

759

REPORT ON DEMARCATION OF PRIORITY SUBWATERSHEDS
IN THE CATCHMENT OF MAHI (Stage II) RIVER VALLEY
PROJECT, RAJASTHAN STATE

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During the 4th Plan period, under the centrally sponsored scheme of soil conservation, Mahi Stage II River Valley Project was taken up with an object to plan soil conservation measures for effectively treating the problematic areas in order to minimise silt yield from the catchment so as to lengthen the life of the dam. Ultimately, around development of the catchment area is envisaged.

In view of the vast areas involved in each of the RVP catchments against the limited resources of technical personnel and funds, it has been decided to concentrate soil conservation works on priority basis in such of the sub-watersheds that are highly problematic and yield higher silt loads.

The task of demarcation of priority subwatersheds has been assigned to the All India Soil and Land Use Survey Organisation, Department of Agriculture.

The field work was carried out by the Delhi Regional Centre of All India Soil and Land Use Survey (Deptt. of Agriculture) for demarcation of priority subwatersheds. A total of 3,82,761 ha. falling in Rajasthan part of the catchment of Mahi Stage-II have been surveyed and priorities have been delineated. In order to select immediately a few priority watersheds, the catchment areas of Bajajnsagar, which is in the upstream of Kadana and north east part of Kadana, proper catchment have not been surveyed so far. The area surveyed and reported covered subcatchments of Anas, Som, Moran and Chap tributaries of Mahi river. The area falls in Banswara and Dungsarpur districts of Rajasthan State and is covered by Survey of India toposheet Nos. 46 E/9,13,14,15 and 46 I/1-8 (Index map

Catchment Characteristics

The oblong shaped Mahi Stage-II R.V.P. Catchment falling in Rajasthan State, is located between latitude 23° and $24^{\circ}35'$ North and longitude $73^{\circ}10'$ and $74^{\circ}50'$ East. The area in general is hilly and mountainous with interspersed

Geologically, north west of the area is covered by Arevalli system comprising quartzite, shales, sandstones, slates, phyllites and gneisses. Granite and limestones, in localised patches are also reported. The south-western side is underlain by Deccan trap.

The climate of the area is semiarid with average annual precipitation of 72.2 cm (1968-1971-Kadana) and mean annual temperature of around 25°C.

The aridity of the climate has reflected in the major landforms of the area. In the Arevalli landscape the main physiographic units are hills, pediments, undulating uplands, foot hills and valleys. There is also a broad general correspondence between these broad physiographic units and soils.

The soils of hills are shallow to very shallow, brown to yellowish brown, coarse to medium textured and well drained (Lithic and Typic Ustorthents). Pediments have moderately deep, yellowish brown to reddish brown, medium to coarse textured, well drained soils (Typic Ustochrepts, Typic Ustorthents with local inclusions, especially on transportation slopes of Udic Haplustalfs). Soils of undulating uplands are very shallow to moderately deep, dark brown to reddish brown, medium to coarse textured and well drained (Typic Ustochrepts, Typic Ustorthents). Soils of valleys are very deep, greyish brown to brown, medium to coarse textured and moderately drained (Udic Haplustalfs). At places hydromorphic influence is clearly manifested.

Basaltic landscape has three major physiographic units, namely Hills, Pediments and plateaus. Soils of basaltic hills are shallow to very shallow, very dark greyish brown to very dark grey, fine textured and moderately well drained (Typic Ustorthents). Soils of pediments are shallow to moderately deep, very dark greyish brown to dark grey, medium to fine textured, moderately drained (Typic Ustorthents, Typic Ustochrepts). Plateaus have very deep, very dark grey to black, fine textured cracking soils (Typic Chromusterts, Typic Pallusterts).

Methodology :

The procedure outlined in the bulletin "Demarcation of priority

watersheds in RVP by Ministry of Agriculture, Department of Agriculture, February 1972" was followed with some modifications.

Handicapped by lack of aerial photographs, field reconnaissance survey was carried out and a legend to indicate erosion intensity units was progressively developed. The units were formulated on the basis of significant difference in physiography, slope, surface conditions, soils, vegetation, land use and erosion. These units have been mapped throughout the survey area. Subsequently, aerial photographs (Task 699 B) in the scale of 1:15,000 when received were used for checking, correcting and improving boundaries between different mapping units as also for differentiating and mapping, different erosion intensity units in the contiguous area.

Survey of India one inch toposheets in the scale were used as base maps. On the base maps various subwatersheds were systematically delineated. While preparing the frame of subwatersheds, an effort was made to maintain minimum viable size for efficient use in the subsequent detailed survey, preparation of working plans and execution of soil conservation programmes.

The system followed for delineation of boundaries between subcatchments, watersheds and subwatersheds comprises :-

1. Demarcation big tributary catchment code. Thus each of the subcatchment in Mahi catchment (M) is indicated Ma, Mb, Mc, Md, etc.
Ma, Mb, Mc, Md, etc. (b) Ma, Mb, Mc, Md
2. Subdivision of subcatchments into watersheds, indicated by Arabic numerals. The watershed in each catchment, thus, bear the code Ma1, Ma2, Mb2, Mb3, Mc4, Mc5, etc. The numbering is made from down to upstream.
Ma1, Ma2, Mb2, Mb3, Mc4, Mc5
3. Each of the watersheds was further subdivided into subwatersheds and differentiated by small case alphabet. Thus, a complete symbol at subwatershed level gives the information about catchment, subcatchment, watershed and subwatershed such as Ma1a, Mb1c, Mc2a, etc.
Ma1a, Mb1c, Mc2a

Each of the erosion unit has been assigned a weightage value implying potentiality of erosion or expected detachment for the particular erosion unit. This was arrived at by considered judgement in the field based on relevant factors of soil erosion, such as slope, vegetation, surface conditions, physiographic position, soil morphology, soil texture and clay mineralogy. A basic factor

K₁₀ was used to make allowance for areas where silt yield is negligible or where even periodic deposition (10-X) is expected.

In partial modification of the procedure outlined in the aforementioned bulletin, delivery ratio was used in place of a distance factor to estimate how much of detached silt from a particular erosion unit is likely to reach reservoir. Adjusted delivery ratio for each of the subwatersheds was worked out in consideration of shape and size of the subwatershed, physiographic position, slope, drainage characteristics, soil surface conditions, soil texture, distance from the reservoir and from the active stream, silt traps such as tanks, ponds, lakes, basins, etc.

△△ Finally the area of each mapping unit in each subwatershed was calculated by planimeter. This was multiplied by its respective weightage value and adjusted delivery ratio. The sum of the product thus obtained was divided by total area of the subwatershed and converted into percent value to obtain "silt load Index" (Table 1).

Priority fixation :

As shown in Table 2, the subwatersheds have been graded in order of priority using "Silt load Index". Higher values of "Silt load Index" suggest higher priority and vice versa. Subwatershed have been grouped into five categories to indicate their priorities as given below :-

Priority category	Silt load Index Range	No. of Sub-watersheds	Area in Hectares	% of total area
1. Very High	Above 1250-1299	20	52,096	13.6
2. High	1200-1299 1150-1240	34	1,10,108	28.8
3. Medium	1000-1199	54	1,40,168	36.6
4. Low	1000-1099	28	76,126	19.9
5. Very low	Below 1000	2	4,263	1.1
Gross total :		138	3,82,761	100.0

It is seen from the above table that the catchment area of 3,82,761 ha. has been divided into 138 subwatersheds. Out of these 20 subwatersheds covering an area of 52096 ha (13.6% of the area) fall under very high priority category and 34 subwatersheds with an area of 1,10,108 ha (28.8% of the area) fall under high priority category.

For the purpose of conservation measures in the catchment, subwatersheds falling under very high and high priority catchments may be selected in the first instance. The priority grading number of the subwatershed does not necessarily mean that the detailed soil survey and soil conservation works should follow the same order. These are primarily meant to show the relative severity of the problem in the different subwatersheds. In case of first priority watersheds (very high category) detailed soil surveys and soil conservation works may be started from upstream in any order to suit local conditions and general conveniences.

With a view to selecting priority small watersheds for preparation of watershed and management plans during 5th Plan, following listed subwatersheds have already been communicated to the Rajasthan State authorities through an interim report.

List of proposed priority watersheds for preparation of Watershed Management Plans and execution of soil conservation programmes during 5th Plan.

Sr. No.	Watershed Code	Area in Ha (approx.)	Inter se priority	Approximate treatable area in Ha.
1.*	Mb5d ✓ Mb5e ✓	1907 4352 5259	4 42	3500
2.	Mc2a	2189	5	1000
3.	Mb5c	2035	6	1500
4.	Me5a	2406	7	1500
5.	Me1b	2458	8	1500
6.	Mc2c	4109	11	3000
7.	Mc4d	3494	13	2500
8.	Mc2g ✓	3635	15	2500
9.	Me4b	4224	23	3000
TOTAL :				20000

* Already approved Bhukia watershed.

For detailed soil surveys, those subwatersheds that would be finally selected by the State authorities will be taken up in due course.

It is expected that the priorities fixed for the reported part of the catchment shall meet the approval of the State Govt. of Rajasthan. Approval of the above selected subwatersheds from the State Govt. is requested. Any suggestions or modifications that State may have shall be very much appreciated.

In further clarifications and explanations are desired, communications would be welcome by the All India Soil & Land Use Survey Organisation, Department of Agriculture, I. A. R. I. Buildings, New Delhi-110012.

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