Government of Kerala

Evaluation study on Soil Conservation in Kerala 2013-14

Department of Economics & Statistics, Thiruvananthapuram
Website: www.ecostat.kerala.gov.in, E-mail: ecostatdir@gmail.com

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DEPARTMENT OF ECONOMICS & STATISTICS
THIRUVANANTHAPURAM
2016

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 soil conservation schemes has been done by the Directorate of Economics and Statistics for all districts except Wayanad. This report relates to the survey results of 36 schemes completed by the Soil Conservation Department and various other agencies. The field survey was conducted during the agricultural year 2013-14 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.

Sd/-

V. RAMACHANDRAN
DIRECTOR GENERAL

Thiruvananthapuram,
05-07-2016

OFFICERS OF EVALUATION DIVISION

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Additional Director	Sri. P.V.BABU
Deputy Director	Sri. N. SURESH KUMAR
Research Assistant	Smt. O.U.SANDHYA KUMARI
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Statistical Assistants Grade I	Smt. K.K. GRACY
Statistical Assistants Grade I	Smt. U. SREEKALA
Statistical Assistants Grade I	Smt. SUNEERA .V P

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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 .

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 prior to the survey i.e. during 2008-09 in the State by the Soil Conservation Department ,Local Self Government Department as other Government agencies. The study covered all the districts of the State except Wayanad. The list of beneficiaries under each scheme is collected from the Soil Conservation Department Local Self Government Department as other Government agencies. The beneficiaries are selected by stratified random sampling method on the basis of the area of the holding. The holdings are stratified into four stratum.

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 from the list of beneficiaries collected from Soil Conservation Department, local bodies and other Government agencies. 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. 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 ï I		Stratum ï II		Stratum ï III		Stratum ï IV		Total	
			No.	Area in acre	No.	Area in acre	No.	Area in acre	No.	Area in acre	No.	Area in acre
1	Thiruvananthapuram	5	117	23.91	8	12.62	0	0	0	0	125	36.53
2	Kollam	1	108	34.71	17	28.17	0	0	0	0	125	62.88
3	Pathanamthitta	2	125	43.04	0	0	0	0	0	0	125	43.04
4	Alappuzha	1	79	33.21	46	51.30	0	0	0	0	125	84.51
5	Kottayam	1	55	25.91	60	98.07	7	25.68	3	17.99	125	167.65
6	Idukki	1	108	54.91	17	22.50	0	0	0	0	125	77.41
7	Eranakulam	5	61	35.95	64	95.41	0	0	0	0	125	131.36
8	Thrissur	2	65	18.25	58	95.42	2	6.95	0	0	125	120.62
9	Palakkad	3	95	37.21	28	44.22	2	6.21	0	0	125	87.64
10	Malappuram	5	49	27.42	74	137.17	1	3.61	1	5.47	125	173.67
11	Kozhikkode	3	34	15.46	87	145.16	3	11.76	1	5.70	125	178.08
12	Kannoor	5	37	21.61	86	128.48	1	4.00	1	5.00	125	159.09
13	Kasaragod	2	13	8.26	41	62.12	20	76.82	21	173.91	95	321.11
Total		**36**	**946**	**379.85**	**586**	**920.64**	**36**	**135.03**	**27**	**208.07**	**1595**	**1643.59**

Table –I (a)

Statement showing stratum wise distribution of selected Control Plots

(Area in acres)

Sl. No	Districts	No. of schemes selected	Stratum ï I		Stratum ï II		Stratum ï III		Stratum ï 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	23	5.95	2	3.55	0	0	0	0	25	9.5
2	Kollam	1	24	6.06	1	1.00	0	0	0	0	25	7.06
3	Pathanamthitta	2	15	8.76	10	12.17	0	0	0	0	25	20.93
4	Alappuzha	1	16	5.10	9	10.82	0	0	0	0	25	15.92
5	Kottayam	1	10	5.59	10	16.59	3	10.35	2	14.05	25	46.58
6	Idukki	1	18	9.89	6	10.45	1	3.20	0	0	25	23.54
7	Eranakulam	5	9	6.32	15	21.30	0	0	1	10.75	25	38.37
8	Thrissur	2	12	4.46	12	19.36	1	3.50	0	0	25	27.32
9	Palakkad	3	11	3.39	14	23.50	0	0	0	0	25	26.89
10	Malappuram	5	9	3.58	14	21.33	1	3.50	1	5.50	25	33.91
11	Kozhikkode	3	8	3.80	17	27.61	0	0	0	0	25	31.41
12	Kannoor	5	9	5.53	16	26.19	0	0	0	0	25	31.72
13	Kasaragod	2	1	0.85	5	8.78	11	42.65	8	54.50	25	106.78
Total		**36**	**165**	**69.28**	**131**	**202.65**	**17**	**63.20**	**12**	**84.80**	**325**	**419.93**

The total number of beneficiaries comes to 1595. About 59.31% of the beneficiaries are having holding less than one acre, 36.74% are having holdings one acre or more but less than 3 acres,2.26% are having holding 3 acre or more but less than 5 acres and only 1.69% 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 50.77%, 40.31%, 5.23% and 3.69% 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 affected agricultural area or reduce 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 ï 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 5cm to 10 cm of the top soil (ranging from 0.05m to 0.1 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 Km 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 to erosion. The different forms of soil erosion cause huge damage to Keralaôs economy every year and reported casualities every year due to landslides in monsoon season.

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 less 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.

Table 2 gives number of beneficiaries selected in each district and cost of the selected schemes. Also gives total area covered under the schemes in each district. In 2013-14 year 36 schemes were selected from 13 districts.

Land Use particulars of Beneficiary plots

Table Ns. 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. 1490.73 acres to 1507.55 acres after the implementation of soil conservation programme. An additional area of 16.82 acre of land has brought under cultivation which was not cultivated earlier. Hence it can be stated that 1.13% 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 90.70% to 91.72% by decreasing the current fallow from 4.22% to 3.11%.

On examining the district wise data, a marginal increase is noted in the area additionally brought under cultivation in Alappuzha, Malappuram ,Thiruvananthapuram, Idukki and Kannur.

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	36.53	9633180	125	125
2	Kollam	62.88	3883660	125	125
3	Pathanamthitta	43.04	11772450	125	125
4	Alappuzha	84.51	1837277	125	125
5	Kottayam	167.65	6372058	125	125
6	Idukki	77.41	7646756	309	125
7	Eranakulam	131.36	2012000	178	125
8	Thrissur	120.62	5930000	125	125
9	Palakkad	87.64	141372	125	125
10	Malappuram	173.67	25242077	125	125
11	Kozhikkode	178.08	11515330	550	125
12	Kannur	159.09	20654520	125	125
13	Kasaragod	321.11	724080	95	95
Total		**1643.59**	**107364760**	**2257**	**1595**

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	28.67	78.48	32.47	88.89	1.60	4.38	0.08	0.22
2	Kollam	53.89	85.70	53.89	85.70	0.67	1.07	0.67	1.06
3	Pathanamthitta	39.96	92.84	39.96	92.84	0.00	0.00	0.00	0.00
4	Alappuzha	74.17	87.76	74.86	88.58	3.22	3.81	1.49	1.76
5	Kottayam	152.59	91.02	152.10	90.72	0.65	0.39	1.09	0.65
6	Idukki	74.59	96.36	76.93	99.38	1.17	1.51	0.20	0.26
7	Eranakulam	115.31	87.78	115.31	87.78	14.03	10.68	14.03	10.68
8	Thrissur	120.62	100.00	120.62	100.00	0.00	0.00	0.00	0.00
9	Palakkad	77.38	88.29	77.80	88.77	1.49	1.70	1.47	1.68
10	Malappuram	153.61	88.45	162.39	93.50	13.58	7.82	4.80	2.76
11	Kozhikkode	166.08	93.26	165.66	93.03	1.48	0.83	1.48	0.83
12	Kannoor	150.48	94.59	152.18	95.66	1.70	1.07	0.10	0.06
13	Kasaragod	283.38	88.25	283.38	88.25	29.73	9.26	25.73	8.01
Total		1490.73	90.70	1507.55	91.72	69.32	4.22	51.14	3.11

Table – 3 Contd...

Sl. No	Districts	Other use				Area not cultivated			
		Before SC Work		After SC Work		Before SC Work		After SC Work	
		Area	%	Area	%	Area	%	Area	%
1	*2*	*11*	*12*	*13*	*14*	*15*	*16*	*17*	*18*
1	Thiruvananthapuram	3.96	10.84	3.96	10.84	2.30	6.30	0.02	0.05
2	Kollam	8.18	13.01	8.18	13.01	0.14	0.22	0.14	0.22
3	Pathanamthitta	3.08	7.16	3.08	7.16	0.00	0.00	0.00	0.00
4	Alappuzha	6.93	8.20	8.00	9.47	0.19	0.22	0.16	0.19
5	Kottayam	9.97	5.95	10.02	5.98	4.44	2.65	4.44	2.65
6	Idukki	0.55	0.71	0.25	0.32	1.10	1.42	0.03	0.04
7	Eranakulam	2.02	1.54	2.02	1.54	0.00	0.00	0.00	0.00
8	Thrissur	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
9	Palakkad	8.66	9.88	8.26	9.42	0.11	0.13	0.11	0.13
10	Malappuram	2.36	1.36	2.36	1.36	4.12	2.37	4.12	2.37
11	Kozhikkode	9.02	5.07	9.44	5.30	1.50	0.84	1.50	0.84
12	Kannur	4.31	2.71	4.31	2.71	2.60	1.63	2.50	1.57
12	Kasaragod	3.00	0.93	7.00	2.18	5.00	1.56	5.00	1.56
Total		62.04	3.77	66.88	4.07	21.50	1.31	18.02	1.10

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

Sl. No.	District	Area Cultivated		Current Fallow		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	7.11	74.84	0.01	0.11	0.92	9.68	1.46	15.37	9.50	100
2	Kollam	5.48	77.62	0.05	0.71	1.53	21.67	0.00	0.00	7.06	100
3	Pathanamthitta	18.19	86.91	0.00	0.00	2.61	12.47	0.13	0.62	20.93	100
4	Alappuzha	13.35	83.86	1.26	7.91	1.31	8.23	0.00	0.00	15.92	100
5	Kottayam	44.47	95.47	0.00	0.00	1.91	4.10	0.20	0.43	46.58	100
6	Idukki	21.68	92.10	0.66	2.80	0.70	2.97	0.50	2.12	23.54	100
7	Eranakulam	24.1	62.81	1.00	2.61	11.37	29.63	1.90	4.95	38.37	100
8	Thrissur	27.32	100.00	0.00	0.00	0.00	0.00	0.00	0.00	27.32	100
9	Palakkad	23.82	88.58	0.56	2.08	2.31	8.59	0.20	0.74	26.89	100
10	Malappuram	33.02	97.38	0.30	0.88	0.04	0.12	0.55	1.62	33.91	100
11	Kozhikkode	25.95	82.62	2.70	8.60	2.21	7.04	0.55	1.75	31.41	100
12	Kannoor	26.13	82.38	1.54	4.85	1.19	3.75	2.86	9.02	31.72	100
13	Kasaragod	68.38	64.04	4.80	4.50	5.55	5.20	28.05	26.27	106.78	100
	Total	339.00	80.73	12.88	3.07	31.65	7.54	36.40	8.67	419.93	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. In Table 4 the area under perennial crops has increased from 1230.94 acres to 1273.25 acres. It showed an

increase of 3.44%. At the same time the percentage change occurred in the cultivation of seasonal crops recorded as 63.96 %. 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, Plantain, Tapioca and Ginger exhibited comparative increase. The respective percentage changes recorded as 189.90%, 68.54%, 56.99%, 53.52% respectively.

Table No. 5 reveals that after the introduction of soil conservation programmes, Rubber and Coconut have occupied the large area under perennial crops contains 592.80 acre and 483.76 acre respectively. The percentage increase of Cocoa comes an increase of 25.78%. The Variation of area under Arecanut and Cashew have decreased to 41.97% and 23.49% 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	25.86	77.54	27.89	72.50	7.49	22.46	10.58	27.50
2	Kollam	62.87	97.65	62.89	97.70	1.51	2.35	1.48	2.30
3	Pathanamthitta	46.37	99.25	46.14	99.10	0.22	0.75	0.28	0.60
4	Alappuzha	69.08	97.31	68.98	97.00	1.97	2.77	2.20	3.09
5	Kottayam	135.76	99.85	139.84	99.81	0.20	0.15	0.27	0.19
6	Idukki	68.44	99.16	71.37	97.59	0.57	0.83	1.26	1.73
7	Eranakulam	117.85	93.56	117.68	93.39	8.18	6.49	8.40	6.66
8	Thrissur	103.91	100	112.19	100.00	0.00	0.00	0.00	0.00
9	Palakkad	58.26	96.55	62.51	94.43	2.08	3.45	3.69	5.57
10	Malappuram	118.37	97.79	137.05	98.17	2.68	2.21	2.56	1.83
11	Kozhikkode	125.15	94.77	118.43	85.34	6.92	5.24	20.84	14.96
12	Kannoor	126.44	98.89	130.63	98.85	1.42	1.11	1.52	1.15
13	Kasaragod	172.58	100	177.65	99.21	0.00	0.00	1.42	0.79
Total		**1230.94**	**97.38**	**1273.25**	**95.90**	**33.24**	**2.62**	**54.50**	**4.10**

Table 5 – Area under selected perennial crops

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	7.64	9.14	19.63	0.26	0.27	3.85	1.65	1.65	0.00
2	Kollam	12.36	12.37	0.08	0.18	0.18	0.00	1.07	1.07	0.00
3	Pathanamthitta	3.16	3.18	0.63	0.06	0.06	0.00	0.90	0.90	0.00
4	Alappuzha	4.95	5.13	3.64	0.15	0.15	0.00			
5	Kottayam	14.79	16.05	8.52	1.29	1.34	3.88	0.65	0.65	0.00
6	Idukki	6.41	7.27	13.42						
7	Ernakulam	25.92	26.10	0.69	2.19	2.19	0.00	1.22	1.22	0.00
8	Trissur	103.91	112.19	7.97						
09	Palakkad	42.49	44.49	4.71	2.62	2.67	1.91	0.03	0.05	66.67
10	Malappuram	79.51	79.37	-0.18	1.46	1.62	10.96	7.81	4.62	-40.85
11	Kozhikode	74.60	78.48	5.20	38.45	11.97	-68.87	0.34	0.47	38.24
12	Kannur	26.99	27.05	0.22	5.66	5.12	-9.54	31.47	22.21	-29.42
13	Kasaragod	62.79	62.94	0.24	10.99	11.17	1.64	6.32	6.53	3.32
Total		**465.52**	**483.76**	**3.92**	**63.31**	**36.74**	**-41.97**	**51.46**	**39.37**	**-23.49**

Table – 5 Contd...

Sl. No	Districts	Cocoa			Coffee			Jack			Mango		
		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	25	26	27
1	Thiruvananthapuram							0.15	0.17	13.33			
2	Kollam				0	0		2.54	2.53	-0.39	1.14	1.13	-0.88
3	Pathanamthitta	0.15	0.17	13.33	0.01	0.01	0.00	1.07	0.89	-16.82			
4	Alappuzha							0.38	0.38	0.00	0.29	0.31	6.90
5	Kottayam	1.83	1.67	-8.74	0.91	0.91	0.00	0.91	1.26	38.46	0.39	0.39	0.00
6	Idukki	0.64	0.67	4.69	8.80	9.84	11.82						
7	Ernakulam	0.25	0.29	16.00	0.19	0.20	5.26	0.71	0.71	0.00	0.01	0.01	0.00
8	Thrissur												
9	Palakkad							0.43	0.46	6.98	1.64	2.07	26.22
10	Malappuram							1.83	2.27	24.04	0.45	0.62	37.78
11	Kozhikkode	0	0.81		0	0.30		2.62	3.30	25.95			
12	Kannur							0.62	0.64	3.23			
13	Kasaragod							0	0.02				
Total		**2.87**	**3.61**	**25.78**	**9.91**	**11.26**	**13.62**	**11.26**	**12.63**	**12.17**	**3.92**	**4.53**	**15.56**

Table ï 5 Contd..

Sl No	Districts	Nutmeg			Papaya			Pepper(Garbled)			Rubber			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	40	41	42			
1	Thiruvananthapuram				0.07	0.07	0.00	0.70	0.72	2.86	15.39	15.87	3.12	25.86	27.89	7.85
2	Kollam				0.04	0.04	0.00	2.23	2.23	0.00	43.31	43.34	0.07	62.87	62.89	0.03
3	Pathanamthitta							2.44	2.39	-2.05	38.58	38.54	-0.10	46.37	46.14	-0.50
4	Alappuzha							0.73	0.73	0.00	62.58	62.28	-0.48	69.08	68.98	-0.14
5	Kottayam	0.26	0.31	19.23				6.35	6.88	8.35	108.38	110.38	1.85	135.76	139.84	3.01
6	Idukki							25.63	26.18	2.15	26.96	27.41	1.67	68.44	71.37	4.28
7	Ernakulam	0.80	0.80	0.00				1.49	1.51	1.34	85.07	84.65	-0.49	117.85	117.68	-0.14
8	Thrissur													103.91	112.19	7.97
9	Palakkad							3.81	4.04	6.04	7.24	8.73	20.58	58.26	62.51	7.29
10	Malappuram							1.31	1.58	20.61	26.00	46.97	80.65	118.37	137.05	15.78
11	Kozhikkode	0	13.53					5.58	4.77	-14.52	3.56	4.80	34.83	125.15	118.43	-5.37
12	Kannur							1.97	2.17	10.15	59.73	73.44	22.95	126.44	130.63	3.31
13	Kasaragod							16.59	20.60	24.17	75.89	76.39	0.66	172.58	177.65	2.94
Total		**1.06**	**14.64**	**1281.13**	**0.11**	**0.11**	**0.00**	**68.83**	**73.80**	**7.22**	**552.69**	**592.80**	**7.26**	**1230.94**	**1273.25**	**3.44**

Table 6 – Area under selected seasonal crops

(Area in Acres)

Sl No	Districts	Paddy			Tapioca			Peas (Pulses)			Ginger		
		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				3.42	4.91	43.57				0.07	0.15	114.29
2	Kollam				0.57	0.57	0.00				0.02	0.02	0.00
3	Pathanamthitta				0.02	0.02	0.00						
4	Alappuzha				0.69	0.81	17.39	0.05	0.05	0.00	0.02	0.03	50.00
5	Kottayam				0.20	0.27	35.00						
6	Idukki												
7	Ernakulam	3.10	3.10	0.00	1.46	1.5	2.74	0.17	0.18	5.88	0.15	0.15	0.00
8	Thrissur												
9	Palakkad				0.40	0.47	17.50	0.05	0.05	0.00	0.25	0.25	0.00
10	Malappuram				2.20	0.30	-86.36						
11	Kozhikkode				5.57	13.96	150.63				0.20	0.49	145.00
12	Kannur												
13	Kasaragod												
Total		**3.10**	**3.10**	**0.00**	**14.53**	**22.81**	**56.99**	**0.27**	**0.28**	**3.70**	**0.71**	**1.09**	**53.52**

Table – 6 Contd...

Sl. No	Districts	Plantain			Banana			Vegetables			Pineapple			Chena		
		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	3.73	5.08	36.19				0	0.13		0.20	0.20	0.00			
2	Kollam	0.58	0.56	-3.45	0.08	0.07	-12.50							0.09	0.09	0.00
3	Pathanamthitta	0.15	0.2	33.33	0.05	0.06	20.00									
4	Alappuzha	0.47	0.54	14.89	0.12	0.13	8.33	0.05	0.05	0.00	0.01	0.01	0.00	0.07	0.08	14.29
5	Kottayam															
6	Idukki	0.29	0.67	131.03	0.28	0.59	110.71									
7	Ernakulam	3.19	3.36	5.33	0.04	0.04	0.00	0.07	0.07	0.00						
8	Thrissur															
9	Palakkad	1.31	2.53	93.13	0.03	0.05	66.67									
10	Malappuram	0.48	2.26	370.83												
11	Kozhikode	0.23	1.51	556.52	0.91	4.33	375.82	0.01	0.5	4900.00						
12	Kannur	0.95	1.05	10.53	0.47	0.47	0.00									
13	Kasaragod	0	1.42													
Total		**11.38**	**19.18**	**68.54**	**1.98**	**5.74**	**189.90**	**0.13**	**0.75**	**476.92**	**0.21**	**0.21**	**0.00**	**0.16**	**0.17**	**6.25**

Table – 6 Contd...

Sl. No	Districts	Colocasia			Turmeric			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	0.07	0.11	57.14							7.49	10.58	41.26
2	Kollam	0.16	0.16	0.00				0.01	0.01	0.00	1.51	1.48	-1.99
3	Pathanamthitta										0.22	0.28	27.27
4	Alappuzha	0.24	0.24	0.00				0.25	0.26	4.00	1.97	2.20	11.68
5	Kottayam										0.20	0.27	35.00
6	Idukki										0.57	1.26	121.05
7	Ernakulam										8.18	8.40	2.69
8	Thrissur										0.00	0.00	
9	Palakkad				0.04	0.04	0.00	0	0.30		2.08	3.69	77.40
10	Malappuram										2.68	2.56	-4.48
11	Kozhikode					0.05					6.92	20.84	201.16
12	Kannur										1.42	1.52	7.04
13	Kasaragod										0.00	1.42	0.00
Total		**0.47**	**0.51**	**8.51**	**0.04**	**0.09**	**125.00**	**0.26**	**0.57**	**119.23**	**33.24**	**54.50**	**63.96**

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 ñBeforeò and ñAfterò 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.

In Malappuram district Gross cropped area is more increased. In this district ,total cropped area before Soil conservation works was 121.05acres. It increased to 139.61 acres after the implementation of Soilconservation measures. The increase in area is accounted as 18.56 acres. The percentage of increase recorded as 15.33%. When we analyze the yield of perennial crops in Kasaragod district, it can be seen that production of Rubber, Pepper, Arecanut, Cashew and Coconut are increased. In the case of Seasonal crops, in Thiruvananthapuram district it can be seen that the yield of tapioca, plantain, colocasia, banana etc. are increased.

In Malappuram,Thrissur,Kozhikkode and Kasaragod districts, before soil conservation work the area were 121.05,103.91,132.07and172.58 acres respectively. It is increased to 139.61,112.19,139.27and179.07acres respectively after the implementation of soil conservation work. Increase in area accounted as18.56,8.28,7.20and6.49acres respectively.

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

The area details of seasonal crops of all districts shows that Plantain area increased after soil conservationworks except Kollam and in the case of tapioca the area as well as production increased except Malappuram districts.

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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	% Change over quantity
1	2	3	4	5	6	7	8	9
Thiruvananthapuram	Coconut	Nos.	22885.00	111019	25407.00	152442	137310	11.02
	Arecanut	Nos.	16950.00	9658	18210.00	14568	13560	7.43
	Pepper(Garbled)	Quintal	1.07	13461	1.24	42586	36748	15.89
	Rubber	Quintal	217.90	2064383	230.15	3619574	3426918	5.62
	Total			**2198521**		**3829170**	**3614536**	
Kollam	Coconut	Nos.	24021.00	136936	31070.00	266276	205865	29.35
	Arecanut	Nos.	6455.00	3552	8170.00	6863	5422	26.57
	Pepper(Garbled)	Quintal	0.98	13344	1.29	46443	35282	31.63
	Cashew	Quintal	1.44	3744	2.38	14083	8521	65.28
	Rubber	Quintal	545.86	5286666	720.27	11501997	8716842	31.95
	Jack	Quintal	156.97	49137	222.54	209857	148024	41.77
	Mango	Quintal	12.96	8644	19.12	36328	24624	47.53
	Total			**5502023**		**12081847**	**9144580**	
Pathanamthitta	Coconut	Nos.	2764.00	16584	5393.00	40179	20592	95.12
	Arecanut	Nos.	520.00	290	1505.00	1056	365	189.42
	Pepper(Garbled)	Quintal	14.65	190950	38.21	1398145	536059	160.82
	Rubber	Quintal	131.64	1303236	223.76	3509679	2064775	69.98
	Total			**1511060**		**4949059**	**2621791**	
Alappuzha	Coconut	Nos.	19198.00	102715	21421.00	143305	128433	11.58
	Arecanut	Nos.	17546.00	8775	19900.00	14927	13161	13.42
	Rubber	Quintal	561.85	5056650	588.24	10544216	10071175	4.70
	Mango	Quintal	22.35	38799	27.84	48721	39113	24.56
	Total			**5206939**		**10751169**	**10251882**	
Kottayam	Coconut	Nos.	53081.00	305745	66593.00	476158	379544	25.46
	Arecnut	Nos.	62425.00	32461	77825.00	81720	65549	24.67
	Pepper(Garbled)	Quintal	18.92	246113	22.33	828550	702023	18.02
	Rubber	Quintal	929.70	9148248	1083.10	17241878	14799902	16.50
	Coffee	Quintal	11.39	82737	13.55	97757	82174	18.96
	Cocoa	Quintal	23.15	14609	30.60	89054	67373	32.18
	Total			**9829913**		**18815117**	**16096565**	

(Table 7 Contd...)

1	2	3	4	5	6	7	8	9
Idukki	Coconut	Nos.	1840.00	10375	5845.50	42905	13505	217.69
	Pepper(Garbled)	Quintal	9.83	129429	27.82	1019614	360273	183.01
	Rubber	Quintal	65.00	643110	114.55	1843148	1045872	76.23
	Coffee	Quintal	12.95	100026	33.91	233619	89218	161.85
	Cocoa	Quintal	1.98	3564	5.06	15332	5999	155.56
	Total			**886504**		**3154618**	**1514867**	
Eranakulam	Coconut	Nos.	109321.00	603450	122420.00	899806	803526	11.98
	Arecnut	Nos.	382235.00	198762	421835.00	337468	305788	10.36
	Pepper(Garbled)	Quintal	17.52	227829	19.72	709584	630421	12.56
	Cashew	Quintal	0.11	318	0.14	588	462	27.27
	Rubber	Quintal	883.51	8685786	967.90	15652152	14287460	9.55
	Coffee	Quintal	10.57	50736	3.47	23659	72068	-67.17
	Cocoa	Quintal	5.62	8992	6.20	15383	13944	10.32
	Nutmeg	Quintal	31.71	7696	32.32	10013	9824	1.92
	Total			**9783569**		**17648653**	**16123493**	
Thrissur	Coconut	Nos.	493130.00	2214156	777668.00	4020549	2549486	57.70
	Arecnut	Nos.	280.00	160	600.00	564	263	114.29
	Total			**2214316**		**4021113**	**2549749**	
Palakkad	Coconut	Nos.	200382.00	781496	220222.00	1193603	1086070	9.90
	Arecnut	Nos.	246320.00	105918	263600.00	197700	184740	7.02
	Pepper(Garbled)	Quintal	6.55	84808	7.33	262424	234499	11.91
	Cashew	Quintal	0.18	594	0.20	1096	986	11.11
	Rubber	Quintal	73.90	724590	79.50	1249543	1161525	7.58
	Jack	Quintal	48.10	13950	52.40	56529	51890	8.94
	Mango	Quintal	126.45	111658	138.85	275133	250562	9.81
	Total			**1823014**		**3236028**	**2970272**	

(Table 7 Contd...)

1	2	3	4	5	6	7	8	9
Malappuram	Coconut	Nos.	365270.00	1428222	449786.00	1979059	1607188	23.14
	Arecnut	Nos.	76630.00	32952	127130.00	88991	53641	65.90
	Pepper(Garbled)	Quintal	4.60	58728	1.48	53104	165053	-67.83
	Cashew	Quintal	73.81	240549	10.09	54607	399459	-86.33
	Rubber	Quintal	216.40	2118772	253.05	4039289	3454267	16.94
	Total			**3879223**		**6215050**	**5679608**	
Kozhikkode	Coconut	Nos.	196435.00	748425	253320.00	1200736	931101	28.96
	Arecnut	Nos.	2279590.00	980224	671600.00	449972	1527325	-70.54
	Pepper(Garbled)	Quintal	10.96	138864	9.50	335132	386636	-13.32
	Cashew	Quintal	0.99	3313	2.45	13425	5425	147.47
	Rubber	Quintal	0.00	0	12.80	198426	0	
	Coffee	Quintal	0.00	0	3.40	23482	0	
	Cocoa	Quintal	0.00	0	6.44	16604	0	
	Nutmeg	Quintal	0.00	0	665.00	216163	0	
	Total			**1870826**		**2453940**	**2850487**	
Kannur	Coconut	Nos.	117490.00	442946	161450.00	829852	603898	37.42
	Arecanut	Nos.	1012900.00	496321	1119500.00	839625	759675	10.52
	Pepper(Garbled)	Quintal	2.00	25688	2.80	100101	71501	40.00
	Cashew	Quintal	145.00	524900	121.90	713606	848834	-15.93
	Rubber	Quintal	349.40	3383588	479.60	7439555	5419893	37.26
	Total			**4873443**		**9922739**	**7703801**	
Kasaragod	Coconut	Nos.	124475.00	547690	146825.00	694485	588769	17.96
	Arecnut	Nos.	1643200.00	1002352	1951500.00	2497920	2103296	18.76
	Pepper(Garbled)	Quintal	67.50	840850	127.30	4575671	2426220	88.59
	Cashew	Quintal	192.00	701952	231.50	1192259	988828	20.57
	Rubber	Quinta	900.50	9950525	1062.50	16992563	14401697	17.99
	Total			**13043369**		**25952898**	**20508810**	

(Table 7 Contd..

STATE	Name of Crop	Unit	Before SC work		After SC work		Value at constant price	% Change over quantity
			Quantity	Value	Quantity	Value		
1	2	3	4	5	6	7	8	9
KERALA	Coconut	Nos.	1730292.00	7449759	2287420.50	11939355	9055287	32.20
	Arecanut	Nos.	5745051.00	2871425	4681375.00	4531374	5032785	-18.51
	Pepper(Garbled)	Quintal	154.58	1970064	259.02	9371354	5584715	67.56
	Cashew	Quintal	413.53	1475370	368.66	1989664	2252515	-10.85
	Rubber	Quintal	4875.66	48365554	5815.42	93832020	78850326	19.27
	Jack	Quintal	205.07	63087	274.94	266386	199914	34.07
	Mango	Quintal	161.76	159101	185.81	360182	314299	14.87
	Coffee	Quintal	34.91	233499	54.33	378517	243460	55.63
	Cocoa	Quintal	30.75	27165	48.30	136373	87316	57.07
	Nutmeg	Quintal	31.71	7696	697.32	226176	9824	2099.05
	Total			**62622720**		**123031401**	**101630441**	

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

District	Name of Crop	Unit	Before SC work		After SC work			% Change over quantity
			Quantity	Value	Quantity	Value	Value at constant price	
1	2	3	4	5	6	7	8	
Thiruvananthapuram	Tapioca	Quintal	668.80	337073	1015.22	879182	579182	51.80
	Peas(pulses)	Quintal	0.30	417	0.50	1705	1023	66.67
	Ginger	Quintal	14.64	33439	18.97	78593	60654	29.58
	Plantain	Quintal	187.54	151163	279.85	436564	292561	49.22
	Banana	Quintal	5.00	7730	6.50	20722	15940	30.00
	Pineapple	Quintal	9.50	12976	10.65	16509	14726	12.11
	Colocasia	Quintal	8.85	12966	12.90	59483	40808	45.76
	Total			**555764**		**1492758**	**1004894**	
Kollam	Tapioca	Quintal	35.07	15993	48.23	45001	32722	37.52
	Ginger	Quintal	0.21	499	0.36	2033	1186	71.43
	Plantain	Quintal	21.91	18520	22.59	37770	36633	3.10
	Banana	Quintal	2.85	4703	2.70	8983	9482	-5.26
	Colocasia	Quintal	2.69	4015	3.64	16678	12325	35.32
	Total			**43730**		**110465**	**92348**	
Pathanamthitta	Tapioca	Quintal	0.30	178	0.35	398	341	16.67
	Plantain	Quintal	4.36	3067	12.47	14877	5202	186.01
	Banana	Quintal	1.42	2316	3.23	10485	4610	127.46
	Total			**5561**		**25760**	**10153**	
Alappuzha	Tapioca	Quintal	66.87	35442	80.83	75254	62257	20.88
	Ginger	Quintal	0.75	1751	0.90	3967	3306	20.00
	Plantain	Quintal	27.61	19494	33.00	41152	34431	19.52
	Banana	Quintal	6.79	11775	7.24	26665	25008	6.63
	Chena	Quintal	7.45	10915	8.78	18394	15608	17.85
	Yam	Quintal	4.65	4055	4.90	7350	6975	5.38
	Kolacasia	Quintal	12.56	18301	13.97	65199	58618	11.23
	Total			**101733**		**237981**	**206203**	
Kottayam	Tapioca	Quintal	11.00	5676	13.75	14021	11217	25.00
	Total			**5676**		**14021**	**11217**	

Table – 8 Contd...								
Idukki	Plantain	Quintal	8.00	5312	21.50	43495	16184	168.75
	Banana	Quintal	6.85	9946	19.40	50533	17843	183.21
	Total			**15258**		**94028**	**34027**	
Eranakulam	Paddy	Quintal	53.15	40927	56.40	76240	71847	6.11
	Tapioca	Quintal	150.85	76784	168.35	143099	128224	11.60
	Peas(pulses)	Quintal	8.30	16642	10.15	33261	27199	22.29
	Ginger	Quintal	1.60	3066	1.90	9836	8283	18.75
	Plantain	Quintal	282.62	199812	334.71	433617	366134	18.43
	Banana	Quintal	0.32	475	0.38	1105	931	18.75
	Total			**337706**		**697158**	**602618**	
Palakkad	Tapioca	Quintal	18.58	7989	23.85	20750	16165	28.36
	Ginger	Quintal	11.50	15330	15.40	39279	29332	33.91
	Plantain	Quintal	109.77	67510	205.96	296751	158159	87.63
	Banana	Quintal	14.60	18265	21.10	54237	37529	44.52
	Pineapple	Quintal	1.20	1046	1.40	2196	1882	16.67
	Turmeric	Quintal	2.70	11408	6.50	8616	3579	140.74
	Total			**121548**		**421829**	**246646**	
Malappuram	Paddy	Quintal	10.50	8327	13.50	19575	15225	28.57
	Tapioca	Quintal	0.90	421	0.00	0	653	-100.00
	Plantain	Quintal	9.37	6598	12.44	19819	14928	32.76
	Total			**15346**		**39394**	**30806**	
Kozhikkode	Tapioca	Quintal	215.07	114638	689.43	740388	230967	220.56
	Ginger	Quintal	2.25	4373	16.15	38067	5303	617.78
	Plantain	Quintal	8.33	6630	32.50	49250	12623	290.16
	Banana	Quintal	42.20	61662	314.85	900160	120650	646.09
	Total			**187303**		**1727865**	**369543**	
Kannur	Plantain	Quintal	51.40	43999	63.45	86420	70008	23.44
	Banana	Quintal	36.50	52414	41.20	115030	101908	12.88
	Total			**96413**		**201450**	**171916**	
Kasaragod	Plantain	Quintal	0.00	0	204.50	397957	0	
	Total			**0**		**397957**	**0**	

Table – 8 Contd..

STATE	Name of Crop	Unit	Before SC work		After SC work			
			Quantity	Value	Quantity	Value	Value at constant price	% Change over quantity
1	2	3	4	5	6	7	8	9
KERALA	Paddy	Quintal	63.65	49254	69.90	95815	87072	9.82
	Tapioca	Quintal	1167.44	594194	2040.01	1918093	1061728	74.74
	Peas(pulses)	Quintal	8.60	17059	10.65	34966	28222	23.84
	Ginger	Quintal	30.95	58458	53.68	171775	108064	73.44
	Plantain	Quintal	710.91	522105	1222.97	1857672	1006863	72.03
	Banana	Quintal	116.53	169286	416.60	1187920	333901	257.50
	Pineapple	Quintal	10.70	14022	12.05	18705	16608	12.62
	Chenai	Quintal	7.45	10915	8.78	18394	15608	17.85
	Yam	Quintal	4.65	4055	4.90	7350	6975	5.38
	Colacasia	Quintal	24.10	35282	30.51	141360	111751	26.60
	Turmeric	Quintal	2.70	11408	6.50	8616	3579	140.74
	Total			**1486038**		**5460666**	**2780371**	

Table 9

Quantity and Value of Selected perennial and seasonal crops for the years 2013-14

	Name of Crops	Units	Before SC Work		After SC Work		Value at constant Price	% Change over quantity
			Quantity	Values (Rs)	Quantity	Value (Rs)		
1	2	3	4	5	6	7	8	9
A. Perennial Crops	Coconut	Nos.	1730292.00	7449759	2287420.50	11939355	9055287	32.20
	Arecnut	Nos.	5745051.00	2871425	4681375.00	4531374	5032785	-18.51
	Pepper(Garbled)	Quintal	154.58	1970064	259.02	9371354	5584715	67.56
	Cashew	Quintal	413.53	1475370	368.66	1989664	2252515	-10.85
	Rubber	Quintal	4875.66	48365554	5815.42	93832020	78850326	19.27
	Jack	Quintal	205.07	63087	274.94	266386	199914	34.07
	Mango	Quintal	161.76	159101	185.81	360182	314299	14.87
	Coffee	Quintal	34.91	233499	54.33	378517	243460	55.63
	Cocoa	Quintal	30.75	27165	48.30	136373	87316	57.07
	Nutmeg	Quintal	31.71	7696	697.32	226176	9824	2099.05
	Total			**62622720**		**123031401**	**101630441.00**	
B. Seasonal Crops	Paddy	Quintal	63.65	49254	69.90	95815	87072	9.82
	Tapioca	Quintal	1167.44	594194	2040.01	1918093	1061728	74.74
	Peas(pulses)	Quintal	8.60	17059	10.65	34966	28222	23.84
	Ginger	Quintal	30.95	58458	53.68	171775	108064	73.44
	Plantain	Quintal	710.91	522105	1222.97	1857672	1006863	72.03
	Banana	Quintal	116.53	169286	416.60	1187920	333901	257.50
	Pineapple	Quintal	10.70	14022	12.05	18705	16608	12.62
	Chena	Quintal	7.45	10915	8.78	18394	15608	17.85
	Yam	Quintal	4.65	4055	4.90	7350	6975	5.38
	Kolacasia	Quintal	24.10	35282	30.51	141360	111751	26.60
	Turmeric	Quintal	2.70	11408	6.50	8616	3579	140.74
	Total			**1486038**		**5460666**	**2780371.00**	
	All Crops (A+B)			***64108758***		***128492067***	***104410812.00***	

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 36 schemes is Rs.107364760

The total area under cultivation after soil conservation work was 1507.55 acres. The value of crops before the soil conservation programme comes to Rs.64108758 The value of crops after the implementation of soil conservation programme has also been calculated as Rs. 128492067/- It is estimated that the value at constant price as Rs104410812/- .

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 16.82 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 Production

Production also increased due to the implementation of soil conservation programme. In the case of coconut, it is recorded 32.20%, Pepper 67.56%, Rubber 19.27%, Jack 34.07 % Mango 14.87%, Coffee 55.63%, Cocoa 57.07%. In the case of seasonal crops, percentage increase in production of Tapioca, Ginger, Plantain Banana and Turmeric are 74.74, 73.44, 72.03, 257.50 and140.74 respectively.

(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 (3.44%). Growing of perennial crops will accelerate conservation of soil more affectively.

Occupational Profile

The occupational profile of the selected beneficiaries reveals that 38.06% included agriculture job, 40. 00% are accounted as non-agriculture; 11.35% agricultural labourers and

10.59% 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	2754285	5321928	974230	2119820	1780055	3202108
2	Kollam	5545753	12192312	1180780	2768334	4364973	9423978
3	Pathanamthitta	1516621	4974819	592458	1737159	924163	3237660
4	Alappuzha	5308672	10989150	2011385	3794642	3297287	7194508
5	Kottayam	9835589	18829138	4058012	7700570	5777577	11128568
6	Idukki	901762	3248646	681245	1983826	220517	1264820
7	Eranakulam	10121275	18345811	2445640	5471692	7675635	12874119
8	Thrissur	2214316	4021113	1324000	1969700	890316	2051413
9	Palakkad	1944562	3657857	671925	1322395	1272637	2335462
10	Malappuram	3894569	6254444	2598905	3632565	1295664	2621879
11	Kozhikkode	2058129	4181805	1352742	3185063	705387	996742
12	Kannoor	4969856	10124189	1770180	3406895	3199676	6717294
13	Kasaragod	13043369	26350855	1822685	4868200	11220684	21482655
State		**64108758**	**128492067**	**21484187**	**43960861**	**42624571**	**84531206**

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	821746	346130	475616
2	Kollam	559317	381834	177483
3	Pathanamthitta	1103987	393700	710287
4	Alappuzha	139136	61150	77986
5	Kottayam	3206698	2833376	373322
6	Idukki	307050	280600	26450
7	Eranakulam	3267579	1188500	2079079
8	Thrissur	589847	446552	143295
9	Palakkad	968228	568200	400028
10	Malappuram	1095915	768800	327115
11	Kozhikkode	627970	409300	218670
12	Kannur	1219692	543750	675942
13	Kasaragod	5501777	966000	4535777
State		19408942	9187892	10221050

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	28.67	1780055	62088	32.47	3202108	98617
2	Kollam	53.89	4364973	80998	53.89	9423978	174874
3	Pathanamthitta	39.96	924163	23127	39.96	3237660	81023
4	Alappuzha	74.17	3297287	44456	74.86	7194508	96106
5	Kottayam	152.59	5777577	37863	152.10	11128568	73166
6	Idukki	74.59	220517	2956	76.93	1264820	16441
7	Eranakulam	115.31	7675635	66565	115.31	12874119	111648
8	Thrissur	120.62	890316	7381	120.62	2051413	17007
9	Palakkad	77.38	1272637	16447	77.80	2335462	30019
10	Malappuram	153.61	1295664	8435	162.39	2621879	16146
11	Kozhikkode	166.08	705387	4247	165.66	996742	6017
12	Kannoor	150.48	3199676	21263	152.18	6717294	44140
13	Kasaragod	283.38	11220684	39596	283.38	21482655	75809
State		**1490.73**	**42624571**	**28593**	**1507.55**	**84531206**	**56072**

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	7.11	475616	66894
2	Kollam	5.48	177483	32387
3	Pathanamthitta	18.19	710287	39048
4	Alappuzha	13.35	77986	5842
5	Kottayam	44.47	373322	8395
6	Idukki	21.68	26450	1220
7	Eranakulam	24.10	2079079	86269
8	Thrissur	27.32	143295	5245
9	Palakkad	23.82	400028	16794
10	Malappuram	33.02	327115	9907
11	Kozhikkode	25.95	218670	8427
12	Kannoor	26.13	675942	25868
13	Kasaragod	68.38	4535777	66332
State		**339.00**	**10221050**	**30151**

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 59.31% of the beneficiary holding belongs to less than one acre, 36.74% have holding area between one acre to 3 acres. And above 3 acre were 2.26%, up to 5 acres were 1.69% respectively.

The opinion of selected beneficiaries is collected. Out of this, 25.52% of the beneficiaries reported that contour bunds effectively controlled soil erosion while about 74.48% rests in the opinion that it moderately controlled soil erosion.

About the fertility of the soil 13.35% are of the view that the conservation measures have improved the fertility of the soil remarkably while 86.46% reported that the fertility of the soil has improved moderately and 0.19% opinioned that it has no effect on the fertility of the soil.

Similarly regarding the moisture retention 11.60% reported that the scheme has substantially controlled moisture retention while 88.21% reported that the scheme has caused moisture retention moderately only. 0.19% are 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	29	96	0	5	120	0	1	124	0	125
2	Kollam	5	120	0	3	122	0	3	122	0	125
3	Pathanamthitta	1	124	0	0	125	0	0	125	0	125
4	Alappuzha	25	100	0	21	104	0	21	104	0	125
5	Kottayam	27	98	0	6	118	1	1	122	2	125
6	Idukki	4	121	0	5	120	0	2	122	1	125
7	Eranakulam	119	6	0	111	14	0	111	14	0	125
8	Thrissur	1	124	0	1	124	0	0	125	0	125
9	Palakkad	75	50	0	43	82	0	36	89	0	125
10	Malappuram	64	61	0	1	122	2	0	125	0	125
11	Kozhikkode	19	106	0	0	125	0	2	123	0	125
12	Kannur	19	106	0	8	117	0	5	120	0	125
13	Kasaragod	19	76	0	9	86	0	3	92	0	95
State		**407**	**1188**	**0**	**213**	**1379**	**3**	**185**	**1407**	**3**	**1595**

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	122	3	0	125
2	Kollam	107	17	1	125
3	Pathanamthitta	125	0	0	125
4	Alappuzha	75	48	2	125
5	Kottayam	93	32	0	125
6	Idukki	117	8	0	125
7	Ernakulam	98	27	0	125
8	Thrissur	3	121	1	125
9	Palakkad	92	33	0	125
10	Malappuram	87	38	0	125
11	Kozhikkode	121	4	0	125
12	Kannur	121	4	0	125
13	Kasaragod	93	2	0	95
State		1254	337	4	1595

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	6	25	19	75	125
2	Kollam	99	7	7	12	125
3	Pathanamthitta	124	1	0	0	125
4	Alappuzha	11	96	17	1	125
5	Kottayam	39	59	10	17	125
6	Idukki	44	55	6	20	125
7	Eranakulam	42	22	40	21	125
8	Thrissur	13	106	6	0	125
9	Palakkad	46	52	22	5	125
10	Malappuram	26	98	1	0	125
11	Kozhikkode	64	31	24	6	125
12	Kannoor	37	50	27	11	125
13	Kasaragod	56	36	2	1	95
State		**607**	**638**	**181**	**169**	**1595**

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	4	14	4	3	25
2	Kollam	20	5	0	0	25
3	Pathanamthitta	25	0	0	0	25
4	Alappuzha	4	18	3	0	25
5	Kottayam	9	10	6	0	25
6	Idukki	10	8	4	3	25
7	Eranakulam	9	6	10	0	25
8	Thrissur	3	22	0	0	25
9	Palakkad	16	8	0	1	25
10	Malappuram	3	22	0	0	25
11	Kozhikkode	9	10	3	3	25
12	Kannoor	16	4	5	0	25
13	Kasaragod	17	5	3	0	25
Total		**145**	**132**	**38**	**10**	**325**

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 78.62% are in good condition 21.13% are partially damaged and 0.25% 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 2013-14. 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 36 schemes were selected. The total number of beneficiaries comes to 2257. Out of this 1595 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 16.82 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 implementing 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 98.32%. It is estimated that the percentage increase of net income per acre in beneficiary plots of the scheme area as 96.10%

Analysis of data collected from the beneficiary and control plots reveals that the net income per acre, received from the beneficiary plot is Rs.56072/- and from the control plot is Rs.30151/- 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.

Cost benefit analysis of the collected data reveals that 100% of the cost of soil conservation programme has benefited in the year under study.

Table 15

Cropping Intensity in Scheme area **(Area in Acres)**

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	28.67	32.47	33.35	38.47	116.32	118.48
2	Kollam	53.89	53.89	64.38	64.37	119.47	119.45
3	Pathanamthitta	39.96	39.96	46.59	46.42	116.59	116.52
4	Alappuzha	74.17	74.86	71.05	71.18	95.79	94.99
5	Kottayam	152.59	152.10	135.96	140.11	89.10	92.12
6	Idukki	74.59	76.93	69.01	72.63	92.52	95.06
7	Ernakulam	115.31	115.31	126.03	126.08	109.30	109.28
7	Thrissur	120.62	120.62	103.91	112.19	86.15	93.01
8	Palakkad	77.38	77.80	60.34	66.20	77.98	85.09
9	Malappuram	153.61	162.39	121.05	139.61	78.80	85.97
10	Kozhikkode	166.08	165.66	132.07	139.27	79.52	83.77
12	Kannur	150.48	152.18	127.86	132.15	84.97	86.84
13	Kasaragod	283.38	283.38	172.58	179.07	60.90	63.19
State		**1490.73**	**1507.55**	**1264.18**	1327.75	**84.80**	**88.07**

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 84.80% to 88.07%. District wise details are presented in table No.15.

Department of Economics & Statistics, Thiruvananthapuram