

# Watershed Project Preparation

Lecture notes by Dr.S.S.Rao

## 1 Standard Project Report

The project report normally varies with the type of watershed and geographical location of the same. However, a standard project report is indicated below so that as far as possible all aspects of watershed may be covered.

### 1.1 Scope of work

#### **Assessment of resources and their utilisation**

A land capability map may be prepared with special reference to erosion prone areas in adequate scale (1:5000)/ (1:4000) in accordance with the scale of cadastral/ village map with proper indication of mapping units in shades of specified colour for different classes of land. The plot boundaries, rivers and physical infrastructure (village, roads, dams, wells, etc.) will be superimposed and shown in the map as well as slope categories to be expressed in hectares: below 1%, 1 to 3%, 3 to 5%, 5 to 10%, 10 to 15%, 15 to 30% & over 30%.

(Note: Prescribed colour for land Classes: Class-I - Green, Class-II - Yellow, Class-III - Red, Class-IV - Blue, Class-V - Uncoloured, Class-VI - Orange, Class-VII - Brown and Class-VIII - Purple)

#### **Present land use pattern (supported by present land use map)**

##### Preliminary soil survey map

Description of climate indicating normal monthly rainfall of the area, annual rainfall for last 10 years may be prepared.

Comments on cropping pattern and assessment of present crop production levels, separate for rainfed and irrigated crops (area, yield, production), degree of food sufficiency; analysis of marketing prospects.

Livestock inventory, conversion to livestock units (LU), assessment of fodder availability. One LU equals one cattle of 250 Kg live weight.

Inventory of open wells and tube wells (if any), assessment of yields, location to be shown on map.

Present stage of physical infrastructure (roads, buildings, dams, tanks, etc.)

Basic information on forest and current situation of forest (Physical, use pattern and ownership).

Detailed analysis of human resources and socio-economic conditions based on official statistics and watershed level data collection.

- a) Population data as per actual survey (as per last census and as of now, growth percentage)
- b) Age group distribution, education status, distribution of household as SC/ST/Others to be presented
- 1. Detailed classification of existing farms giving number and size of holdings, landless households), income analysis (farm, off farm), of such groups (representative farm budgets); subsistence requirements, level of indebtedness, source and availability of credit.
- d) Social status, economic status, economic activities of population of various areas of the project.
- e) Role of beneficiaries in projects decision-taking implementation and operation including women.

## 1.2 Description of the project

### Planning and design

- a) Detailed review of the carrying capacity and sustainability of land use,
- b) Presentation of recommended land use with overall layout of works on project map (zoning, micro watershed management units)
- c) Computation of tolerable and potential soil losses (tons/ha/yr) under various management systems without and with project.
- d) Available analysed research data on rainfall intensity frequency and duration from nearby meteorological stations and the run off coefficient to be used for designing erosion control structures.

- e) Planning and design of control measures such as vegetative treatment (conservation cropping, cover cropping, critical area planting, pasture interplanting), protection of existing vegetative cover (fire, encroachment protecting, grazing management), water conservation measures (bundling, trenching, gully stabilization structures, channel improvement, preventing channel erosion and stabilization structures)
- f) **Forestry/Horticulture development:** Selection of appropriate management regimes, comprehensive scheme description (scale of development, planting schedules, species selection and seed/planting material resources, nursery location and seedling production, layout of plantations, protection, infrastructure, yield estimates, marketing). Existing and planned institutional arrangements for treatment of forest land.
- g) Detailed description of crop and livestock production, complete integration of sustainable production systems (agriculture, horticulture, forestry) into the soil conservation concept, zoning and programming of all measures.
- h) Formulation of development scheme approved in principal by representatives of the communities affected. No measures shall be proposed which are technically feasible but not acceptable to the majority of the community.

### 1.3 Implementation, Operation and Maintenance

- a) **Organization, Operation and Management**  
Specific institutional and management proposals for implementation, operation and maintenance will be formulated defining capacity requirements and responsibilities of agency (ies) implementing project. Proposals for organization, e.g. Village Watershed Committee (VWC) to organize above activities and its financing may be separately worked in consultation with the agency implementing the watershed projects.
- b) Phasing for project implementation.
- c) Legal aspects.

### 1.4 Investment costs

- a) Investment costs calculation (by component and total). This should also consider price escalation in relation to the above timetable as well as physical contingencies. Please state base year for calculation.

- b) Basis and underlying assumptions of investment cost calculation (labour, material, fuel, vehicles, etc.)
- c) Investment costs according to year.

## 1.5 Economic and socio-economic analysis

- a) Socio-economic impact:

The benefits likely to accrue to various income groups especially landless and women shall be described. Specific indicators are to be formulated which may be applied during project implementation and operation to assess the progress achieved.

# 2 Standard Project Format

## 2.1 Contents of the Project Report

### Table of Contents

The pages in the report, including those in the annexure should be serially numbered. The table of contents should indicate the sections/chapters in the main text, list of tables, list of figures and maps and also indicate the corresponding page numbers for each item listed.

- i) Project Summary

The summary will give the salient features of the project covering the problem to be tackled; the strategy adopted and project measures to be introduced, the objectives to be achieved and the physical and financial phasing (extent 2 to 3 pages).

- ii) The Main Text

Introduction, problem definition based on survey and investigations carried out, strategy to be adopted and objectives to be achieved, detailed project measures to be introduced, management system for project measures to be introduced, managements system for project execution highlighting the involvement of the community, the community's commitment to controlling free grazing, felling of trees, voluntary unpaid labour or contribution towards

16 per cent of the unskilled labour costs and protection and maintenance of the treatments, quantitative and qualitative assessment of benefits to be derived from project implementation.

The issue of distribution of additional benefits (water, fodder, etc.) to the landless, very poor, single parent households as a result of Watershed Development should also be addressed by NGO and VWC.

## 1. Annexure

All the Tables, cost details should be given in the annexures. As far as possible, no tables may be presented in the main text.

### iv) Maps

All the maps indicated below to be presented only at the end of the report or in a separate folder. Copy of toposheet indicating watershed boundary as well as scale, if available, may be placed before the main text.

<u>Sl.No.</u>	<u>Description maps</u>
1	Location sketch
2	Toposheet of the watershed area
3.	Watershed map in the scale of 1:4000/1:5000 (based on Revenue sheet with the following details super imposed. i) Watershed boundary ii) Field boundaries (Survey number wise) iii) All physical features, roads, settlement, wells, drainage courses, existing dams, weirs and other conservation structures. iv) Location of soil samples sites v) Present land use
4.	Map (based on Revenue sheet) showing <u>land capability classes</u> with specific mapping units and colours may be given.
5.	Map (based on Revenue sheet) indicating proposed land use, drainage network and drainage line treatments.
6.	Map (based on revenue sheet) showing proposed phasing of project measures over the duration of the project may be indicated

### 3 Various Proformas to be used in Preparing Watershed Projects

PROFORMA: IA

TABLE: GENERAL DESCRIPTION OF THE WATERSHED AREA

Name of the Watershed:

Villages Covered:                      Latitude:

Block and District:                      Longitude:

Major drainage system of which the:                      Length:  
Watershed is a part

Identification code of the Watershed if any:                      Breadth:  
From Government sources

Highest elevation in the Watershed (Above MSL):

Lowest elevation in the Watershed (Above MSL):

Height difference (in meters):

#### DETAILS OF THE AREA OF THE WATERSHED (Govt. Records)

(Give as per Revenue records with land use interpretation)

Description of land	Village wise area		Total
	Village 1	Village 2	
<b>Forest Land</b>			
<b>Other Public Land</b>			
Sub Total			
<b>Private land</b>			
Sub total			
<b>TOTAL</b>			

PROFORMA: IB

### DETAILS OF DRAINAGE NETWORK

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Sl.No.	Drain No.	Identification	Length	
	Location on map	(With location On drainage map)	in Km	drainage

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### EXAMPLE

1	D1	Main Nala	4.3375
2	D2	Neele Nala	3.3875

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NOTE: This should correspond with Map No.5 (Drainage Network)

PROFORMA: IC

A land capability map with special reference to erosion prone areas in adequate scale (1:5000)/ (1:4000) (based on cadastral map) with proper indication of mapping units in shades of specified colour (please see note below) for different classes of land may be prepared. The plot boundaries, rivers and physical infrastructure (village, roads, dams, wells, etc.) will be superimposed and shown in the map as well as slope categories to be expressed in hectares: below 1%, 1 to 3%, 3 to 5%, 5 to 10%, 10 to 15%, 15 to 30% & over 30%.

Description	Village-wise Area (ha.)					
	0-1	1-3	3-5	5-10	10-15	Above 15
Public Land						
Reserve Forest Land						
Other forest lands (specify)						
Revenue land						
Gochar						
Submergence areas due to tanks/ponds						
Bas-stand						
Sub-total						
Land privately owned (give local revenue classification with land use						

explanation)  
 Uplands  
 Medium Lands  
 Lowlands (rainfed)  
 Lowland (irrigated)  
 Unculturable waste lands  
 Area not available for treatment  
 Sub Total  
 Total

PROFORMA: II

TABLE: DEMOGRAPHIC DETAILS  
 (For a complete Household Survey)

- Reference Year:**
- 1 Total number of households/families
  - 2 Average family size
  3. Age group

Population	0<5	5<15	15<40	40<60	60 and above	Total
Male						
Female						
Total	0					

4. Education

Illiterate	Male	Female	Total
Read and write only			
Primary			
Secondary			
Matriculate			
Intermediate			
Graduate and above			

5. Households

	SC	ST	Others	Total
No of Household				

PROFORMA: III

TABLE: LAND HOLDING PATTERN



**EXISTING GROSS HOLDING (ha.)**

#	Land holding Class	Households		Land Held	
		Number	% To total	Acres	% To total
1	Landless				
2	Marginal Farmer (<1 ha)				
3	Small farmers (1-2 ha)				
4	Semi-medium farmers (2-4 ha)				
5	Medium farmers (4-10 ha acres)				
6	Large Farmers (>10 ha)				
	Total				

Average gross land holding per Household:

**PROFORMA: IV**

TABLE: CLIMATIC DATA

Nearest Meteorological Station or observation point from which the data has been obtained.

Distance from project site:

1. Normal Rainfall of the area month wise (mm) (December to January):

Month	Jan.	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov.	Dec.
Normal rainfall												

2. Rainfall data

Year	Total Annual Rainfall (mm)
1	
2	
3	
4	
5	
6	
7	
8	
9	
10*	

\* Current year

Information on drought cycle if available may be given in the text.

### 3. Temperature - (degree centigrade)

	Summer	Monsoon	Winter
Maximum			
Minimum			

4. Monthly daily evaporation data may be collected from near by meteorological station.

It is recommended that Rainfall, Temperature and Evaporation measurement equipments may be installed in the watershed and measured regularly.

### PORFORMA V

TABLE: ESTIMATE OF EXISTING AND POST DEVELOPMENT AGRICULTURAL PRODUCTION (the major cropping sequence only)

#### 1 Per hectare with out irrigation (After discussing with farmers)

Area in Ha	Season	Crops	Yield rates (qtls)/ha	Price per qtl. (Rs)	Gross Value of Produce (Rs)	Cost of cultivation (Rs)	Net Income (Rs)
	Kharif	Juwar					
	Kharif	Groundnut					
	Do	Hy.Bajri					
	Rabi	Wheat	--				
	Do	Garlic					
	Do	Mustard					
	Two seasonal	Hy.Cotton					
	T0tal						



PROFORMA: VI

TABLE: LIVESTOCK RESOURCES AND FEED REQUIREMENTS  
PRESENT AND PLANNED\*

Sl. No.	Category of livestock	Existing Number	Feed Require- Mint* per unit per year kg (dry matter)	Total Feed Requirement kg (dry matter)
A.				
1	Work Animal			
2	Buffaloes			
3	Cross bred-cows			
4	Indigenous cows			
5	Sheep			
6	Goat			
7	Pigs			
8	Other (Specify)			
	TOTAL:			

B. Target livestock under proposed land use  
(5 years after completion of project)

Sl. No.	Category of Livestock	Number	Feed Require- ment* per unit per year kg(dry matter)	Total Feed Requirement kg (dry matter)
A.				
1	Work Animal			
2	Buffaloes			
3	Cross bred-cows			
4	Indigenous cows			
5	Sheep			
6	Goat			
7	Pigs			
8	Other (Specify)			
	TOTAL:			

@ 275 Kg dry matter per 100 Kg body weights per day each equivalent livestock unit being considered as 250 Kg body weight.

PROFORMA: VII

TABLE: FODDER AVAILABILITY EXISTING AND WITH PROPOSED LAND USE

A. EXISTING

#	Source	Availability of tons dry matter/ha	Area (ha.)	Total yearly production
1	>From cultivated lands			
	- Kharif			
	- Rabi			
2	>From private waste land			
	- Fallow			
3	>From Forest land			
4	>From Gochar and other common lands			
	TOTAL:			

B. AFTER TREATMENT WITH PROPOSED LAND USE

	Source	Yield tons dry matter/ha	Area (ha.)	Total yearly production
1	>From cultivated lands			
	- Kharif			
	-Rabi			
2	>From private fallow lands			
3	>From Gochar and other common lands			
4	>From Forests			
	TOTAL:			

Text to comment on the matching of fodder requirement and availability (fodder per livestock unit) and on how the deficits, if any, are managed.

**PROFORMA: VIII**

**TABLE: ENERGY REQUIREMENTS AND AVAILABILITY \*1**

Sl.No	End Use	How satisfied	If Fuel wood is used requirement of fuel wood per year	Remarks on Availability

\*1 Stratified representative random sampling on the basis of 25% of the total households in each of the landholding categories may be done subject to a minimum of 5 households per category (if available)

**FROFORMA: IX**

**TABLE: INCOME ASSESSMENT BY HOUSEHOLD CATEGORIES \*1**

Sl. No.	Household category	Number in Sample	Average income from different sources (Rs.)					Total	Average
			Agril. Labour	Non- Agrl. Employment	Agriculture	Forest product collection	Other sources (specify)		
1	Landless								
2	Marginal Farmer (<1 ha)								
3	Small farmers (1-2 ha)								
4	Semi-medium farmers (2-4 ha)								
5	Medium farmers (4-10 ha)								
6	Large Farmers (>10 ha)								
7	(Other significant categories, if any in the area)								

\*1 Stratified representative random sampling (as in Proforma no.8)

The text should comment on the livelihood pattern of each household category. Also comment briefly on each significant economic activity in terms of inputs, production product or service), marketing and organisational arrangements and whether any of these aspects have a specific implication for execution and maintenance of the watershed project.





PROFORMA: XI

TABLE: DETAILS OF SOIL SURVEY STUDIES

#	Survey No. (where sample taken)*1	Soil Depth	Soil texture (as per mechanical analysis)					Soil pH	Organs Carbon %	Soil Type
			Clay	Silt	Sand	Gravel	Texture category			

**Note:**

- \*1. Representatives soil samples at 1 per 75- 125 acres. Should be collected depending upon the problem/land class.
- \*2. Text should comment on the general status of soil fertility and the recommended doses of chemical as well as organic fertilisers/bio fertilisers for major cereals, oil seeds and pulses as per the State Govt. Deptt. /University/Research Institutes Detailed soil analysis for physio-chemical properties may be done where it is absolutely necessary. If horticulture is of sufficient importance or proposed as development, treatment doses of fertiliser for the major horticultural crop may be mentioned.





						(Rs. per cum)							16% of labour cost	tions
								Lab our	Mate rial					
	Sub Total													
	Sub Total													
	Total													
	Supervision (8% of labour cost)													
	GRAND TOTAL													

PROFORMA: XV

TABLE: SUMMARY OF TREATMENTS TO DRAINAGE LINES AND COSTS  
 (Other than major engineering structures listed in Proforma 13, for example, Gabion Structures, Loose Boulder structures, etc.)

Sl.No.	Type of Treatment	Unit of measure nos./vol	Cost per Unit (Av.)	Number of Units Planned	Total Cost (Rs.)	Labour (Rs.)	Material (Rs.)	Grant (Rs.)
	Total:							
	Supervision (8% of labour)							
	Grand Total							

Details of unit cost of each type of treatment as well as design details, cross sectional drawings of nala bed (refer Proforma 1B) should be provided separately.

PROFORMA XVI(A)

TABLE: PHYSICAL AND FINANCIAL PHASING OF THE PROJECT

#	Proposed land use	Unit of Measurement	Year 1				Year 2				*Total	
			First half		Second half		First half		Second half			
			Units	Amount (Rs.)	Units	Amount (Rs.)	Units	Amount (Rs.)	Units	Amount (Rs.)		
1	2	3	4	5	6	7	8	9	10	11	20	
<b>AREA TREATMENT</b>												
Sub-total												
Supervision cost												
Total (Area treatment)												
<b>DRAINAGE LINE TREATMENT</b>												
Sub-Total												
Supervision cost												
Total (Drainage line Treatment)												
<b>PROJECT MANAGEMENT COSTS</b>												
1	2	3	4	5	6	7	8	9	10	11	20	
Sub-total												
<b>TOTAL</b>												

\* Years 3 and 4 may be included if necessary

**PERFORMA XVI(B)**

TABLE: SURVEY NO. WISE PHASING

#	PROPOSED LAND USE	COVERAGE AS PER SURVEY NO.			
		YEAR 1		YEAR 2	
		Ist half	2nd half	Ist half	2nd half
1					
2					
3					
4					
5					

PROFORMA: XVII(A)

### Administration Overheads

1. Administrative Cost
2. Community Organisation
3. Training Programmes

PROFORMA: XVII(B)

TABLE: TREATMENT MEASURE COST.

Sl.No.	Item	Labour Cost (Rs.)	Material Cost (Rs.)	Supervision & Transport (Rs.)	Total Cost (Rs.)
1	Area treatment cost				
2	Drainage line treatment				
3	Administration overhead				
4	Development of women @5% of project measures				
5	Development of Landless (5% of project measures)				
	Total:				

Administrative overhead is \_\_\_% of the total project cost and \_\_\_% of the treatment cost.

PROFORMA: XVIII

TABLE: CREDIT IN WATERSHED

Service area Branch for the watershed  
Distance

Nearest Credit Cooperative Society  
Distance

Credit outstanding with the formal credit institutions in the watershed  
Reference date

S.No	Purpose	Total	
		Credit	Out Standing
1	Crop Loans		
2	Other Short term loan		
3	Term loans		
	Total		

#### SCHEDULES OF COST ESTIMATES

Various Schedules of cost estimates for different activities may be given separately on activity wise.

## CODE SHEET(1)

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### Soil

Code	Soil
c	Clay
s	Sands
l	loam
si	Silty
si1	Silty loam
c1	Clay loam
s1	Silty loam
1s	Loamy sand
sc	Sandy clay
sic	Silty clay
scl	Sandy clay loam
sici	Silly clay loam
Slope	
Code	% Slope
A	0 -1
B	1 -3
C	3 -.5
D	5 -1
E	10 -15
F	15 -25
G	More than 25
Present/Proposed Land Use	
Code	Land use
C1R	Single crop rainfed
C2R	Double crop rainfed
C1I	Single crop irrigated
C2I	Double crop irrigated
C3I	Triple crop irrigated
W1	Wasteland cultivable
W2	Wasteland uncultivable
F0	Open forest

	Land use
CC	Crop Cultivation
AH	Agro-Horticulture
HP	Hortipasture
GT	Grass land with trees
RDF	Rehabilitaion of degraded forest
AF	Afforestation
Soil Depth	
Code	Soil depth (cm)
d1	less than 7
d2	7.5 - 22.5
d3	22.5 - 45
d4	45- 90
d5	More than 90
Erodibility	
Code	Type of erosion
e1	Sheet erosion
e2	Rill erosion
e3	Small gullied erosion
e4	Severe gullied erosion
Proposed Treatment	
Code	Treatment
RFB	Repair of farm bunds
CB	Conter bunding
FB	Farm bunding
CS1	Staggered contour trenching
CC1	Continuous contour trenching
GP	Gully plug
EP	Earthen plug
SO	Stone Outlet
PO	Pipe Outlet
GB	Gabion structure



F1	Thin forest
P	Pasture land

LB	Loose boulder
P11	Pits

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### Code Sheet(2)

Code	Soil	Present/Proposed Land Use	Erodibility Code	Type of erosion	Proposed Treatment Code	Treatment
c	Clay		e1	Sheet erosion		
s	Sands	<b>Code Land use</b>	e2	Rill erosion		
l	loam	C1R Single crop rainfed	e3	Small gullied erosion		
si	Silty	C2R Double crop rainfed	e4	Severe gullied erosion		
si1	Silty loam	C1I Single crop irrigated				
c1	Clay loam	C2I Double crop irrigated				
s1	Silty loam	C3I Triple crop irrigated				
1s	Loamy sand	W1 Wasteland cultivable				
sc	Sandy clay	W2 Wasteland uncultivable	RFB	Repair of farm bunds		
sic	Silty clay	F0 Open forest	CB	Contour bunding		
scl	Sandy clay loam	F1 Thin forest	FB	Farm bunding		
sici	Silly clay loam	P Pasture land	CS1	Staggered contour trenching		
		CC Crop Cultivation	CC1	Continuous contour trenching		
		AH Agro-Horticulture	GP	Gully plug		
		HP Hortipasture	EP	Earthen plug		
		GT Grass land with trees	SO	Stone Outlet		
		RDF Rehabilitaion of degraded forest	PO	Pipe Outlet		
		AF Afforestation	GB	Gabion structure		
			LB	Loose boulder		
			P11	Pits		