SOIL SURVEY AND LAND USE REPORT OF PRIORITY "C" AREA ON THE LEFT BANK OF LOWER MAND WATERSHED, MAHANADI CATCHMENT, TAH. AND DIST: RAIGARH, M.P.

I N T R O D U C T I O N

NAGPUR CENTRE of All India Soil and Land Use Survey Organisation, Ministry of Food and Agriculture (Department of Agriculture) Govt. of India, carried out the detailed Soil Surveys on priority basis in Mahanadi Catchment above Hirakund dam. The priority areas have been assessed and fixed by Aerial Photo Interpretation techniques and areas in order of priority have been transfered on 1" = 1 mile toposheet to furnish on erosion assessment map of the catchment. The area surveyed and reported belong to priority "C" in Lower Mand Watershed under Mahanadi Catchment.

The main objectives of the survey are to define, describe, demarcate and classify various kinds of soils and interpret, the data to determine the land use for each unit of land delineated on the maps. It is envisaged that such information will be useful for general planning and development of the area and also for soil & water conservation programme. It is felt that suitable soil and water conservation treatments to check soil erosion especially in vulnerable areas are necessary to minimise the silt load in Mahanadi and its tributories and reduce silt deposition in Hirakund reservior, thus, eventually lengthening the life span of the Hirakund dam.

The report pertains to the priority "C" area falling under the left bank of Lower Mand Watershed which were surveyed during the period between Feb. 1969 to June, 1970.

GENERAL DESCRIPTION OF THE AREA

1.1 Location and Extent:

The area under review pertains to the left bank of river Mand comprising the millicatchments of Doliva and Ramjharan nalah. Surveyed area forms the part of Raigarh Tahsil of Dist: Raigarh in M.P. The area is located between 83°- 8' to 83°- 21' E longitudes and 21° - 48' to 22° - 3' N latitudes. The western side is bounded by river mand. Hilly ranges of Rabo and Urdana reserved forests form the north and north eastern boundry of the area. The eastern plain land merges indistictly with the watershed of Lower Kelo watershed, a tributary of river Mand. The Survey area is about 10 Km distance from the district Head quarter Raigarh. Bombay-Howarh broad guage railway line passes through the northern portion of the area.

Geomorphic setting	Soil Series	Parent rocks
1. Soils on broken hill ranges:	1. Adapathra	Denuded quartzitic granite gneiss.
	2. Laripani	Sand stone
	3. Tumidihi	-do-
2. Soils of low swell convex upland near foot hills and along upland slopes	4. Chhal	Medium textured Barakar sand stone
	5. Tamnar	-do-
	6. Bawankera	Weathered migratory material of quartzitic gneiss.
3. a) Soils of nearly level to very gently sloping upland along lower slopes	7. Dumarpali	Lower Gondwana shales
	8. Lakholi	Altered shaly material
	9. Nandeli	Lower Gondwana pink shale
	10. Nawagaon	Weathered and migratory deposits of calcareous shale and lime stone materials.
b) Soils of low lying nearly level midlands along toe slopes	11. Jatri	Weathered deposits of Gondwana pink shale
	12. Dhoram	Weathered materials of fine grained yellowish brown sand stone.
c) Soils of local concave depressions along toe slopes	13. Choda	Weathered materials of lime stone and calcareous shale.
4. Recent alluvial soils of flood plains	14. Kutela	River alluvium.

The lands are grouped according to their potentialities and limitation for substained production of common cultiviated crops; permanent vegetation and the risk of soil damage if misused. This interpretive grouping is based on various soil characteristics that influence the use and managements. Hence, the soil characteristics such as, effective depth, texture, structure, soil reaction, plant nutrient status, associated land features like slope, situation, evironment; past erosion hazards; susceptibility to erosion; are the basis of such interpretive groupings.

Capability units are formulated from one or more mapping units; such that the soils are sufficiently uniform in respect of depth, slope, erosion, climate and other permanent characteristics having similar inherent potentialities and certain limitations or hazards of similar degree and nature.

Hence soils in a capability unit are nearly homogenous in respect of major crop adaptibility; management practices and general levels of yield response.

Capability units are grouped under capability sub classes in accordance with the kind of hazard and limitations. Sub class provides information about the degree and kind of limitation needing specific measures during land management.

The kinds of limitations recognised at sub class levels.

i) risk of erosion designated by symbol (e)
ii) wetness; drainage or over flow (w)
iii) root zone limitations (s)
iv) climatic limitation (c)

Where erosion susceptibility and past erosion hazards are the major limiting factors for their use; soils are placed in sub class (e). Sub class (w) is made up of soils where excess water is the dominant hazard or limitation in their use. Poor drainage, wetness; high water table and overflow are the criterion for determing the soil belonging to this sub class. Soils of sub class (s) have their major limitations due to shallow depth, stoniness, low moisture holding capacity; low fertility difficult to correct, and salinity or alkalinity.

Each of the unit of soil mapped in the area has been interpreted on the basis of its permanent characteristics and inherent limitations affecting the kind of use and management, etc. and classified into capability classes indicating the inherent potentiality of that soil. The mapping units or different phases encountered in the same soil have been interpreted according to the progressive increase and decrease of the degree of limitations. Soil units are grouped into different capability classes and sub classes indicating the ranges of capability of the same soil. The table gives the permanent characteristics, inherent limitations, range of the available moisture etc. with inherent capability class and the range of capability classes for each of the soil series.

The capability classes have been designated with Roman letters on the soil map of each village and are also indicated in the soil unit list appended with the report. Class I lands, however, has not been found in the area reported.

Class II :- Comprising 21,016 acres accounting for 49.1 % of the total arable lands. These are good cultivable lands but subjected to moderate limitation that reduce the choice of crops and need moderate soil conservation practices. Paddy is the main crop but variety of crops both in Kharif and Rabi seasons can be taken with fairly good management practices. These are deep to very deep soils on very gentle to moderately sloping lands and are bunded having optimum moisture regime for crop growth, subjected to moderate erosion hazard. For double cropping addition of organic manure and irrigation are essential . This includes the majority area of Jatri, Nawagaon, Tamnar, Nandeli and Kutela series.

Class IIe :- This comprises 1426 acres accounting for 3.3 % of the total area. This includes the soils of Jatri and Tamnar series that have severe to very severe erosion hazards. In such areas in addition to usual management practices required for Class II and contour bunding and at places small check dams, for gullies are to be adopted.

Class IIw :- This comprises 2174 lands accounting 5.03 % of the total area. This includes the soils of Dhoram and Ghoda series of the mid land and depressions. In the rainy season the water is accumulated from the surrounding area and, moreover due to the underlain impervious shale strata water table remains too high; resulting into the stagnant water conditions restricting the choice of crop and timing of operations. As such only paddy can best be taken in this area in rainy season and then any suitable rabi crops like wheat or gram, can also be raised effectively with one or two irrigation.

Class III :- Comprises 2440 acres and accounts for 5.7 percent of the total area surveyed. These lands have more limitations that restrict the choice of crops and the timing of such operations such as planting and tillage. In the area under review Class III lands include the soils of Nawagaon, Nandeli and Chhal series occuring on plain lands and at foot hill slopes. They are moderately deep to very deep having either lighter to medium texture surface and heavy textured sub soil. These need terracing, contour bunding contour tillage, good measures of soil and moisture conservation, safe disposal of run off water; crop rotation, including legumes in the sequence are advisable although exact combination of measures will differ from place to place and soil to soil, In general the addition of organic matter is essential to promote aggregation and amending deteriorating soil conditions.

Sub Class IIIe :- This comprises 6288 acres and accounts for 14.7 % of the total area. It includes soils of Nawagaon, Nandeli Bawankera and Tamnar series, that have undergone severe to very severe gully erosion. In such areas, in addition to usual management practices required for Class III lands, specific measures such as, gully plugging either by masonary or earthen dams terracing of gully beds diversion of run off and vegetal cover, etc. are of vital importance.

Sub-Class IIIs :- Comprises 366 acres accounting for 0.9 % of the total area. This includes the moderately deep to deep soils of Nandeli series and flood plain soils of Kutela series. Soils of these series are mostly unbunded. In case of former the root penetration is limited due to gravels of shale while soils of kutela series are affected by heavy deposit of sand and as such are deficient in water retentive capacity. Characteristids of these soils as such have restriction for the choice of crop, and require very careful management like contour bunding, terracing, application of organic measures, etc.

Class IV :- Soils in this class have very severe limitations that restrict the choice of plants and required very careful management. This comprises 84 acres of lands accounting for 0.1 % only of the total reported area. The only series included in this class is Dumarpali series. The soils are of lighter texture, shallow in depth occur on moderate to moderately steep sloping lands and are occassionally cultivated . Productive perenial vegetation and grasses are needed to protect, these lands against further erosion because shallow gravels are exposed on the surface in many places and this restricst their choice for any type of crops.

Sub Class IVe :- Soils of this class are subjected to severe erosion hazards and gully erosion and need suitable care to check further loss of land surface due to headward gullies. This class comprises 285 acres accounting for 0.7 % of the total area. Soils of Lakholi and Tumidih series; lighter to medium texture; shallow to moderately deep occuring on moderate to moderstely steep sloping land and having severe erosion hazards are included in this class. Terracing of gully beds, check bunds across the gully beds and permanent pasture management with restircted grazing must be followed for the protection of these lands. It is recommended that these soils should be bunded and terraced with provision of safe removal of excess water. These areas could then be used for suitable worked out rotation including minor crops, legumes and grasses, etc.

Sub class IVes :- Comprises 265 acres accounting 0.7 % of the total land. This includes the soils of Adapatra, Laripani and Tumidih series. All the measures needed for Class IV and sub class IVe can be followed for the protection of these lands. Soils of these series are usually shallow to medium in depth at places and are lighter to medium textured, on moderate to steep slopes. Erosion control in such areas by planting permanent vegetation and restricted grazing is very important.

Class VI :- Soils in this Class have very severe limitations that make them generally unsuited to cultivation and limit their use largely to pasture, range or wood land. This class comprises 42 acres accounting for 0.05 percent of the total area reported. Soils of Tumidih series are only grouped in this class. Soils are subjected to very serve erosion hazard that have reduced the soil depth and exposed rock-outcrops. As this land occures on steep slopes, the soil conservation measures like vegetal cover with economically important species gully plugging, construction of check dams, diversion channels for excess run off etc. are to be adopted to minimise the velecity of run off.

Sub class VI e :- Soils of Adapatra, Laripani, Dumarpali and Nawagaon series are included in this Class. It comprises 2051 acres accounting for 8 percent of the total area. Stone and rock out exposures are common in these lands. Careful management practices with specific care to minimise the effects of erosion hazards are essential in these lands in addition to usual management practices needed for Class VI lands. These lands need to be stablized by growing grasses and fast growing valuable timber trees. Controlled grazing is essencial. In areas susceptible to very severe gullying, mechanical control measures such as gully plugging, construction of dams etc. should be tried. It is very important to keep this area under permanent vegetation to reduce silt load.

Class VII :- Comprises 2266 acres accounting for 5.3 percent of the total area. This includes the very shallow soils of Laripani and Dumarpali series . These lands are subjected to severe limitations and hazards. By adopting suitable management practices, these lands can be put to wood lands with thick ground cover. The gullied patches should be planted with trees and grasses across the gradient. Some of these lands occur on steep to very steep slopes and mostly under rock out crops as such are not suitable even for wood land but such areas can be better suited to watershed protection areas and are suitable for developing picnic spots and wild life management.