Government Of Kerala

EVALUATION STUDY ON SOIL CONSERVATION IN KERALA 2012-13

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Department of Economics & Statistics
Thiruvananthapuram
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DEPARTMENT OF ECONOMICS & STATISTICS
THIRUVANANTHAPURAM
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PREFACE

One of the most valuable gifts of nature to mankind is soil. For the maintenance of soil, adequate protection and conservation is necessary. Due to the peculiarity of the rainfall and topography of the state, soil conservation assumes importance in our planning process. Heavy soil erosion results in the loss of fertility and moisture content of the earth's surface and diminishing rate of agricultural production. Hence Government is implementing various soil conservation measures through the soil conservation department, local bodies, etc., for maintaining the fertility and moisture content of the surface soil.

The Evaluation study of these schemes has been done by the Directorate of Economics and Statistics for all districts except Wayanad; where the direct implementation and evaluation of the schemes are done by the Central Agency.

This report relates to the survey results of 43 schemes completed by the Soil Conservation Department and various other agencies. The field survey was conducted during the agricultural year 2012-13 by the Statistical Investigators under the supervision of the Research Officer and Deputy Director in the District Offices. The schemes implemented and completed before five years are taken up for study so that full benefit of the scheme could be evaluated and assessed. This evaluation study results may be much of use to Administrators, Statisticians, Research Scholars, Agricultural Geologists and others interested in the subject.

I acknowledge my thanks to the staff of Soil Conservation Department and other local bodies for their valuable suggestion and whole hearted co-operation for the successful conduct of the survey in the state.

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Chapter – I

1.1 Introduction

Land is one of the basic resources of a nation. Productive land is the source of human sustenance and security. The future of the country and its teeming, millions depend to a large extent, the conservation of its fertile soil through the proper land use and scientific agricultural practices.

Soil conservation means applying of all necessary practices to maintain the capability of land for which it is suited and to improve the productivity of agricultural land. Considering the importance of soil conservation our plan provisions enhanced for optimizing the use of land resources. An evaluation study in this front can be helpful for developing much more suitable conservation measures for the State

1.2 Objectives and Methodology

The main objectives of the evaluation study are:

1. To assess the benefit of the programme particularly in relation to the cultivation of seasonal and perennial crops.
2. To throw light on various aspects like cost benefit analysis, production potential etc
3. To estimate the extent of additional area brought under cultivation consequent on the implementation of the programme.
4. To study the effects of the work carried out by the Soil Conservation Department in this direction

For this, schemes were selected which were executed five years before ie during 2007-08 in the State by the Soil Conservation Department and other local bodies. The study covered all the districts of the State except Wayanad, where the same is directly done by the Central Government. The list of beneficiaries under each scheme is obtained from the Soil Conservation Department and other local bodies. The beneficiaries are selected by stratified random sampling method on the basis of the area of the holding. The holdings are stratified into four, viz.

Holdings with less than 1 acre	-	Stratum I
Holdings with 1 acre or more but less than 3 acres	-	Stratum II
Holdings with 3 acre or more but less than 5 acres	-	Stratum III
Holdings with 5 acres and above	-	Stratum IV

Selection of Beneficiaries

Selection of beneficiaries is done by the District Level Officers from the list of beneficiaries collected from Soil Conservation Department and from other local bodies. A total number of 25 beneficiaries are selected from each scheme by simple random sampling covering all the above 4 stratum with at least 6 from each stratum. If in any stratum, the total number of beneficiaries in the frame is less than the number to be selected the shortfall is compensated from another stratum with the nearest area of the holding. If the beneficiaries in a scheme are less than 25, all of them are selected. For the purpose of comparison 5 control plots are also selected from the scheme area, where the soil conservation works are not carried out under any scheme. The district wise selection details of beneficiary plots and control plots are given in the table 1 & 1 (a).

Table – 1

Statement showing stratum wise distribution of selected beneficiaries

(Area in Acres)

Sl No:	Districts	No. of schemes selected	Stratum – I		Stratum – II		Stratum – III		Stratum – IV		Total	
			No.	Area in acre	No.	Area in acre	No.	Area in acre	No	Area in acre	No.	Area in acre
1	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*	*10*	*11*	*12*	*13*
1	Thiruvananthapuram	5	125	11.11							125	11.11
2	Kollam	3	114	32.19	11	14.5					125	46.69
3	Pathanamthitta	1	124	30.46	1	1					125	31.46
4	Alappuzha	5	125	8.88							125	8.88
5	Kottayam	2	45	25.44	75	140.4			5	46.62	125	212.46
6	Idukki	5	102	22.58	20	29.6	3	10.6			125	62.78
7	Eranakulam	3	53	28.23	61	105.78	9	32.4	2	11.91	125	178.32
8	Thrissur	5	67	41.5	49	83.62	9	31.31			125	156.43
9	Palakkad	2	57	25.86	56	97.85	12	41.11			125	164.82
10	Malappuram	5	78	27.96	42	69.86	5	20			125	117.82
11	Kozhikkode	5	50	22.22	75	111.42					125	133.64
12	Kannur	1	25	13.86	21	38.04	1	3			47	54.9
13	Kasaragod	1	23	12.9	63	96.56	20	72.82	19	142.29	125	324.57
Total		**43**	**988**	**303.19**	**474**	**788.63**	**59**	**211.24**	**26**	**200.82**	**1547**	**1503.88**

Table –I (a)

Statement showing stratum wise distribution of selected Control Plots

(Area in acres)

Sl No	Districts	No. of schemes selected	Stratum – I		Stratum – II		Stratum – III		Stratum – IV		Total	
			No.	Area in acre	No.	Area in acre	No.	Area in acre	No.	Area in acre	No.	Area in acre
1	***2***	***3***	***4***	***5***	***6***	***7***	***8***	***9***	***10***	***0***	***12***	***13***
1	Thiruvananthapuram	5	24	10.76	1	1.20					25	11.96
2	Kollam	3	15	1.74	0	0					15	1.74
3	Pathanamthitta	1	16	8.59	9	9.80					25	18.39
4	Alappuzha	5	25	3.17	0	0					25	3.17
5	Kottayam	2	1	0.90	9	17.10					10	18
6	Idukki	5	21	7.74	4	4.60					25	12.34
7	Eranakulam	3	5	3.24	9	18.02	1	3.25			15	24.51
8	Thrissur	5	12	6.34	9	13.55	4	13.05			25	32.94
9	Palakkad	2	6	3.64	11	22.16	8	28.38			25	54.18
10	Malappuram	5	15	5.38	9	10.61	1	4.00			25	19.99
11	Kozhikkode	5	8	5.34	17	23.85					25	29.19
12	Kannur	1	5	3.10	4	7.56	1	3.10			10	13.76
13	Kasaragod	1	1	0.75	2	3.50	1	3.50	1	5.00	5	12.75
Total		**43**	**154**	**60.69**	**84**	**131.95**	**16**	**55.28**	**1**	**5.00**	**255**	**252.92**

The total number of beneficiaries comes to 1547. About 63.87% of the beneficiaries are having holding less than one acre, 30.64% are having holdings one acre or more but less than 3 acres, 3.81% are having holding 3 acre or more but less than 5 acres and only 1.68% of the beneficiaries are having holdings of more than 5 acres. In order to compare the benefits of the implementation of Soil Conservation Programmes, control plots were also selected. Its distribution is 60.39%, 32.94%, 6.28% and 0.39 % respectively under Stratum I, II, III and IV.

Following schedules were used for collecting the details from beneficiary plots and control plots.

Schedule I - List of selected beneficiaries

Schedule II - Detailed study of the selected beneficiaries

Schedule III - List of control plots

Schedule IV - Detailed enumeration of the control plots

1.1 Problems of Soil Erosion

Soil erosion means the disappearance of the topsoil by the action of wind and water. Ultimately soil erosion leads the desertification of land. Degradation of natural resources has lead to many indirect damages, such as increasing extent of wasteland, soil erosion, land sliding, etc. all these cumulatively or independently has affected agricultural or independently has affected agricultural productivity. Unlike other parts of the country, Kerala has some unique land form related aspects such as over 90% of the geographical area is either in midland or high land category. The average rate of soil erosion in the country, to the tune of 16.3t/ha/yr – has been alarming and has to be checked. In hilly areas, the rate is much higher, i.e. about 30 to 50 t/ha/yr/, considering that about 5 to 10 cm of the top soil (ranging from 0.3 to 1.0 m depth) is being lost every year due to lead management practices. It has been estimated 9-5 lakh hectares of cultivated land in the State is having soil erosion problems.

Responsibility for prevention of erosion

Land which is one of the precious gifts of the nature embodies soil, water and associated flora and fauna involving the total ecosystem. The topography of the land plays the most important role in soil erosion. Kerala is a narrow strip of land (width varies from 15 to 120 Km) situated on the Western Slopes of the Western Ghats (the Sahyadri). The very steep slopes facilitate quick run off of the rainfall resulting in low time of concentration poor ground water recharge. This high velocity of the surface flow causes soil displacement and movement. The surface soil gets washed away along with the running water. The major portion of the state is laterite and as such is more prone is erosion. The different forms of soil erosion cause huge damage to Kerala's economy every year. Many people die every year due to landslides.

1.4 Methods of Soil Conservation Programme

Soil Conservation practices are mainly grouped into two categories viz. Agronomical and Engineering measures. Agronomic measures are comparatively low costly such as contour ploughing / optimal fertilizing, organic farming, etc. Engineering measures include contour bunding, land leveling, construction of check dams and water harvesting structure, etc. At present various watershed programmes are being implemented in the state for effective preservation and management of the natural resources.

1.5 Land Use Particulars of the State

There has been a significant change in the land use of the state over the years. On many occasions the change is adversely affecting the environment by way of intensified soil erosion, water logging, conversion of paddy lands, etc. are some of the examples. Cultivation of very steep lands without adopting scientific conservation practices lead to heavy soil erosion. Use of chemicals on a large scale for agricultural productions leaves dangerous quantities of the residues in the soil and the water sources.

Chapter – II

2.1 Impact of Soil Conservation Programme on Land Use and Crop Pattern

Before 1994-95, soil conservation programme was executed by Department of Agriculture/Soil and Water conservation, etc. There was increased employment to rural people due to soil and water conservation works and this improved income of people and reduced migration of labour from these places to outside. Soil and water conservation structures in arable and non arable lands reduced soil erosion, soil loss, run-off water, etc. and increased rainwater infiltration, ground water table, surface storage, cropping intensity, productivity of crops, etc. As long as works were carried out based on funding by Government and subsides provided for supporting income generating enterprises, there was positive impact.

After 1994-95, there was a proposal from the Government that people should contribute 5-10% or more towards soil and water conservation works. Farmers contributed in some of the watersheds based on the direct benefits derived from such activities;

Soil can be well maintained through bunding (mechanical and mechanical-cum-vegetative barriers), deep ploughing, leveling, smoothening, etc. Bunding was accepted by farmers to strengthen existing bunds without any obstruction in their plot Moisture conservation on measures increased yield magically.

Farmers in different parts reported that the fact that the sustainability of agriculture is only possible by soil and water conservation measures. They also reported that soil erosion can be minimized and irrigation potentials can be improved through soil and water conservation measures. In addition, vegetation covering the soil is a must for minimizing soil loss even further.

Land Use particulars of Beneficiary plots

Table Nos. 3 and 3(a) reveals the land use particulars of beneficiary plots and control plots respectively. It gives us certain positive trends while comparing with the area before and after soil conservation programme. Area increased from. 1355.89 acres to 1393.55 acres after the implementation of soil conservation programme. An additional area of 37.66 acre of land has brought under cultivation which was not cultivated earlier. Hence it can be stated that 2.78% of area over the area cultivated before soil conservation programme is due to the implementation of soil conservation measures. In other words area under cultivation has increased from 90.16% to 92.66% by decreasing the current fallow.

On examining the district wise data, a marginal increase is noted in the area additionally brought under cultivation in Thrissur, Palakkad and Kozhikode.

In control plots also the land use is more or less same as in the area of beneficiary plots, before soil conservation programme. Hence it is suited for a comparison with the beneficiary plots.

Table – 2

District wise details of area, cost and number of beneficiaries

Sl No	District	Area (Acres)	Cost (Rs.)	Number of beneficiaries	
				Total	Selected
1	2	3	4	5	6
1	Thiruvananthapuram	11.11	992369	208	125
2	Kollam	46.69	4311395	125	125
3	Pathanamthitta	31.46	4551049	125	125
4	Alappuzha	8.88	4811585	125	125
5	Kottayam	212.46	16000000	125	125
6	Idukki	62.78	1668965	125	125
7	Eranakulam	178.32	3693924	125	125
8	Thrissur	156.43	2506697	125	125
9	Palakkad	164.82	1709034	125	125
10	Malappuram	117.82	1121271	125	125
11	Kozhikkode	133.64	532776	280	125
12	Kannur	54.90	439402	47	47
13	Kasaragod	324.57	888194	125	125
Total		**1503.88**	**43226661**	**1785**	**1547**

Table – 3 Land use particulars of Beneficiary Plots

(Area in Acres)

Sl. No	Districts	Area cultivated				Current fallow			
		Before SC Work		After SC Work		Before SC Work		After SC Work	
		Area	%	Area	%	Area	%	Area	%
1	2	3	4	5	6	7	8	9	10
1	Thiruvananthapuram	9.54	85.87	9.54	85.87				
2	Kollam	39.26	84.09	39.26	84.09	0.29	0.62	0.29	0.62
3	Pathanamthitta	30.37	96.54	30.37	96.54				
4	Alappuzha	4.96	55.86	4.94	55.63	0.19	2.14	0.19	2.14
5	Kottayam	195.89	92.2	196.29	92.39	4.75	2.24	4.45	2.09
6	Idukki	56.51	90.01	56.61	90.17	0.50	0.8	0.40	0.64
7	Eranakulam	169.72	95.18	169.72	95.18	1.29	0.72	1.29	0.72
8	Thrissur	131.5	84.06	156.43	100	24.93	15.94		
9	Palakkad	160.5	97.38	160.5	97.38	0.14	0.08	0.14	0.08
10	Malappuram	101.25	85.94	102.06	86.62	1.35	1.15	0.68	0.58
11	Kozhikkode	132.82	99.39	129.26	96.72				
12	Kannur	52.59	95.79	52.59	95.79				
13	Kasaragod	270.98	83.49	285.98	88.11	30.93	9.53	15.93	4.91
Total		**1355.89**	**90.16**	**1393.55**	**92.66**	**64.37**	**4.28**	**23.37**	**1.55**

Table – 3 Contd...

Sl. No	Districts	Other use				Area not cultivated				Total			
		Before SC Work		After SC Work		Before SC Work		After SC Work		Before SC Work		After SC Work	
		Area	%	Area	%	Area	%	Area	%	Area	%	Area	%
1	2	11	12	13	14	15	16	17	18	19	20	21	22
1	Thiruvananthapuram	1.47	13.23	1.47	13.23	0.10	0.9	0.10	0.9	11.11	100	11.11	100
2	Kollam	7.14	15.29	7.14	15.29	0	0	0	0	46.69	100	46.69	100
3	Pathanamthitta	1.07	3.4	1.07	3.4	0.02	0.06	0.02	0.06	31.46	100	31.46	100
4	Alappuzha	3.28	36.94	3.30	37.16	0.45	5.07	0.45	5.07	8.88	100	8.88	100
5	Kottayam	5.60	2.64	5.50	2.59	6.22	2.93	6.22	2.93	212.46	100	212.46	100
6	Idukki	5.44	8.67	5.48	8.73	0.33	0.53	0.29	0.46	62.78	100	62.78	100
7	Eranakulam	7.21	4.04	7.12	3.99	0.10	0.06	0.19	0.11	178.32	100	178.32	100
8	Thrissur	0	0	0	0	0	0	0	0	156.43	100	156.43	100
9	Palakkad	3.87	2.35	3.87	2.35	0.31	0.19	0.31	0.19	164.82	100	164.82	100
10	Malappuram	12.02	10.2	12.14	10.3	3.20	2.72	2.94	2.5	117.82	100	117.82	100
11	Kozhikkode	0.82	0.61	4.38	3.28	0	0	0	0	133.64	100	133.64	100
12	Kannur	1.91	3.48	1.91	3.48	0.40	0.73	0.40	0.73	54.90	100	54.90	100
13	Kasaragod	8.33	2.57	8.33	2.57	14.33	4.42	14.33	4.42	324.57	100	324.57	100
Total		**58.16**	**3.87**	**61.71**	**4.1**	**25.46**	**1.69**	**25.25**	**1.68**	**1503.88**	**100**	**1503.88**	**100**

Table 3(a) Land Use particulars (Control Plots)

Sl. No	Districts	Area cultivated		Current follow		Other use		Area not cultivated		Total	
		Area	%	Area	%	Area	%	Area	%	Area	%
1	2	3	4	5	6	7	8	9	10	11	12
1	Thiruvananthapuram	11.06	92.47	0.00	0.00	0.90	7.53	0.00	0.00	**11.96**	**100**
2	Kollam	0.94	54.02	0.00	0.00	0.80	45.98	0.00	0.00	**1.74**	**100**
3	Pathanamthitta	15.2	82.65	0.10	0.54	3.09	16.80	0.00	0.00	**18.39**	**100**
4	Alappuzha	1.94	61.20	0.10	3.15	0.90	28.39	0.23	7.26	**3.17**	**100**
5	Kottayam	14.3	79.44	0.20	1.11	3.50	19.44	0.00	0.00	**18.00**	**100**
6	Idukki	10.89	88.25	0.00	0.00	1.25	10.13	0.20	1.62	**12.34**	**100**
7	Eranakulam	23.53	96.00	0.39	1.59	0.59	2.41	0.00	0.00	**24.51**	**100**
8	Thrissur	32.94	100.00	0.00	0.00	0.00	0.00	0.00	0.00	**32.94**	**100**
9	Palakkad	51.51	95.07	0.50	0.92	1.12	2.07	1.05	1.94	**54.18**	**100**
10	Malappuram	17.32	86.64	0.50	2.50	1.07	5.35	1.10	5.50	**19.99**	**100**
11	Kozhikkode	28.2	96.61	0.00	0.00	0.99	3.39	0.00	0.00	**29.19**	**100**
12	Kannur	13.39	97.31	0.00	0.00	0.37	2.69	0.00	0.00	**13.76**	**100**
13	Kasaragod	10.15	79.61	0.80	6.27	0.50	3.92	1.30	10.20	**12.75**	**100**
Total		**231.37**	**91.48**	**2.59**	**1.02**	**15.08**	**5.96**	**3.88**	**1.53**	**252.92**	**100**

Crop Pattern

In order to reduce the soil loss an appropriate cropping pattern is essential. The selection of suitable vegetation that form good canopy can reduce erosion since soil loss is governed by the extent of exposed land surface. The binding force of the roots also offers good resistance to erosion. Grass roots have excellent soil binding property. Legumes are also good soil binders. The grasses, legumes and tree crops are classified as erosion preventing or soil conserving crops while cereals, tapioca, ginger, etc. are erosion permitting/erosion favouring crops.

Depending upon the capability class to which a land belongs and the socio-economic needs of the people, the appropriate crops can be selected to achieve maximum conservation of soil and water.

Contour Farming

Contour farming refers to village practices of applying all treatments along contour; i.e. across the direction of the slope. The crops are cultivated along contour ridges and furrows. In regions of low rainfall contour farming helps in the conservation of rainwater and in human areas it reduces soil loss and increases recharge of aquifers. This practice can minimize the effects of flash floods and droughts.

Mixed farming, intercropping, mixed cropping; multistoried cropping, etc. are also beneficial in controlling soil erosion.

The growing of perennial horticultural crops, including plantation crops will give a permanent protective cover for the soil. In high rainfall areas of the humid tropics this higher level tree cover for the soil helps in reducing the erosive action of highly intensive rainfall.

Consequent in the introduction of the soil conservation programmes significant changes in the cropping pattern occurred which favours perennial crops. The area under perennial crops has increased from 1060.25 acres to 1122.25 acres. It showed an increase of

5.85%. At the same time the percentage change occurred in the cultivation of seasonal crops recorded as 21.67 %. From this we can arrive at the conclusion that the farmers have shown a tendency to cultivate perennial crops in sloppy regions where the soil conservation measures are carried out. The cultivation of seasonal crops in such regions is likely to increase soil erosion. In seasonal crops, the cultivation of Plantain, Tapioca and Banana exhibited comparative increase. The respective percentage changes recorded as 39.58%, 56.48%, 25.00% respectively.

Table No. 5 reveals that after the introduction of soil conservation programmes, Jack has occupied the largest area under perennial crops; the percentage increase is 17.72 %. Pepper comes next with an increase of 15.96% followed by Arecanut and Cashew with 13.01% and 12.23% respectively after the Soil Conservation Programme.

On going through the district wise data, it is noted that the cropping area under different crops are interchanged according to the suitability of land.

Table – 4

Crop Pattern (Area wise)

Sl. No.	Districts	Perennial crops				Seasonal Crops			
		Before SC work	%	After SC work	%	Before SC work	%	After SC work	%
1	2	3	4	5	6	7	8	9	10
1	Thiruvananthapuram	0.63	5.81	0.63	4.81	10.21	94.19	12.47	95.19
2	Kollam	44.84	97.71	45.55	97.62	1.05	2.29	1.11	2.38
3	Pathanamthitta	33.44	98.56	33.56	98.24	0.49	1.44	0.60	1.76
4	Alappuzha	5.54	98.58	9.28	97.58	0.08	1.42	0.23	2.42
5	Kottayam	188.96	99.90	189.06	99.85	0.18	0.10	0.29	0.15
6	Idukki	50.87	93.93	59.73	90.47	3.29	6.07	6.29	9.53
7	Eranakulam	122.15	99.31	125.23	99.22	0.85	0.69	0.99	0.78
8	Thrissur					131.70	100.00	156.63	100.00
9	Palakkad	91.71	82.64	93.78	82.95	19.27	17.36	19.27	17.05
10	Malappuram	98.79	96.96	110.78	98.19	3.10	3.04	2.04	1.81
11	Kozhikkode	119.35	96.68	131.50	90.43	4.10	3.32	13.92	9.57
12	Kannur	53.03	97.95	56.21	97.88	1.11	2.05	1.22	2.12
13	Kasaragod	250.94	96.49	266.94	96.56	9.13	3.51	9.50	3.44
Total		**1060.25**	**85.17**	**1122.25**	**83.33**	**184.56**	**14.83**	**224.56**	**16.67**

Table – 4 Contd...

Sl. No	Districts	Total Gross area cropped			
		Before SC work	%	After SC work	%
1	2	11	12	13	14
1	Thiruvananthapuram	10.84	100	13.10	100
2	Kollam	45.89	100	46.66	100
3	Pathanamthitta	33.93	100	34.16	100
4	Alappuzha	5.62	100	9.51	100
5	Kottayam	189.14	100	189.35	100
6	Idukki	54.16	100	66.02	100
7	Eranakulam	123.00	100	126.22	100
8	Thrissur	131.70	100	156.63	100
9	Palakkad	110.98	100	113.05	100
10	Malappuram	101.89	100	112.82	100
11	Kozhikode	123.45	100	145.42	100
12	Kannur	54.14	100	57.43	100
13	Kasaragod	260.07	100	276.44	100
Total		**1244.81**	**100**	**1346.81**	**100**

Table 5 – Area under selected perennial crops

Sl. No	Districts	Coconut			Arecanut			Cashew			Papaya		
		Before SC work	After SC work	% increase	Before SC work	After SC work	% increase	Before SC work	After SC work	% increase	Before SC work	After SC work	% increase
1	2	3	4	5	6	7	8	9	10	11	12	13	14
1	Thiruvananthapuram	0.63	0.63	0									
2	Kollam	9.33	9.64	3.32	0.24	0.24	0.00	0.81	0.82	1.23			
3	Pathanamthitta	3.02	3.05	0.99	0.08	0.08	0.00	1.21	1.21	0			
4	Alappuzha	4.28	6.38	49.07	0.21	0.39	85.71	0.01	0.07	600.00	0.01	0.02	100.00
5	Kottayam	16.16	16.59	2.66	0.41	0.41	0	3.31	3.31	0			
6	Idukki	8.13	9.66	18.82	0.37	0.54	45.95	0.41	1.24	202.44			
7	Ernakulam	19.87	20.33	2.32	0.2	0.25	25.00	0.08	0.1	25.00			
8	Trissur												
09	Palakkad	68.41	67.97	-0.64	1.54	1.69	9.74	0	1.32	0			
10	Malappuram	46.57	47.29	1.55	0.34	0.34	0	8.26	8.11	-1.82	0.07	0.07	0
11	Kozhikode	70.39	75.52	7.29	4.36	5.4	23.85	2.06	2.79	35.44			
12	Kannur	11.36	11.39	0.26	2.26	2.85	26.11	2.38	2.18	-8.40			
13	Kasaragod	32.68	32.81	0.40	6.74	6.74	0	3.05	3.07	0.66			
Total		**290.83**	**301.26**	**3.59**	**16.75**	**18.93**	**13.01**	**21.58**	**24.22**	**12.23**	**0.08**	**0.09**	**12.50**

Table – 5 Contd...

Sl. No	Districts	Rubber			Pepper			Jack			Mango			Tamarind		
		Before SC work	After SC work	% increase	Before SC work	After SC work	% increase	Before SC work	After SC work	% increase	Before SC work	After SC work	% increase	Before SC work	After SC work	% increase
1	2	15	16	17	16	17	18	19	20	21	22	23	24	25	26	27
1	Thiruvananthapuram															
2	Kollam	31.02	31.27	0.81	0.36	0.35	-2.78	2.21	2.26	2.26	0.83	0.91	9.64	0.02	0.04	100.00
3	Pathanamthitta	27.77	27.87	0.36	0.7	0.69	-1.43	0.66	0.66	0						
4	Alappuzha				0.06	0.07	16.67	0.11	0.31	181.82	0.77	1.87	142.86	0.09	0.17	88.89
5	Kottayam	163.63	163.18	-0.28	1.78	1.86	4.49	2.28	2.28	0	1.09	1.06	-2.75			
6	Idukki	35.14	38.82	10.47	2.62	3.25	24.05	0.91	1.37	50.55	0.41	0.45	9.76			
7	Ernakulam	94.66	96.69	2.14	0.51	0.6	17.65	0.76	0.81	6.58	0.12	0.17	41.67			
8	Thrissur															
9	Palakkad	13.61	15.1	10.95	0.26	0.26	0				7.89	7.44	-5.70			
10	Malappuram	37.78	49.26	30.39	2.18	2.11	-3.21	3.54	3.55	0.28	0.05	0.05	0			
11	Kozhikkode	32.38	32.92	1.67	2.96	4.73	59.80	5.9	8.4	42.37	1.1	1.36	23.64			
12	Kannur	32.68	35.2	7.71	2.92	2.91	-0.34	1.3	1.39	6.92	0.13	0.21	61.54			
13	Kasaragod	205.31	221.05	7.67	1.82	1.92	5.49	1.29	1.29	0						
Total		**673.98**	**711.36**	**5.55**	**16.17**	**18.75**	**15.96**	**18.96**	**22.32**	**17.72**	**12.39**	**13.52**	**9.12**	**0.11**	**0.21**	**90.91**

Table – 5 Contd..

Sl No	Districts	Cocoa			Coffee			Nutmeg			Cardamom			Total		
		Before SC work	After SC work	% increase	Before SC work	After SC work	% increase	Before SC work	After SC work	% increase	Before SC work	After SC work	% increase	Before SC work	After SC work	% increase
1	2	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42
1	Thiruvananthapuram													0.63	0.63	0
2	Kollam	0.01	0.01	0	0.01	0.01	0							44.84	45.55	1.58
3	Pathanamthitta													33.44	33.56	0.36
4	Alappuzha													5.54	9.28	67.51
5	Kottayam	0.3	0.37	23.33										188.96	189.06	0.05
6	Idukki	2.66	3.7	39.10	0.11	0.16	45.45	0.04	0.3	650.00	0.07	0.24	242.86	50.87	59.73	17.42
7	Ernakulam	0.47	0.67	42.55	0.35	0.35	0	5.13	5.26	2.53				122.15	125.23	2.52
8	Thrissur													0	0	0
9	Palakkad													91.71	93.78	2.26
10	Malappuram													98.79	110.78	12.14
11	Kozhikkode	0.11	0.19	72.73	0.01	0.02	100.00	0.08	0.17	112.50				119.35	131.5	10.18
12	Kannur				0	0.08	0							53.03	56.21	6.00
13	Kasaragod	0.05	0.06	20.00										250.94	266.94	6.38
Total		**3.6**	**5**	**38.89**	**0.48**	**0.62**	**29.17**	**5.25**	**5.73**	**9.14**	**0.07**	**0.24**	**242.86**	**1060.25**	**1122.25**	**5.85**

Table 6 – Area under selected seasonal crops

(Area in Acres)

Sl No	Districts	Paddy			Tapioca			Peas (Pulses)			Turmeric		
		Before SC work	After SC work	% increase	Before SC work	After SC work	% increase	Before SC work	After SC work	% increase	Before SC work	After SC work	% increase
1	2	3	4	5	6	7	8	9	10	11	12	13	14
1	Thiruvananthapuram				4.45	4.47	0.45						
2	Kollam				0.32	0.33	3.13						
3	Pathanamthitta				0.35	0.42	20.00						
4	Alappuzha												
5	Kottayam				0.18	0.29	61.11						
6	Idukki	1.5	1.5	0	1.1	3.26	196.36						
7	Ernakulam	0.48	0.48	0	0.02	0.02	0						
8	Trissur	131.7	156.63	18.93									
9	Palakkad	17.47	17.47	0							**0.05**	**0.05**	**0**
10	Malappuram	1.08	0	0	1.18	1.2	1.69						
11	Kozhikkode				2.7	9.2	240.74	0.08	0.24	200.00	**0.01**	**0.03**	**200.00**
12	Kannur				0.15	0.16	6.67				**0**	**0.01**	**0**
13	Kasaragod	0.01	0.01	0	5.29	5.28	-0.19						
Total		**152.24**	**176.09**	**15.67**	**15.74**	**24.63**	**56.48**	**0.08**	**0.24**	**200**	**0.06**	**0.09**	**50.00**

Table – 6 Contd...

Sl. No	Districts	Ginger			Plantain			Banana			Vegetables			Pineapple		
		Before SC work	After SC work	% increase	Before SC work	After SC work	% increase	Before SC work	After SC work	% increase	Before SC work	After SC work	% increase	Before SC work	After SC work	% increase
1	2	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29
1	Thiruvananthapuram				5.76	8	38.89									
2	Kollam	0.02	0.02	0	0.52	0.53	1.92	0.04	0.05	25.00						
3	Pathanamthitta				0.14	0.18	28.57									
4	Alappuzha				0.08	0.19	137.50				0	0.01	0			
5	Kottayam															
6	Idukki	0	0.04	0	0.27	0.69	155.56	0.35	0.64	82.86	0.07	0.16	128.57			
7	Ernakulam				0.07	0.13	85.71	0.05	0.08	60.00	0.23	0.28	21.74			
8	Thrissur															
9	Palakkad	0.05	0.05	0				1.11	1.11	0.00						
10	Malappuram				0.8	0.76	-5.00	0	0.01	0	0.04	0.07	75.00			
11	Kozhikode	0.51	2.03	298.04	0.57	1.85	224.56	0.17	0.46	170.59	0.01	0.04	300.00	.05	.07	40
12	Kannur				0.64	0.67	4.69	0.32	0.35	9.37	0	0.02	0	0	.01	0
13	Kasaragod	0.2	0.21	5.00	2.47	2.8	13.36	0.6	0.6	0.00	0.25	0.28	12.00	.03	.03	0
Total		**0.78**	**2.35**	**201.28**	**11.32**	**15.80**	**39.58**	**2.64**	**3.30**	**25.00**	**0.60**	**0.86**	**43.33**	**0.08**	**0.11**	**37.5**

Table – 6 Contd...

Sl. No	Districts	Chenai			Colocasia			Others			Total		
		Before SC work	After SC work	% increase	Before SC work	After SC work	% increase	Before SC work	After SC work	% increase	Before SC work	After SC work	% increase
1	2	30	31	32	33	34	35	36	37	38	39	40	41
1	Thiruvananthapuram										10.21	12.47	22.14
2	Kollam	0.11	0.12	9.09	0.03	0.05	66.67	0.01	0.01	0	1.05	1.11	5.71
3	Pathanamthitta										0.49	0.60	22.45
4	Alappuzha	0	0.01	0	0	0.01	0	0	0.01	0	0.08	0.23	187.50
5	Kottayam										0.18	0.29	61.11
6	Idukki										3.29	6.29	91.19
7	Ernakulam										0.85	0.99	16.47
8	Thrissur										131.70	156.63	18.93
9	Palakkad				0.1	0.1	00	0.49	0.49	0	19.27	19.27	0.00
10	Malappuram										3.10	2.04	-34.19
11	Kozhikode										4.10	13.92	239.51
12	Kannur										1.11	1.22	9.91
13	Kasaragod	0.02	0.02	0.00				0.26	0.27	3.85	9.13	9.50	4.05
Total		**0.13**	**0.15**	**15.38**	**0.13**	**0.16**	**23.08**	**0.76**	**0.78**	**2.63**	**184.56**	**224.56**	**21.67**

Impact of Soil Conservation Treatment on the Yield of Crops

For studying the impact of soil conservation treatment on the yield of crops, a detailed survey was conducted following the "Before" and "After" method. Details regarding the yield and value of crops are collected from the beneficiaries in the scheme area. District wise details are presented in table No. 7 and 8 Survey results reveals that in most cases, the crop yields after the implementation of the programme were higher than that of before. Therefore, the total output from crops represented a big increase. As much as major portion of this output came from perennial crops indicating improved stability in output. Almost all perennial crops have also shown a marked improvement.

For example, in Kozhikode district, total cropped area before soil conservation works was 123.45 acres. It increased to 145.42 acres after the implementation of soil conservation measures. The increase in area is accounted as 21.97 acres. The percentage of increase recorded as 17.80%. When we analyze the yield of perennial crops in this district it can be seen that production of Coconut, Arecanut, Pepper, Cashew, Cocoa and Rubber are increased. In the case of seasonal crops Tapioca, Ginger, Plantain and Banana also increased.--

In Thrissur, Kasargode, Idukki and Malappuram districts, before soil conservation work, the area were 131.7 acres, 260.07, 54.16 and 101.89 acres respectively. It increased to 156.63, 276.44, 66.02 and 112.82 acres after the implementation of soil conservation work. Increase in area accounted as 24.93, 16.37, 11.86 and 10.93 acres respectively. .

Production impact is also commendable. Output of all perennial crops increased after soil conservation works.

The area details of seasonal crops of these districts shows that vegetable area of all districts except Thrissur increased and in the case of tapioca, the area as well as production increased except Thrissur.

Table 7

Crop wise yield and Value of Perennial crops in scheme area.

District	Name of Crop	Unit	Before SC work		After SC work		
			Quantity	Value	Quantity	Value	Value at constant price
1	2	3	4	5	6	7	8
Thiruvananthapuram	Coconut	Nos.	12126.00	55176	16592.00	116144	84882
	Arecanut	Nos.	60.00	38	88.00	88	60
	Rubber	Quintal	8.50	70048	10.81	202017	158848
	Total			**125262**		**318249**	**243790**
Kollam	Coconut	Nos.	15339.00	85290	20515.00	205150	153390
	Arecanut	Nos.	8405.00	5295	10690.00	10690	8405
	Pepper(Garbled)	Quintal	0.77	7798	1.06	32825	23845
	Cashew	Quintal	0.61	2013	0.96	5932	3769
	Rubber	Quintal	234.06	1910161	297.44	5750113	4524850
	Jack	Quintal	81.80	11287	101.65	48081	38692
	Mango	Quintal	9.34	6576	12.62	13175	9751
	Tamarind	Quintal	0.32	981	0.45	3777	2686
	Total			**2029401**		**6069743**	**4765388**
Pathanamthitta	Coconut	Nos.	2254.00	12412	3520.00	35200	22540
	Arecanut	Nos.	1120.00	650	1595.00	1595	1120
	Pepper(Garbled)	Quintal	7.02	88946	13.18	431791	229983
	Rubber	Quintal	111.56	934872	156.94	3046362	2165491
	Total			**1036880**		**3514948**	**2419134**
Alappuzha	Coconut	Nos.	6560.00	32214	11683.00	93464	52480
	Arecanut	Nos.	640.00	302	2962.00	2962	640
	Cashew	Quintal	0.00	0	0.03	152	0
	Mango	Quintal	2.49	2032	5.04	7660	3784
	Tamarind	Quintal	0.07	126	0.18	900	350
	Total			**34674**		**105138**	**57254**

(Table 7 Contd...)

1	2	3	4	5	6	7	8
Kottayam	Coconut	Nos.	64178.00	358109	92878.00	928780	641780
	Arecanut	Nos.	50750.00	28420	63790.00	63790	50750
	Pepper(Garbled)	Quintal	3.81	42291	5.13	167600	124475
	Rubber	Quintal	582.82	4893360	715.05	13897713	11327690
	Coco	Quintal	4.85	9381	7.60	26579	16962
	Total			**5331561**		**15084462**	**12161657**
Idukki	Coconut	Nos.	27011.00	170445	31977.00	287793	243099
	Pepper(Garbled)	Quintal	7.72	85023	11.06	361629	252421
	Rubber	Quintal	96.27	754565	101.62	1972954	1869084
	Coffee	Quintal	7.55	16331	9.38	55201	44432
	Coco	Quintal	11.63	13956	23.00	81793	41359
	Cardamom	Quintal	0.20	6893	0.53	33468	12629
	Total			**1047213**		**2792838**	**2463024**
Eranakulam	Coconut	Nos.	106341.00	538088	111334.00	1002006	957069
	Arecanut	Nos.	65325.00	34622	65724.00	65724	65325
	Pepper(Garbled)	Quintal	2.28	23957	2.36	81035	78288
	Rubber	Quintal	737.37	5929934	770.35	14867755	14231241
	Total			**6526601**		**16016520**	**15331923**
Palakkad	Coconut	Nos.	470311.50	1711935	534695.10	3208171	2821869
	Arecanut	Nos.	280620.00	115054	332530.00	332530	280620
	Pepper(Garbled)	Quintal	0.86	9116	1.08	33808	26921
	Rubber	Quintal	92.51	770053	98.25	1868518	1759355

(Table 7 Contd...)

1	2	3	4	5	6	7	8
Palakkad (Contd..)	Mango	Quintal	630.15	438584	750.50	1579051	1325835
	Total			**3044742**		**7022078**	**6214600**
Malappuram	Coconut	Nos.	170440.00	644264	255005.00	1530030	1022640
	Arecanut	Nos.	31860.00	13063	92352.00	92352	31860
	Pepper(Garbled)	Quintal	5.64	59829	7.13	223640	176905
	Cashew	Quintal	29.55	83330	34.23	202815	175086
	Rubber	Quintal	469.90	3883252	497.45	9807726	9264550
	Jack	Quintal	11.30	1243	7.76	730	1063
	Total			**4684981**		**11857293**	**10672104**
Kozhikkode	Coconut	Nos.	115520.00	467864	179650.00	1077900	693120
	Arecanut	Nos.	253500.00	119145	533150.00	533150	253500
	Pepper(Garbled)	Quintal	8.87	91973	16.77	524619	277482
	Cashew	Quintal	5.78	14424	10.79	66056	35385
	Rubber	Quintal	28.20	232819	177.60	3451662	548068
	Coco	Quintal	0.02	10	0.22	781	71
	Total			**926235**		**5654168**	**1807626**
Kannur	Coconut	Nos.	49880.00	195037	54480.00	326880	299280
	Arecanut	Nos.	139995.00	65798	153760.00	153760	139995
	Pepper(Garbled)	Quintal	7.44	80466	9.41	301667	238512
	Cashew	Quintal	4.02	12374	1.90	12678	26824
	Rubber	Quintal	126.25	1049267	141.20	1464954	1309847
	Total			**1402942**		**2259939**	**2014458**
Kasaragod	Coconut	Nos.	182075.00	828443	195510.00	1368570	1274525
	Arecnut	Nos.	1188740.00	784568	1332750.00	1332750	1188740
	Pepper(Garbled)	Quintal	13.15	129975	13.20	412474	410912
	Rubber	Quintal	1846.80	15644243	1868.70	35669746	35251719
	Total			**17387229**		**38783540**	**38125896**

(Table 7 Contd...)

STATE	Name of Crop	Unit	Before SC work	After SC work	Before SC work	After SC work	Value at constant price
			Quantity	Value	Quantity	Value	
1	2	3	4	5	6	7	8
KERALA	Coconut	Nos.	1222036	5099277	1507839	10180088	8266674
	Arecanut	Nos.	2021015	1166955	2589391	2589391	2021015
	Cashew	Quintal	39.96	112141	47.91	287633	241064
	Pepper(Garbled)	Quintal	57.56	619374	80.38	2571088	1839744
	Rubber	Quintal	4334.24	36072574	4835.41	91999520	82410743
	Jack	Quintal	93.10	12530	109.41	48811	39755
	Mango	Quintal	641.98	447192	768.16	1599886	1339370
	Coffee	Quintal	7.55	16331	9.38	55201	44432
	Coco	Quintal	16.50	23347	30.82	109153	58392
	Tamarind	Quintal	0.39	1107	0.63	4677	3036
	Cardamom	Quintal	0.20	6893	0.53	33468	12629
	Total			**43577721**		**109478916**	**96276854**

Table – 8 – Crop wise yield and Value of Seasonal crops in scheme area.

District	Name of Crop	Unit	Before SC work		After SC work		
			Quantity	Value	Quantity	Value	Value at constant price
1	2	3	4	5	6	7	8
Thiruvananthapuram	Tapioca	Quintal	80.24	32733	117.30	112372	76869
	Plantain	Quintal	104.52	86332	150.48	169303	117594
	Total			**119065**		**281675**	**194463**
Kollam	Tapioca	Quintal	15.82	5820	22.26	19167	13622
	Ginger	Quintal	0.88	916	1.11	2682	2126
	Plantain	Quintal	16.23	11962	19.20	22468	18992
	Chenai	Quintal	3.86	2222	5.95	9278	6019
	Colocasia	Quintal	0.64	709	1.20	3271	1745
	Total			**21629**		**56866**	**42504**
Pathanamthitta	Tapioca	Quintal	59.20	29898	57.30	64003	66125
	Plantain	Quintal	7.35	5342	11.84	10918	6778
	Banana	Quintal	0.25	386	0.30	764	637
	Total			**35626**		**75685**	**73540**
Alappuzha	Plantain	Quintal	2.42	1692	3.51	3583	2470
	Chenai	Quintal	0.00	0	0.08	163	0
	Total			**1692**		**3746**	**2470**
Kottayam	Tapioca	Quintal	10.75	5645	24.00	24384	10922
	Total			**5645**		**24384**	**10922**
Idukki	Tapioca	Quintal	19.20	10675	42.90	42043	18816
	Banana	Quintal	36.23	41670	73.00	168053	83405
	Total			**52345**		**210096**	**102221**
Eranakulam	Paddy	Quintal	9.60	6509	10.08	12822	12211
	Plantain	Quintal	4.44	3089	5.26	5192	4383
	Banana	Quintal	4.23	5320	5.36	13400	10575
	Total			**14918**		**31414**	**27169**
Thrissur	Paddy	Quintal	1287.61	878151	1719.65	1743733	1305642
	Total			**878151**		**1743733**	**1305642**

Table – 8 Contd...

1	2	3	4	5	6	7	8
Palakkad	Paddy	Quintal	549.00	378263	647.60	787481	667583
	Ginger	Quintal	6.50	4882	7.50	12473	10810
	Banana	Quintal	52.50	58433	57.00	104310	96075
	Colocasia	Quintal	7.00	5894	9.00	13491	10493
	Turmeric	Quintal	7.00	15400	7.50	10080	9408
	Total			**462872**		**927835**	**794369**
Malappuram	Paddy	Quintal	15.00	9765	0.00	0	14055
	Tapioca	Quintal	74.70	33989	90.27	64905	53710
	Ginger	Quintal	2.50	1887	3.42	5808	4246
	Plantain	Quintal	59.21	42751	79.46	86769	64656
	Total			**88392**		**157482**	**136667**
Kozhikkode	Tapioca	Quintal	63.47	34723	582.72	537268	58519
	Ginger	Quintal	5.20	4343	78.40	96117	6375
	Plantain	Quintal	23.29	20246	88.77	93030	24408
	Banana	Quintal	4.66	6305	17.00	36738	10071
	Total			**65617**		**763153**	**99373**
Kannur	Tapioca	Quintal	10.00	5660	12.50	13663	10930
	Plantain	Quintal	14.55	12006	19.22	20970	15875
	Banana	Quintal	39.95	53653	45.50	115434	101354
	Total			**71319**		**150067**	**128159**
Kasaragod	Tapioca	Quintal	345.20	203668	358.00	384852	371092
	Ginger	Quintal	8.00	33600	8.00	18832	18832
	Plantain	Quintal	180.00	147960	185.00	256780	249840
	Banana	Quintal	56.00	78904	57.50	161000	156800
	Total			**464132**		**821464**	**796564**

Table – 8 Contd..

STATE	Name of Crop	Unit	Before SC work		After SC work		
			Quantity	Value	Quantity	Value	Value at constant price
1	2	3	4	5	6	7	8
KERALA	Paddy	Quintal	1861.21	1272688	2377.33	2544036	1999491
	Tapioca	Quintal	678.58	362811	1307.25	1262657	680605
	Ginger	Quintal	23.08	45628	98.43	135912	42389
	Plantain	Quintal	412.01	331380	562.74	669013	504996
	Banana	Quintal	193.82	244671	255.66	599699	458917
	Chenai	Quintal	3.86	2222	6.03	9441	6019
	Kolacasia	Quintal	7.64	6603	10.20	16762	12238
	Turmeric	Quintal	7.00	15400	7.50	10080	9408
	Total			**2281403**		**5247600**	**3714063**

Table 9

Quantity and Value of Selected perennial and seasonal crops for the years 2012-13

	Name of Crops	Units	Before SC Work		After SC Work		Value at constant Price
			Quantity	Values (Rs)	Quantity	Value (Rs)	
1	2	3	4	5	6	7	8
A. Perennial Crops	Coconut	Nos.	1222036	5099277	1507839	10180088	8266674
	Arecanut	Nos.	2021015	1166955	2589391	2589391	2021015
	Cashew	Quintal	39.96	112141	47.91	287633	241064
	Pepper(Garbled)	Quintal	57.56	619374	80.38	2571088	1839744
	Rubber	Quintal	4334.24	36072574	4835.41	91999520	82410743
	Jack	Quintal	93.10	12530	109.41	48811	39755
	Mango	Quintal	641.98	447192	768.16	1599886	1339370
	Coffee	Quintal	7.55	16331	9.38	55201	44432
	Cocoa	Quintal	16.50	23347	30.82	109153	58392
	Tamarind	Quintal	0.39	1107	0.63	4677	3036
	Cardamom	Quintal	0.20	6893	0.53	33468	12629
	Total(A)			**43577721**		**109478916**	**96276854**
B. Seasonal Crops	Paddy	Quintal	1861.21	1272688	2377.33	2544036	1999491
	Tapioca	Quintal	678.58	362811	1307.25	1262657	680605
	Ginger	Quintal	23.08	45628	98.43	135912	42389
	Plantain	Quintal	412.01	331380	562.74	669013	504996
	Banana	Quintal	193.82	244671	255.66	599699	458917
	Chenai	Quintal	3.86	2222	6.03	9441	6019
	Colocasia	Quintal	7.64	6603	10.20	16762	12238
	Turmeric	Quintal	7.00	15400	7.50	10080	9408
	Total			**2281403**		**5247600**	**3714063**
	All Crops (A+B)			**45859124**		**114726516**	**99990917**

2.2. Cost Benefit Analysis of the Soil Conservation Programmes

An important objective of a project evaluation is to estimate various impacts of its operation such as income, employment, demographic change, regional development and so on. Hence an analysis to appraise the performance of operating investment projects is essential for improved planning process. Degradation of land due to soil erosion leads to destruction of agricultural land. If it continues over a period, the entire soil will be lost and the land will become barren and unproductive. In the case of sloppy regions, soil erosion depletes the fertility of the soil and production and degradation of the area under agriculture is to be assessed in terms of production and protection benefits accrued from these areas. These benefits are to be compared further with the investments to arrive at benefit cost ratio, which gives an indication of viability of the programme implemented.

Productive benefits are the direct returns from the programmes implemented. In regular agricultural lands, increase in the yield provides the productive benefits. In addition, production from degraded land, which are cultivated after the soil conservation measures are also taken into consideration.

Protective benefits are the intangible benefits derived from implementation of soil conservation programme. These benefits are more stable and provide base for the continued prosperity in the area. In the case of agricultural land, protective benefits are assessed in terms of these increased values because of the prevention of further soil erosion and its increased productive potentialities.

In the light of the present study an attempt is made for cost benefit analysis with the collected data. Total cost incurred for the soil conservation works, including maintenance work for the 43 schemes is Rs.43226661/-

The total area under cultivation after soil conservation work was 1393.55 acres. The value of crops before the soil conservation programme comes to Rs.45859124. The value of crops after the implementation of soil conservation programme has also been calculated as Rs. 114726516/- Thus the additional benefits due to the implementation of soil conservation programme is worked out to be Rs.68867392/-. It is estimated that the value at constant price as Rs. 99990917/- .

Several benefits flow from the soil conservation programme implementation, three of them, which derive special attention are taken up for consideration.

They are:

(i) Extension of area under cultivation

(ii) Increase in productivity

(iii) Diversification of cropping pattern

(i) Extension of area under cultivation

The study revealed that 37.66 acres of land has been additionally brought under cultivation by cultivating areas which were not cultivated before soil conservation programme. This benefit is achieved only due to the implementation of soil conservation programme.

(ii) Increase in Productivity

Productivity also increased due to the implementation of soil conservation programme. In the case of coconut, it is recorded 23.39%, Arecanut 28.12%, Cashew 19.89%, Pepper 39.65%, Cardamom 165%, Rubber 11.56%, Plantain 36.41%...

(iii) Diversification of cropping pattern

Soil Conservation Programmes increased the soil capacity and which facilitates the cultivation of more remunerative crops. This advantage can be reaped in full, only if the conservation programmes are followed properly, i.e. the dissemination of new techniques of production, adequate provision of inputs and service which will promote the land to improve production.

In the scheme area, cultivation of perennial crops has shown encouraging performance. The increase in area of perennial crops is higher over the area under same before soil conservation programme (5.85%). Growing of perennial crops will accelerate conservation of soil more affectively.

Occupational Profile

The occupational profile of the selected beneficiaries reveals that 36.91% included agriculture job, 36.26% are accounted as non-agriculture; 13.06% agricultural labourers and 13.77% are categorized as non-agricultural labourers. Details are presented in Table No. 14 and 14 (a).

Table 10 - Total Income, expenditure and Net Income of Scheme area (Rs)

Sl No	Name of District	Income (Rs)		Expenditure (Rs)		Net Income (Rs)	
		Before SC work	After SC work	Before SC work	After SC work	Before SC work	After SC work
1	2	3	4	5	6	7	8
1	Thiruvananthapuram	244327	599924	110660	184420	133667	415504
2	Kollam	2051030	6126609	528460	990527	1522570	5136082
3	Pathanamthitta	1072506	3590633	512450	1107115	560056	2483518
4	Alappuzha	36366	108884	16500	63930	19866	44954
5	Kottayam	5337206	15108846	2608133	6326392	2729073	8782454
6	Idukki	1099558	3002934	665630	1340040	433928	1662894
7	Eranakulam	6541519	16047934	1222865	4371728	5318654	11676206
8	Thrissur	878151	1743733	788700	1541050	89451	202683
9	Palakkad	3507614	7949913	711065	1408395	2796549	6541518
10	Malappuram	4773373	12014775	3182470	3703915	1590903	8310860
11	Kozhikkode	991852	6417321	502675	3774900	489177	2642421
12	Kannur	1474261	2410006	725800	1579940	748461	830066
13	Kasaragod	17851361	39605004	5580184	9114500	12271177	30490504
State		**45859124**	**114726516**	**17155592**	**35506852**	**28703532**	**79219664**

Table 10 (a) - Income, Expenditure and Net Income of Control Plots (Rs)

Sl No	Name of District	Income	Expenditure	Net Income
1	2	3	4	5
1	Thiruvananthapuram	247759	163450	84309
2	Kollam	27757	18364	9393
3	Pathanamthitta	1559271	353400	1205871
4	Alappuzha	28991	22650	6341
5	Kottayam	219977	202600	17377
6	Idukki	621674	234915	386759
7	Eranakulam	2163065	617100	1545965
8	Thrissur	337966	299500	38466
9	Palakkad	2730622	433500	2297122
10	Malappuram	2143204	888281	1254923
11	Kozhikkode	792669	471750	320919
12	Kannur	618535	338796	279739
13	Kasaragod	423514	141700	281814
State		**11915004**	**4186006**	**7728998**

Table 11 – Income per Acre before and after soil conservation programme

(Income in Rs)

Sl No	Name of District	Before SC work			After SC work		
		Area in acre	Net Income	Net Income per acre	Area in acre	Net Income	Net Income per acre
			(Rs)	(Rs)		(Rs)	(Rs)
1	2	3	4	5	6	7	8
1	Thiruvananthapuram	9.54	133667	14011	9.54	415504	43554
2	Kollam	39.26	1522570	38782	39.26	5136082	130822
3	Pathanamthitta	30.37	560056	18441	30.37	2483518	81775
4	Alappuzha	4.96	19866	4005	4.94	44954	9100
5	Kottayam	195.89	2729073	13932	196.29	8782454	44742
6	Idukki	56.51	433928	7679	56.61	1662894	29375
7	Eranakulam	169.72	5318654	31338	169.72	11676206	68797
8	Thrissur	131.50	89451	680	156.43	202683	1296
9	Palakkad	160.50	2796549	17424	160.50	6541518	40757
10	Malappuram	101.25	1590903	15713	102.06	8310860	81431
11	Kozhikkode	132.82	489177	3683	129.26	2642421	20443
12	Kannur	52.59	748461	14232	52.59	830066	15784
12	Kasaragod	270.98	12271177	45284	285.98	30490504	106618
State		**1355.89**	**28703532**	**21170**	**1393.55**	**79219664**	**56847**

Table 11 (a) - Income per acre in the Control Plots

Sl No	Name of District	Area in acre	Net Income (Rs)	Net Income per acre
1	***2***	***3***	***4***	***5***
1	Thiruvananthapuram	11.06	84309	7623
2	Kollam	0.94	9393	9993
3	Pathanamthitta	15.20	1205871	79334
4	Alappuzha	1.94	6341	3269
5	Kottayam	14.30	17377	1215
6	Idukki	10.89	386759	35515
7	Eranakulam	23.53	1545965	65702
8	Thrissur	32.94	38466	1168
9	Palakkad	51.51	2297122	44596
10	Malappuram	17.32	1254923	72455
11	Kozhikkode	28.20	320919	11380
12	Kannur	13.39	279739	20892
13	Kasaragod	10.15	281814	27765
State		**231.37**	**7728998**	**33405**

Chapter III

3.1 General Observations

During the survey period the staff of this department has visited all the beneficiary plots.

The distribution of holdings of the selected beneficiaries of the soil conservation programmes reveals that 63.87% of the beneficiary holding belongs to less than one acre, 30.64% have holding area between one acre to 3 acres. And above 3 acre were 3.81%, up to 5 acres were 1.68% respectively.

The opinion of selected beneficiaries is collected. Out of this, 21.53% of the beneficiaries reported that contour bunds effectively controlled soil erosion while about 76.79% rests in the opinion that it moderately controlled soil erosion. The remaining 1.68% is of the opinion that it has no effect.

About the fertility of the soil 10.15% are of the view that the conservation measures have improved the fertility of the soil remarkably while 87.59% reported that the fertility of the soil has improved moderately and 2.26% opinioned that it has no effect on the fertility of the soil.

Similarly regarding the moisture retention 6.79% reported that the scheme has substantially increased moisture retention while 90.30% reported that the scheme has caused moisture retention moderately only. 2.91% are of no effect. Details are presented in Table No. 12

Table 12
Opinion of cultivators about of Effectiveness of bunds, Fertility of the soil and Moisture retention of scheme area

Sl No	Name of District	Effectiveness of contour bunds			Fertility of soil			Moisture retention			
		Effectively controlled	Moderately controlled	No effect	Remarkably controlled	Moderately controlled	No effect	Substantially controlled	Moderately controlled	No effect	Total
1	2	3	4	5	6	7	8	9	10	11	12
1	Thiruvananthapuram	3	122	0	0	125	0	1	124	0	125
2	Kollam	10	112	3	3	122	0	1	124	0	125
3	Pathanamthitta	1	124	0	1	124	0	1	124	0	125
4	Alappuzha	8	104	13	1	100	24	0	102	23	125
5	Kottayam	50	75	0	47	78	0	12	111	2	125
6	Idukki	20	101	4	0	119	6	0	115	10	125
7	Ernakulam	0	125	0	0	125	0	0	125	0	125
8	Thrissur	92	33	0	21	104	0	18	107	0	125
9	Palakkad	85	39	1	64	60	1	63	61	1	125
10	Malappuram	4	121	0	0	125	0	0	125	0	125
11	Kozhikkode	31	91	3	4	118	3	3	116	6	125
12	Kannur	18	28	1	11	36	0	4	43	0	47
13	Kasaragod	11	113	1	5	119	1	2	120	3	125
State		**333**	**1188**	**26**	**157**	**1355**	**35**	**105**	**1397**	**45**	**1547**

Table 13

Conditions of Bund

(Scheme Area)

Sl	Name of District	Good	Partially	Seriously	Total
1	2	3	4	5	6
1	Thiruvananthapuram	0	125		125
2	Kollam	111	14		125
3	Pathanamthitta	124	1		125
4	Alappuzha	125	0		125
5	Kottayam	100	25		125
6	Idukki	107	18		125
7	Ernakulam	38	87		125
8	Thrissur	123	2		125
9	Palakkad	119	5	1	125
10	Malappuram	36	89		125
11	Kozhikkode	107	16	2	125
12	Kannur	42	5		47
13	Kasaragod	110	15		125
State		**1142**	**402**	**3**	**1547**

Table 14

Occupational profile

(Scheme Area)

Sl No	Name of District	Occupation				
		Agriculture	Non-agriculture	Agricultural Labours	Non-agriculture labourers	Total
1	2	3	4	5	6	7
1	Thiruvananthapuram	0	51	2	72	125
2	Kollam	79	21	8	17	125
3	Pathanamthitta	93	20	9	3	125
4	Alappuzha	1	16	57	51	125
5	Kottayam	56	59	9	1	125
6	Idukki	33	41	29	22	125
7	Ernakulam	21	67	19	18	125
8	Thrissur	17	107	0	1	125
9	Palakkad	99	0	22	4	125
10	Malappuram	11	97	5	12	125
11	Kozhikkode	45	44	32	4	125
12	Kannur	22	11	8	6	47
13	Kasaragod	94	27	2	2	125
State		**571**	**561**	**202**	**213**	**1547**

Table 14 (a)

Occupational profile (Control Plots)

Sl No	Name of District	Occupation				
		Agriculture	Non-agriculture	Agriculture labourers	Non-agriculture labourers	Total
1	2	3	4	5	6	7
1	Thiruvananthapuram	0	17	0	8	25
2	Kollam	11	2	1	1	15
3	Pathanamthitta	21	3	1	0	25
4	Alappuzha	0	7	9	9	25
5	Kottayam	2	8	0	0	10
6	Idukki	14	10	1	0	25
7	Ernakulam	1	9	3	2	15
8	Thrissur	3	22	0	0	25
9	Palakkad	18	2	5	0	25
10	Malappuram	4	15	0	6	25
11	Kozhikkode	8	12	5	0	25
12	Kannur	8	1	1	0	10
13	Kasaragod	3	1	0	1	5
Total		**93**	**109**	**26**	**27**	**255**

One important finding of this study is that the concept of watershed management has been well recognized in the scheme area. Watershed management implies the wise use of soil, water and bio-resources in a watershed to obtain optimum production with minimum disturbance to the environment. Through this water and soil can be conserved since both of them are interdependent. The overall objective of watershed programme includes recognition of watershed as a basic unit for judicious utilization and development of all lands. The land is to be treated according to the capability and requirement by adopting suitable methods that will control soil erosion, conserve water, improve farm income, control flood and droughts, etc.

There are a number of direct and indirect outcome of the project that can be associated with the impact of watershed development project. These include raising rain fed agricultural productivity changes in land use pattern, etc.

Conditions of Bund

While examining the condition of bund the study revealed that 73.81% are in good condition 26% are partially damaged and 0.19% is seriously damaged. District wise statement is given in Table No. 13.

Summary of Findings

The data furnished in this report are collected through the Evaluation study on soil conservation programmes conducted during 2012-13. The entire districts except Wayanad were covered in this study. In Wayanad the study is directly done by the Central Government. The methodology of this study was stratified sampling method on the basis of the area of the holding. For the study purpose schemes implemented by the Soil Conservation Department and other Local Self Government were included. For the purpose of comparison control plots are also selected from the scheme area where the soil conservation works are not carried out under any scheme. In the light of the present study, an attempt is made for the cost benefit analysis with the collected data. Several benefits flow from the soil conservation programme implementation. Some of the findings of the study are given below:

For the study purpose 43 schemes were selected. The total number of beneficiaries comes to 1785. Out of this 1547 number of beneficiaries were selected for the detailed study. Land use particulars of beneficiary plots give us certain positive trends while comparing with the area before and after the soil conservation programme. The study revealed that 37.66 acres of land has been additionally brought under cultivation by cultivating area which was under the fallow land.

There is an increasing awareness of the importance of the soil conservation programme especially watershed management programme among the people in the scheme area. Besides Soil Conservation Department, Local Self Government also activated various programmes in this direction. WGDP, RIDF, TSP programmes are included under study. Tribal colonies also enjoyed benefits.

Income and Expenditure

The particulars relating to income and expenditure of beneficiary plots reveals that after implementation of SC programme net income of the beneficiaries of the scheme area increased to 175.99%. It is estimated that the percentage increase of net income per acre in beneficiary plots of the scheme area as 168.53%

Analysis of data collected from the beneficiary and control plots reveals that the net income per acre, received from the beneficiary plot is Rs.56847/- and from the control plot is Rs.33405/- The district wise details are presented in Table No. 11 and 11 (a). The higher rate of income from the scheme area is due to the positive impact of soil conservation programme.

While analyzing the production details of various crops, it is revealed that an increase 11.56% recorded in the case of Rubber. Production of Coconut also increased 23.38% whereas the increase of area was 10.43 acres. Likewise in Rubber, production area increase is recorded as 37.38 acres. The area of Jack increases 3.36 acres.

Cost benefit analysis of the collected data reveals that 159% of the cost of soil conservation programme has benefited in the year under study itself.

Table 15

Cropping Intensity in Scheme area

Sl.No	District	Net area cultivated		Total Gross Area Cropped		Intensity of Cropping (%)	
		Before SC Work	After SC work	Before SC work	After SC work	Before SC work	After work
1	2	3	4	5	6	7	8
01	Thiruvananthapuram	9.54	9.54	10.84	13.1	113.62	137.31
2	Kollam	39.26	39.26	45.89	46.66	116.89	118.84
3	Pathanamthitta	30.37	30.37	33.93	34.16	111.72	112.48
4	Alappuzha	4.96	4.94	5.62	9.51	113.30	192.51
5	Kottayam	195.89	196.29	189.14	189.35	96.56	96.46
6	Idukki	56.51	56.61	54.16	66.02	95.84	116.62
7	Ernakulam	169.72	169.72	123	126.22	72.48	74.36
7	Thrissur	131.50	156.43	131.70	156.63	100.15	100.13
8	Palakkad	160.50	160.50	110.98	113.05	69.15	70.44
9	Malappuram	101.25	102.06	101.89	112.82	100.63	110.54
10	Kozhikkode	132.82	129.26	123.45	145.42	92.94	112.49
12	Kannur	52.59	52.59	54.14	57.43	102.95	109.20
13	Kasaragod	270.98	285.98	260.07	276.44	95.97	96.66
State		**1355.89**	**1393.55**	**1244.81**	**1346.81**	**91.81**	**96.65**

Cropping Intensity

Productivity of the land to a certain extent influenced the cropping pattern of a locality. Through this study, it is seen that, the cropping intensity of the scheme is increased from 91.81% to 96.65%. District wise details are presented in table No.15.

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