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EFFECT AND FEASIBILITY OF SOIL AND WATER CONSERVATION MEASURES IN TUNGABHADRA RIVER VALLEY CATCHMENTS OF SOUTHERN KARNATAKA

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ABSTRACT

Available data from 32 small watersheds of Tungabadhra river valley project region were subjected to analysis for developing relationships between the intensity of land treatment and runoff/soil loss. The land treatment consisted of contour *bunds* gully plug and farm ponds in the arable land and nala *bunds* and gully checks/check dams in the non arable lands. It is evident from the curve fitted with the available data that runoff and soil loss decreases exponentially with increase in intensity of land treatment. The results show that with the increase in land treatment, reduction in runoff was from 28% to 2% of annual rainfall while it was from 5000 to 250 cu.cm/ha/mm of runoff in case of soil loss. The reduction of runoff and soil loss minimised the reduction of gross storage in Tungabhadra Reservoir.

Natural dam sites are gifts of nature and it is of national interest to preserve their life for the benefit of the society. Realising the impending threat to the life of the costly reservoirs, Government of India initiated a centrally sponsored scheme of soil conservation in the catchments of River Valley Projects (RVPs) in 13 catchments in the 3rd Five Year Plan. The programme was subsequently extended to more catchments. In the 7th plan, 27 RVPs in 17 States involving a total area of about 69 m ha were covered under the RVPs. The cost involved in creating 1 ha of irrigation potential, excluding the cost of command area development, during the 7th plan period was to the tune of Rs. 35,240/- (Subramaniyan and Jose, 1990). Assets created out of such huge investment will have to be protected and utilised judiciously. The programme for catchment rehabilitation with soil and water conservation measures, therefore, are of vital importance today.

Various soil and water conservation measures like contour *bunding*, gully plugging, farm ponds in the arable land and nala *bund*, check dams in non arable land are being constructed in the catchment areas of river valley project in order to reduce the sediment flow into the reservoirs. The need for assessing the quantitative effect of these conservation measures is felt with respect to evaluation of the priority areas selected for treatment and assessing the extents to which the treatment of these priority areas are effective in bringing down the runoff and sediment yield.

These catchments under the river valley projects are regularly monitored for runoff and sediment yield with a view to quantitatively assess the effect of soil and water conservation measures on runoff and sediment yield. In the present study, an attempt has been made to establish relationship between per cent of land treatment and runoff/sediment yield for Tungabadhra River Valley Project, which is centrally sponsored schemes in the state of Karnataka.

Available data on rainfall, runoff, silt load, treatment intensity, physiographic characteristics, etc. from 1978 to 1989 were collected from different sub watersheds of Tungabadhra river catchment areas ranging from 8-252 sq. km with gentle to steep slopes (2-15%) having different land uses, have been taken up for treatment with soil and water conservation measures. Out of these 49 sub watersheds, 32 were considered used for the

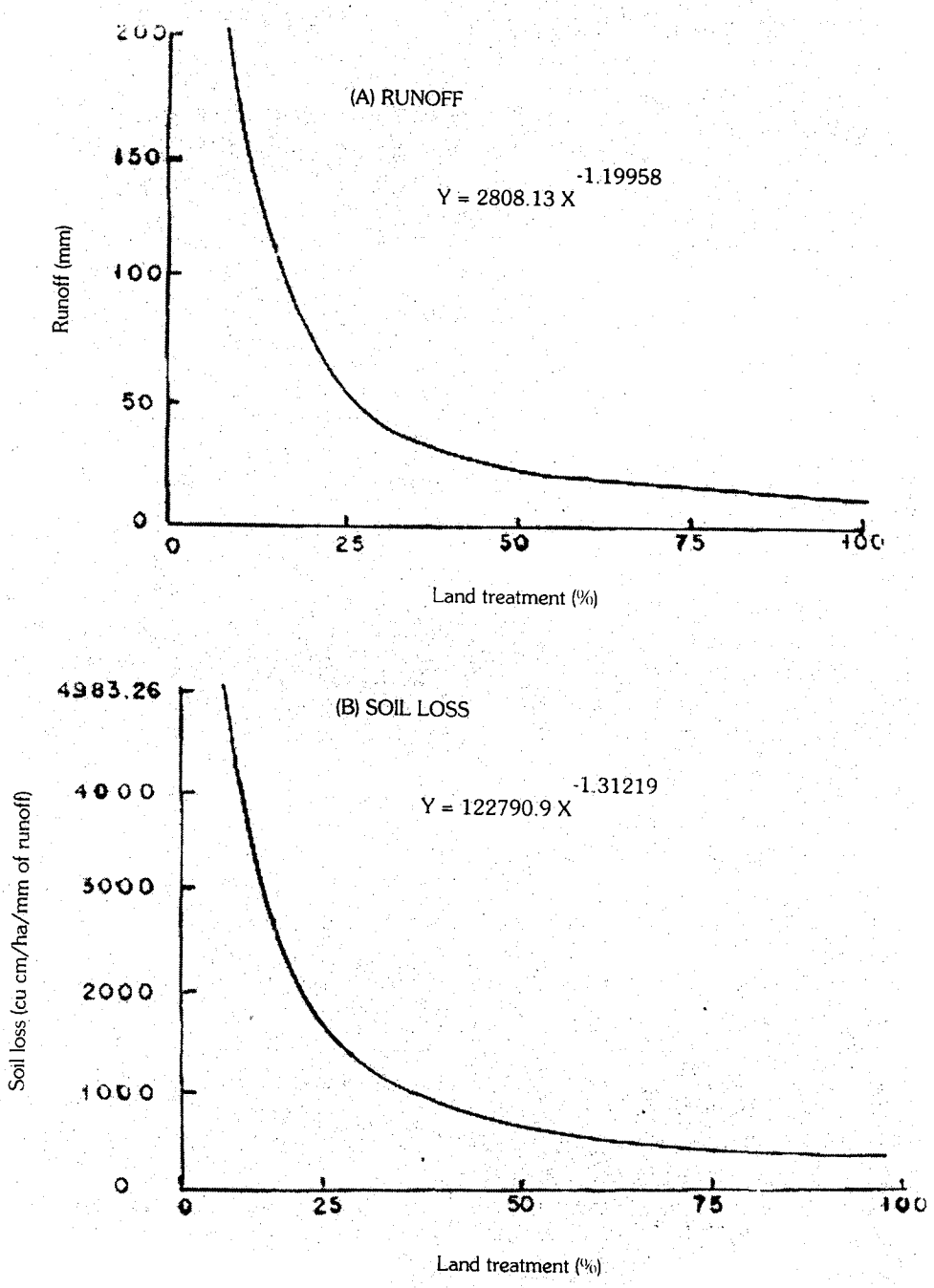

Fig. 1. Effect of land treatment on runoff and soil loss in the Tungabhadra river valley project

present study as these were monitored regularly for various soil and water conservation measures. Availability of data were varied from 2 to 12 years between the watersheds.

The data for all the 32 watersheds were analysed in computer (Basic programming). The yearwise per cent of land treatment is plotted against the yearwise runoff and soil loss for all the watershed to identify the response of treatment intensity on runoff and soil loss.

Data from all the individual watersheds were plotted and number of points were obtained and finally, average curves and equations were found out Fig. 1 (A) and (B) which were considered to be representative of 32 watersheds of Tungabadhra river valley catchments.

The effect of soil conservation treatment in the catchment will be more truly reflected by the sediment data if the runoff factor is also considered and hence the unit becomes sediment loss per unit of runoff. This would take care of the fluctuating factor of annual runoff and show the real picture of the effect of soil conservation on the sediment rate as the disturbing factor of runoff becomes uniform Anonymous (1988). Hence, in the present study the unit of sediment loss is taken as volume of soil loss (cu cm)/ha/mm of runoff. Results indicated that on an average, runoff and soil loss decreased with increase in land treatment and they are related exponentially (Fig. 1A and 1B). It was observed that reduction in runoff and soil loss with response to treatment widely varied from watershed to watershed.

From the figure 1 (A) and (B), it is observed that with the 25 per cent of land treatment, runoff was reduced from 200 (28 % of annual rainfall) to 50 mm (7% of annual rainfall) and soil loss from 5000 to less than 2000 cu.cm/ha/mm of runoff, respectively. For 100 per cent treatment, the corresponding figures were 14mm (2% of annual rainfall) and 250 cu.cm/ha/mm of runoff respectively. The results show that during the initial year in upper reaches for smaller areas were more effective than that of larger areas in lower reaches in subsequent years with respect to reduction on runoff and soil loss. It was also observed that despite 100 per cent land treatment with soil and water conservation measures, runoff and soil loss could not be reduced to zero. The observed data also confirmed that the sediment yield potentials of the watersheds are quite variable. The 32 watersheds within the Tungabadhra river catchments shown different runoff and sediment yield potentials. This justified the approach of taking priority watersheds which were identified by the priority delineation surveys for immediate land treatment with limited resources. The prediction equations obtained for gauged watersheds could be used for estimating runoff and sediment production rates from ungauged watershed located in similar agro climatic areas.

The report on sedimentation and silt survey (Anonymous 1993) shows that between 1985 and 1993, there is a significant reduction in sediment in flow into reservoir, which in turn minimising the reduction of gross storage from 111.832 to only 111.5 tmc (Table 1). This confirms the result of this study, which is, land treatment reduced the sediment loss.

Table 1. Reduction in gross storage in Tungabhadra Reservoir

Year of survey	1972	1978	1981	1985	1993
Gross storage (t mc)	121	117.695	115.68	111.832	111.5

CONCLUSION

Runoff and sediment yield was found to be significantly decreased to 2% from 28% and 250 cu cm/ha/mm of runoff from 5000 cu cm/ha/mm of runoff respectively with increase in soil and water conservation measures. Potential of runoff and sediment production varied considerably from watershed to watershed in the same river catchments. Severe erosion prone watersheds can be identified for immediate action to take up land treatment for conservation of runoff and sediment yield. The results obtained in this study can be applied to other areas in similar agro climatic zones where limited information is available.

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