CHAPTER VII

GENERAL LAND USE CLASS

Introduction - Land is the basic source of natural resources and it serves as storehouse of minerals, reservoir of water, conserver of soil fertility, producer of vegetation and home for varied organisms including man. Land is the important factor of production in the context of human society. Almost every nation is conservation-conscious. But no nation seems to have hit upon the best method of conservation of resources. The theories of soil conservation have been changing with the variation in the context of soil-complex. Soil conservation means prevention of exhaustion or depletion of soils. It means that the land should be put to the best use.

The need of scientific method of inquiry becomes urgent in the man's attempt to ensure optimum use of land. Difficulties in deciding upon the best or optimum use for any particular type of land arise out of the dilemma of producing maximum amount of food and other products with minimum ill-effects on land capacity. The relationship between man and land resource has been more obvious for ensuring optimum use of land in recent decades as population has been increasing rapidly. A rapid rate of economic development is essential to keep pace with the increasing needs of evergrowing population.

There is no possibility of our being able to meet the existing and increasing needs unless our techniques of land
utilisation are greatly improved. Apart from the need of increasing production, there is the vital question of preservation of our natural resources of soil, water and vegetation. There is evidence everywhere to impress upon the gravity and vast magnitude of the problems arising from the wasteful use of our natural resources. In many areas fertile lands have been lost, and soil layers have been wasted away by erosional processes. The need of food, fodder and fuel has increased manyfold. Human society will have a difficult time ahead, if proper conservation and planning are not informed to the present situation.

The present land use pattern of an area reflects the pattern of land resource utilisation and consequences inform of wasting of land potentialities. The inhabitants have been utilising land for their various needs, viz. food, fodder, fuel, orchards, settlements, communication water, recreation, etc. since then they have been there. The earlier inhabitants carried primitive jungle economy and maintained the part of the ecosystem in the long past. Afterwards the introduction of agrarian economy initiated the change of once forest-clad area into a human habitat area. Jungles were cleared in patches for farming and this led to a number of interrelated changes in the physical make-up of the area. Later on permanent agriculture gradually replaced the shifting cultivation and the area became important in selection of sites, construction of cultivation fields and in choice of crops according to availability of moisture and soil characteristics.

Terrain Effect - Terrain has a profound impact over the choice of land and use of that land. The various terrain aspects,
such as slope, soil water, etc. were considered before land was put to certain use. The general topography is to a large extent composed of hills, rolling lands, undulating lands, dissected lands and intermittent valleys. All the landscapes are mantled by soils of varying thicknesses and textures. The subsurface flow of water is guided by topography and nature and extent of basement rocks. The valleys between slopes have thick deposition of soils consisting of good amount of humus contents. The crest and steep slopes of hills are, however, composed of sterile gravels with thin layer of soils and are as a rule very poor in fertility status.

Moisture Effect - The main source of moisture is rain which is mainly available during rainy season. The level of underground water rises in the wet months. Owing to the nature of terrain conditions, valleys of lowland situations are generally more wet than the lands of the midland and upland situations. The plains, gentle slopes of rolling and undulating lands and valley bottoms or depressions are very suitable for cultivation for their fine-textured soils having water retentive capacity. Moreover, for suitable cultivation slopes of such lands are made terraced and bunded and these terraced slopes appear to be series of steps of varying heights. The capability of cultivated land is in direct proportion to soil moisture available either from underground seepage or from rain. Irrigation facilities are hardly available in the area under study. Cropping pattern changes from wet cultivation of rice in lowlying lands of deep and heavy soils to dry farming in upland situations having shallow and light soils.
PART OF THE MAND BASIN
RAIGARH DIST MADHYA PRADESH
VILLAGEWISE LANDUSE IN PERCENT

REFERENCES

Arable Land: Forest Land: Culturable waste Land:
> 75% > 50% > 20%
25%-75% 20%-50% Other
< 25% < 20% Non-cultivated Land:

Reserved & Protected Forests

Boundaries: village, tahsil ---, ---
Land Use Class - The study area as stated in the Chapter I comprises parts of Udaipur and Gharghoda tahsil of Raigarh district with a total area of 1323 sq.km. The area is extensively covered by reserved and protected forests with an area of about 526 sq.km. and the remaining area of 797 sq.km. is occupied by 127 villages.

Major land use classification of the study area comprises (1) arable lands, (2) forest lands, (3) culturable waste lands and (4) lands not available for cultivation. Arable lands comprise an area of about 355 sq.km. occupying 27 per cent land of the total area. Forest lands, which consists of reserved and protected forests outside the village areas and the village forests within the village areas comprise an area of about 797 sq.km. occupying 60 per cent lands of the total area. Culturable waste lands consisting of pastures and grazing lands comprise an area of about 122 sq.km. spread over 9 per cent lands of the total area. The remaining area of 49 sq.km. is covered by other lands which are not available for cultivation occupying 4 per cent lands of the total area. Land uses of parts of the two tahsils are dealt separately (Map No. 23).

Land Use of the Part of Udaipur Tahsil - Udaipur tahsil occupies north-western part of the study area comprising an area of about 877 sq.km. Out of total 299 villages of the whole tahsil only 75 villages lie within the jurisdiction of the study area. Twelve of the 75 villages lie partly in the study area. Land use data of these part villages have been processed accordingly. Udaipur tahsil (part) is mainly covered by forest lands which consist of a number of reserved and protected forests and also village forests.
Forest lands comprise an area of about 565 sq.km. occupying 64 per cent lands of the tahsil (part). Arable lands comprise an area of about 242 sq.km. occupying only 28 per cent lands. Culturable waste lands occupy an area of about 41 sq.km. only comprising 5 per cent lands. Lands, which are not available for cultivation, comprise an area of about 29 sq.km. occupying 3 per cent lands.

Land Use of the Part of Gharghoda Tahsil - Gharghoda tahsil occupies the remaining south-eastern part of the study area. Out of the total 324 villages only 52 villages of the tahsil lie in the study area. Fourteen of the 52 villages lie partly in the study area. Land use data of these part villages have been processed in accordance with their areas falling in the study area. In the tahsil (part) main land use type is forest lands which consist of reserved and protected forests and also village forests. Forest lands comprise an area of about 232 sq.km. occupying 52 per cent lands of the tahsil (part). Forest lands of Gharghoda tahsil are less than those of Udaipur tahsil. Arable lands occupy an area of about 113 sq.km. comprising 25 per cent lands which are also less than those of Udaipur tahsil. Culturable waste lands comprise an area of about 81 sq.km. occupying 18 per cent lands. These lands are more in area than those of Udaipur tahsil. Lands, which are not available for cultivation, comprise an area of about 20 sq.km. occupying 5 per cent lands. These lands are also comparatively more in percentage of area in the tahsil.

Arable Land Use - The study area is mainly occupied by non-agricultural uses of lands which comprise an area of about 968 sq.km. constituting 73 per cent lands of the total area. Arable lands
comprise only an area of about 355 sq.km. constituting 27 per cent lands. Arable lands occupy mainly level lands of lowland, midland and upland situations, terraced slopes of the undulating and rolling lands and valley depressions and the arable lands are given to rabi and kharif crops. Paddy is the traditional and main crop occupying about two-thirds of the total cropped area. The remaining one-third cropped area is given to the cultivation of wheat, various millets like tur, kodo, kutki, etc., oilseeds like sesamum, castor, mustard, ground nut, etc., pulses like urid, lentil, mung, arhar, horsegram, etc., fibrous crop like mesta, cotton, etc., cash crop like sugarcane, etc.

Paddy is the main kharif crop and it is mainly rainfed. Varieties of paddy grown in the upland situations are malchi, sakkaidahi, kodai, champakali, govindbhog, etc.; in the terraced lands are sarai, daor, sakhai, etc.; and in the valley depressions are rajga, bhata chaora, routhjoli, kapurbhog, raskadam, etc. Paddy yields per acre vary from 3 to 5 quintals in uplands, 6 to 10 quintals in terraced lands and 10 to 15 quintals in valley depressions. Manuring of fields is hardly done by the cultivators. Practice of rotation of crops is very negligible. Early variety of paddy is sometimes rotated with pulses or other minor crops in some terraced lands or in some other suitable lands. Irrigation facilities are negligible. Local ponds and nalas provide irrigation water to less than one per cent cropped lands of the study area. Lands of low-lying situations and valley depressions receive prolonged water supply due to high ground water-table. Other important kharif crops are arhar, kodo, sugarcane, castor, horsegram, cotton, etc. Ground nut and maize have been recently introduced by the State Agricultural
Department in the fields of upland situations (tikra land).

Sugarcane is mainly grown in the valley depressions where irrigation water is available. Mesta has been introduced by the displaced persons from erstwhile East Pakistan (now Bangladesh) in the upland situations around Dharmjaygarh. Among rabi crops wheat is grown mainly in the banks and the levees of the Mand river and also in the areas having irrigational facilities. Other important rabi crops grown are gram, lentil, Bengal gram, mustard, sesamum, etc.

Forest Land Use - Major portion of the study area is under forests occupying about 60 per cent lands. The area under reserved and protected forests is not available in the District Census Handbook, but it has been estimated to about 526 sq.km. in accordance with the extent of forests in the topographical maps. Udaipur and Gharghoda tahsils have areas of 342 sq.km. and 184 sq.km. respectively under reserved and protected forests in the study area. Out of 127 villages lying in the study area, 89 villages have village forests covering an area of 271 sq.km. of which Udaipur has 223 sq.km. and Gharghoda has 48 sq.km.

Reserved and protected forests are of deciduous type and are dense having mixed jungles mainly of sal. Village forests are also of deciduous type having sal as predominating species. Sal possesses high economic value among forest products. Sal grows well in deep loamy soils in plains and in valleys. It grows dwarf on slopes where shallow soils and erosion hazards interact unfavourably. In association with it saja, dhawara, tendu, shisam, palas, salai, etc. grow. Hill crests and sides are mainly clothed with bamboo and shrub vegetation.
The deficiency of pasture is compensated by grazing in the forests adjoining the villages. Patches of cultivated lands have been noted here and there within the forests during photo-interpretation. Shifting cultivation is still in existence in some forests. Primitive method of shifting cultivation, reckless felling of forest trees and uncontrolled grazing in the forests are the main causes of destruction of forests. Reforestation is, of course, the permanent measure for maintenance of ecological balance. An observation on forests is dealt in chapter III in detail.

Culturable Waste Land Use - Culturable waste lands in the study area are used as grazing lands which are locally called 'gouchar'. These lands occupy an area of about 122 sq.km. comprising 9 per cent lands of the study area. The disorganised grazing grounds are to occupy rugged lands having light soils in midland and upland situations. In village rugged lands having infertile soils are left usually as waste lands.

Man pastured his herds and flocks upon the native vegetation of the uncultivated lands before the dawn of history. It is only in the last few decades that man has begun to realise that grazing land use is far more than a primitive form of agricultural land use. He has only now begun to explore the possibilities and has gained necessary knowledge to develop and apply grazing management with a view to achieving sustained production. Due to wide difference in physical suitability, workability and conservability of the soil types, the soils need to be studied to consider whether a particular piece of waste land is suitable for agriculture or not. Lands, whose workability and conservability are not favourable for agriculture,
but productivity is favourable for pasture, should be put under grass. Lands, in which physical limiting factors, such as landform conditions, soil conditions, moisture conditions, etc. can not be corrected economically, should put to grass. The uncared waste lands should be brought under improved techniques of grazing land management. Application of grabbing, manuring and controlled burning from time to time would control the spread of unwanted species in the grazing lands.

Lands Not Available For Cultivation - Various land uses other than agricultural land use include homesteads, farmyards, religious places, public places, roads, railways, streambeds, waterbodies, etc. In the study area Udaipur and Gharghoda tahsils constitute areas of 29 sq.km. and 20 sq.km. respectively covering non-cultivated lands. These lands constitute only 4 per cent lands of the total study area. This land use type on the one hand includes lands which command very high prices, but on the other hand, it includes lands which are useless.

Pedogeomorphological Impact On Land Uses - The land use pattern of the study area is strongly governed by the impact of the interrelationship between soil and geomorphology. Different landform categories and their associated soils imprint their impression upon the related land use types which in turn express their intimate relationship with soil and landform. In general, coarse-textured soils occur in hill crests and sides and in upland situations of the rolling and the undulating lands. These soils are unsuitable for crop cultivation but suited to forestry and pastures. Fine-textured soils, which are suitable for cultivation, occur in
plains and valleys. These soils are usually deep to very deep. Areas of rock-outcrops covering generally hill crests and sides have thin mantle of coarse soils which are suited to shrubs and grasses. Sometimes, very fertile soils, which are suited to cultivation, are given to some non-agricultural uses for some socio-economic and ethnic reasons.

Concluding Remarks - For improvement of land use practices in the study area two very important aspects of problem to be tackled scientifically are:

1. The extensive aspect deals with the distribution of land to its various uses.

2. The intensive aspect aims at improving practices within each use.

The objective should be to secure a pattern of land use in which lands are used according to their land use capability. This means on the one hand, reduction of idle lands and waste lands in the study area to minimum by suitable reclamation and land improvement measures but on the other hand, securing such alteration in the existing pattern of land use is for raising balanced land use. It is necessary to classify lands according to their land use capability. Soil surveys and land use capability analyses are needed for this purpose and their results are suggested for implementation of development programmes.

Some other important measures needed for improvement of agriculture, pasture and forest managements are: (a) dry farming techniques to be practised widely in the light soils of upland situations by erecting bunds for conservation of moisture, (b) maintenance of catchments and subcatchments and prevention of further damage from
erosion by constructing lateral bunds at breaches, (c) improvement of grazing lands by the system of rotational use, (d) restriction of afforestation scheme to favourable rock formations, and (e) undertaking of contour trenching and gully plugging.

LAND CAPABILITY CLASSIFICATION

Introduction - The country is faced with Herculian task of increasing agricultural production to achieve self-sufficiency in food grains for ever-increasing population as well as in raw materials for agro-based industries. The agricultural production in an area can be improved by increasing yields per unit area through application of advanced technology and appropriate utilisation of production, increasing inputs or by bringing existing cultivable waste lands through proper reclamation measures. It should be adequate if only limited items of information are available from soil and landform surveys, on the basis of which a decision can be arrived at regarding the capability of soil for cultivation and production of crops and to make an assessment of the limiting factors that are operative on the land and remedial measure that may be needed to make the land fit for satisfactory cultivation. The comprehensive information of soils and landscapes thus collected through standard soil and landform survey help in formulating a detailed analysis for classification of land capability in classes and subclasses. These analytical data and information are very helpful for drawing up reclamation measures to overcome the limitations or hazards (Digar & Sen, 1960).

Standard soil and landform survey using aerial photo-interpretation techniques of an area unfolds different landforms and their
PART OF THE MAND BASIN
RAIGARH DISTRICT, MADHYA PRADESH

LAND CAPABILITY

SCALE 1:20,000

Kilometer

Map no. 24
representative soil units and information of other environmental and cultural factors that influence the use and management of the area. All these factors are then interpreted in the context of the present conditions of lands and climate to assess the particular use of lands. On the basis of the aerial photo-interpretation of soil and landform survey of a portion of the Mamd catchment land capability classes and subclasses have been worked out correlating the characteristics of the soil units (Map No.24).

The land capability rating has been done in accordance with the system of classification described by A. A. Klingebiel and P. H. Montgomery (1961) for the United States Department of Agriculture (U.S.D.A.) and the land capability map has been prepared for the study area. Boundaries of the soil units, as contained in the soil map of the area, have, therefore, been recognised as primary demarcations for seven land capability classes designated by Roman numbers from I to VII. Within these seven classes twelve subclasses have been worked out on the basis of four general kinds of limitations or hazards, such as, (e) stages of past, present and potential erosion; (w) condition of constant wetness, water-logging, poor drainage, etc.; (s) soil limitations like, salinity, alkalinity, unhealthy texture, shallow rooting zone, low moisture capacity, etc.; and (c) climatic hazards like, prolonged droughts, concentrated nature of rainfall, etc. Thus incorporating all information final map of land capability classification has been designed with delineation of capability subclasses. For each of the subclasses use of land has been suggested on the principles of soil management and treatment on the basis of determination of suitability for different varieties of crops and manure requirements.
to give optimum crop yields.

Soils and Land Capability - A taxonomic soil classification is based directly on soil characteristics. The land capability classification is an interpretative classification based on effects of combinations of climate and permanent soil characteristics on risks of soil damage, limitations in use, productive capacity and soil management requirements. Slope, soil texture, soil depth, effects of past erosion, permeability, water-holding capacity, type of clay minerals and many other similar features are considered as permanent soil qualities and characteristics.

The capability classification is one of a number of interpretative groupings made primarily for agricultural purposes. Capability classification begins with soil mapping units. In this classification arable soils are grouped according to their potentialities and limitations for sustained production of common cultivated crops requiring no specialized treatment and non-arable soils are grouped according to their potentialities and limitations for production of pasture plants and forest trees (Sarkar, 1984).

The individual soil units in the soil map show the location and extent of different kinds of soils. The capability grouping of soils is designed to help land-owners and land users to use and interpret the soil map and to make broad generalization based on soil potentialities, limitations in use and management problems.

Soils of the four broad landscapes of the area have been analysed and classified in thirty nine soil mapping units which have been grouped into seven land capability classes designated by Roman numerals, viz., I, II, III, IV, V, VI and VII. Soils in first
four classes under good management are capable of producing adapted plants, e.g., common cultivated crops, pasture plants and forest trees. Soils in remaining three classes are suited to the use of local trees, certain fruit trees and even some vegetables under intensive management. The seven classes have been divided into twelve subclasses denoted by e, w, s and c on the basis of the following four kinds of limitations or hazards:

Subclass (e) - Erosion is made up of soils where the susceptibility to erosion is the dominant problem or hazard in their use. Erosional susceptibility and past erosional damage are the major soil factors for placing soils in this subclass.

Subclass (w) - Excess water is made up of soils where the excess water is the dominant hazard or limitation in their use. Poor soil drainage, wetness, high water table, and overflow are the criteria for determining soils which belong to this subclass.

Subclass (s) - Soil limitation within the rooting zone includes soils that have such limitations as shallowness of rooting zones, stones, low moisture-holding capacity, less fertility status, salinity and alkalinity.

Subclass (c) - Climatic limitation is made up of soils where the climatic conditions (temperature or lack of moisture) are the only hazards or limitations in their use.

Where soil groups have two kinds of limitations, both can be indicated there by placing the dominant one first.

Analysis of Land Capability Subclasses:

The twelve worked out land capability subclasses are described below in respect of their potentialities and limitations:
I land - Soils in class I have insignificant limitations that restrict their use. Soils in this class are suited to a wide range of plants and may be used safely for cultivated crops and also for other purposes. The soils are nearly level and erosion hazard is low. Soils are generally very deep and are well drained and easily cultivable. They hold water well and are highly responsive to application of fertilizers. They are productive and suited to intensive cultivation. Local climate must be favourable for growing of many common crops. Soils in class I that are used for crops need ordinary management practices to maintain productivity.

Vertisolic clayey soils in level lands (VC1) and vertisolic clayey terraced soils (VCt) are fertile and are used for various cultivated crops. Erosion hazard is checked by bunding or terracing. Water-holding capacity of these soils is good. The soils have vertisolic characteristics of self-mulching properties. Ordinary management practices may be applied, if necessary.

IIe land - Soils in this class provide the land uses less latitude in the choice of either crops or management practices than the soils in class I. They may also require special soil-conserving cropping systems, soil conservation practices and tillage methods for cultivated crops. Soils in this subclass occur in gently undulating to level lands. Soils are very deep and clayey throughout their solum. Soils have vertisolic characteristics with self-mulching property. Soils are slowly permeable and at slopes are susceptible to rill and gully erosions. Soils of mapping unit in this subclass comprising vertisolic clayey gullied soils (VCg) suffer from erosion. Soil erosion can be checked by bunding or terracing and its maintenance is necessary. It is suggested that double cropping practices
using crop rotation system with leguminous crops may be carried out in the land of these soils. For increasing crop yield, improved and high-yielding seeds, organic manures and fertilizers are to be used.

IIw land - Wetness in the soils of this subclass presents a limitation in use. Such wetness is due to poor soil drainage, high water table, and runoff water from higher areas. The wetness of these soils can be corrected by adopting proper drainage system. Soils in this subclass occur in both narrow and broad valley bottoms or depressions of different landscapes. These soils have hydromorphic characteristics with loamy and silty textures. These soils are poorly drained and they suffer from water-logging during rains due to lowlying situation. As such they are difficult to manage for any other crops excepting paddy during rains. Yellow loamy hydromorphic soils (YLh), yellow clayey and silty hydromorphic soils (YCh), brown and red silty hydromorphic soils (BSh), fluvial loamy and sandy hydromorphic soils (FSh), brown loamy and silty hydromorphic soils (BSh), and vertisolic clayey hydromorphic soils (VCh) are grouped under this subclass and textures of the surface soils are generally light because of accumulation of loamy colluvial materials from surrounding higher areas. Soils are deep to very deep and neutral to acidic in reaction. There is little or no erosional hazard in these soils. Water-logging or poor drainage conditions are the limitations of these soils. Attention is required for these soils to improve their conditions by construction of protective waterways. Double-cropping practices are suitable to be carried out.
IIc land - Soils in this subclass have slight climatic limitation due to lack of moisture contents for uncertain rains. Soils in this subclass require careful soil management including conservation practices to improve moisture conditions when the soils are cultivated. To conserve run-off water into the soils bunding along slopes is necessary. The conservation practices vary from place to place depending on the characteristics of the soils, local climatic conditions and the farming systems. Soils in this subclass occur in gentle slopes of the undulating and dissected lands. The lands are well bunded and terraced having hardly any erosional hazard. Soil permeability is moderately good and the water-holding capacity of the soils is good. Soil grouping in this subclass comprises yellow loamy terraced soils (YLt), yellow clayey and silty terraced soils (Yct), brown and red silty deep soils (BSd), brown loamy and silty deep soils (BLd), and brown loamy and silty terraced soils (BLt). Soils of this subclass are very deep and their textures are generally silt loam, silty clay loam, sandy loam, clay loam and sandy clay loam. With normal rainfall crop-yields are good. Conservation measures for soil water are to be adopted to ensure better crop-yields. For increasing crop-yields improved high-yielding seeds, organic manures and fertilizers are to be used. Maintenance of bunds and terraces is necessary.

IIIe land - Soils in this subclass have severe limitation of high susceptibility to water erosion that reduces the choice of crop plants and requires special conservation measures. Soils in this subclass occur in the undulating and dissected lands and also in the river levees. The soils of these lands comprise yellow loamy
soils overlying clayey and silty subsoils (YLC), and fluviial loamy and sandy levee soils (FL1). These soils are deep to very deep and the textures of the soils are sandy loam, loam, sandy clay loam, silt loam, and silty clay loam. Erosional hazard is the major limitation encountered by these soils for their occurrences on slopes. Besides the agricultural practices these lands support good vegetation cover. The lands may be suitably utilised for paddy and some other crops if they are well bunded and terraced. To check severe erosion and to conserve soil and soil water the lands are suggested for bunding or terracing and their maintenance. Application of adequate organic manures, fertilizers and systematic crop rotation practices are also suggested.

IIIs land - Soils of this subclass occur in the undulating lands having major limitations in combination of severe erosion hazard and shallow rooting zone. These soils are generally very shallow to shallow with loamy textures. Soil permeability is rapid and water-holding capacity of the soils is little. The soils are derived from sandstones, siltstones and shales and also from gneiss and hornblende schist. Because of sheet erosion the soils of this subclass are shallow in depth. These shallow soils comprise yellow loamy shallow soils (YLs), brown and red silty shallow soils (BSs), and brown loamy and silty shallow soils (BLs). Contour bunding can check further soil erosion and conserve soil and soil water for cultivation of selected crops like kodo, kutki, etc. Improved managements like contour ploughing, strip-cropping, etc. are suggested. Application of adequate organic manures on basal dose and nitrogenous and phosphatic fertilizers as top dressing will increase the crop-yields.
IIIc land - Soils in this subclass occur in midland situations of undulating lands. This subclass comprises yellow loamy deep soils (YLD). These soils are very deep and moderately well drained with susceptibility to slight sheet erosion. Soil textures are sandy loam, sandy clay loam, and clay loam. These soils have major climatic limitation that reduces the choice of plants or requires special measures for safe and substantial production of moderate to good yields of adapted crops. The moisture regime of the soils is fair, if there is sufficient rainfall, otherwise crop-yields suffer from lack of moisture. Dryland crops can be grown on higher situation if moisture can be provided. Application of organic manures, such as, farmyard manures, compost at higher doses and fertilizers will step up crop-yields. Paddy can be grown in lower situation with the provision of bunds. Provisions of irrigation system to guard against the regime of dry climate are absolutely necessary with suitable cropping practices including deeply rooted legumes will promote crop-yields.

IVc land - Soils in this subclass occur in upland situations and are derived from sandstones. Soils in this subclass have severe climatic limitations that restrict the choice of plants. Soils are suited to only two or three common crops and the yield is low in relation to inputs over a long period of time. Use of cultivated crops is limited as a result of some permanent features like low water table, very light texture, very low moisture-holding capacity, etc. Yields of adapted cultivated crops are entirely dependent on rainfall. Soils comprising red loamy deep soils (RLD) derived from the Lower Gondwana sedimentary rocks, are very deep and well drained.
These soils are susceptible to slight sheet erosion. Textures are loamy sand, sandy loam, and sandy clay loam with rapid soil permeability. Soils are yellowish red to reddish brown in colour and are medium acid in reaction. These soils require careful management measures for suitable production of adapted crops or fruit trees to reduce the major climatic limitation. To increase soil moisture content measures are to be adopted for accumulation of rain water by throwing bunds along slopes or by providing irrigational facilities wherever possible. Application of farmyard manures and compost of higher doses will facilitate the cultivation of adapted crops and fruit trees.

IVes land - Soils in this subclass occur in the gently sloping to moderately sloping uplands having severe erosion hazards and shallow depth. The soils are derived from sandstones, siltstones and shales. Soils are suited to only two or three common crops with the provision of bench-terracing. Severe soil erosion is a menace in maintaining the soil depth. Soils comprising red loamy shallow soils (RLs), yellow loamy gullied soils (YLG), and brown and red silty gullied soils (BSg) formed on the Lower Gondwana sedimentary rocks are very shallow to shallow overlying coarse sandy and gravelly sandstones and siltstones. Soil textures are generally loamy sand, sandy loam, sandy clay loam, silt loam, and silty clay loam. Soils have moderate to rapid permeability. The major limitation in the use of these lands is obstruction to root penetration due to shallowness, gravelliness, severe erosion, and other unfavourable soil conditions. Appropriate soil conservation measures like contour bunding, terracing with grassy waterways and gully-plugging are to
be adopted. Seasonal protection of fields is to be made with crop rotation practices. In severely eroded areas, lands should be put under permanent cover of forest vegetation. To increase productivity of soils farmyard manures and suitable fertilizers have to be applied.

Ves land - Lands of this subclass are not generally suited to cultivation. Soils in this subclass have climatic limitations in combination with erosional hazard and stoniness that prevent normal tillage of cultivated crops. Soils are suited to shrub vegetation and grasses. Soils comprising yellow clayey and silty gravel-capped soils (YCc) and yellow clayey and silty gullied soils (YCg) formed from the Lower Gondwana sedimentary rocks, are shallow to moderately deep with fine textures. Soils of gravel-capped phase represent areas where generally gravelly and loamy residues of the original surface sandstones are present as cappings overlying clayey and silty materials. Soils of these loamy materials support good vegetation. Cultivation of common crops is feasible in these lands, but pastures can be improved through suitable management system. Afforestation is suggested in the sloping areas to develop forestry for conservation of soils.

Vies land - Soils in this subclass occur in the steep slopes of the rolling lands and the hilly terrains. Soils have limitations of erosion hazard, shallow rooting zone, stoniness, etc. that make them generally unsuited to cultivation and limit their use largely to pasture or forestry. Soils comprising yellow loamy bouldery soils on slopes less than 8 per cent (YLb1), yellow loamy bouldery soils on slopes more than 8 per cent (YLb2), red loamy cobbly and bouldery soils on slopes less than 8 per cent (RLc1), red loamy cobbly and
bouldery soils on slopes more than 8 per cent (RLc2), red loamy
bouldery soils on slopes less than 8 per cent (RLb1), red loamy
bouldery soils on slopes more than 8 per cent (RLb2), brown loamy
and silty cherty soils on slopes less than 8 per cent (BLc1), brown
loamy and silty cherty soils on slopes more than 8 per cent (BLc2)
derived from sedimentary and metamorphic rocks, are very shallow
and suited only to forestry. Erosional activities are dominant
over soil forming processes and the soils are very shallow with
rocky and bouldery phases on severely eroded steep slopes. It is
suggested that the lands in this subclass should be given to mixed
dry and moist deciduous forest trees and suitable forest management
measures should be implemented wherever necessary.

VIIes land - Soils in this subclass occur in the hill ridges
developed on quartzitic sandstones and shales, in the cobbly slopes
of the dissected undulating lands developed on siltstones and shales
and in the river beds developed from recent fluvial deposits. Soils
under this subclass have very severe limitations that make them
completely unsuited to cultivation and that restrict their use largely
to grazing, woodland or wildlife. Soils of this subclass comprising
yellow bouldery soils on rock-outcrops with slopes less than 8 per
cent (YBr1), yellow bouldery soils on rock-outcrops with slopes more
than 8 per cent (YBr2), brown and red silty cobbly soils (BSc), and
fluvial loamy and sandy riverbed soils (FLb) have severe limitations
due to intensity of erosion hazards, presence of rock-outcrops,
shallowness, cobbleness, and devastative floods. Physical conditions
of these soils are such that it is impracticable to apply any
measure for correction of these limitations. Soil restrictions in
this subclass are more severe than those under the subclass VIes land. Soils under this subclass need special soil conservation measures through afforestation scheme to protect the soils from further damage.

Conclusion:

The above analyses reveal that the study area is not endowed with class VIII lands at all. Lands under class II, class III and class IV contain varieties of soils spread over the study area. Improved agricultural practices are bright in the areas where as many as 23 different kinds of soils unsuitable for intensive cultivation are identified. It is noteworthy that the lands under class V, class VI, and class VII consisting of 14 different kinds of soils unsuitable for cultivation of crops, cover the major portion of the forested area. Thus the suitability of the study area as a whole stands not only for moderate to intensive cultivation but also for non-agricultural land uses. Lands under class I are highly productive and are suited to intensive cultivation. But lands under class VII need soil conservation measures through afforestation scheme for soil protection.