

## 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 before ie during 2002-03 in the State by the Soil Conservation Department and other local bodies. The study covered all the districts of the State except Wayanad where the same is directly done by the Central Government. The list of beneficiaries under each scheme is obtained from the Soil Conservation Department and other local bodies. The beneficiaries are selected by stratified random sampling method on the basis of the area of the holding. The holdings are stratified 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

## 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	11	122	27.64	3	3.30		0			125	30.94
2	Kollam	3	114	33.47	11	13.65					125	47.12
3	Pathanamthitta	7	120	24.29	5	6					125	30.29
4	Alappuzha	5	92	15.45	25	40.69	6	22.85	2	13	125	91.99
5	Kottayam	3	77	11.69	48	80.64					125	92.33
6	Idukki	5	31	19.04	43	72.89	22	81.3	29	222.81	125	396.04
7	Eranakulam	3	123	22.58	2	2	0	0	0	0	125	24.58
8	Thrissur	1	15	5.85	10	11.18					25	17.03
9	Palakkad	5	42	23.72	55	97.47	19	71.85	9	63.56	125	256.60
10	Malappuram	3	70	37.78	45	73.71	6	20.18	4	23.02	125	154.69
11	Kozhikode	2	43	12.11	29	42.39	6	22.70	1	5	79	82.20
12	Kannur	1	37	16.54	88	157.85					125	174.39
13	Kasaragod	5	28	19.39	36	67.68	29	103.14	32	211.78	125	401.99
<b>Total</b>		<b>54</b>	<b>914</b>	<b>269.55</b>	<b>400</b>	<b>669.45</b>	<b>88</b>	<b>322.02</b>	<b>77</b>	<b>539.17</b>	<b>1479</b>	<b>1800.19</b>

**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	Thiruvananthapuram	11	26	3.68							26	3.68
2	Kollam	3	21	6.25	4	4.99					25	11.24
3	Pathanamthitta	7	25	3.36	1	1.15					26	4.51
4	Alappuzha	5	22	4.44	3	4.26					25	8.7
5	Kottayam	3	7	2.65	8	10.04					15	12.69
6	Idukki	5	1	0.95	15	27.41	6	23.60	3	18.10	25	70.06
7	Eranakulam	3	12	1.57	3	4.39					15	5.96
8	Thrissur	1	5	2.57							5	2.57
9	Palakkad	5	7	3.29	14	19.59	3	10.46	1	6.20	25	39.54
10	Malappuram	3	14	8.64	9	15.40	1	4.05	1	7.55	25	35.64
11	Kozhikode	2	9	2.43	1	1.50					10	3.93
12	Kannur	1	19	7.21	6	8.51					25	15.72
13	Kasaragod	5	15	7.57	6	8.30	3	9.25	1	6	25	31.12
<b>Total</b>		<b>54</b>	<b>183</b>	<b>54.61</b>	<b>70</b>	<b>105.54</b>	<b>13</b>	<b>47.36</b>	<b>6</b>	<b>37.85</b>	<b>272</b>	<b>245.36</b>

The total number of beneficiaries comes to 1479. About 61.80% of the beneficiaries are having holding less than one acre, 27.04% are having holdings one acre or more but less than 3 acres, 5.95% are having holding 3 acre or more but less than 5 acres and above only 5.21% 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 67.28%, 25.74%, 4.78% and 2.2% 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

### **1.3 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 are erosion. The different forms of soil erosion causes huge damage to Kerala's 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 measures are comparatively low costly such as contour ploughing / optimal fertilizing organic farming, etc. Engineering measures include contour bunding, land leveling, construction of check dams and water harvesting structure, etc. At present various watershed programmes are being implemented in the state for effective preservation and management of the natural resources.

#### **1.5 Land Use Particulars of the State**

There has been a significant change in the land use of the state over the years. On many occasions the change is adversely affecting the environment by way of intensified soil erosion, water logging, conversion of paddy lands, etc. are some of the examples. Cultivation of very steep lands without adopting scientific conservation practices lead to heavy soil erosion. Use of chemicals on a large scale for agricultural productions leave 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 subsidies provided for supporting income generating enterprises, there was positive impact.

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

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

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

#### **Land Use particulars of Beneficiary plots**

Table Nos. 3 and 3(a) reveals the land use particulars of beneficiary plots and control plots respectively. It gives us certain positive trends while comparing with the area before and after soil conservation programme. Area increased from 1629.03 acres to 1638.59 acre after the implementation of soil conservation programme. An additional area of 9.56 acre of

land has brought under cultivation which was not cultivated earlier. Hence it can be stated that 0.59% 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 90.49% to 91.02% by decreasing the current fallow.

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

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	30.94	128500	125	125
2	Kollam	47.12	1140916	125	125
3	Pathanamthitta	30.29	2218132	125	125
4	Alappuzha	91.99	1750559	125	125
5	Kottayam	92.33	2987559	125	125
6	Idukki	396.04	15029879	125	125
7	Eranakulam	24.58	1644471	125	125
8	Thrissur	17.03	487398	25	25
9	Palakkad	256.60	4807796	449	125
10	Malappuram	154.69	5209298	1937	125
11	Kozhikkode	82.20	50000	79	79
12	Kannur	174.39	8228310	125	125
13	Kasaragod	401.99	12383845	125	125
<b>Total</b>		<b>1800.19</b>	<b>56066663</b>	<b>3615</b>	<b>1479</b>



**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		
1	Thiruvananthapuram	30.09	97.25	30.09	97.25	0.21	0.68	0.21	0.68
2	Kollam	34.35	72.90	35.18	74.66	3.26	6.92	2.21	4.69
3	Pathanamthitta	25.35	83.69	25.88	85.44	2.07	6.83	1.42	4.69
4	Alappuzha	87.13	94.72	87.20	94.79	1.62	1.76	1.56	1.70
5	Kottayam	78.83	85.38	78.83	85.38	0	0	0	0
6	Idukki	353.09	89.16	354.24	89.45	3.50	0.88	2.35	0.59
7	Eranakulam	21.31	86.70	21.22	86.33	0.06	0.24	0.06	0.24
8	Thrissur	17.03	100.00	17.03	100.00	0	0	0	0
9	Palakkad	223.03	86.92	227.62	88.71	15.97	6.22	11.40	4.44
10	Malappuram	137.76	89.06	137.74	89.04	2.44	1.58	2.21	1.43
11	Kozhikode	75.69	92.08	76.24	92.75	1.06	1.29	1.03	1.25
12	Kannur	156.11	89.52	158.06	90.64	2.29	1.31	0.3	0.17
13	Kasaragod	389.26	96.83	389.26	96.83	2.77	0.69	2.77	0.69
<b>Total</b>		<b>1629.03</b>	<b>90.49</b>	<b>1638.59</b>	<b>91.02</b>	<b>35.25</b>	<b>1.96</b>	<b>25.52</b>	<b>1.42</b>

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	0.57	1.84	0.57	1.84	0.07	0.23	0.07	0.23	30.94	100	30.94	100
2	Kollam	8.16	17.32	8.50	18.04	1.35	2.87	1.23	2.61	47.12	100	47.12	100
3	Pathanamthitta	2.80	9.24	2.92	9.64	0.07	0.23	0.07	0.23	30.29	100	30.29	100
4	Alappuzha	3.22	3.50	3.21	3.49	0.02	0.02	0.02	0.02	91.99	100	91.99	100
5	Kottayam	13.40	14.51	13.40	14.51	0.10	0.11	0.10	0.11	92.33	100	92.33	100
6	Idukki	38.70	9.77	38.70	9.77	0.75	0.19	0.75	0.19	396.04	100	396.04	100
7	Eranakulam	3.21	13.06	3.30	13.43	0	0	0	0	24.58	100	24.58	100
8	Thrissur	0	0	0	0	0	0	0	0	17.03	100	17.03	100
9	Palakkad	5.13	2	5.13	2.00	12.47	4.86	12.45	4.85	256.60	100	256.60	100
10	Malappuram	6.71	4.34	6.96	4.50	7.78	5.03	7.78	5.03	154.69	100	154.69	100
11	Kozhikkode	3.01	3.66	3.06	3.72	2.44	2.97	1.87	2.27	82.20	100	82.20	100
12	Kannur	2.76	1.58	2.8	1.61	13.23	7.59	13.23	7.59	174.39	100	174.39	100
13	Kasaragod	4.00	1.00	4.00	1.00	5.96	1.48	5.96	1.48	401.99	100	401.99	100
<b>Total</b>		<b>91.67</b>	<b>5.09</b>	<b>92.55</b>	<b>5.14</b>	<b>44.24</b>	<b>2.46</b>	<b>43.53</b>	<b>2.42</b>	<b>1800.19</b>	<b>100</b>	<b>1800.19</b>	<b>100</b>

**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	3.44	93.48	0.00	0.00	0.24	6.52	0.00	0.00	3.68	100
2	Kollam	9.74	86.65	0.20	1.78	1.30	11.57	0.00	0.00	11.24	100
3	Pathanamthitta	3.63	80.49	0.05	1.11	0.83	18.40	0.00	0.00	4.51	100
4	Alappuzha	7.91	90.92	0.10	1.15	0.69	7.93	0.00	0.00	8.70	100
5	Kottayam	11.12	87.63	0.00	0.00	1.43	11.27	0.14	1.10	12.69	100
6	Idukki	62.89	89.77	2.00	2.85	5.17	7.38	0.00	0.00	70.06	100
7	Eranakulam	5.61	94.13	0.02	0.34	0.33	5.54	0.00	0.00	5.96	100
8	Thrissur	2.29	89.11	0.00	0.00	0.28	10.89	0.00	0.00	2.57	100
9	Palakkad	34.46	87.15	0.92	2.33	2.60	6.58	1.56	3.95	39.54	100
10	Malappuram	31.11	87.29	0.35	0.98	1.85	5.19	2.33	6.54	35.64	100
11	Kozhikkode	3.59	91.35	0.02	0.51	0.27	6.87	0.05	1.27	3.93	100
12	Kannur	15.13	96.25	0.00	0.00	0.59	3.75	0.00	0.00	15.72	100
13	Kasaragod	30.47	97.91	0.50	1.61	0.15	0.48	0.00	0.00	31.12	100
<b>Total</b>		<b>221.39</b>	<b>90.23</b>	<b>4.16</b>	<b>1.70</b>	<b>15.73</b>	<b>6.41</b>	<b>4.08</b>	1.66	<b>245.36</b>	<b>100</b>

## **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 1431.21 acre to 1488.36 acre. It showed an increase of 4%. At the same time the percentage change occurred in the cultivation of seasonal crops

recorded as 12.50 %. From this we can arrive at the conclusion that the farmers have shown a tendency to cultivate seasonal 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 changes are recorded as 133.63 % and 26.25 %. The plantain cultivation percentage increase recorded as 32 % At the same time in paddy cultivation percentage variation is in a negative trend. It is recorded as -9.29 %. In perennial crops all are shown an increasing trend.

Table No. 5 reveals that after the introduction of soil conservation programmes, Rubber has occupied the largest area under perennial crops; the percentage increase is 5.40 %. Coconut comes next with an increase of 5.82%. The area under pepper has decreased to 2.09 % 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	20.73	68.37	21.17	58.32	9.59	31.63	15.13	41.68
2	Kollam	31.25	86.9	38.88	83.01	4.71	13.1	7.96	16.99
3	Pathanamthitta	41.28	95.33	43.25	94.25	2.02	4.67	2.64	5.75
4	Alappuzha	16.71	19.03	17.88	20.18	71.08	80.97	70.74	79.82
5	Kottayam	78.92	98.96	79.89	98.87	0.83	1.04	0.91	1.13
6	Idukki	325.36	93.04	330.51	93.01	24.33	6.96	24.85	6.99
7	Eranakulam	4.22	17.36	4.27	17.46	20.09	82.64	20.19	82.54
8	Thrissur	1.81	10.59	1.84	10.75	15.28	89.41	15.28	89.25
9	Palakkad	190.51	92.76	204.19	89.42	14.86	7.24	24.15	10.58
10	Malappuram	131.02	95.64	134.83	94.71	5.97	4.36	7.53	5.29
11	Kozhikkode	70.63	95.87	76.85	94.13	3.04	4.13	4.79	5.87
12	Kannur	141.68	96.32	152.5	96.16	5.41	3.68	6.09	3.84
13	Kasaragod	377.09	97.07	382.3	96.99	11.39	2.93	11.88	3.01
<b>Total</b>		<b>1431.21</b>	<b>88.36</b>	<b>1488.36</b>	<b>87.52</b>	<b>188.60</b>	<b>11.64</b>	<b>212.14</b>	<b>12.48</b>

**Table – 4 Contd..**

Sl. No	Districts	Total Gross area cropped			
		Before SC work	%	After SC work	%
1	2	11	12	13	14
1	Thiruvananthapuram	30.32	100	36.30	100
2	Kollam	35.96	100	46.84	100
3	Pathanamthitta	43.30	100	45.89	100
4	Alappuzha	87.79	100	88.62	100
5	Kottayam	79.75	100	80.80	100
6	Idukki	349.69	100	355.36	100
7	Eranakulam	24.31	100	24.46	100
8	Thrissur	17.09	100	17.12	100
9	Palakkad	205.37	100	228.34	100
10	Malappuram	136.99	100	142.36	100
11	Kozhikode	73.67	100	81.64	100
12	Kannur	147.09	100	158.59	100
13	Kasaragod	388.48	100	394.18	100
<b>Total</b>		<b>1619.81</b>	<b>100</b>	<b>1700.50</b>	<b>100</b>

**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	19.65	19.73	0.41	0.16	0.2	25	0.01	0.01	0
2	Kollam	8.42	10.5	24.7	0.2	0.26	30	1.17	1.17	0
3	Pathanamthitta	3.16	3.52	11.39	0.23	0.27	17.39	0.02	0.03	50
4	Alappuzha	14.24	14.99	5.27	0.78	1.02	30.77	0.03	0.04	33.33
5	Kottayam	10.56	11.11	5.21	0.15	0.18	20	0.03	0.03	0
6	Idukki	70.14	71.71	2.24				6.23	5.93	-4.82
7	Eranakulam	3.52	3.79	7.67	0.14	0.17	21.43	0.05	0.05	0
8	Thrissur	1.22	1.25	2.46	0.43	0.43	0	0.11	0.11	0
9	Palakkad	85.02	94.28	10.89	9.54	10.8	13.21	3.08	3.36	9.09
10	Malappuram	84.37	86.19	2.16	9.11	9.19	0.88	8.61	10.17	18.12
11	Kozhikode	33.37	35.29	5.75	6.76	7.27	7.54	1.78	1.79	0.56
12	Kannur	20.63	23.79	15.32	1.65	1.71	3.64	37.98	29.08	-23.43
13	Kasaragod	43.83	45.15	3.01	11.77	11.82	0.42	106.45	110.08	3.41
<b>Total</b>		<b>398.13</b>	<b>421.3</b>	<b>5.82</b>	<b>40.92</b>	<b>43.32</b>	<b>5.87</b>	<b>165.55</b>	<b>161.85</b>	<b>-2.23</b>



Table – 5 Contd..

Sl. No	Districts	Rubber			Pepper			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	12	13	14	15	16	17	16	17	18	19	20	21
1	Thiruvananthapuram	0	0		0.08	0.14	75	0.45	0.61	35.56	0.26	0.31	19.23
2	Kollam	16.67	21.93	31.55	2.28	2.22	-2.63	2.23	2.48	11.21	0.27	0.31	14.81
3	Pathanamthitta	35.69	37.65	5.49	0.05	0.05	0	0.67	0.65	-2.99	0.15	0.15	0
4	Alappuzha	0	0		0.22	0.22	0	0.79	0.86	8.86	0.6	0.68	13.33
5	Kottayam	64.47	64.77	0.47	1.18	1.25	5.93	2.37	2.39	0.84	0.14	0.14	0
6	Idukki	91.61	97.72	6.67	124.99	122.16	-2.26	1.19	1.51	26.89	0	0	
7	Eranakulam	0	0		0.44	0.19	-56.82	0.05	0.05	0	0	0	
8	Thrissur	0	0		0	0		0.05	0.05	0	0	0	
9	Palakkad	76.48	76.9	0.55	10.78	10.96	1.67	2.57	3.48	35.41	2.36	3.46	46.61
10	Malappuram	17.86	17.89	0.17	2.46	2.12	-13.82	4.31	4.65	7.89	4.03	4.34	7.69
11	Kozhikkode	8.54	9.43	10.42	10.78	10.54	-2.23	1.73	2.34	35.26	0.3	0.36	20
12	Kannur	71.22	87.8	23.28	5.75	5.62	-2.26	3.22	3.25	0.93	0.72	0.74	2.78
13	Kasaragod	204.75	204.89	0.07	7.71	7.76	0.65	1.72	1.74	1.16	0	0	
<b>Total</b>		<b>587.29</b>	<b>618.98</b>	<b>5.4</b>	<b>166.72</b>	<b>163.23</b>	<b>-2.09</b>	<b>21.35</b>	<b>24.06</b>	<b>12.69</b>	<b>8.83</b>	<b>10.49</b>	<b>18.8</b>

Sl. No	Districts	Coco			Coffee			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			20	21	22	23
1	Thiruvananthapuram							0.12	0.17	41.67	20.73	21.17	2.12
2	Kollam							0.01	0.01	0	31.25	38.88	24.42
3	Pathanamthitta	1.3	0.92	-29.23	0.01	0.01	0	0	0		41.28	43.25	4.77
4	Alappuzha							0.05	0.07	40	16.71	17.88	7
5	Kottayam	0.02	0.02	0				0	0		78.92	79.89	1.23
6	Idukki	24.22	23.44	-3.22	6.98	8.04	15.19	0	0		325.36	330.51	1.58
7	Eranakulam	0.02	0.02	0				0	0		4.22	4.27	1.18
8	Thrissur							0	0		1.81	1.84	1.66
9	Palakkad							0.68	0.95	39.71	190.51	204.19	7.18
10	Malappuram				0.04	0.04	0	0.23	0.24	4.35	131.02	134.83	2.91
11	Kozhikkode	7.24	9.5	31.22	0.13	0.16	23.08	0	0.17		70.63	76.85	8.81
12	Kannur	0.32	0.32	0	0.19	0.19	0	0	0		141.68	152.5	7.64
13	Kasaragod	0.84	0.84	0	0.02	0.02	0	0	0		377.09	382.3	1.38
<b>Total</b>		<b>33.96</b>	<b>35.06</b>	<b>3.24</b>	<b>7.37</b>	<b>8.46</b>	<b>14.79</b>	<b>1.09</b>	<b>1.61</b>	<b>47.71</b>	<b>1431.21</b>	<b>1488.36</b>	<b>3.99</b>

**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	1	2	3	5	6	7	8	9	10
1	Thiruvananthapuram				0.62	4.29	591.94	2.57	2.97	15.56
2	Kollam				2.6	5.84		0.75	0.73	-2.67
3	Pathanamthitta				1.65	1.36	-17.58	0.27	1.26	366.67
4	Alappuzha	68.39	67.09	-1.9	0.18	0.46	155.56	1.41	1.66	17.73
5	Kottayam							0.44	0.51	15.91
6	Idukki				7.75	6.1	-21.29	16.1	18.21	13.11
7	Eranakulam	17.53	8.27	-52.82	1.2	1.11	-7.5	0.29	1.3	348.28
8	Thrissur	15.28	15.28	0						
9	Palakkad	12.19	12.19	0				2.48	4.5	
10	Malappuram	1.63	1.5	-7.98	0.31	0.09	-70.97	1.54	3.44	123.38
11	Kozhikkode				0.72	1.03	43.06	1.87	1.91	2.14
12	Kannur				4.12	4.12	0	0.76	1.31	72.37
13	Kasaragod				0.81	0.81	0	1.19	1.34	12.61
<b>Total</b>		<b>115.02</b>	<b>104.33</b>	<b>-9.29</b>	<b>19.96</b>	<b>25.21</b>	<b>26.3</b>	<b>29.67</b>	<b>39.14</b>	<b>31.92</b>

Table – 6 Contd..

Sl. No	Districts	Ginger			Banana			Vegetables			Pineapple		
		Before SC work	After SC work	% increase	Before SC work	After SC work	% increase	Before SC work	After SC work	% increase	Before SC work	After SC work	% increase
1	2	12	13	14	15	16	17	18	19	20	21	22	23
1	Thiruvananthapuram				6.38	6.89	7.99		0.84		0.01	0.02	100
2	Kollam	0.07	0.07	0	0.89	0.95	6.74	0.2	0.2	0	0.03	0.03	0
3	Pathanamthitta												
4	Alappuzha				0.13	0.23	76.92	0.83	0.88	6.02			
5	Kottayam				0.35	0.36	2.86						
6	Idukki				0.48	0.54	0.54						
7	Eranakulam	0.06		-100	0.42	8.39	1897.6 2	0.03	0.78	2500		0.18	
8	Thrissur												
9	Palakkad				0.19	7.37	3778.9 5						
10	Malappuram							0.7	0.7	0			
11	Kozhikode	0.11	0.31	181.8 2	0.28	1.46	421.43	0.01	0.01	0		0.01	
12	Kannur	0.22	0.22	0	0.17	0.25	47.06				0.1	0.1	0
13	Kasaragod	3.99	3.72	-6.77	3.97	4.54	14.36	0.66	0.69	4.55	0.59	0.6	1.69
	<b>Total</b>	<b>4.45</b>	<b>4.32</b>	<b>-2.92</b>	<b>13.26</b>	<b>30.98</b>	<b>133.63</b>	<b>2.43</b>	<b>4.1</b>	<b>68.72</b>	<b>0.73</b>	<b>0.94</b>	<b>28.77</b>

**Table – 6 Contd..**

Sl. No	Districts	Chennai			Kolacasia			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		0.02		0.01	0.02	100	0	0.08		9.59	15.13	57.77
2	Kollam	0.1	0.07	-30	0.04	0.04	0	0.03	0.03	0	4.71	7.96	69
3	Pathanamthitta	0.07		-100				0.03	0.02	-33.33	2.02	2.64	30.69
4	Alappuzha	0.14	0.42	200				0	0		71.08	70.74	-0.48
5	Kottayam	0.04	0.04	0				0	0		0.83	0.91	9.64
6	Idukki							0	0		24.33	24.85	2.14
7	Eranakulam							0.56	0.16	-71.43	20.09	20.19	0.5
8	Thrissur							0	0		15.28	15.28	0
9	Palakkad		0.06			0.01		0	0.02		14.86	24.15	62.52
10	Malappuram	0.13	0.14	7.69	0.07	0.07	0	1.59	1.59	0	5.97	7.53	26.13
11	Kozhikode					0.01		0.05	0.05	0	3.04	4.79	57.57
12	Kannur							0.04	0.09	125	5.41	6.09	12.57
13	Kasaragod							0.18	0.18	0	11.39	11.88	4.3
<b>Total</b>		<b>0.48</b>	<b>0.75</b>	<b>56.25</b>	<b>0.12</b>	<b>0.15</b>	<b>25</b>	<b>2.48</b>	<b>2.22</b>	<b>-10.48</b>	<b>188.6</b>	<b>212.14</b>	<b>12.48</b>

### **Impact of Soil Conservation Treatment on the Yield of Crops**

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

For example in Palakkad district total area before soil conservation works was 205.37 acres. It increases to 228.34 acres after the implementation of soil conservation measures. The increase in area is accounted as 22.97 acres. The percentage increase recorded as 11.18%. 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.

In Kannur district before soil conservation work the area was 147.09 acres. It increased to 158.59 acres after the implementation of soil conservation work. Increase in area accounted as 11.50 acres. Production impact reveals that output and area of coconut, arecanut and Rubber increased.

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 area and production decreased. Whereas banana, other plantain and tapioca 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	66861.0 0	205931	79043.0 0	359655	304225
	Arecanut	Nos.	3550.00	1527	4165.00	2624	2237
	Cashew	Qtl.			0.30	857	
	Pepper	Qtl.			0.29	2992	
	Rubber	Qtl.					
	Pappaya	Qtl	0.86	602	0.85	595	602
	Jack	Qtl	14.60	876	8.72	3053	5112
	Mango	Qyl	0.40	430	0.37	449	485
	Coffee	Qtl					
	Coco	Qtl					
	Tamarind	Qtl	0.20	327	1.07	3479	650
	<b>Total</b>			<b>20969 3</b>		<b>373704</b>	<b>313311</b>
Kollam	Coconut	Nos	11761.0 0	47044	12243.0 0	68076	65396
	Arecanut	Nos.	3895.00	1444	5200.00	3280	2457
	Cashew	Qtl.	1.03	2588	1.28	4227	3401
	Pepper	Qtl.	1.43	10027	1.67	16914	14483
	Rubber	Qtl.	108.66	302188	103.83	847358	886776
	Pappaya	Qtl					
	Jack	Qtl	167.92	12232	143.69	19838	23183
	Mango	Qyl	4.17	2031	4.23	2129	2099
	Coffee	Qtl					
	Coco	Qtl					
	Tamarind	Qtl	0.05	113	0.06	184	153
	<b>Total</b>			<b>37766 7</b>		<b>962006</b>	<b>997948</b>
Pathanamthitta	Coconut	Nos	8713.00	35640	12085.0 0	66587	48008
	Arecanut	Nos.	11770.0 0	5061	20910.0 0	12128	6827
	Cashew	Qtl.	0.05	115	0.11	327	149
	Pepper	Qtl.	0.23	1665	0.47	5955	2914
	Rubber	Qtl.	118.38	327677	109.08	914090	992024
	Pappaya	Qtl					
	Jack	Qtl	137.00	9590	84.10	18885	30764
	Mango	Qyl	2.60	1362	5.25	5159	2555
	Coffee	Qtl					

	Coco	Qtl	45.80	59450	93.75	42188	20610
	Vanila	Qtl					
	Tamarind	Qtl					
	<b>Total</b>			<b>440560</b>		<b>1065319</b>	<b>1103851</b>

(Table 7 Contd..)

1	2	3	4	5	6	7	8
Alappuzha	Coconut	Nos	44895.00	149950	63572.00	312139	220435
	Arecanut	Nos.	24054.00	8904	35316.00	16601	11307
	Cashew	Qtl.	0.20	459	0.24	696	580
	Pepper	Qtl.	0.63	4020	0.81	5595	4352
	Rubber	Qtl.					
	Pappaya	Qtl					
	Jack	Qtl	330.52	23137	274.96	41245	49579
	Mango	Qyl	11.84	4035	13.33	10867	9652
	Coffee	Qtl					
	Coco	Qtl					
	Tamarind	Qtl	0.49	837	0.71	1278	882
	<b>Total</b>			<b>191342</b>		<b>388421</b>	<b>296787</b>
Kottayam	Coconut	Nos	31236	121192	32570	181742	174298
	Arecanut	Nos.	9706	3688	11370	6367	5435
	Cashew	Qtl.	1.03	2691	1.10	2720	2547
	Pepper	Qtl.	9.5	66491	10.37	115116	105458
	Rubber	Qtl.	1031.1	3142792	1110.35	9322498	8657115
	Pappaya	Qtl					
	Jack	Qtl	10.20	715	12.30	1599	1326
	Mango	Qyl	1.48	1099	1.83	1878	1519
	Coffee	Qtl					
	Coco	Qtl	0.04	56	0.05	97	78
	Tamarind	Qtl					
	<b>Total</b>			<b>3338724</b>		<b>9632017</b>	<b>8947776</b>
Idukki	Coconut	Nos	144950.00	584159	164040.00	1035094	914636
	Arecanut	Nos.	7.00	3			3
	Cashew	Qtl.	40.55	100402	19.74	48875	100399
	Pepper	Qtl.	336.65	2400986	533.36	5873911	3707537
	Rubber	Qtl.	774.38	2287517	1129.43	8852471	6069590
	Pappaya	Qtl					
	Jack	Qtl					
	Mango	Qyl					
	Coffee	Qtl	42.43	146939	87.91	190156	91779
	Coco	Qtl	112.11	170754	218.23	82925	42601
	Tamarind	Qtl					
	<b>Total</b>			<b>5690760</b>		<b>16083432</b>	<b>10926545</b>
Ernakulam	Coconut	Nos	5877.00	20162	8575.00	43387	29736
	Arecanut	Nos.	840.00	286	2110.00	1119	445
	Cashew	Qtl.					
	Pepper	Qtl.	2.47	16984	0.29	3047	25952
	Rubber	Qtl.					



	Pappaya	Qtl					
	Jack	Qtl					
	Mango	Qyl					
	Coffee	Qtl					
	Coco	Qtl					
	Tamarind	Qtl					
	<b>Total</b>			<b>37432</b>		<b>47553</b>	<b>56133</b>

(Table 7 Contd..)

1	2	3	4	5	6	7	8
Thrissur	Coconut	Nos	2238.00	7185	3073.00	12569	9154
	Arecanut	Nos.	15278.00	5348	19563.00	10564	8250
	Cashew	Qtl.	0.99	2604	1.18	3446	2891
	Pepper	Qtl.					
	Rubber	Qtl.					
	Pappaya	Qtl					
	Jack	Qtl					
	Mango	Qyl					
	Coffee	Qtl					
	Coco	Qtl					
	Tamarind	Qtl					
	<b>Total</b>			<b>15137</b>		<b>26579</b>	<b>20295</b>
Palakkad	Coconut	Nos	282090.00	863196	320410.00	1166293	1026808
	Arecanut	Nos.	443570.00	119764	641550.00	263041	181868
	Cashew	Qtl.	4.95	12982	5.94	17236	14363
	Pepper	Qtl.	7.30	49651	11.48	121688	77380
	Rubber	Qtl.	621.48	1807263	635.35	5288653	5173199
	Pappaya	Qtl					
	Jack	Qtl	177.20	19502	123.78	29592	42363
	Mango	Qyl	144.30	93506	151.70	105582	100432
	Coffee	Qtl					
	Coco	Qtl					
	Tamarind	Qtl	71.10	42091	83.25	75258	64274
	<b>Total</b>			<b>300795</b>		<b>706734</b>	<b>668068</b>
Malappuram	Coconut	Nos	320230.00	925467	316908.00	1197916	1210473
	Arecanut	Nos.	1622900.0	421959	1662079.0	681456	665393
	Cashew	Qtl.	55.70	151003	48.07	135560	157077
	Pepper	Qtl.	5.04	35312	5.01	53145	53463
	Rubber	Qtl.	155.60	455285	186.53	1541484	1285878
	Pappaya	Qtl					
	Jack	Qtl	791.46	39573	875.33	96287	87061
	Mango	Qyl	114.02	64519	124.95	100837	92016
	Coffee	Qtl					
	Coco	Qtl					
	Tamarind	Qtl	0.65	683	1.18	1711	943
	<b>Total</b>			<b>209380</b>		<b>380839</b>	<b>355230</b>
Kozhikode	Coconut	Nos	71031.00	219492	97545.00	395067	287683
	Arecanut	Nos.	385790.00	100305	578420.00	271858	181322
	Cashew	Qtl.	3.75	9815	6.00	14975	9359
	Pepper	Qtl.	10.67	73380	11.80	122359	110642
	Rubber	Qtl.	22.20	63892	40.00	330240	183283
	Pappaya	Qtl					
	Jack	Qtl	57.97	3196	48.94	8521	10093
	Mango	Qyl	2.70	3691	3.45	2050	1604
	Coffee	Qtl					
	Coco	Qtl	1.00	1525	13.21	6605	500
	Tamarind	Qtl					
	<b>Total</b>			<b>475296</b>		<b>115167</b>	<b>784486</b>

(Table 7 Contd..)

1	2	3	4	5	6	7	8
Kannur	Coconut	Nos	64150.00	194382	78355.00	306375	250832
	Arecanut	Nos.	136600.00	36883	189950.00	89277	64202
	Cashew	Qtl.	130.06	382516	131.98	406245	400335
	Pepper	Qtl.	12.88	91478	25.65	277409	139299
	Rubber	Qtl.	376.50	1099380	489.00	4064095	3129104
	Pappaya	Qtl					
	Jack	Qtl	8.00	480	10.00	1250	1000
	Mango	Qyl					
	Coffee	Qtl					
	Coco	Qtl					
	Tamarind	Qtl					
	<b>Total</b>			<b>1805119</b>		<b>5144651</b>	<b>3984772</b>
Kasaragod	Coconut	Nos	233910.00	783601	302950.00	1378425	1064292
	Arecanut	Nos.	1906600.0	629179	2430300.0	1603998	1258356
	Cashew	Qtl.	602.55	1733540	770.05	2321703	1816690
	Pepper	Qtl.	14.37	101526	17.52	173170	142035
	Rubber	Qtl.	1228.45	3623928	1275.50	10804768	10406207
	Pappaya	Qtl					
	Jack	Qtl					
	Mango	Qyl					
	Coffee	Qtl					
	Coco	Qtl					
	Tamarind	Qtl					
	<b>Total</b>			<b>6871774</b>		<b>1628206</b>	<b>1468758</b>
STATE	Coconut	Nos	1287942.0	4157401	1491369.0	6523325	5605976
	Arecanut	Nos.	4564560.0	1334351	5600933.0	2962313	2388102
	Cashew	Qtl.	840.86	2398715	985.99	2956867	2507791
	Pepper	Qtl.	401.17	2851520	618.72	6771301	4383515
	Rubber	Qtl.	4436.75	13109922	5079.07	41965657	36783176
	Pappaya	Qtl	0.86	602	0.85	595	602
	Jack	Qtl	1694.87	109301	1581.82	220270	250481
	Mango	Qyl	281.51	170673	305.11	228951	210362
	Coffee	Qtl	42.43	146939	87.91	190156	91779
	Coco	Qtl	158.95	231785	325.24	131815	63789
	Tamarind	Qtl	72.49	44051	86.27	81910	66902
	<b>Total</b>			<b>2455526</b>		<b>6203316</b>	<b>5235247</b>

**Table – 8 – Crop wise yield and value of seasonal crops in scheme area.**

District	Name of Crop	Unit	Before SC work		After SC work		
			Quantity	Value	Quantity	Value	Value at constant price
1	2	3	4	5	6	7	8
Thiruvananthapuram	Paddy	Qtl					
	Tapioca	Qtl			94.79	38674	0
	Banana	Qtl	514.00	586475	730.43	1024794	721142
	Other Plantain	Qtl	54.03	41010	376.70	311157	44629
	Ginger	Qtl					
	Turmeric	Qtl					
	Vegitables	Qtl			5.47	6017	0
	Pineapple	Qtl			0.85	669	0
	Chennai	Qtl					
	Others	Qtl			0.12	138	0
		<b>Total</b>			<b>627485</b>		<b>1381449</b>
Kollam	Paddy	Qtl					
	Tapioca	Qtl	44.15	13029	8.45	3110	16249
	Banana	Qtl	23.30	23652	57.48	82310	33365
	Other Plantain	Qtl	34.22	21487	40.32	29718	25222
	Ginger	Qtl	0.93	2763	1.45	1510	968
	Turmeric	Qtl	0.05	81	0.06	180	150
	Vegitables	Qtl	2.40	1046	2.62	1405	1287
	Pineapple	Qtl	0.40	285	0.65	321	198
	Chennai	Qtl					
	Others	Qtl	200.00	1200	250.00	1875	1500
		<b>Total</b>			<b>63543</b>		<b>120429</b>

Table – 8 Contd.

1	2	3	4	5	6	7	8
Pathanamthitta	Paddy	Qtl					
	Tapioca	Qtl	189.3 5	67979	215.28	108720	95625
	Banana	Qtl					
	Other Plantain	Qtl	16.46	10026	95.90	69721	11967
	Ginger	Qtl					
	Turmeric	Qtl					
	Vegitables	Qtl					
	Pineapple	Qtl					
	Chennai	Qtl					
	Others	Qtl					
	<b>Total</b>			<b>78005</b>		<b>178441</b>	<b>107592</b>
Alappuzha	Paddy	Qtl	1047. 00	610401	1110.6 4	889624	838648
	Tapioca	Qtl	18.00	5693	52.00	23764	8226
	Banana	Qtl	22.60	21251	30.34	41141	30646
	Other Plantain	Qtl	54.05	30541	78.02	54461	37729
	Ginger	Qtl					
	Turmeric	Qtl					
	Vegitables	Qtl					
	Pineapple	Qtl					
	Chennai	Qtl	1.90	1330	12.25	8808	1366
	Others	Qtl	54.00	324	67.00	503	405
	<b>Total</b>			<b>669540</b>		<b>1018301</b>	<b>917020</b>
Kottayam	Paddy	Qtl					
	Tapioca	Qtl					
	Banana	Qtl	16.64	17954	17.82	26134	24403
	Other Plantain	Qtl	21.21	12069	23.00	16027	14780
	Ginger	Qtl					
	Turmeric	Qtl					
	Vegitables	Qtl					
	Pineapple	Qtl					
	Chennai	Qtl	4.01	2129	4.30	2279	2125
	Others	Qtl					
	<b>Total</b>			<b>32152</b>		<b>44440</b>	<b>41308</b>

Table – 8 Contd..

1	2	3	4	5	6	7	8
Idukki	Paddy	Qtl					
	Tapioca	Qtl	576.0 0	19411 2	299.00	166244	320256
	Banana	Qtl	55.50	51504	78.80	90620	63825
	Other Plantain	Qtl	1203. 10	64246 3	688.25	490724	857813
	Ginger	Qtl					
	Turmeric	Qtl					
	Vegitables	Qtl					
	Pineapple	Qtl					
	Chennai	Qtl					
	Others	Qtl					
	<b>Total</b>			<b>88807 9</b>		<b>747588</b>	<b>1241894</b>
Ernakulam	Paddy	Qtl	488.60	26726 9	120.50	81699	331271
	Tapioca	Qtl	2.50	738	112.00	49616	1108
	Banana	Qtl	33.40	31463	757.32	952708	42017
	Other Plantain	Qtl	14.12	7006	17.02	11845	9827
	Ginger	Qtl	3.50	10028			5054
	Turmeric	Qtl					
	Vegitables	Qtl					
	Pineapple	Qtl			19.00	10336	
	Chennai	Qtl					
	Others	Qtl	167.80	25724.00	109.80	26430.0 0	29877.00
	<b>Total</b>			<b>34222 8</b>		<b>1132634</b>	<b>419154</b>
Thrissur	Paddy	Qtl	227.26	124766	308.45	210363	154991
	Tapioca	Qtl					
	Banana	Qtl					
	Other Plantain	Qtl					
	Ginger	Qtl					
	Turmeric	Qtl					
	Vegitables	Qtl					
	Pineapple	Qtl					
	Chennai	Qtl					
	Others	Qtl					
	<b>Total</b>			<b>12476 6</b>		<b>210363</b>	<b>154991</b>
Palakkad	Paddy	Qtl	288.00	16444 8	299.50	206357	198433
	Tapioca	Qtl					
	Banana	Qtl	2.40	1994	498.25	554555	2671
	Other Plantain	Qtl	128.10	67380	174.00	108758	80068
	Ginger	Qtl					
	Turmeric	Qtl			0.50	1100	
	Vegitables	Qtl					

	Pineapple	Qtl					
	Chennai	Qtl					
	Others	Qtl	4000.00	3001	4080.00	4080	4000
	<b>Total</b>			<b>23682</b>		<b>874850</b>	<b>285172</b>

Table – 8 Contd..

1	2	3	4	5	6	7	8
Malappuram	Paddy	Qtl	34.85	20422	33.05	21516	22688
	Tapioca	Qtl	21.62	5903	5.73	2607	9837
	Banana	Qtl					
	Other Plantain	Qtl	100.77	54415	90.66	65458	72758
	Ginger	Qtl					
	Turmeric	Qtl					
	Vegitables	Qtl					
	Pineapple	Qtl					
	Chenai	Qtl					
	Others	Qtl	28099.00	22479	30936.00	24749	22479
	<b>Total</b>			<b>103219</b>		<b>114330</b>	<b>127762</b>
Kozhikode	Paddy	Qtl					
	Tapioca	Qtl	18.40	5961	23.91	13079	10065
	Banana	Qtl	1.40	1240	60.84	75551	1894
	Other Plantain	Qtl	18.55	12093	46.22	40167	16121
	Ginger	Qtl	1.60	3920	1.51	1261	1336
	Turmeric	Qtl					
	Vegitables	Qtl					
	Pineapple	Qtl					
	Chenai	Qtl					
	Others	Qtl					
	<b>Total</b>			<b>23214</b>		<b>130058</b>	<b>29416</b>
Kannur	Paddy	Qtl					
	Tapioca	Qtl	276.00	109573	363.50	205741	156216
	Banana	Qtl	6.80	6059	9.80	13163	9134
	Other Plantain	Qtl	34.45	20330	77.30	63776	28423
	Ginger	Qtl	6.15	15080	7.80	7731	6096
	Turmeric	Qtl	1.00	2700	3.25	9100	2800
	Vegitables	Qtl					
	Pineapple	Qtl	1.50	600	3.00	2091	1046
	Chenai	Qtl					
	Others	Qtl					
	<b>Total</b>			<b>154342</b>		<b>301602</b>	<b>203715</b>
Kasaragod	Paddy	Qtl					
	Tapioca	Qtl					
	Banana	Qtl	200.50	201104	230.00	324073	282507
	Other Plantain	Qtl	25.50	13695	34.00	27948	20961
	Ginger	Qtl	20.50	19475	20.00	84000	86100
	Turmeric	Qtl					
	Vegitables	Qtl					
	Pineapple	Qtl					
	Chenai	Qtl					
	Others	Qtl					
	<b>Total</b>			<b>234274</b>		<b>436021</b>	<b>389568</b>



STATE	Paddy	Qtl	2085.71	1187306.0	1872.14	1409559.00	1546031.00
	Tapioca	Qtl	1146.02	402988.00	1174.66	611555.00	617582.00
	Banana	Qtl	876.54	942696.00	2471.08	3185049.00	1211604.00
	Other Plantain	Qtl	1704.56	932515.00	1741.39	1289760.00	1220298.00
	Ginger	Qtl	32.68	51266.00	30.76	94502.00	99554.00
	Turmeric	Qtl	1.05	2781.00	3.81	10380.00	2950.00
	Vegitables	Qtl	2.40	1046.00	8.09	7422.00	1287.00
	Pineapple	Qtl	1.90	885.00	23.50	13417.00	1244.00
	Chennai	Qtl	5.91	3459.00	16.55	11087.00	3491.00
	Others	Qtl	32520.80	52728.00	35442.92	57775.00	58261.00
	<b>Total</b>			<b>3577670</b>		<b>6690506</b>	<b>4762302</b>

Table 9

## Quantity and Value of Selected perennial and seasonal crops for the years 2007-08

1	Name of Crops	Units	Before SC Work		After SC Work		Value at constant Price
			Quantity	Values (Rs)	Quantity	Value (Rs)	
2	3	4	5	6	7	8	
A. Perennial Crops	Coconut	Nos	1287942.00	4157401	1491369.00	6523325	5605947
	Arecanut	Nos.	4564560.00	1334351	5600933.00	2962313	2388102
	Cashew	Qtl.	840.86	2398715	985.99	2956867	2507791
	Pepper	Qtl.	401.17	2851520	618.72	6771301	4383517
	Rubber	Qtl.	4436.75	13109922	5079.07	41965657	36783176
	Pappaya	Qtl	0.86	602	0.85	595	602
	Jack	Qtl	1694.87	109301	1581.82	220270	250481
	Mango	Qyl	281.51	170673	305.11	228951	210362
	Coffee	Qtl	42.43	146939	87.91	190156	91779
	Coco	Qtl	158.95	231785	325.24	131815	63789
	Tamarind	Qtl	72.49	44051	86.27	81910	66902
	<b>Total ( A )</b>		<b>24555260</b>		<b>62033160</b>	<b>52355017</b>	
B. Seasonal Crops	Paddy	Qtl	2085.71	1187306.00	1872.14	1409559.00	1546031.00
	Tapioca	Qtl	1146.02	402988.00	1174.66	611555.00	617582.00
	Banana	Qtl	876.54	942696.00	2471.08	3185049.00	1211604.00
	Other Plantain	Qtl	1704.56	932515.00	1741.39	1289760.00	1220298.00
	Ginger	Qtl	32.68	51266.00	30.76	94502.00	99554.00
	Turmeric	Qtl	1.05	2781.00	3.81	10380.00	2950.00
	Vegitables	Qtl	2.40	1046.00	8.09	7422.00	1287.00
	Pineapple	Qtl	1.90	885.00	23.50	13417.00	1244.00
	Chennai	Qtl	5.91	3459.00	16.55	11087.00	3491.00
	Others	Qtl	32520.80	52728.00	35442.92	57775.00	58261.00
		<b>Total ( B )</b>		<b>3577670</b>		<b>6690506</b>	<b>4762302</b>
	All Crops (A+B)						
			<b>28132930</b>		<b>68723666</b>	<b>57117319</b>	

## **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 destruction 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 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 it's 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.5,60,66,663/-

The total area under cultivation after soil conservation work was 1638.59 acres. The value of crops before the soil conservation programme comes to Rs.2,81,32,930. The value of crops after the implementation of soil conservation programme has also been calculated as Rs. 6,87,23,666/- Thus the additional benefits due to the implementation of soil conservation programme is worked out to be Rs.4,05,90,736. It is estimated that the value at constant price as Rs. 5,71,17,319/- This shows that 78% 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 9.56 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 16%, cashew 17%, Rubber 15%, Banana 181%, Pepper 54% etc. As a seasonal crop productivity of tapioca increased to 3%.

#### **(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 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 have shown encouraging performance. The increase in area of perennial crops is higher over the area under same before soil conservation programme (4%). Growing of perennial crops will accelerate conservation of soil more affectively.

### **Occupational Profile**

The occupational profile of the selected beneficiaries reveals that 34% included agriculture job, 32% are accounted as non-agriculture; 13% agricultural labourers and 21% 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	846123	1755069	490386	781608	355737	973461
2	Kollam	441792	1084225	233795	349975	207997	734250
3	Pathanamthitta	518565	1243760	163867	346157	354698	897603
4	Alappuzha	863445	1412375	361666	480798	501779	931577
5	Kottayam	3370806	9676457	1448300	1450330	1922506	8226127
6	Idukki	6575793	16701465	1999008	2860459	4576785	13841006
7	Eranakulam	414857	1180187	242620	818088	172237	362099
8	Thrissur	139903	236942	136225	180715	3678	56227
9	Palakkad	3248046	7942163	1879750	2527444	1368296	5414719
10	Malappuram	2197497	3930270	883838	1208718	1313659	2721552
11	Kozhikkode	489451	1268412	185345	392837	304106	875575
12	Kannur	1959201	5446253	0	1511482	1959201	3934771
13	Kasaragod	7106048	16718085	3556677	5949285	3549371	10768800
<b>State</b>		<b>28171527</b>	<b>68595663</b>	<b>11581477</b>	<b>18857896</b>	<b>16590050</b>	<b>49737767</b>

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

SI No	Name of District	Income	Expenditure	Net Income
1	2			
1	Thiruvananthapuram	78160	28500	49660
2	Kollam	599993	98175	501818
3	Pathanamthitta	197309	53830	143479
4	Alappuzha	98596	48250	50346
5	Kottayam	829336	158852	670484
6	Idukki	3987773	1316700	2671073
7	Eranakulam	146606	94000	52606
8	Thrissur	324531	25400	299131
9	Palakkad	997441	374600	622841
10	Malappuram	607286	226315	380971
11	Kozhikkode	27963	12220	15743
12	Kannur	242309	91600	150709
13	Kasaragod	1192951	498700	694251
<b>State</b>		<b>9330254</b>	<b>3027142</b>	<b>6303112</b>

**Table 11 – Income per Acre before and after soil conservation programme***(Income in Rs)*

SI 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	30.09	355737	11822	30.09	973461	32352
2	Kollam	34.35	207997	6055	35.18	734250	20871
3	Pathanamthitta	25.35	354698	13992	25.88	897603	34683
4	Alappuzha	87.13	501779	5759	87.2	931577	10683
5	Kottayam	78.83	1922506	24388	78.83	8226127	104353
6	Idukki	353.09	4576785	12962	354.24	13841006	39072
7	Eranakulam	21.31	172237	8082	21.22	362099	17064
8	Thrissur	17.03	3678	216	17.03	56227	3302
9	Palakkad	223.03	1368296	6135	227.62	5414719	23788
10	Malappuram	137.76	1313659	9536	137.74	2721552	19759

11	Kozhikkode	75.69	304106	4018	76.24	875575	11484
12	Kannur	156.11	1959201	12550	158.06	3934771	24894
13	Kasaragod	389.26	3549371	9118	389.26	10768800	27665
<b>State</b>		<b>1629.03</b>	<b>16590050</b>	<b>10184</b>	<b>1638.59</b>	<b>49737767</b>	<b>30354</b>

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

SI No	Name of District	Area in acre	Net Income (Rs)	Net Income per acre
1	2	3	4	5
1	Thiruvananthapuram	3.44	49660	14436
2	Kollam	9.74	501818	51521
3	Pathanamthitta	3.63	143479	39526
4	Alappuzha	7.91	50346	6365
5	Kottayam	11.12	670484	60295
6	Idukki	62.89	2671073	42472
7	Eranakulam	5.61	52606	9377
8	Thrissur	2.29	299131	130625
9	Palakkad	34.46	622841	18074
10	Malappuram	31.11	380971	12246
11	Kozhikkode	3.59	15743	4385
12	Kannur	15.13	150709	9961
13	Kasaragod	30.47	694251	22785
<b>State</b>		<b>221.39</b>	<b>6303112</b>	<b>28471</b>

## 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 62% of the beneficiary holding belongs to less than one acre, 27% have holding area between one acre to 3 acre. And above 3 acre were 11 % respectively..

The opinion of selected beneficiaries are collected. Out of that 13% of the beneficiaries reported that contour bunds effectively control soil erosion while about 78 percent opinioned that it moderately controls soil erosion. The rest 9% are of opinion that it has no effect.

About the fertility of the soil 7% are of the view that the conservation measures have improved the fertility of the soil remarkably. While 91% 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 6% reported that the scheme has substantially increased moisture retention while 92% 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			Total
		Effectively controlled	Moderately controlled	No effect	Remarkably controlled	Moderately controlled	No effect	Substantially controlled	Moderately controlled	No effect	
1	2	3	4	5	6	7	8	9	10	11	12
1	Thiruvananthapuram	19	106	0	19	106	0	27	98	0	125
2	Kollam	0	13	112	0	118	7	1	119	5	125
3	Pathanamthitta	4	121	0	2	123	0	2	123	0	125
4	Alappuzha	0	123	2	2	121	2	0	123	2	125
5	Kottayam	3	116	6	6	119	0	0	121	4	125
6	Idukki	2	117	6	1	120	4	0	118	7	125
7	Eranakulam	0	124	1	0	124	1	0	121	4	125
8	Thrissur	0	24	1	1	21	3	0	23	2	25
9	Palakkad	1	122	2	1	122	2	2	120	3	125
10	Malappuram	5	108	12	0	114	11	0	112	13	125
11	Kozhikkode	2	76	1	0	79	0	0	79	0	79
12	Kannur	119	6	0	41	84	0	18	107	0	125
13	Kasaragod	34	91	0	34	91	0	34	91	0	125
<b>State</b>		<b>189</b>	<b>1147</b>	<b>143</b>	<b>107</b>	<b>1342</b>	<b>30</b>	<b>84</b>	<b>1355</b>	<b>40</b>	<b>1479</b>



**Table 13**  
**Conditions of Bund**  
(Scheme Area)

Sl	Name of District	Good	Partially	Seriously	Total
1	2	3	4	5	6
1	Thiruvananthapuram	119	5	1	125
2	Kollam	93	31	1	125
3	Pathanamthitta	125	0	0	125
4	Alappuzha	121	4	0	125
5	Kottayam	96	28	1	125
6	Idukki	78	41	6	125
7	Eranakulam	90	34	1	125
8	Thrissur	24	1	0	25
9	Palakkad	65	53	7	125
10	Malappuram	41	59	25	125
11	Kozhikkode	73	6	0	79
12	Kannur	112	13	0	125
13	Kasaragod	124	1	0	125
<b>State</b>		<b>1161</b>	<b>276</b>	<b>42</b>	<b>1479</b>

**Table 14**  
**Occupational profile**

(Scheme Area)

Sl No	Name of District	Occupation				Total
		Agriculture	Non-agriculture	Agricultural Labours	Non-agriculture	
1	2	3	4	5	6	7
1	Thiruvananthapuram	50	14	23	38	125
2	Kollam	14	102	9	0	125
3	Pathanamthitta	27	37	13	48	125
4	Alappuzha	19	59	22	25	125
5	Kottayam	51	14	12	48	125
6	Idukki	70	20	33	2	125
7	Eranakulam	13	18	8	86	125
8	Thrissur	8	11	3	3	25
9	Palakkad	36	58	10	21	125
10	Malappuram	19	80	16	10	125
11	Kozhikkode	44	7	20	8	79
12	Kannur	83	16	5	21	125
13	Kasaragod	73	31	13	8	125
<b>State</b>		<b>507</b>	<b>467</b>	<b>187</b>	<b>318</b>	<b>1479</b>

**Table 14 (a)****Occupational profile (Control Plots)**

Sl No	Name of District	Occupation				Total
		Agriculture	Non-agriculture	Agriculture labours	Non-agriculture labours	
1	2	3	4	5	6	7
1	Thiruvananthapuram	16	6	4	0	26
2	Kollam	5	19	1	0	25
3	Pathanamthitta	2	2	5	17	26
4	Alappuzha	1	13	2	9	25
5	Kottayam	10	2	0	3	15
6	Idukki	17	3	5	0	25
7	Eranakulam	2	8	0	5	15
8	Thrissur	2	2	1	0	5
9	Palakkad	9	5	6	5	25
10	Malappuram	3	19	0	3	25
11	Kozhikkode	1	1	6	2	10
12	Kannur	13	9	1	2	25
13	Kasaragod	9	5	10	1	25
<b>Total</b>		<b>90</b>	<b>94</b>	<b>41</b>	<b>47</b>	<b>272</b>

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.

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## **Conditions of Bund**

While examining the condition of bund the study revealed that 78% are in good condition 19% 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 2007-08. 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 fiftyone schemes were selected. The total number of beneficiaries comes to 3615. Out of this 1479 number of beneficiaries were selected for the detailed study (41%). 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 9.56 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 199%. It is estimated that the percentage increase of net income per acre in beneficiary plots of the scheme area as 199%

Analysis of data collected from the beneficiary and control plots reveals that the net income per acre, received from the beneficiary plot is Rs.30354/- and from the control plot is Rs.28471/- 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 54% recorded in the case of pepper even though the area under pepper showed a decrease of 2.1% . Production of coconut also increased 16%. Whereas the percentage increase of area was 5.82%. Likewise in rubber production the percentage increase is recorded as 15%. Whereas the area increase was only 5.4%.

Cost benefit analysis of the collected data reveals that 78% 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	30.09	30.09	30.37	36.32	100.93	120.70
2	Kollam	34.35	35.18	35.95	46.82	104.66	133.09
3	Pathanamthitta	25.35	25.88	43.3	45.92	170.81	177.43
4	Alappuzha	87.13	87.2	87.77	88.6	100.73	101.61
5	Kottayam	78.83	78.83	79.74	80.8	101.15	102.50
6	Idukki	353.09	354.24	349.72	355.36	99.05	100.32
7	Eranakulam	21.31	21.22	24.3	24.45	114.03	115.22
8	Thrissur	17.03	17.03	17.09	17.12	100.35	100.53
9	Palakkad	223.03	227.62	205.38	228.36	92.09	100.33
10	Malappuram	137.76	137.74	137	142.37	99.45	103.36
11	Kozhikkode	75.69	76.24	73.67	81.66	97.33	107.11
12	Kannur	156.11	158.06	147.09	158.59	94.22	100.34
13	Kasaragod	389.26	389.26	388.49	394.17	99.80	101.26
<b>State</b>		<b>1629.03</b>	<b>1638.59</b>	<b>1619.87</b>	<b>1700.54</b>	99.44	103.78

### 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 99.44% to 103.78%. Districtwise details are presented in Table No.15.