GOVERNMENT OF KERALA

Evaluation Study on Soil Conservation in Kerala 2005-06

Department of Economics & Statistics
Thiruvananthapuram
2007

Government of Kerala

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PREFACE

The geographical peculiarity of Kerala with its ghats section in the East sloping towards the West with its extensive sea coast and heavy monsoon causes tremendous erosion of its surface soil and fertility. Western Ghats give rise to important rivers of peninsular India including Godavari, Krishna, Kaveri, Periyar, etc. The Nilgiris Biosphere Reserve (NBR), one of the13 biosphere reserves of the country is located in the Western Ghats, spread over an area of 5520 sq.km. covering the Southern States of Tamil Nadu, Kerala and Karnataka. The Western Ghats region is endowed with one of the rich flora and fauna and has a unique biodiversity. Arecanut, Coconut, Mango, Jackfruit , Tea, Coffee, Rubber, Cashew, Tapioca, etc. are the important horticultural/plantation crops of the region. This region is affected by soil erosion, land slides, loss of productivity and rapid loss of habitat and genetic diversity. Hence Government is implementing various soil conservation measures through Soil Conservation Department and Local Self Governments in order to maintain the fertility and moisture content of the surface soil. Every year crores of rupees have been spent to implement various schemes

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 50 schemes completed by the Soil Conservation Department and various agencies. The field survey was conducted during the agricultural year 2005-06. 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 and Agricultural Geologists and others interested in the subject.

The tabulation and consolidation of data were done in the Evaluation Division of this Directorate. The Report of the survey has been prepared by Dr. T Bhavana, Deputy Director, under the guidance of Sri. S. Rajendran, Additional Director. In this context I acknowledge my thanks to the staff of Soil Conservation Department and other local bodies for their valuable suggestion and whole hearted co-operation in the successful conduct of the survey. The computer support extended by Sri. S. Saseendran, U.D. Typist is also acknowledged

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Thiruvananthapuram,
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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 of the Survey:-

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 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 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 in to 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

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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	1	71	45.69	54	61.61	-	-	-	-	125	107.30
2	Kollam	2	51	15.9	74	109.51	-	-	-	-	125	125.41
3	Pathanamthitta	11	125	38.37	-	-	-	-	-	-	125	38.37
4	Alappuzha	7	83	29.56	42	58.94	3	10.73	-	-	128	99.23
5	Kottayam	4	55	29.95	70	127.49	-	-	-	-	125	157.44
6	Idukki	3	51	28.50	68	102.18	6	25.07	-	-	125	155.65
7	Eranakulam	4	111	44.41	14	21.41	-	-	-	-	125	65.82
8	Thrissur	3	29	11.15	95	151.18	-	-	1	5.00	125	167.33
9	Palakkad	5	40	23.42	54	99.41	22	81.66	9	90.62	125	295.11
10	Malappuram	3	74	32.26	43	66.30	7	28.66	1	5.92	125	133.14
11	Kozhikode	4	51	25.52	70	125.59	4	25.82	-	-	125	176.93
12	Kannur	2	36	22.53	86	141.77	1	3.80	3	18.9	12.5	187.00
13	Kasaragod	1	30	19.4	89	160.08	6	20.79	-	-	125	200.27
Total		**50**	**807**	**366.56**	**759**	**1225.47**	**49**	**196.53**	**14**	**120.44**	**1628**	**1909.03**

TABLE I (a)

Statement showing stratum wise distribution of selected Control Plots

(Area in acres)

Sl. No.	Districts	No. of control plots 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	Thiruvanan-thapuram	1	23	5.54	2	3.25	-	-	-	-	25	8.79
2	Kollam	2	6	2.59	6	10.15	-	-	-	-	12	12.74
3	Pathanamthitta	11	55	12.80	-	-	-	-	-	-	55	12.8
4	Alappuzha	7	34	6.17	1	1.00	-	-	-	-	35	7.17
5	Kottayam	4	8	5.75	12	25.17	-	-	-	-	20	30.92
6	Idukki	3	10	5.07	14	18.55	1	4.00	-	-	25	27.62
7	Eranakulam	4	18	7.07	2	2.65	-	-	-	-	20	9.72
8	Thrissur	3	14	5.45	-	-	1	3.50	-	-	15	8.95
9	Palakkad	5	9	4.15	11	20.22	5	19.3	-	-	25	43.67
10	Malappuram	3	14	4.725	9	14.91	1	3.20	1	5.42	25	28.255
11	Kozhikode	4	12	5.15	13	17.89	-	-	-	-	25	23.04
12	Kannur	2	20	10.35	5	7.50	-	-	-	-	25	17.85
13	Kasaragod	1	1	0.75	3	4.68	1	3.35	-	-	25	8.78
Total		**50**	**224**	**75.565**	**78**	**125.97**	**9**	**33.35**	**1**	**5.42**	**312**	**240.302**

The total number of beneficiaries comes to 1628. About 50% of the beneficiaries are having holding less than one acre and 46% are having holdings one acre and above only 1% 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 71%, 25%, 2% and 2% respectively under stratum I and II.

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

1.3 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 led 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 16.3 t/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 gift 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 are more prone is erosion. The different forms of soil erosion causes huge damage to Kerala is economy every year. Many people die every year due to land slides.

1.4 Methods of Soil Conservation Programme

Soil Conservation practices are mainly grouped into two categories viz. Agronomical and Engineering measures. Agronomic 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 charge in the land use of the state over the years. On many occasions the charge is adversely affecting the environment by w. y of intensified soil erosion, water logging, conservation 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 leave dangerous quantities of the residues in the soil and the water sources.

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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 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 1733.56 acres to 1757.21 acre after the implementation of soil conservation programme. An additional area of 23.65 acre of

land has brought under cultivation which was not cultivated earlier. Hence it can bestated that 1.36% 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 90.81% to 92.05 by decreasing the current fallow.

On examining the district wise data a remarkable increase is noted in the area additionally brought under cultivation in Idukki district. In this district the percentage increase in area under cultivations is recorded as 28.64%. In Palakkad district the respective change is recorded as 1.62%

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	107.30	11,65,876	125	125
2	Kollam	125.41	17,25,250	131	125
3	Pathanamthitta	38.37	9,67,220	125	125
4	Alappuzha	99.23	15,35,925	128	128
5	Kottayam	157.44	12,70,895	198	125
6	Idukki	155.65	16,93,274	125	125
7	Eranakulam	65.82	53,85,243	380	125
8	Thrissur	167.33	20,98,547	125	125
9	Palakkad	295.11	924209	471	125
10	Malappuram	133.14	488098	505	125
11	Kozhikkode	176.93	1056009	351	125
12	Kannur	187	14,90,642	125	125
13	Kasaragod	200.27	11,03,279	125	125
Total		**1909.03**	**20904467**	**2914**	**1628**

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	99.32	92.56	99.49	92.72	3.52	3.28	3.35	3.12
2	Kollam	112.32	89.56	112.61	89.79	0.10	0.08	0.10	0.08
3	Pathanamthitta	26.02	67.81	13.22	34.45	10.19	26.56	22.78	59.37
4	Alappuzha	98.20	98.93	97.90	98.62	11.98	12.07	11.68	11.77
5	Kottayam	150.84	95.81	150.86	95.82	0.01	0.01	0.01	0.01
6	Idukki	106.68	68.54	137.23	88.17	41.36	26.57	10.72	6.89
7	Eranakulam	62.06	96.98	62.06	96.98	0.56	1.61	0.40	1.15
8	Thrissur	159.71	95.45	159.71	95.45	-	-	-	-
9	Palakkad	260.50	88.27	264.73	89.71	17.66	5.98	14.45	4.90
10	Malappuram	112.35	84.38	113.54	85.28	6.97	5.24	5.04	3.79
11	Kozhikode	166.76	94.25	167.06	94.42	2.00	1.13	1.70	0.96
12	Kannur	186.86	99.93	186.86	99.93	5.10	2.73	5.10	2.73
13	Kasaragod	191.94	95.84	191.94	95.84	0.19	0.09	0.19	0.09
Total		**1733.56**	**90.81**	**1757.21**	**92.05**	**99.64**	**5.22**	**75.52**	**3.96**

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	2.82	2.63	2.82	2.63	1.64	1.53	1.64	1.53	107.30	100	107.30	100
2	Kollam	10.02	7.99	9.73	7.76	2.97	2.37	2.97	2.37	125.41	100	125.41	100
3	Pathanamthitta	2.16	5.63	2.36	6.15	-	-	-	-	38.37	100	38.37	100
4	Alappuzha	1.01	1.02	1.31	1.32	-	-	-	-	99.26	100	99.26	100
5	Kottayam	6.48	4.12	6.48	4.12	0.11	0.06	0.09	0.06	157.44	100	157.44	100
6	Idukki	5.01	3.22	5.35	3.44	2.60	1.67	2.35	1.51	155.65	100	155.65	100
7	Eranakulam	3.76	6.03	3.76	6.03	-	-	-	-	65.82	100	65.82	100
8	Thrissur	6.62	3.96	6.62	3.96	1.00	0.59	1.00	0.59	167.33	100	167.33	100
9	Palakkad	2.29	0.78	1.15	0.39	14.66	4.97	14.78	5.01	295.11	100	295.11	100
10	Malappuram	8.51	6.39	9.09	6.83	5.31	3.99	5.47	4.11	133.14	100	133.14	100
11	Kozhikkode	3.48	1.97	3.48	1.97	4.69	2.65	4.69	2.65	176.93	100	176.93	100
12	Kannur	0.74	0.39	0.74	0.39	0.30	0.16	0.30	0.16	187	100	187	100
13	Kasaragod	728	364	728	364	0.86	0.43	0.86	0.43	200.27	100	200.27	100
Total		**60.18**	**3.15**	**60.17**	**3.15**	**34.14**	**1.79**	**34.15**	**1.79**	1927.52 diff. 18.49	**100**	1927.05 diff. 18.02	100

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

(Area in Acres)

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	7.24	82.37	0.32	3.64	0.56	6.37	0.67	7.62	8.79	100
2	Kollam	1.20	9.42	-	-	1.05	8.24	10.59	83.12	12.84	100
3	Pathanamthitta	9.29	72.69	0.88	6.89	2.63	20.58	0.02	0.16	12.78	100
4	Alappuzha	5.27	81.71	0.26	4.03	0.92	14.26	-	-	6.45	100
5	Kottayam	29.84	96.51	-	-	1.08	3.49	-	-	30.92	100
6	Idukki	22.68	77.67	5.68	19.45	0.84	2.88	-	-	29.2	100
7	Eranakulam	9.38	98.41	-	-	0.34	9.37	-	-	9.72	100
8	Thrissur	8.11	90.61	-	-	0.84	9.39	-	-	8.95	100
9	Palakkad	34.68	79.41	1.10	2.52	1.62	3.71	7.35	16.83	43.67	100
10	Malappuram	24.915	88.18	1.50	5.31	1.45	5.13	0.39	1.38	28.255	100
11	Kozhikkode	21.42	92.97	-	-	1.06	4.60	0.56	2.43	23.04	100
12	Kannur	17.3	96.92	-	-	0.55	3.08	-	-	17.85	100
13	Kasaragod	8.22	93.62	-	-	0.56	6.38	-	-	8.78	100
Total		**199.545**	**82.714**	**9.74**	**4.037**	**13.50**	**5.595**	**19.58**	**8.116**	**240.302** diff. 0.943	**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 1352.47 acre to 1450.89 acre. It showed an increase of 7.28%. At the same time the percentage change occurred in the cultivation of seasonal crops

recorded as 4.28%. At the same of seasonal crops recorded as 4.28%. 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 banana and tapioca are exhibited increases. The respective percentage charges are recorded as 113.46% and 23.38%. The plantain cultivation percentage increase recorded as 39.63% At the same time in paddy cultivation percentage variation is in a negative trend. It is recorded as –14.53%. In perennial crops the only crop which shows a negative trend in pepper (-7.01%). All other crops have shown an increasing trend.

Table No. 5 reveals that after the introduction of soil conservation programmes, coconut has occupied the largest area under perennial crops; the percentage increase is 11.70%. Arecanut comes next with an increase of 9.52%. The area under pepper has decreased to 7.01% 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	98.00	99.87	103.38	99.09	0.13	0.13	0.94	0.90
2	Kollam	101.05	96.91	101.14	96.37	3.22	3.09	3.81	3.63
3	Pathanamthitta	8.833	32.09	11.469	72.41	18.69	67.91	4.37	27.59
4	Alappuzha	4.594	5.41	5.36	6.95	80.391	94.59	71.732	93.04
5	Kottayam	147.48	94.61	159.94	94.84	8.40	5.39	8.71	5.16
6	Idukki	112.35	97.71	123.29	97.49	2.63	2.29	3.18	2.51
7	Eranakulam	38.54	25.52	41.94	25.41	31.25	74.48	33.12	74.59
8	Thrissur	115.65	99.89	121.17	99.84	0.13	0.11	0.19	0.16
9	Palakkad	143.03	45.02	152.43	44.14	174.67	54.98	192.89	55.86
10	Malappuram	123.06	81.89	133.66	78.10	27.22	18.11	37.48	21.90
11	Kozhikkode	187.29	97.65	196.14	95.67	4.51	2.35	8.88	4.33
12	Kannur	110.70	97.03	128.12	97.02	3.39	2.97	3.93	2.98
13	Kasaragod	161.87	96.42	172.86	96.19	6.01	3.58	6.84	3.81
Total		**1352.447**	**79.04**	**1450.899**	**79.415**	360.641	**21.076**	**376.072**	**20.58**

TABLE – 4 Contd..

Sl. No	Districts	Total Gross area cropped			
		Before SC work	%	After SC work	%
1	2	11	12	13	14
1	Thiruvananthapuram	98.130	100	104.32	100
2	Kollam	104.29	100	104.95	100
3	Pathanamthitta	27.523	100	15.839	100
4	Alappuzha	84.985	100	77.092	100
5	Kottayam	155.88	100	168.65	100
6	Idukki	114.98	100	126.47	100
7	Eranakulam	69.79	100	75.06	100
8	Thrissur	115.78	100	121.36	100
9	Palakkad	317.7	100	345.32	100
10	Malappuram	150.28	100	171.14	100
11	Kozhikode	191.8	100	205.02	100
12	Kannur	114.09	100	132.05	100
13	Kasaragod	167.88	100	179.7	100
Total		**1711.108**	**100**	**1826.971**	**100**

TABLE 5 – Area under selected perennial crops

(Area in acres

Sl. No	Districts	Coconut			Arecanut			Cashew		
		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
1	Thiruvananthapuram	37.73	41.36	9.62	0.22	0.25	13.64	2.36	0.11	(--) 95.34
2	Kollam	16.87	17.10	1.36	0.47	0.47	0.00	0.46	0.46	0.00
3	Pathanamthitta	5.79	7.24	25.04	0.193	0.279	44.56	0.08	0.09	12.50
4	Alappuzha	4.15	4.34	4.58	0.14	0.20	42.86	0.03	0.03	0.00
5	Kottayam	12.08	17.22	42.55	0.81	1.28	58.02	0.50	0.50	0.00
6	Idukki	7.78	7.56	(--) 2.83	2.09	2.93	40.19	-	2.07	-
7	Eranakulam	8.26	8.55	6.95	1.03	1.18	4.12	0.49	0.66	8.67
8	Thrissur	10.04	10.93	8.86	0.28	0.41	46.43	3.12	3.12	0.00
9	Palakkad	55.29	54.57	(--) 1.30	4.45	4.93	10.79	40.80	38.73	(--)5.07
10	Malappuram	83.75	92.35	10.27	11.06	10.24	(--) 7.41	6.99	7.44	6.44
11	Kozhikode	31.23	37.27	19.34	27.37	32.29	17.98	5.93	6.82	15.00
12	Kannur	20.44	25.33	23.92	3.15	4.09	29.84	14.17	22.05	55.61
13	Kasaragod	60.29	71.17	18.05	26.30	26.40	0.38	5.98	5.98	0.00
Total		353.62	394.99	11.698	77.563	84.949	9.522	80.91	88.06	8.836

TABLE – 5 Contd..

Sl. No	Districts	Rubber			Pepper			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	12	13	14	15	16	17	18	19	20	21	22	23
1	Thiruvananthapuram	54.08	57.28	5.92	0.97	1.77	82.47	2.64	2.61	(--) 1.14	98.000	103.38	5.49
2	Kollam	75.57	75.21	(--) 0.48	5.55	5.69	2.52	2.13	2.21	3.76	101.05	101.14	0.09
3	Pathanamthitta	1.66	2.50	50.60	0.18	0.20	11.11	0.93	1.16	24.73	8.83	11.47	29.89
4	Alappuzha	--	--	--	0.04	0.33	725.00	0.234	0.26	11.11	4.594	5.16	12.32
5	Kottayam	124.05	129.02	4.01	5.87	7.69	31.01	4.17	4.23	1.44	147.48	159.94	8.45
6	Idukki	35.32	35.67	0.99	37.03	45.74	23.52	30.13	29.32	(--) 2.69	112.35	123.29	9.74
7	Eranakulam	26.67	28.59	7.19	0.84	1.10	30.95	0.88	1.42	61.36	38.54	41.94	8.82
8	Thrissur	92.16	95.01	3.09	9.80	9.80	0.00	0.25	0.25	0.00	115.65	121.17	4.77
9	Palakkad	27.91	24.46	(--) 12.36	3.70	19.14	417.29	10.88	10.6	(--) 2.57	143.03	152.43	6.57
10	Malappuram	4.98	5.91	18.67	4.79	5.28	10.23	11.49	12.44	8.27	123.06	133.66	8.61
11	Kozhikkode	51.77	68.42	32.16	53.82	15.57	(--) 71.07	17.17	35.77	108.33	187.29	196.14	4.73
12	Kannur	62.42	65.57	5.05	7.91	8.56	8.22	2.61	2.52	(--) 3.45	110.70	128.12	15.74
13	Kasaragod	62.61	62.61	0.00	6.69	6.70	0.15	-	-	-	161.87	172.86	6.79
Total		**619.20**	**650.25**	**5.015**	**137.19**	**127.57**	**(--) 7.01**	**83.514**	**102.79**	**23.08**	**1352.444**	**1450.07**	**7.26**

TABLE 6 – Area under selected seasonal crops

(Area in Acres)

Sl. No	Districts	Paddy			Tapioca			Plantain		
		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
1	Thiruvananthapuram	--	--	--	0.06	0.32	433.33	0.07	0.61	771.43
2	Kollam	--	--	--	1.14	1.21	6.14	1.94	2.46	26.80
3	Pathanamthitta	17.32	0.05	(--) 99.71	0.42	2.23	430.95	0.85	0.96	12.94
4	Alappuzha	80.04	71.5	(--) 10.67	0.18	0.02	(--) 88.89	0.171	0.212	23.98
5	Kottayam	-	--	--	4.84	4.87	0.62	0.97	1.06	9.28
6	Idukki	1.5	0.95	(--) 36.67	0.12	0.08	(--) 33.33	1.01	1.86	84.16
7	Eranakulam	29.82	28.57	(--) 4.32	0.10	0.81	710	1.04	1.45	38.38
8	Thrissur	--	--	--	---	--	--	0.13	0.19	46.15
9	Palakkad	127.51	117.31	(--) 7.99	0.50	0.03	(--) 94	3.41	4.87	42.82
10	Malappuram	4.50	4.50	0.00	9.40	11.30	20.21	0.73	0.98	34.25
11	Kozhikkode	--	--	--	0.33	1.72	421.21	1.36	1.86	36.76
12	Kannur	--	--	--	1.72	0.78	(--) 54.65	0.41	0.64	56.09
13	Kasaragod	--	--	--	0.78	0.80	2.56	2.32	2.97	28.02
Total		**260.89**	**222.82**	**(--) 14.59**	**19.59**	**24.17**	**23.38**	**14.411**	**20.122**	**39.63**

TABLE – 6 Contd..

Sl. No	Districts	Ginger			Banana			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	12	13	14	15	16	17	18	19	20	21	22	23
1	Thiruvananthapuram	--	--	--	--	--	--	--	0.01	--	0.13	0.94	623.08
2	Kollam	0.14	0.14	--	--	--	--	--	--	--	3.22	3.81	18.32
3	Pathanamthitta	0.05	0.10	100.00	--	0.85	--	0.05	0.18	260.00	12.69	4.37	(--) 65.56
4	Alappuzha	--	--	--	--	--	--	--	--	--	80.391	71.732	10.77
5	Kottayam	0.02	0.02	0.00	2.07	2.24	8.21	0.50	0.52	4.00	8.4	8.71	3.69
6	Idukki	-	-	-	-	-	-	-	0.29	--	2.63	3.18	20.91
7	Eranakulam	0.15	0.20		0.14	1.97	1307.14	-	0.12	12	31.25	33.12	6.05
8	Thrissur	-	-	-	-	-	-	-	-	-	0.13	0.19	46.15
9	Palakkad	-	0.78	-	-	1.40	-	43.25	68.5	58.38	174.67	192.89	10.43
10	Malappuram	1.28	2.72	112.5	0.04	0.06	50	11.27	17.92	59.01	27.22	37.48	37.69
11	Kozhikode	1.15	3.90	239.13	-	0.35	-	1.05	1.05	0.00	4.51	8.88	96.90
12	Kannur	0.24	0.24	00	0.84	2.13	153.57	0.18	0.14	(--) 22.22	3.39	3.93	15.93
13	Kasaragod	0.20	0.20	0.00	2.26	2.42	7.08	0.45	0.45	0.00	6.01	6.84	13.81
Total		**3.23**	**8.3**	**156.97**	**5.35**	**11.42**	**113.46**	**56.75**	**89.18**	**57.15**	**354.641**	**376.072**	**6.04**

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 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. All most all perennial crops have also shown a marked improvement.

For example in Idukki district total area before soil conservation works was 114.98 acres. It increases to 126.47 acres after the implementation of soil conservation measures. The increase in area is accounted as 11.49 acres. The percentage increase recorded as 10%. When we analyse the yield of perennial crops in this district it can be seen that production of arecanut, rubber, pepper, etc. increased. Production of coconut also increased even though there was a decrease in area after the implementation of soil conservation works. This may be due to the implementation of soil conservation works.

In Palakkad district before soil conservati0on work the area was 317.7 acres. It increased to 345.32 acres after the implementation of soil conservation work. Increase in area accounted as 27.62 acres. Production impact reveals that output of coconut increased even though there was a nominal decreases (-1.30%) in area. In the case of arecanut and pepper both area and out increased.

In Kannur district total area before soil conservation work was 114.09 acres. It increased to 132.05 acres after the implementation of soil conservation work. It can be seen that due to the implementation of soil conservation work an additional area of 17.96 acres could be brought under cultivation.

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

The production details of seasonal crops of these districts shows that paddy and tapioca area and production decreased. Whereas banana and other plantain, area and production increased.

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.	73422	327603	109059	688860	578030
	Arecanut	Nos.	3433	2593	5614	2306	4154
	Cashew	Qtl.	0.31	1212	0.96	3811	3744
	Pepper	Qtl.	11.61	226200	37.56	247319	770881
	Rubber	Qtl.	526.98	1399515	619.98	3151887	1646047
	Others		--	11730	--	23763	23763
	Total			1968853		4117946	2966619
Kollam	Coconut	Nos.	17758	107023	17411	104862	82702
	Arecanut	Nos.	13125	4597	15710	5502	11468
	Cashew	Qtl.	600	22080	645	26400	214849
	Pepper	Qtl.	599	35940	683	40980	140179
	Rubber	Qtl.	35150	1720191	39742	1944262	1111981
	Others	Qtl	2454	17197	3257	20901	129302
	Total		--	1907028	--	2142907	1690481
Pathanamthitta	Coconut	Nos.	20172	66992	23788	127341	112994
	Arecanut	Nos.	12940	7246	18675	11461	13820
	Cashew	Qtl.	0.11	281	0.44	1860	1138
	Pepper	Qtl.	0.99	4102	1.62	9607	3324
	Rubber	Qtl.	25.6	73431	13.4	94165	39370
	Others			24100		37918	24413
	Total			176152		282352	195059
Alappuzha	Coconut	Nos.	25399	114551	23663	145536	112400
	Arecanut	Nos.	12430	11187	16232	9769	11946
	Cashew	Qtl.	0.42	1050	0.47	1410	1566
	Pepper	Qtl.	0.08	512	0.15	960	3079
	Rubber	Qtl.	--	--	--	--	--
	Others	Qtl	4.95	4628	6.65	6769	5685
	Total			131928		164444	134676
Kottayam	Coconut	Nos.	17360	49044	20666	58478	98164
	Arecanut	Nos.	48270	21724	55895	25153	41363
	Cashew	Qtl.	2.55	5848	2.92	6694	6696
	Pepper	Qtl.	30.63	386890	35.74	495643	451432
	Rubber	Qtl.	1441.1	3875133	1612.05	4335620	4334802
	Others			87644		98126	98126
	Total	Qtl.		4426283		5019714	5030583

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(Table 7 Contd..)

1	2	3	4	5	6	7	8
Idukki	Coconut	Nos.	21355	128130	21940	153580	104215
	Arecanut	Nos.	62250	62790	112950	42652	82454
	Cashew	Qtl.					
	Pepper	Qtl.	29.88	617937	76.38	585791	1567622
	Rubber	Qtl.	153.30	424019	238.05	1268574	666063
	Others	Qtl	39602.98	783269	7732.93	1939699	6012379
	Total	Qtl.	--	2016145	--	3990296	8432733
Ernakulam	Coconut	Nos.	22631	110213	22544	156725	109699
	Arecanut	Nos.	38480	18917	44420	17164	21837
	Cashew	Qtl.	0.43	1432	0.61	1685	2032
	Pepper	Qtl.	5.31	111154	7.81	48032	163487
	Rubber	Qtl.	65.75	183985	75.60	389497	211548
	Others						
	Total			425701		613103	508603
Thrissur	Coconut	Nos.	43366	216830	58594	299817	278322
	Arecanut	Nos.	9970	8741	15000	6675	10950
	Cashew	Qtl.	11.38	41860	18.7	44460	65450
	Pepper	Qtl.	27.32	130372	11.74	79394	240953
	Rubber	Qtl.	2864.18	3209468	3439.67	5190493	3379671
	Others			680		1350	
	Total			3607951		5622189	3975346
Palakkad	Coconut	Nos.	193250	583710	199969	758125	949853
	Arecanut	Nos.	106355	26730	137415	42495	100313
	Cashew	Qtl.	31.11	132334	811.41	127973	104037
	Pepper	Qtl.	6.03	94210	422.26	139480	1040217
	Rubber	Qtl.	204.2	588135	155.95	859820	859820
	Others	Qtl.	5188.77	129560	8732.79	213899	845231
	Total			1554679		2141792	3899471
Malappuram	Coconut	Nos.	398188	1433466	470403	2217790	2234415
	Arecanut	Nos.	1735156	849680	886243	1027204	655820
	Cashew	Qtl.	95.72	290630	159.26	366776	485987
	Pepper	Qtl.	96.8	172248	75.48	243676	133117
	Rubber	Qtl.	55.44	130785	58.28	303248	137490
	Others	Qtl.	--	75417	--	97367	97367
	Total			29,52,226		42,56,061	37,44,196
Kozhikode	Coconut	Nos.	59738	190775	70567	300244	228491
	Arecanut	Nos.	1000446	251040	1607879	418089	1189831
	Cashew	Qtl.	39.63	159816	46.00	185489	179127
	Pepper	Qtl.	36.67	344463	16.85	97655	345829
	Rubber	Qtl.	91.00	246750	102.43	712010	255075
	Others	Qtl.		106472		143593	136305
	Total			1299316		1857080	2334658

(Table 7 Contd..)

1	2	3	4	5	6	7	8
Kannur	Coconut	Nos.	105625	481081.25	154700	837000	734825
	Arecanut	Nos.	313700	244282.5	538700	202752	393251
	Cashew	Qtl.	69.605	298366.5	103.69	466108	345391
	Pepper	Qtl.	35.4	729062.5	65.75	3361523	1349453
	Rubber	Qtl.	523.5	1490888	717	3683513	2006166
	Others	Qtl.	--	--	--	--	--
	Total			3243681	--	8550596	4829086
Kasaragod	Coconut	Nos.	256415	1019689	358309	1435236	1701968
	Arecanut	Nos.	2294871	1053722	3084879	1438727	2282810
	Cashew	Qtl.	19.01	62433	24.94	81878	81903
	Pepper	Qtl.	12.39	78824	18.9	120979	120242
	Rubber	Qtl.	536.77	5307221	622.72	6159073	6156833
	Others	Qtl.					
	Total			7521889		9235893	10343756
STATE	Coconut	Nos	1254679	4829107.2	1551613	7283594	7266078
	Arecanut	Nos.	5651426	2563249.5	6539612	3249949	4820017
	Cashew	Qtl.	870.275	1017342.5	1814.4	1314544	1491920
	Pepper	Qtl.	892.11	2931914.5	1453.24	5471039	6329815
	Rubber	Qtl.	41637.82	18649521	47397.13	28092162	20804866
	Others			1240697		2583385	7372571
	Total			31231832		47994373	48085267

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
	Paddy	Qtl	--	--	--	--	--
Thiruvananthapuram	Tapioca	Qtl	--	--	1220.08	544156	
	Banana	Qtl	--	--	--	--	--
	other plantain	Qtl	0.65	685	250.59	13406	171654
	Ginger	Qtl					
	Others	Qtl					
	Total	**Qtl**				**557562**	**171654**
Kollam	Paddy	Qtl					
	Tapioca	Qtl	4995	17502	5790	20293	20960
	Banana	Qtl	--	--	--	--	--
	other plantain	Qtl	15756	94536	21099	126594	101697
	Ginger	Qtl	20	1300	17	1105	1095
	Others	Qtl	--	--	100	500	500
	Total	**Qtl**	**--**	**113338**	**--**	**148492**	**124252**
Pathanamthitta	Paddy	Qtl	261.37	154690	16.80	6384	11458
	Tapioca	Qtl	36.56	33554	184.3	61192	66714
	Banana	Qtl	--	--	59.4	77220	52510
	other Plantain	Qtl	15.75	10198	20.84	14475	14177
	Ginger	Qtl	2.00	3346	5.00	7475	32220
	Others	Qtl	1.35	554	12.8	7798	7811
	Total	**Qtl**		**202342**		**174544**	**184890**
Alappuzha	Paddy	Qtl	1044.93	757702	801.65	594970	546901
	Tapioca	Qtl	15	6000	--	--	--
	Banana	Qtl	0.06	48	0.12	108	106
	other Plantain	Qtl	8.07	6468	10.28	9252	4947
	Ginger	Qtl	--	--	--	--	--
	Others	Qtl	--	--	--	--	--
	Total	**Qtl**	**--**	**770218**	**--**	**604330**	**551954**

Table – 8 Contd..

1	2	3	4	5	6	7	8
Kottayam	Paddy	Qtl	--	--	--	--	--
	Tapioca	Qtl	464.63	153800	531.75	175917	192494
	Banana	Qtl	82.65	87263	99.2	120703	87692
	Other Plantain	Qtl	39.57	15473	45.93	23247	17959
	Ginger	Qtl	0.7	2853	0.9	3668	5800
	Others	Qtl	24.985	10175	29.68	12090	12090
	Total	Qtl		269564		335625	316035
Idukki	Paddy	Qtl	--	--	--	--	--
	Tapioca	Qtl	63.7	253000	150.25	66157	54240
	Banana	Qtl	--	--	--	--	--
	Other Plantain		43.9	18228	111.2	68033	53598
	Ginger	Qtl	--	--	--	--	--
	Others	Qtl	12.04	7296	26.6	8481	10561
	Total	Qtl		278524	--	142671	118399
Eranakulam	Paddy	Qtl	835.84	573947	808.44	528857	555131
	Tapioca	Qtl	12.25	4544	58.25	21508	21791
	Banana	Qtl	0.80	735	4.60	4745	4226
	Other Plantain	Qtl	25.54	12291	48.62	26235	23398
	Ginger	Qtl	--	--	0.80	800	1000
	Others		--	7887	--	9206	--
	Total			599404		591351	605546
Thrissur	Paddy	Qtl	--	--	--	--	--
	Tapioca	Qtl	--	--	--	--	--
	Banana	Qtl	--	--	--	--	--
	Other Plantain	Qtl	5.78	2312	11.82	5870	10449
	Ginger	Qtl	--	--	--	--	--
	Others	Qtl	--	---	--	--	--
	Total	Qtl	--	2312	--	5870	10449
Palakkad	Paddy	Qtl	1326.3	900690	1304.28	753415	889805
	Tapioca	Qtl	48.00	27390	44.1	25415	15965
	Banana	Qtl	--	--	333.15	159850	197265
	Other Plantain	Qtl	250.85	115100	269.42	104330	106421
	Ginger	Qtl	2.2	8700	56.25	62380	362612
	Others	Qtl	4412.7	512145	5391.38	714155	265732
	Total	Qtl	--	1564025	--	1819545	1837800

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Table – 8 Contd..

1	2	3	4	5	6	7	8
Malappuram	Paddy	Qtl	71	40470	72	43200	49104
	Tapioca	Qtl	12.27	3760	12.27	4400	4442
	Banana	Qtl	5.4	4758	4.92	6822	4350
	Other Plantain	Qtl	187.89	19100	82.06	37496	5621
	Ginger	Qtl	2.49	3178	9.91	18781	63850
	Others	Qtl		51941		64162	64162
	Total	Qtl		123207		174861	191529
Kozhikode	Paddy	Qtl	--	--	--	--	--
	Tapioca	Qtl	44.6	18170	56.05	27251	20287
	Banana	Qtl	9.4	8930	43.12	46080	38121
	Other Plantain	Qtl	92.78	77617	89.76	91323	61486
	Ginger	Qtl	29.4	106470	44.75	67125	288362
	Others	Qtl	--	--	1.97	925	1005
	Total	Qtl		211187		232705	409261
Kannur	Paddy	Qtl	--	--	--	--	--
	Tapioca	Qtl	215.6	81633.2	159.2	64807	57471
	Banana	Qtl	44.5	38456.25	121	109698.75	106964
	Other Plantain	Qtl	23.65	15188.75	42.7	19814.75	20581
	Ginger	Qtl	4.8	30160	6.1	57340	39302
	Others	Qtl	36.15	14381.75	58.9	46487.5	23383
	Total	Qtl	--	179820	--	298148	247701
Kasaragod	Paddy	Qtl	--	--	--	--	--
	Tapioca	Qtl	25.00	12500	34.05	17025	12326
	Banana	Qtl	89.05	115765	108.02	140426	95490
	Other Plantain	Qtl	97.98	138427	143.03	199353	97976
	Ginger	Qtl	1.2	2160	1.45	2610	9344
	Others	Qtl	10.26	10260	14.22	14220	14220
	Total	Qtl		279112		373634	229356
STATE	Paddy	Qtl	3539.44	2427499	3003.17	1926826	2052399
	Tapioca	Qtl	6505.91	611853	8240.3	1028121	466690
	Banana	Qtl	231.86	255955	773.53	665653	586724
	Other Plantain	Qtl	16548.41	525624	22225.25	739429	689964
	Ginger	Qtl	62.79	158167	142.16	221284	803585
	Others	Qtl	4497.485	614640	5635.55	878025	399464
	Total	**Qtl**		**4593738**		**5459338**	**4998826**

TABLE 9

Quantity and Value of Selected perennial and seasonal crops for the years 2005-06

	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	1254679	4829107.2	1551613	7283594	7266078
	Arecanut	,,	5651426	2563249.5	6539612	3249949	4820017
	Cashew	Qtl	870.275	1017342.5	1814.4	1314544	1491920
	Pepper	,,	892.11	2931914.5	1453.24	5471039	6329815
	Rubber	,,	41637.82	18649521	47397.13	28092162	20804866
	Others	,,		1240697		2583385	7372571
	Total A			31231832	--	47994373	48085267
B. Seasonal Crops	Paddy	Qtl	3539.44	2427499	3003.17	1926826	2052399
	Tapioca	,,	6505.91	611853	8240.3	1028121	466690
	Banana	,,	231.86	255955	773.53	665653	586727
	Other plantain	,,	16548.41	525624	22225.25	739429	689964
	Ginger	,,	62.79	158167	142.16	221284	803585
	Others	,,	4497.485	614640	5635.55	878025	399464
	Total B			4593738		5459338	4998826
	All Crops (A+B)			35825570		53453711	53084093

2.2. Cost Benefit Analysis of the Soil Conservation Programmes

An important objective of a project evaluation is to estimate the 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 distruction of agricultural land. If it continue 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 deplete 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 further compared 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 a 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 interms 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. The cost incurred for the soil conservation works, including maintenance work collected from the beneficiaries is Rs.20904469/-

The total area under cultivation after soil conservation work was 1757.21 acres. The value of crops before the soil conservation programme comes to Rs.35825570. The value of crops after the implementation of soil conservation programme has also been calculated as Rs. 53453711/- Thus the additional benefits due to the implementation of soil conservation programme is worked out to be Rs.17628141. It is estimated that the value at constant price as Rs. 53084093/- This shows that 82% of the cost of soil conservation programme (including maintenance) has benefited in the year under study itself.

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 23.65 acre 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 as 10%, cashew(91%) etc. As a seasonal crop productivity of tapioca increased to 2.66%.

(iii) Diversification of cropping pattern

Soil Conservation Programmes increase 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 dissimination 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 have shown encouraging performance. The increase in area of perennial crops is higher over the area under same before soil conservation programme (7.28%). Growing of perennial crops will accelerate conservation of soil more affectively.

Occupational Profile

The occupational profile of the selected beneficiaries reveals that 38% included agriculture job, 31% are accounted as non-agriculture; 16% agricultural labourers and 15% are categorized as non-agricultural labourers. Details are presented in Table No. 14 and 14 (a)

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TABLE 1—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	2047830	4179393	467754	880067	1580076	3289326
2	Kollam	2016925	2297312	722200	911510	1294725	1385802
3	Pathanamthitta	356084	455148	107650	99884	248434	355264
4	Alappuzha	901041	770071	398069	522932	502972	247139
5	Kottayam	4695792	5295097	1173035	1173035	3522757	4122062
6	Idukki	2125689	3629068	769797	1342815	1355892	2286253
7	Eranakulam	1074914	1234686	--	727679	1074914	507007
8	Thrissur	3610665	5628099	1536195	1891890	2074470	3736209
9	Palakkad	3484149	4682562	1556850	2146770	1927299	2535792
10	Malappuram	2822810	4123392	480438	814815	2342372	3308577
11	Kozhikkode	1552583	2023223	227952	467929	1324631	1555294
12	Kannur	3447178	5826718	--	2156639	3447178	3670079
13	Kasaragod	7770632	9576880	1310702	1606670	6459930	7970210
State		**35906292**	**49721649**	**8750642**	**14742635**	**27155650**	**34979014**

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	198186	26400	171786
2	Kollam	229509	114000	115509
3	Pathanamthitta	335063	91600	243463
4	Alappuzha	208138	49241	158897
5	Kottayam	1134075	272360	861715
6	Idukki	276821	165900	110921
7	Eranakulam	254495	134205	120290
8	Thrissur	153772	56615	97157
9	Palakkad	650485	311365	339120
10	Malappuram	704162	196925	507237
11	Kozhikkode	216455	40504	175951
12	Kannur	449997	180600	269397
13	Kasaragod	167564	56558	111006
State		**4978722**	**1696273**	**3282449**

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 (Rs)	Net Income per acre (Rs)	Area in acre	Net Income (Rs)	Net Income per acre (Rs)
1	2	3	4	5	6	7	8
1	Thiruvananthapuram	99.32	1580076	15909	99.49	3299326	33162
2	Kollam	112.32	1294725	11527	112.61	1385802	12306
3	Pathanamthitta	26.02	248434	9548	13.22	355264	26873
4	Alappuzha	86.27	502972	5830	86.27	247139	2865
5	Kottayam	150.84	3522757	23354	150.86	4122062	27324
6	Idukki	106.68	1355892	12710	137.23	2286253	16660
7	Eranakulam	61.5	1074914	70766	61.66	507007	21194
8	Thrissur	159.71	2074470	12989	159.71	3736209	23394
9	Palakkad	260.50	1927299	7398	264.73	2535792	9579
10	Malappuram	112.35	2342372	20849	113.54	33,08,577	29140
11	Kozhikkode	164.76	1324631	8040	165.36	1555294	9406
12	Kannur	180.86	3447178	19060	180.86	3670079	20292
13	Kasaragod	191.94	6459930	33656	191.94	7970210	41524
State		**1713.07**	**27155650**	**15852**	**1737.48**	**34979014**	**20132**

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	7.24	171786	23727
2	Kollam	0.2	115509	577545
3	Pathanamthitta	9.29	243463	26206
4	Alappuzha	5.27	158897	30151
5	Kottayam	29.84	861715	28877
6	Idukki	22.68	110921	4891
7	Eranakulam	9.38	120290	39726
8	Thrissur	8.11	97157	11979
9	Palakkad	34.68	339120	9778
10	Malappuram	24.915	507237	20359
11	Kozhikkode	21.42	175951	8214
12	Kannur	17.30	269397	15572
13	Kasaragod	8.22	111006	13504
State		**198.545**	**3282449**	**16533**

CHAPTER III

3.1 General Observations

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

The distribution of holdings of the selected beneficiaries of the soil conservation programmes reveals that 50% of the beneficiary holding belongs to less than one acre, 46% have holding area between one acre to 3 acre. Size class over 3 acre to 5 acre and above 5 acre were 3% and one percent respectively..

The opinion of selected beneficiaries are collected. Out of that 28% of the beneficiaries reported that contour bunds effectively control soil erosion while about 67 percent opinioned that it moderately controls soil erosion. The rest 5% are of opinion that it has no effect.

About the fertility of the soil 22% are of the view that the conservation measures have improved the fertility of the soil remarkably. While 76% reported that the fertility of the soil has improved moderately and 2% opinioned that it has no effect on the fertility of the soil.

Similarly regarding the moisture retention 23% reported that the scheme has substantially increased moisture retention while 75% reported that the scheme has caused moisture retention moderately only. 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	125	--	--	115	10	--	76	49	--	125
2	Kollam	3	60	62	4	119	2	4	119	2	125
3	Pathanamthitta	--	125	--	--	125	--	--	125	--	125
4	Alappuzha	15	94	19	15	94	19	14	95	19	128
5	Kottayam	11	114	--	5	120	--	1	123	1	125
6	Idukki	14	111	--	17	108	--	4	119	2	125
7	Eranakulam	1	123	1	-	123	2	31	94	--	125
8	Thrissur	85	40	-	40	85	-	40	85	-	125
9	Palakkad	--	125	--	1	124	--	--	125	--	125
10	Malappuram	32	89	4	30	91	4	35	86	4	125
11	Kozhikkode	11	114	-	5	119	1	45	76	4	125
12	Kannur	30	95	--	1	124	--	--	125	--	125
13	Kasaragod	125	--	--	125	--	--	124	1	--	125
State		**452**	**1090**	**86**	**358**	**1242**	**28**	**374**	**1222**	**32**	**1628**

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TABLE 13

Conditions of Bund

(Scheme Area)

Sl No	Name of District	Good	Partially damaged	Seriously damaged	Total
1	2	3	4	5	6
1	Thiruvananthapuram	125	--	--	125
2	Kollam	56	66	3	125
3	Pathanamthitta	124	1	--	125
4	Alappuzha	103	25	--	128
5	Kottayam	120	5	--	125
6	Idukki	102	23	--	125
7	Eranakulam	109	16	--	125
8	Thrissur	125	-	--	125
9	Palakkad	54	67	4	125
10	Malappuram	31	55	39	125
11	Kozhikkode	80	34	11	125
12	Kannur	125	--	--	125
13	Kasaragod	125	--	--	125
State		**1279**	**292**	**57**	**1628**

TABLE 14

Occupational profile

(Scheme Area)

Sl No	Name of District	Occupation				
		Agriculture	Non-agriculture	Agricultural Labours	Non-agriculture labours	Total
1	2	3	4	5	6	7
1	Thiruvananthapuram	13	43	31	38	125
2	Kollam	47	49	14	15	125
3	Pathanamthitta	7	91	4	23	125
4	Alappuzha	14	80	18	16	128
5	Kottayam	53	24	31	17	125
6	Idukki	45	1	64	15	125
7	Eranakulam	32	65	7	21	125
8	Thrissur	71	10	9	35	125
9	Palakkad	76	32	8	9	125
10	Malappuram	30	58	16	21	125
11	Kozhikkode	78	22	15	10	125
12	Kannur	46	36	23	20	125
13	Kasaragod	109	7	8	1	125
State		**621**	**518**	**248**	**241**	**1628**

TABLE 14 (a)

Occupational profile (Control Plots)

Sl No	Name of District	Occupation				
		Agriculture	Non-agriculture	Agriculture labours	Non-agriculture labours	Total
1	2	3	4	5	6	7
1	Thiruvananthapuram	3	7	8	7	25
2	Kollam	2	9	1	--	12
3	Pathanamthitta	3	24	5	23	55
4	Alappuzha	1	12	7	15	35
5	Kottayam	9	4	5	2	20
6	Idukki	9	3	11	2	25
7	Eranakulam	6	11	2	1	20
8	Thrissur	1	3	2	9	15
9	Palakkad	12	5	7	1	25
10	Malappuram	7	8	3	7	25
11	Kozhikkode	10	8	7	--	25
12	Kannur	11	10	1	3	25
13	Kasaragod	3	--	2	--	5
Total		**77**	**104**	**61**	**70**	**312**

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 include, 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 79% are in good condition 18% are partially damaged and 3% 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 2005-06. All the district 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 fifty schemes were selected. The total number of beneficiaries comes to 2914. Out of this 1628 number of beneficiaries were selected for the detailed study (56%). Land use particulars of beneficiary plots gives us certain positive trends while comparing with the area before and after the soil conservation programme. The study revealed that 23.65 acre of land has been additionally brought under cultivation by cultivating area which are 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 directions. 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 29%. It is estimated that the percentage increase of net income per acre in beneficiary plots of the scheme area as 27%

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Analysis of data collected from the beneficiary and control plots reveals that the net income per acre, received from the beneficiary plot is Rs.20132/- and from the control plot is Rs.16533/- 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 analysing the production details of various crops it is revealed that an increase 63% recorded in the case of pepper even though the area under pepper showed a decrease of seven percent. Production of coconut also increased 24%. Whereas the percentage increase of area was 11.69%. Likewise in rubber production the percentage increase is recorded as 14%. Whereas the area increase was only 5%.

Cost benefit analysis of the collected data reveals that 82% 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
1	Thiruvananthapuram	99.32	99.49	98.13	104.32	98.80	104.85
2	Kollam	112.32	112.61	104.27	104.95	92.83	93.20
3	Pathanamthitta	26.02	13.22	27.523	15.839	105.78	119.81
4	Alappuzha	86.27	86.27	84.985	77.092	99	89
5	Kottayam	150.84	150.86	155.88	168.65	103.34	111.79
6	Idukki	106.68	137.23	114.98	126.47	107.78	92.16
7	Eranakulam	61.50	61.66	69.79	75.06	424.63	442.59
8	Thrissur	159.71	159.71	115.78	121.36	72.49	75.99
9	Palakkad	260.50	264.73	317.70	345.32	121.96	130.44
10	Malappuram	112.35	113.54	150.28	171.14	133.76	150.73
11	Kozhikkode	164.76	165.36	191.8	205.02	116.41	123.98
12	Kannur	180.86	180.86	114.09	132.05	63.08	73.01
13	Kasaragod	191.94	191.94	167.88	179.7	87.46	93.62
State		**1713.07**	**1737.48**	**1713.088**	**1826.971**	**100.00**	**105.15**

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 are increased from 100% to 105%.Districtwise details are presented in Table No.15.