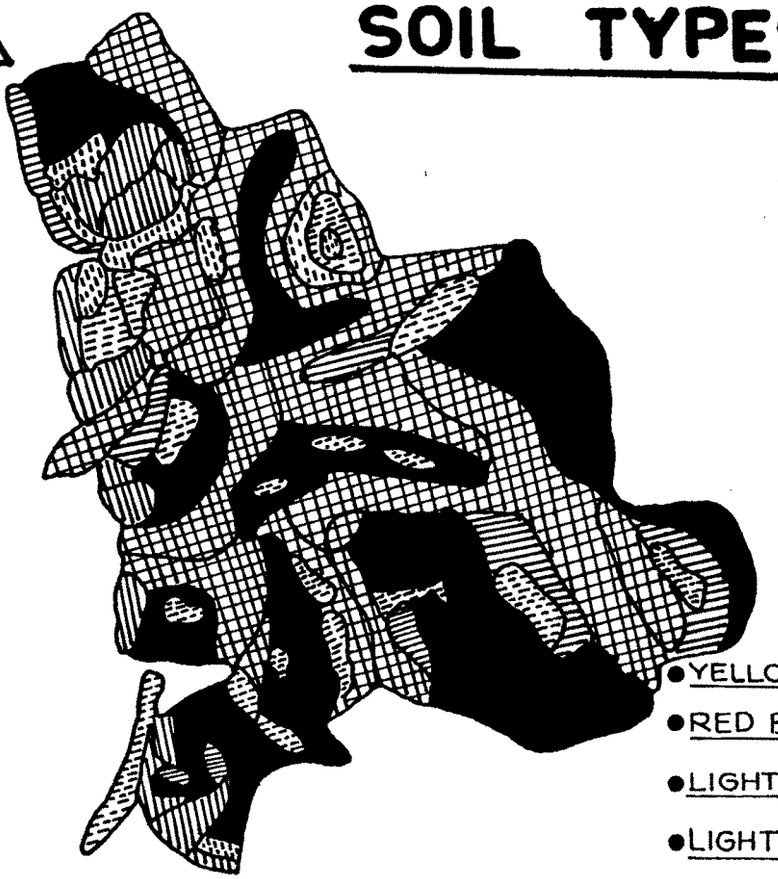
area of about 0.98 percent of the total area. Major portion of Ratnagiri district is covered by yellow brown, red brown, light brown, light gray, white gray black, and dark brown soil occurs in the villages of Ganapatipule, Bhandarpule, Kajirbhati, Dhokamble, Nevare, Dhamanse, Ori, Narme, Jambharun, Vetoshi and its proportion is 8.45 percent and 11.68 percent of the total area (Table 2.1). Gray black and dark brown colour soil is found in the eastern part of the Kotavade block of villages Ori, Narme, Nivandi, Dhamanse, Jambharun and its proportion is only 29.59 percent and 42.95 percent of the land of villages that display this colour group are Jambharun, Ori, Nivedi, Marathwadi, Dhokamble, Bhandarwada, Wadajun.

The light gray brown soil is found in major portion of the district and its areal extent is 6.35 percent of the total area. Red brown soil occurs in the south eastern part of the Talepatwadi, Ori, Narone, Kotavade, Jambharun. South western parts of Bholewadi, Mayekarwadi, Kalbadevi, Basani and southern part of the Kasarwadi, Sadye, Vetashi villages.

Covering an area of about 8.45 percent of the total major portion of Kotavade circle is covered by medium red brown colour soil, yellow brown light brown soil and its proportion is 0.98 percent and 11.68 percent of the total area. Medium high gray; while gray black soil is found in

A

SOIL TYPES

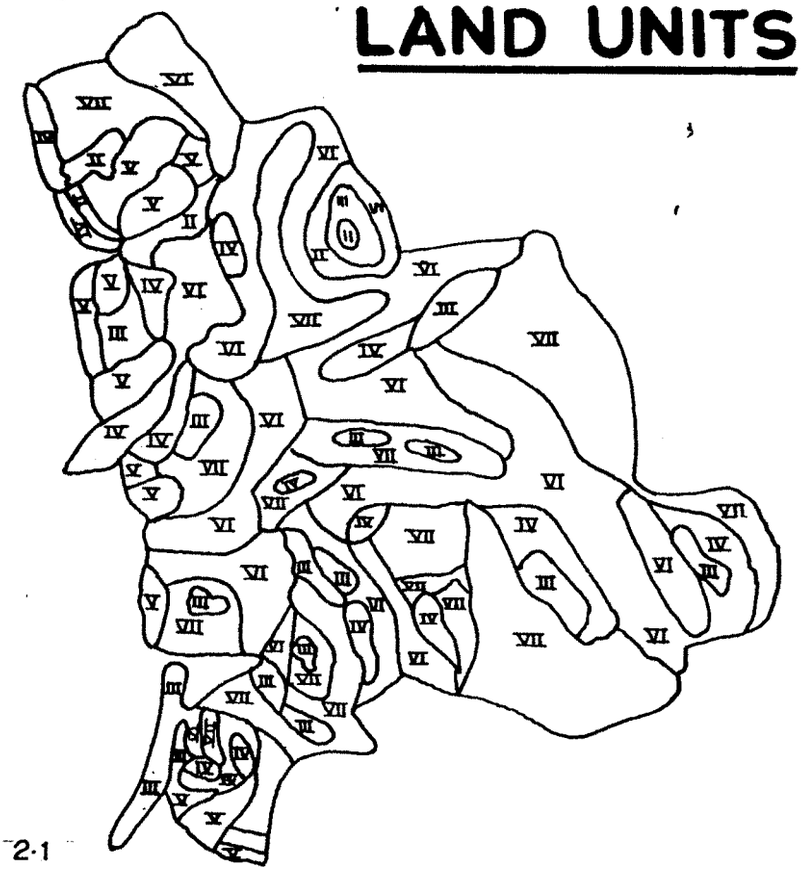


N

- YELLOW BROWN
- RED BROWN
- LIGHT BROWN
- LIGHT GERY WHITE
- GERY BLACK
- DARK BROWN

B

LAND UNITS



N

II
III
IV
V
VI
VII

FIG. NO. 2·1

Table 2.1 : The percentage of area under different soil properties in Kotavade circle.

Sr. No.	Class	Percentage area
1	Soil texture	
	Gravel, silty, heavy clay	18.60
	sandy loam, clay silty	9.40
	Clay, clay loam, sandy	10.20
	Sandy loam	10.20
	Sandy clay loam	12.50
	Katal stony	40.10
	Total	100.00
2	Soil depth	
	Very shallow	13.70
	Shallow soil	16.61
	Moderate deep	13.70
	Deep soil	14.63
	Very deep soil	41.36
	Total	100.00
3	Slope	
	Very gently sloping	10.44
	Gently sloping	42.88
	Moderate sloping	12.35
	Strongly sloping	34.33
	Total	100.00

Conti.

VAJI UNIVE... KOT...

Table 2.1 conti..

Sr. No.	Class	Percentage area
4	Soil erosion	
	Less erosion	8.15
	Moderate erosion	10.15
	High erosion	49.80
	Occassionally deep qullies	31.90
	Total	100.00
5	Gravels	
	Less gravel	31.41
	Moderately gravel	16.99
	High gravel	51.60
	Total	100.00
6	Soil colour	
	Yellow brown	0.98
	Red brown	8.45
	Light brown	11.68
	Light gray white	6.35
	Gray black	29.59
	Dark brown	42.95
	Total	100.00
7	Soil drainage	
	Poorly drained	4.37
	Moderate drained	20.53
	Well drained	75.10
	Total	100.00

Conti..

Table 2.1 conti..

Sr. No.	Class	Percentage area
8	Soil wetness	
	Very wet	4.47
	Moderately wet	20.53
	Slightly wet	75.10
	Total	100.00
9	Soil permeability	
	Rapid	4.47
	Moderate	20.53
	Low	75.10
	Total	100.00
10	Available moisture	
	Low	75.10
	Moderate	20.53
	High	4.47
	Total	100.00

SOURCE : Compiled by the author.

in the central part of Kharavate, Dhanase, Nevare, Bhage, Vatinagar, Malgund villages, north part of Marathwadi, Nevedi, eastern part of Ori, Narme, Jambharun and also some villages of Kotavade circle of the total geographical area.

Based on these soil types the area is divided into different land units as below.

2.2 LAND UNITS :

The land units are very important to study the land capability and landuse pattern in any circle. The physical properties of soil are identified and mapped. On the basis of all physical properties the unit map is presented. These units are defined and mapped by natural resource surveys,, soil survey, forest inventory. Their degree of homogeneity or of internal variation varies with the scale and intensity of the landscape that has similar characteristics and qualities (Olson 1984). In the study area six soil units are observed. The basic mapping units are the basis for all interpretative grouping of soils. They furnish information needed for developing capability units. The larger part of the study area is occupied by sandy loam clay sand. Soil 5° to 10° slope covering an area of about 2852.63 hectare. Gravel silty have clay 1° to 3° slope and sandy loam clay sily 3°to 5° slope. Sandy loam 0 to 1° slope. On the basis

of these soils an attempt is made to classify the land of Kotavade circle into different land units as below (Fig.2.1). The Kotavade circle in Ratnagiri district consisting of nine villages is divided into land units and they are used as bases for representing the soil properties.

i) Yellow, brown soil unit
ii) Red brown soil unit
iii) Light brown soil unit
iv) Bright gray white soil unit
v) Gray black soil unit
vi) Dark brown soil unit

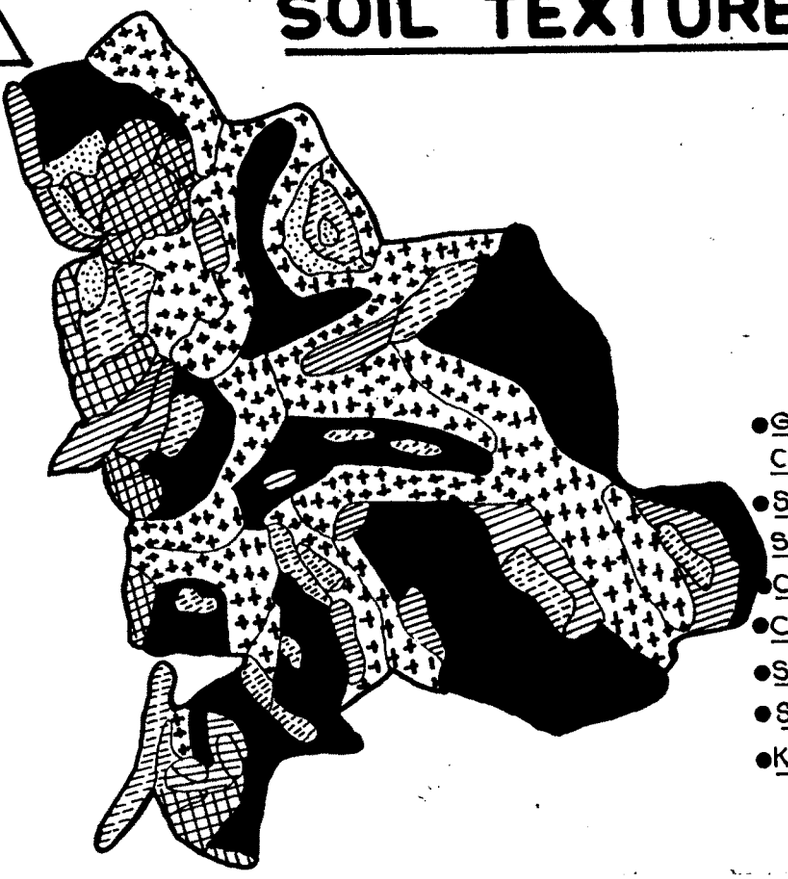
2.3 SOIL TEXTURE :

Soil is a heterogeneous mixture of particles, humus, and a variety of insolubles. Soil means the upper strata of earth surface. The physical properties of soil need critical and careful study because soil is a natural medium for the agricultural and plant growth. Physical properties of soil are most important for determining land capability and landuse pattern. They are, soil texture, soil depth, soil slope, soil erosion, soil gravel, soil colour, soil drainage etc.

Soil texture refers to the size of soil particles that constitute the soil. It relates to the relative proportions of sandy, silty loam, clay and dam slit that are present in the soil. The proportion of sandy silty and loam, clay sand

A

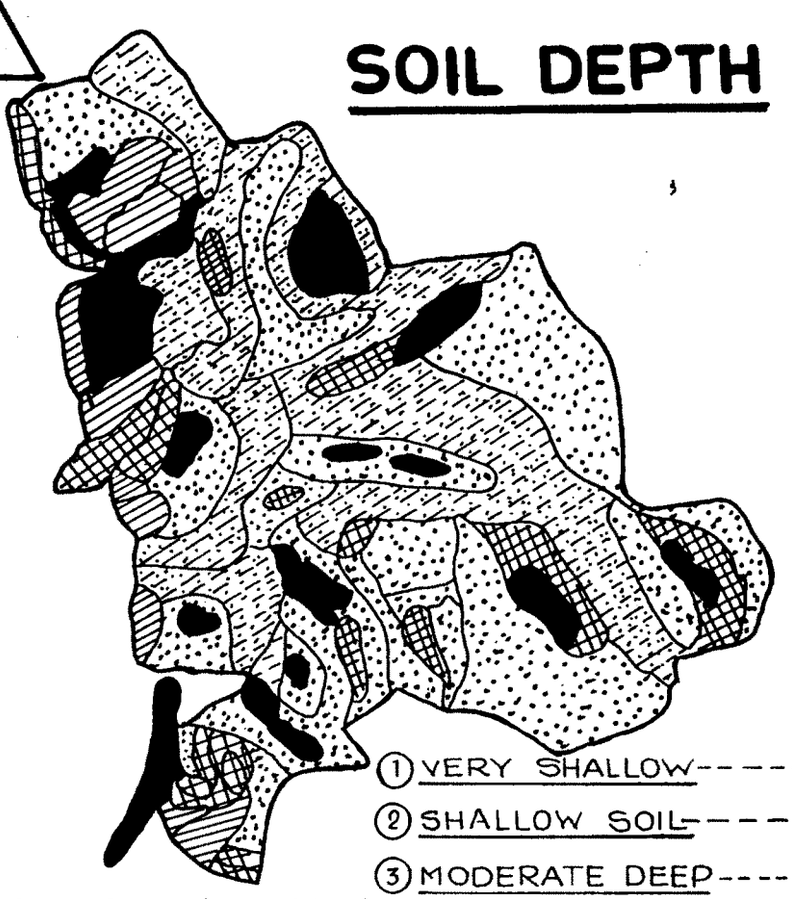
SOIL TEXTURE



- GRAVEL SILTY HEAVY CLAY
- SANDY LOAM, CLAY SILTY
- CLAY, CLAY LOAM, SANDY CLAY LOAM
- SANDY LOAM
- SANDY, CLAY LOAM
- KATAL, STONY

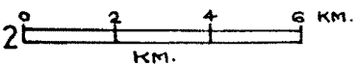
B

SOIL DEPTH



1. VERY SHALLOW
2. SHALLOW SOIL
3. MODERATE DEEP
4. DEEP SOIL
5. VERY DEEP SOIL ABOVE

FIG. NO 2·2



particles in relation to each other is called the texture of soil (Lorentz C.Pearson 1966). The large amount of sand or sandy is called as coarse soil and less amount is called sandy or sandy loam. If silt is in large quantities it is called as silty loam or loam. Large amount of clay in soils makes it sticky and it is termed as clay or clay loam. The texture of soil can be also classified as coarse textural, medium textural and fine or good quality textural.

In the region the texture of soil is observed as gravel, silty, clay, sandy loam, clay silty, clay, clay loam, sandy, sandy loam, sand clay loam, katal stony. The gravel silty have clay textural class which covers an area of about 18.60 percent of the total area (Table 2.1). This types of textural class is found in northern parts of Malgund, Rahataghar, Marathwada, Bhandarpule and eastern part of Nivedi, Talepatwadi villages (Fig.2.2). 9.40 percent land of Kotavade circle is covered by the sandy loam, clay, silty textural class soil. This type of textural class is observed in north western parts of Ganapatipule, Bhandarpule, Bhagavatinagar, Nevare and central parts of Dhamanse, Kotavade, Ori and south-western part of Are, Bholewadi, Mayekarwadi, Kalbadevi and western part of Jambharun. 10.20 percent land of the part is covered by the clay, clay loam, sandy clay loam, textural class soil. This type of class is covered by north western part of Bhandarwada, Nevare, Nivedi, central parts of Dhamanse and south eastern part of Narone, Jambharun, Basani. 12.50 percent land of the

part is covered by the sandy clay loam textural class soil. North eastern part of Marathwada, Talepatwadi, Bhagavati-nagar, central part of the Dhamanse, Kharavate, and south western part of Dhokamble, Kasarwadi, Jambharun and Vetoshi villages. Katal, stony soil has covered 40.20 percent land in the south western and eastern parts of Basani, Sadye, Sakharwadi, Pirandavane, Wadajun, Vetoshi, Narone, Ori, Nevare, central and north parts of Kotavade, Marathwada villages.

2.4 SOIL DEPTH :

The thickness of soil layers readily occupied by plant roots determine the effective soil depth. In a deep soil, plants withstand drought better because the roots are spread through a larger volume of soil and also plants can absorb the minerals stored in the sub soil if their roots can reach them.

Soil varies in depth from few centimeters to several meters. It is determined by the thickness of soil layers. The soil depth is important for the growth of the plants or crop. The fertility status also depends upon the depth of soil. The areal variation of soil depth in the Kotavade circle in Ratnagiri district is shown in the map (Fig.2.2).

Kotavade circle covers the northern parts of Malgund, Nivedi and eastern part of Ori, Dhanamse, Narane. The southern

part of Jambharun, Vetoshi, Kotavade, Kasarwadi villages. In these villages soil depth is above 0 to 7.5 cms and the area extent is about 41.36 percent of the total area of circle (Table 2.1). The deep soil class from 50 to 100 cm depth is observed in western parts of Ganpatipule, Bhandarwada, central parts of Ori, Nevare and south parts of Jambharan, Wadajan. The shallow soil is observed north eastern parts of Marathwada, Nivadi, Dhamanse, Kharavate, and western part of Dhokamble, Sandye, Kajirbhati villages and the area extent is 16.61 percent.

The moderately deep soil ranging from 25 to 50 cm. depth is observed in western and north parts of Rahataghar, Bhandarpule, Malgand, Bhandarwada and southern parts of Sakharwadi, Dhokamble, Kajirbhati and the area extent about 14.70 percent. The very deep soil above the 100cm. depth is observed in western and southern parts of Are, Bholewadi, Mayekarwadi, Kalabadevi villages; eastern parts of Narme, Jambharun, Kotavade and the area extent is about 14.63 percent. The 13.70 percent area has been covered by very deep soil in different parts of the Kotavade circle. This type of soil depth is recorded mostly in the south western and north western part of the area and central and eastern part of the villages in Kotavade circle.

2.5 RELIEF :

The relief features of the Kotavade circle are essentially the product of its geological mantle. The outstanding feature in the relief of the Kotavade is its highly uneven nature and very narrow riverine plain that fringes the coastline. Over 85 percent of the land surface is hilly. The landscape of the Kotavade circle is basically influenced by the Deccan lavas which cover most of the area except the southern and southeastern part which is underlain by metamorphic types. The typical lava landscape developed under tropical hurried conditions persists about everywhere. But locally, even this general aspect has five different types - the coastline, the esturine alluvial plains and basins of the main rivers, the laterite plateaues, the highly eroded remnant hills partly detached from and partly connected to the main range, and the scarp face of the Sahyadri.

2.6 SLOPE :

Slope of land is also one of the important aspects influencing the agricultural landuse of Kotavade circle area. The effects of slope on agriculture may be both direct and indirect for practical purposes especially for agricultural landuse hardly any data is available from which the significance of slope can be adjusted. But steeply slopping areas

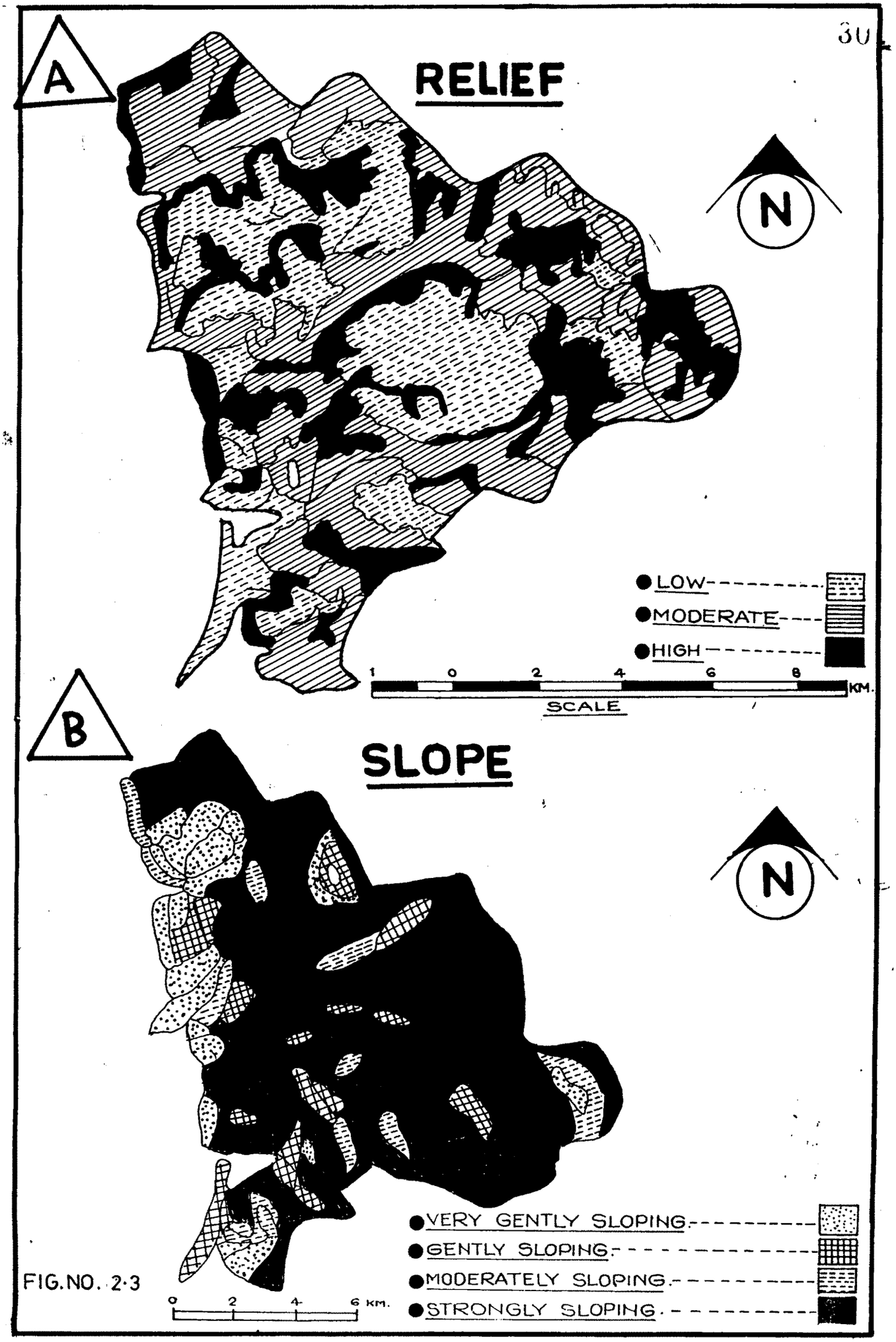

A
RELIEF
N
LOW
MODERATE
HIGH
1 0 2 4 6 8 KM.
SCALE
B
SLOPE
N
VERY GENTLY SLOPING
GENTLY SLOPING
MODERATELY SLOPING
STRONGLY SLOPING
0 2 4 6 km.

FIG. NO. 2·3

cannot be brought under cultivation because of inherited limitations.

Slope determines the soil erosion intensity as it increases with the steepness of slope. Thus slope causes soil erosion and due to erosion the fertility of soil is reduced and it affects the crop growth and production.

The slope of land of the circle is measured and four slope categories, namely moderately slopping, gently sloping and very gently sloping and strongly sloping are demarcated. Most part of the Kotavade circle has been occupied by moderately sloping land (3-5 to 5-10 cm.) and it's areal extent is about 12.35 percent and only 10.44 percent land is covered by very gently sloping land category (Table 2.1). The gently sloping land covers 42.88 percent and strongly sloping above 34.33 percent of land. Due to the steepness of slope the use of even very simple farm machinery becomes difficult. Steeper slopes are generally avoided and ploughed only if warranted by population pressure and steeper slopes are brought under the plough to raise gain crops and trees side by side in Kotavade circle of Ratnagiri district.

2.7 SOIL EROSION :

'Erosion' means wearing away. Natural or normal geologic erosion is the erosion of land in its natural

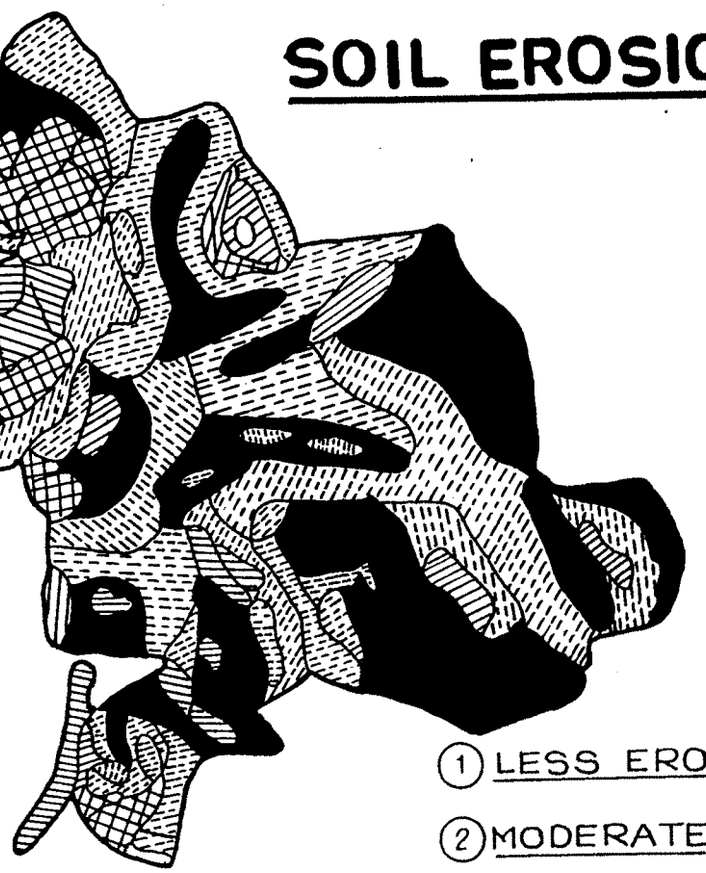
state, undisturbed by human activity. Uneven land surfaces are being continually eroded by running water, wind, ice or other geological agents. The removal and formation of soil go on simultaneously. The process of soil formation is slow, but that of erosion may vary in its rate and magnitude. However, nature has a way of balancing the two.

The intensity of the erosion in the area under study is not uniform. It is caused by flowing water, slope, sheet, splash, rainfall, wind effect of water erosion of runoff and soil loss, loss of rain water, loss of soil, loss of nutrients, exposure of a loss fertile soil layer, development of cutups and irregular land surface adversely affecting agricultural operations. In an extreme situation, the land becomes soil by the wind, water and other agent. Due to erosion the fertility of soil is reduced in this area. The soil erosion is caused by rainfall and flowing water and about (49.80%) of the total geographical area appears to be affected by high erosion and is located in Kotavade circle which happen to be the water divided of the smaller streams and rivers.

The area moderately affected (by erosion) covers about 10.15 percent of the total area and 8.15 percent of land in the Kotavade circle in Ratnagiri district is occupied by less erosion hazard. 31.90 percent of land appears to be affected by occasionally deep gallies erosion. The total land of Kotavade of Ratnagiri district and villages, namely

A

SOIL EROSION



N

0 2 4 6 KM.

(1) LESS EROSION

(2) MODERATE EROSION

(3) HIGH EROSION

(4) OCCASIONALLY DEEP GULLIES.

B

SOIL GRAVELS

N

0 2 4 6 KM.

(1) LESS GRAVELS

(2) MODERATE GRAVELS

(3) HIGH GRAVELS

FIG. NO. 2-4

Ori, Narme, Jambharun are eastern part of area. South part of Wadjan, Sadye, Kasarwadi, north part of Marathwadi, central part of Dhamanse, Khavate and face the problems of occasionally deep gullies erosion. 8.15 percent land of the circle is occupied by the villages of Malgund, Rahataghar, Ganpatipule and south part of Kasarwadi. 10.15 percent land of the area has been affected by south western part of Are, Bholewadi, Mayekarwadi, Kalbadevi, Sadye, north central part of Ori, Dhamanse, Kotavade, Wadajun, Talepatwadi.

2.8 SOIL GRAVELS :

When the size of sand or stone particles exceeds to 2.0 mm. it is called soil gravel. The presence of gravels effects the fertility of good quality of soil and so the capability. The soil gravel is assessed by the amount and size of gravels which is based on keen observation.

The fertility of soil is affected by the presence of gravels. The region under study is classified into three classes of gravel content namely less gravels, moderate gravels and high gravels in the Kotavade circle of Ratnagiri district. Small river bank has less gravels and its proportion in the region is about 31.41 percent. Whereas the proportion of the moderate gravel is about 16.99 percent and the high gravel is about 51.60 percent of the total (Fig.2.3).

The south eastern part of Basani, Sakharwadi, Kasarwadi,

Pirandavane, Sandye, Wadajun, Kotavde, Vetashi, Jambharun, Kharavate and Narme is covered by high gravel soil with 51.60 percent of the soil.

The northwestern part of Malagand, Bhandarpule, Bhandarwada, Nevare, Kajirbhati, villages and the south eastern part of Narme, Jambharan, Ori is covered by moderate gravel soil with 16.99 percent of the total area.

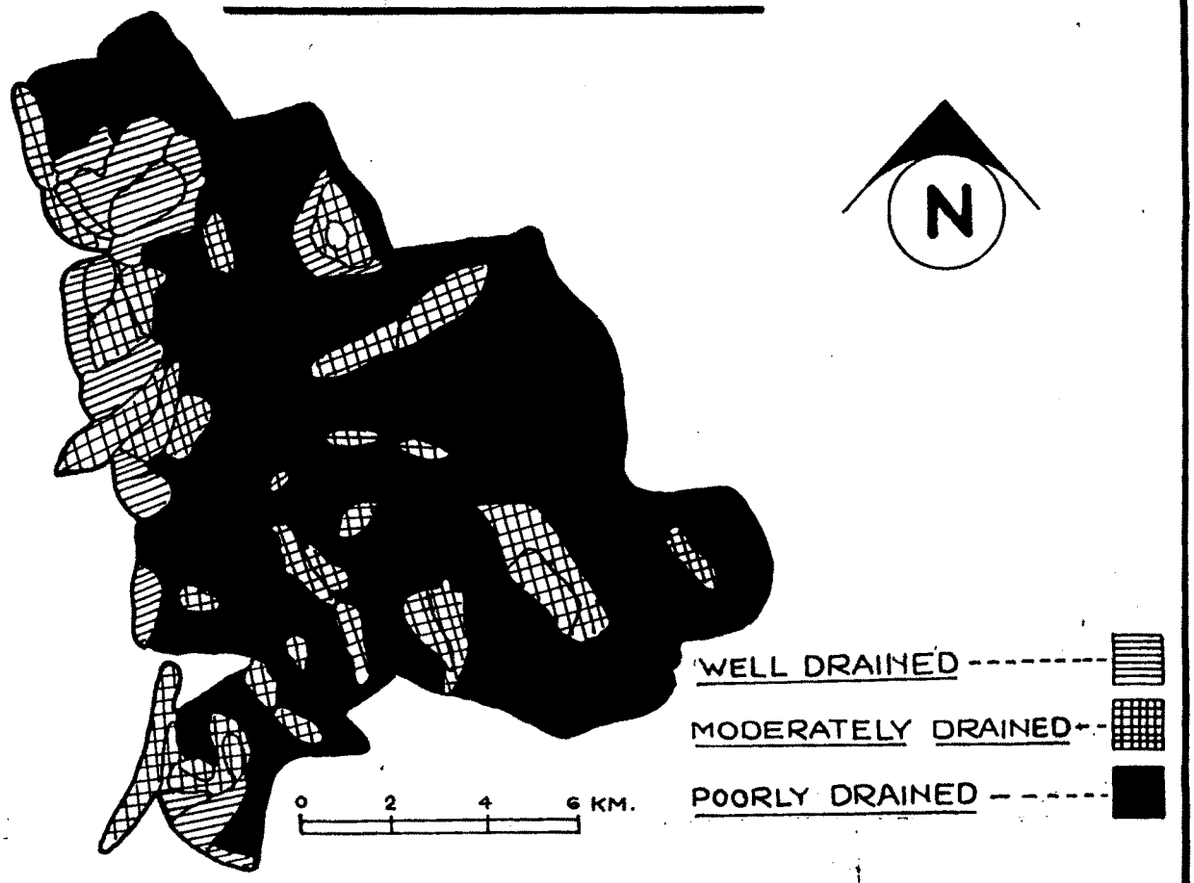
The north western and eastern part of Rahataghar, Malagund, Marathwadi, Are, Bholewadi, Mayekarwadi, Kalabadevi and eastern part of Talepatwadi and southern part of Kotavade, Jambharan, Narme is covered by less gravel soil with 31.41 percent of the total area.

2.9 SOIL DRAINAGE :

The nature of watertable in the soil may be caused by excessive rainfall, see page, injudicious irrigation or low permeability of surface layers (I.C.A.R.,1970). When the infilteration is not rapid enough, the rain or irrigation water will flow over the soil surface and water attains rapid velocity. It will carry top fertile soil with it and will carry in erosion (Naidya and Sahastrabudhe 1979). The fertile top soil surface will be protected from erosion and water-logging if the soil drainage is poor.

The land of Kotavade circle is classified into three categories of soil drainage i.e. poorly drained, moderately

SOIL DRAINAGE



SOIL WETNESS

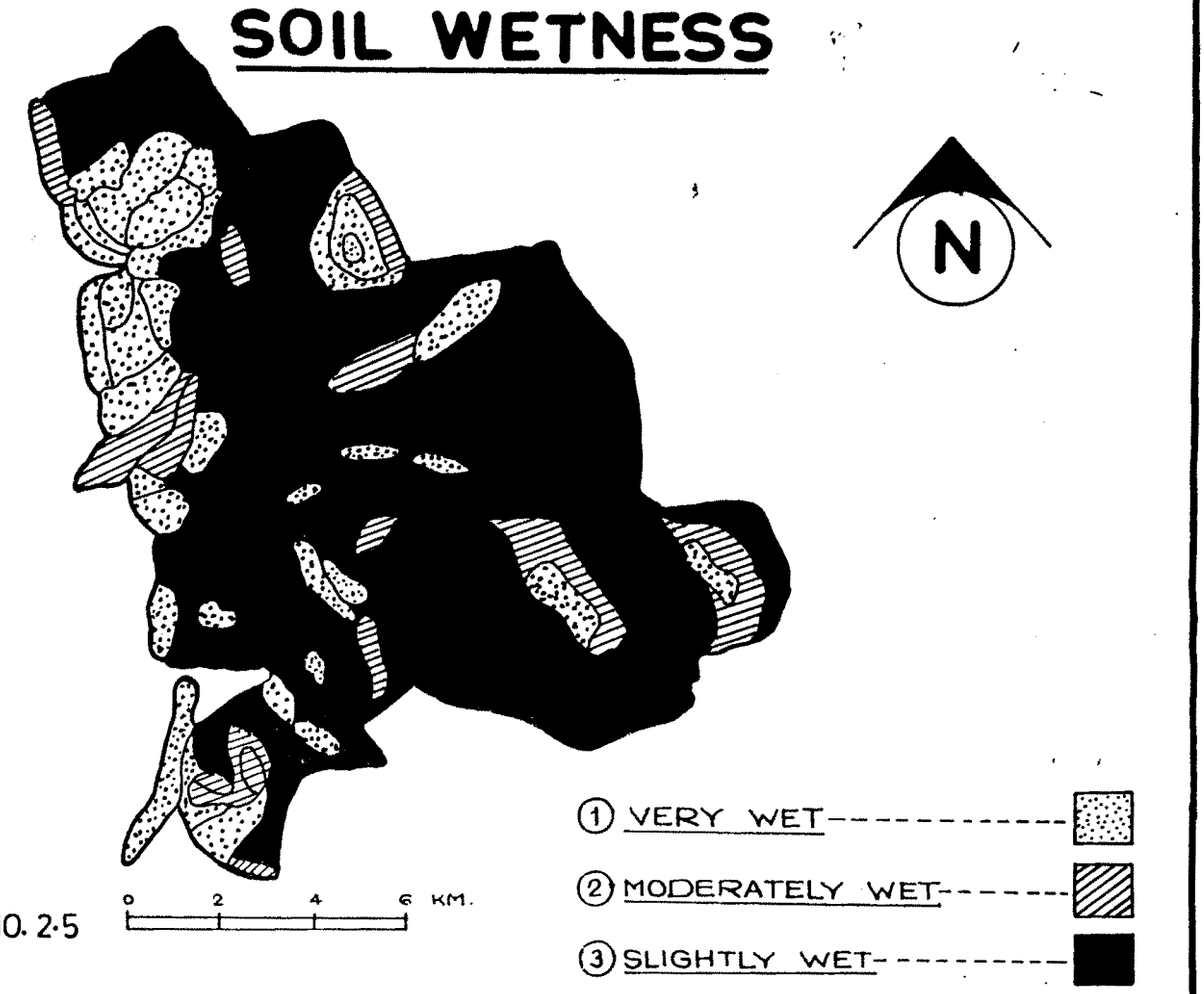


FIG. NO. 2·5

drained and well drained. Soil class unit of VI and VII are 75.10 percent under the poorly drained area. It is very strongly sloping area of the circle. 20.53 percent area is moderately drained in soil categories of III and IV class. The well drained area is about 4.37 percent in Kotavade circle (Fig.2.5).

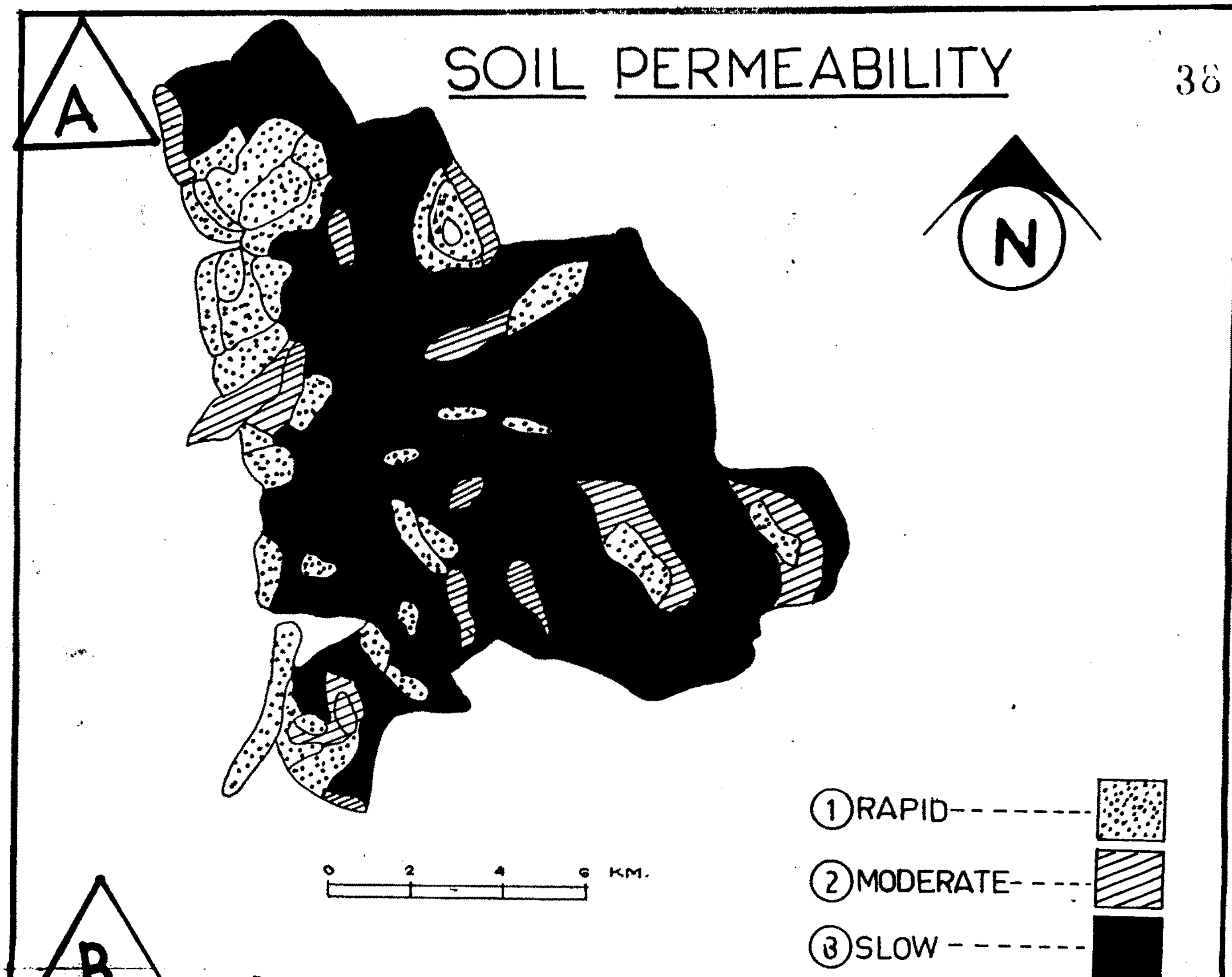
2.10 SOIL WETNESS :

When water is added to a dry soil, it is first absorbed and embided by the soil particles and it is known as soil wetness.

The study area is divided into three categories of soil wetness i.e. very wet, moderately wet and slightly wet soil. Major portion of Kotavade circle is covered by very wet soil and its proportion is 4.47 percent of the total area. Moderately wet soil is found in the north western and south part of the circle and it is 20.53 percent. The slightly wet soil is found in north eastern part and south eastern part of the circle and its proportion is only 75.10 percent (Fig.2.5).

2.11 SOIL PERMEABILITY :

When the amount of water in a soil is increased beyond its maximum capillary capacity, the additional water appears as


A
SOIL PERMEABILITY
N
0 2 4 6 KM.
1 RAPID
2 MODERATE
3 SLOW

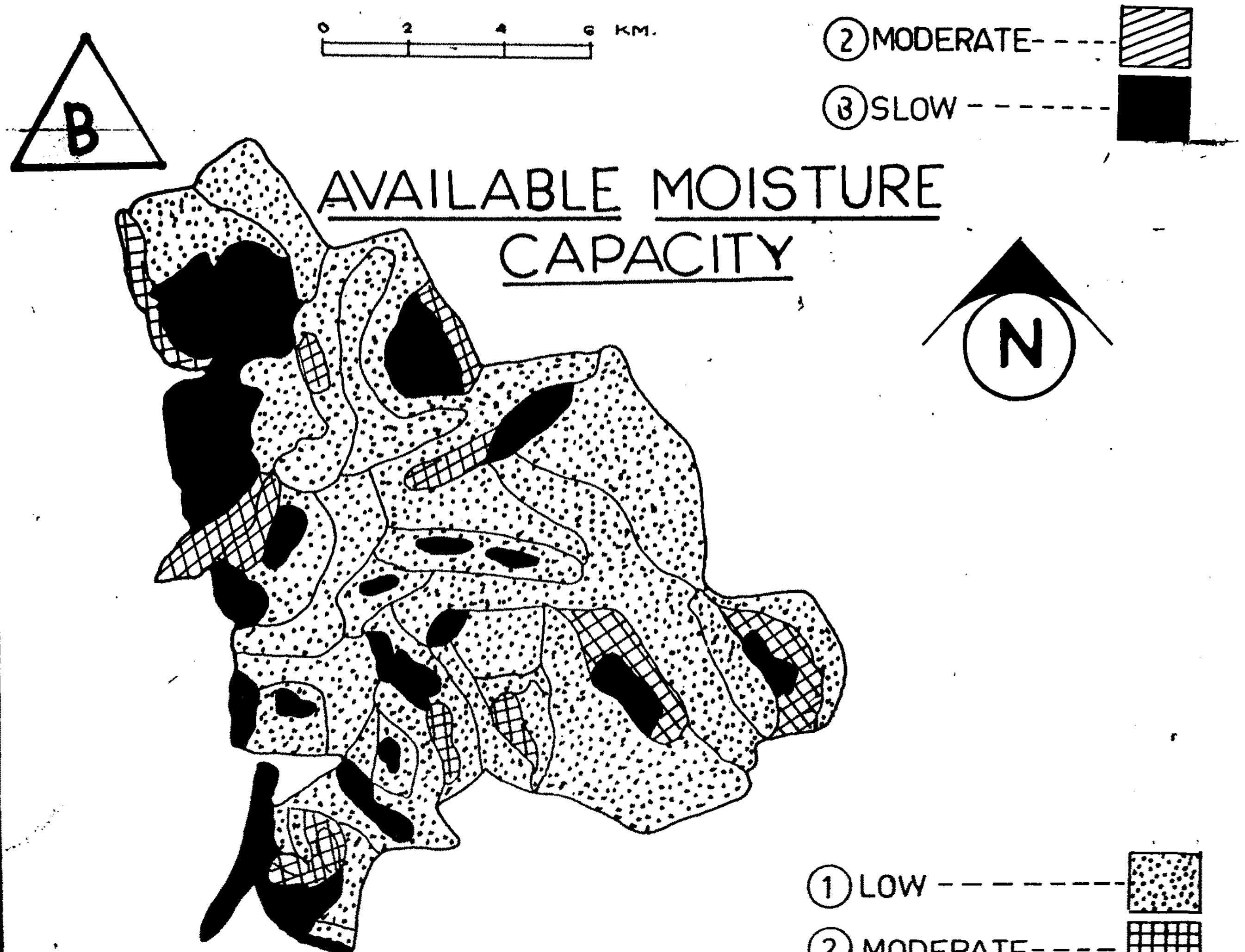

B
AVAILABLE MOISTURE CAPACITY
N
0 2 4 6 KM.
1 LOW
2 MODERATE
3 HIGH

FIG. NO. 2·6

free water in the pore space. This water is beyond the force exerted by soil particles and therefore comes under the influence of gravity. Hence, this water called gravitational water. Due to the force of gravity action on it the water moves downward through the soil. The downward movement of gravitational water through the soil is called permeability (Daji 1980).

The land of Kotavade circle is divided into three categories of soil permeability viz. rapid, moderate and slow permeable soil. 75.10 percent land of the circle is occupied by rapid permeability and the 20.53 percent area has been occupied by moderate permeability. The proportion of rapid permeability has been occupied by 4.47 percent of the total land of the circle and it is more dominant in the study area (Fig.2.6-A).

2.12 AVAILABLE MOISTURE CAPACITY :

When water is applied to a dry field it moves down rapidly and wets the soil mass and after several days the amount of water held by the soil in the form of moisture is known as the available moisture capacity (Daji 1980).

The land of Kotavade circle is classified into three categories of available moisture capacity i.e. low, moderate and high moisture capacity (Fig.2.6). 75.10 percent land of

the circle is occupied by low available moisture capacity and 20.53 percent area by moderate available moisture capacity. The proportion of high available moisture capacity is 4.47 percent of the total land of the circle.

2.13 SUMMARY :

The physical properties of soil such as texture, depth, slope, erosion, gravels, colour, drainage, wetness, permeability and available moisture capacity are used as bases for land capability classification.

Soil texture means the composition of soil in respect to particle size, clay loam, sandy silty clay loam, sandy loam and sandy textured soil found in the study area. Soil depth is determined by the thickness of soil layers and mostly the proportion of less deep soil cover is wide spread in the study area. The average slope of the land of Kotavade circle is moderately slopping.

Soil erosion means wearing away of soil layers by different agents. Moderate erosion and less erosion hazard has covered about 18.30 percent land of the circle. The presence of gravels affects the fertility of soil. In the Kotavade circle the land that falls on the banks of Nivade, Ganpatipule river and Kotavade river has less gravels. Generally, all over the area under study the medium brown

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and medium red colour soil is observed. The soil drainage is moderate to well drained and it occurs in 20.53 percent area of the circle. Generally, in study area very wet and moderately wet soils are observed and they occur in 20.53 percent area of the total. The soil permeability is moderate to slow and it covers in 20.53 percent area of the total. The permeability is moderate to slow and it covers in 20.53 percent area of the total. The permeability is moderate to slow and it covers in 20.53 percent area of the circle. Generally all over the circle the moderate and high available moisture capacity soils are observed.

In the study area the four types of soil are observed. The major part of the study area is covered by sandy clay loam, silty soil of 0° to 5° slope. But very small portion is covered by red high drained shallow sandy soil of 5° to 10° slope.

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A

R E F E R E N C E S

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