Chapter-5

Development at what cost?

5.1 Introduction

This chapter deals with the site effects of the development process of the district economy. As we know, every action has opportunity cost, the process of development has not exempted from it. Development process also has its own costs. In this chapter I have tried to discuss some of the issues relating to the development process of the district economy.

Since Kolhapur is an agrarian district; the growth of the district economy is mainly depending upon the agriculture sector. However, the share of this sector is declining in the district income still it contributes a significant share about 20 per cent.

Now a day everybody is talking about the sustainable development. In the further part of this chapter, I have also attempted to discuss the need of sustainable development to protect the environment.

Since Kolhapur district is facing the problem of soil salinity mainly due to the excessive use of water for the cultivation of sugarcane crop. Causes and status of soil salinity is also discussed in this chapter along with some of the remedial measures to control it.

Proper economic accounting of soil degradation is vital important to know the actual and potential losses due to the salinity. This particular issue along with measuring losses is also discussed in the last part of this chapter.

5.2 Economic Development And The Environment

There was a time, several decades ago, when problem of environment were widely regarded as being unique to developed industrial economies. Industrial development was associated with air and water pollution, over reliance on chemicals, visual blight, and so on. Developing countries, however, were thought to have fewer environmental problems because their preindustrial technology was more environmentally benign and because they had not ye committed themselves to a materialistic style of life, with the negative trade offs many believe that this implies.

Ideas have changed recent years, however. For on thing, it has become clear that massive environmental degradation has in fact occurred in the developing countries. Rural areas have seen large-scale soil erosion and water quality deterioration deforestation and declining soil productivity. Urban area experienced seriously diminished air and water quality. Further more this environmental deterioration in developing countries is no just a matter of aesthetics or quality of life, but rather a more serious issue involving the diminishment of economic productivity and the acceleration of social dislocation. Environmental problems ii developing countries are much more likely to be matters of life and death than they are in the developed world.

a. Environmental Degradation in Developing Economies

Many people in the developed countries have been brought to a realization of the existence of environmental problems in the developing countries through recent global concerns, such as global warming and rapid pace of species extinction. A disproportionately high number of the world's endangered species are residents of developing countries, so efforts to preserve the habitats of these species have brought people to focus on the development environment linkages in non industrialized countries. Similarly the developed countries concern about global warming has heightened concern about deforestation because forests act to absorb atmospheric CO_2.

In many developing countries the harvesting of fuel wood and timber and the conversion of forested lands to agricultural use has led to high rates of deforestation. Thus, large scale deforestation has the potential to worsen the global green house effect.

But from the stand point of the developing countries themselves, their worst environmental problems are probably the water and air pollution they suffer, especially in their expanding urban areas. In the developing countries the chemical treatments of water supplies, together with the treatment of waste water, have largely neutralized the water system as a source of widespread human disease. In place where there has been an expansion of industry, mining, and the use of agricultural chemicals, rivers have become contaminated with toxic chemicals and with heavy metals. Seepage of hazardous materials from industrial sites and waste dumps is increasingly threatening the ground water resources toward which many countries are turning as surface water become more heavily contaminated.

b. Relationship Between Economic Development and Environmental Quality

Probably the most frequently mentioned view point on these matters is that developing countries simply can not afford high levels of environmental quality. According to this view, the situation of these countries, in comparison to developed economies, can be pictured by production possibilities curves (PPCs).

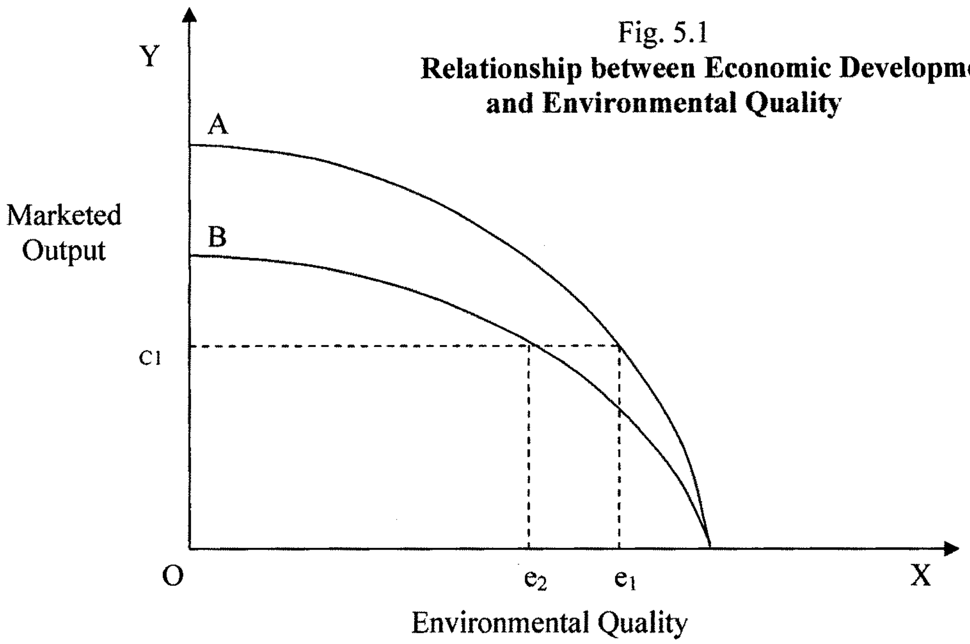

Fig. 5.1
Relationship between Economic Development and Environmental Quality

Marketed output refers to the conventional types of goods and services produces and distributed through economic markets. The production possibility curve A is for a typical developed country, while B refers to a developing nation. Because of past resource exploitation, or population pressures, or less sophisticated technology, B lies entirely within A. Thus to achieve higher levels of marketed income, which it must be willing to put up with lower level of environmental quality. For example, for the developing country to reach a level of marketed output of C_1 it must trade off environmental quality back to the level e_2 the developed country can have C_1 of marketed output with a much higher level of environmental quality el instead of only e_2.

Developing countries, according to this view, can not afford the high levels of environmental quality sought in the developed world because this would mean lower monetary incomes and a lessened capacity to support their populations.

There is another side to this argument, however. The production possibilities curve approach sees marketed output and environmental quality as substitutes; more efforts devoted to reducing environmental impacts leading to lower monitory incomes. But in the developing world there are clear cases where environmental quality and measured GDP are complementary. Most developing country depend proportionately more on primary industries than do developed once. For example, they usually have a greater proportion of their population involved in agriculture. Thus, degradation of environmental resource has the potential for being more highly destructive of productive assets in developing countries. In industrial countries environmental quality issues hinge primarily on matters of human health and the aesthetic quality of the environment. Furthermore, technological developments have decoupled, to a considerable extent, the resource using sector from the rest of the economy. In developing countries, however, environmental issues are related to human health and productivity and also to the degradation of the future productivity of the natural resource base on which many people are and will be directly dependent. According to this argument the environment and the economy are not so much substitutes as they are compliments.

c. Long-Run Relationships

It is widely anticipated that over the next few decades developing countries will experience relatively rapid rates of economic growth. The World Bank estimates that collectively they will grow at a rate of 45 % a year with long run growth rates of this type what impacts can be expected on environmental quality in these countries? If all technological factors were to stay the same over this period, environmental impacts and damages would increase alone with this economic growth. But these factors are unlikely to remain constant. Economic development brings with it many changes. The most obvious is an increase in per capita incomes and as peoples income goes up, so does their willingness to sacrifice for improved environmental quality. Developing economies usually also experience a variety of structural changes, often in the direction of replacing relatively high polluting industries with those that pollute less.

We may conclude the above discussion with the remark that environmental problems in developing countries have become increasingly critical in the last few decades. While the appearance of global issues has helped people to see that alt countries are inextricably linked in the global environment, more attention has been directed at traditional air and water pollution problems of developing countries. It can play a substantial role in helping developing countries to develop without large scale environmental destruction. The primary mechanism for this is through technology transfer, understood broadly to include the transfer of skills and technological capabilities that are culturally sound and not solely the transfer of western capital goods.

5.3 Growth of the District Economy

Growth of the district economy has been studied in regard with the overall annual rate of growth of the district economy as against of state and national economy. Details regarding this are shown in the following table.

Table No. 5.1

Growth of District Economy as against State and National Economy

Year	District Income	Per Capita District Income	State Income	Per Capita State Income	National Income	Per Capita National Income
2001-02	7.37	5.91	3.5	1.6	5.8	3.7
2002-03	1.88	0.80	6.9	5.3	3.6	2.0
2003-04	5.23	6.36	7.2	5.5	8.7	7.1
2004-05	9.03	5.76	8.4	6.7	7.2	5.5
2005-06	10.46	9.53	9.5	7.9	9.6	7.9
2006-07#	15.96	14.46	9.8	8.1	9.7	8.1

Advanced Estimates
Source: Computed from database provided by DES, Mumbai & Economic Survey Report of Maharashtra, 2007-08.

It is clear from the above table that the rate of growth of both district income and also per capital district income for Kolhapur district is always higher than the state and national average. It shows the rapid rate of growth during the recent period. The situation was not same for year 2002-03 because of drought condition in the district and therefore the rate of growth for that year was lowest of 1.88 per cent for district income and 0.88 per cent for per capita district income. Afterwards the rate of growth of district income and along with rate of growth of per capita district income is showing the significant increase and takes over the state and even national rate of growth in income and per capita income also.

5.4 Problem of Soil Salinity and Water Logging

Economic development leads to lots of problem regarding the environmental quality. In the last few years the development process is conducted by compensating with the environmental quality.

As far as the Kolhapur district is concerned economic development of the district leads to environmental deterioration. Since the sugarcane is the prime crop of the district, the excessive use of water for sugarcane leads to the problem of soil salinity and the water logging in the district.

The details regarding the soil salinity is given in the following table.

Table No. 5.2

Saline land in India (in lakh hectares) 1991-92

Sr. No.	States	Net irrigated area	Saline land	% to NIA
1	Andhra Pradesh	43.51	2.94	6.76
2	Bihar	33.54	8.44	25.16
3	Gujarat	23.72	10.83	45.66
4	Harayana	26.66	4.46	16.73
5	Karnataka	23.08	0.75	3.25
6	Madhya Pradesh	46.27	1.08	2.33
7	Maharashtra	21.65	0.21	0.97
8	Orissa	11.93	1.96	16.43
9	Punjab	39.40	6.90	17.51
10	Rajasthan	43.43	2.49	5.73
11	Tamil Nadu	26.05	1.56	5.99
12	Uttar Pradesh	105.42	15.81	15.0
	Total (1 +12)	440.00	57.43	13.03
	All India Total	488.00	37.60	11.80
	% to All India	90.3	99.70	

Source:(Jugale V. B. 2002), GOI, Ministry of Water Resources, 1991

The table highlights the state wise condition of soil salinity along with net irrigated area. The percentage of saline soil to the net irrigated area for each state is different. It was accounted near to 1 per cent for Maharashtra state as against national average of 11.80 per cent.

In the case of Maharashtra the distribution of saline soil is varies between the various districts which is described in the following table no. 5.3

Table No. 5.3

Salt Affected Area in Maharashtra

Sr. No.	Districts	Soil Survey Area (Hectares)	Salt Affected Area (Hectares)
1	Pune	8,29,098	15,027
2	Satara	7,83,890	11,455
3	Sangli	5,47,713	6,949
4	Kolhapur	1,88,164	22,201
5	Thane	7,86,350	6,605
6	Raigad	6,16,795	7,695
7	Ratnagiri	7,61,375	8,000
8	Sindudurg	4,24,941	2,056
9	Ahmadnagar	7,70,940	7,242
10	Solapur	8,02,881	32,356
11	Nasik	7,96,386	-
12	Dhule	6,95,877	207
13	Jalgaon	8,28,476	-
14	Aurangabad	8,11,118	126
15	Beed	7,49,972	655
16	Jalana	3,78,269	424
17	Parbhani	8,37,474	3,293
18	Nanded	8,23,320	940
19	Osmanabad	4,68,572	2,075
20	Latur	3,75,927	4,174
21	Akola	5,35,478	1,22,074
22	Buldhana	8,38,305	39,733
23	Amaravati	7,30,384	58,247

Note: data as on March, 1996

Source: Jugale 2002

Table No. 3.6 illustrates the district wise area affected by soil salinity in Maharashtra. Akola district has 34.78 per cent of saline area followed by Amaravati district (16.57%) and Buldhana district (11.30%). Pune (4.2%), Satara (3.26%), Kolhapur (6.3%) and Solapur (9.20%) are hastily falling into the belt of salinity. This region has a very fertile land with perennial irrigation in the river basins.

The problem of soil salinity is more occurred in the irrigation command area of various irrigation projects. The state of soil salinity is described in the private and co-operative lift irrigation projects in the western Maharashtra is given in the table no. 5.4

Table No. 5.4

Saline Soil in the Command Area of Private and Co-operative Lift Irrigation Projects in Western Maharashtra

Sr. No.	District	Total Saline soil (in ha)
1	Sangli	7157
2	Kolhapur	2399
3	Satara	247
4	Pune (Dound)	783
5	Total =	10586

Source: Irrigation Research and Development Directorate, Pune.

It is quite clear from the above table that the Sangli district has more problem of soil salinity than the Satara and Pune district. Area under saline soil is accounted nearly 7157 ha. in the irrigation command area of the district. In the Kolhapur district the area of saline soil in the irrigation command area is about 2400 ha. The Sangli, Kolhapur, Satara and Pune district together contributes nearly 10,586 ha. saline land in the Maharashtra state.

Water Logging:

Water logging refers to the conditions when ground water is at or near the ground surface at least of some time in a year. Accounting to National Commission on Agriculture an area is termed as water logged when the water table attains a level at which the soil pores in the root zone become saturated resulting in restriction of the normal circulation of air, decline in the level of oxygen and increase in the level of carbon dioxide. The water logging also creates conditions for surfaced water stagnation and excess moisture after irrigation or a rainfall. The prevailing wet conditions affected land preparation and sowing and also the inter cultivation practices. The ill effects of water logged are manifold in areas which have saline soils and or saline ground water.

Since it is difficult to measure the direct effects of water logging in the filed, these are related indirectly to depth of water table. The soil type may influence the performance of the crops under excess moisture conditions. As a result of the studies conducted so far within or outside the country the required depths of the water table for different types of soil and crops are generalised in the following table.

Table No. 5.5

Desirable Minimum Average Water Table Depths

(m below soil surface)

Crop	Soil		
	Sandy	Loam/silt	Clay
Grasses	0.5	0.6	0.7
Cereals	0.6	0.7	0.8
Crops Grown for fodder, tuber & root crops, fiber crops, oil seeds	0.7	0.8	0.9
Sugarcane, Vegetables	0.8	0.9	1.0
Orchards and trees	1.0	1.2	1.4
Temporarily dry or fellow land with up-world seepage of saline ground water	1.2	1.5	1.2

Source: Chougule B.A., ARS, MPKV, Sangli.

The water table fluctuates with season attaining the lowest depth before the onset of monsoon and subsequently rising to the shallow level in the post monsoon period. A 3m water table depth or more before the onset of monsoon is quite desirable to accommodate the percolated rain water, leaving one meter depth for root growth. Thus area having water table within 3 m can be considered as critically waterlogged, demanding immediate implementation of drainage practise to lower the water table. Areas having water table within 3 to 6 m can be termed as sub critical and necessary drainage and water management are to be planned for the immediate future. In areas where the prevailing water table is between 6 to 10m, precautionary measures such as on-farm water management practices, better water conveyance system, conjunctive use of ground and surface waters and improvement in surface drainage system need to be undertaken. (Chougule B. A.)

Characteristics of Problematic Soil

Saline or water logged soil (we may call it as Problematic soil) has some special characteristics different than the normal soil. These principle characteristics of problematic soil are summarised in the following table no. 5.6

Table No. 5.6

Principle characteristics of Problematic Soil

Soil Group	pH	Electric Conductivity Ece dSm-1-	Exchangeable sodium percentage
Saline	< 8.5	> 4.0	<15
Sodic or Chopan	> 8.5	< 4.0	> 15
Saline Sodic	< 8.5	> 4.0	> 15

Source: As above.

From the above table we may describe the characteristics of problematic soil. Soil is called saline soil when the pH is calculated more than 8.5 along with Electronic Conductivity (EC) should be more than 4.0 and the percentage of exchangeable sodium also should be less than 15 per cent.

In the case of Sodic or Chopan soil, it contains pH more than 8.5 but EC is lower than the saline soil (i.e. less than 4.0) and percentage of exchangeable sodium also should be greater than 15 per cent.

Soil is called Saline Soidic when the pH for it calculated less than 8.5 along with EC should be greater than 4.0 and percentage of exchangeable sodium greater than 15 per cent.

Saline Soil:

A soil which contains soluble salts in the root zone to adversely affect the crop growth and production are called saline soils. Locally known as no one these soils are recognised by the presence of white salt crusts on soil surface, parchy crop stands, deep green foliage and stunted and irregular crop growth. Plants differ widely in their ability to tolerate salts in the soil. Salt rating of the plants

(Table 5.7) are based on the yield reduction in saline soil when compared with yields on non-saline soils.

Table No. 5.7

Soil Salinity Classes and Crop growth

Soil salinity classes	Conductivity of the soil saturation extract Ece (dS/m)	Effects on growth of crop
Non-saline	0 - 2	Negligible effect
Slightly-saline	2 - 4	Yield of sensitive crops may be restricted
Moderately-saline	4 - 8	Yield of many crops restricted
Strong-saline	8 - 16	Only tolerant crops
Very strong-saline	> 16	Only a few very tolerant crops or non fertile land

Source: As above

The above table shows the effect of soil salinity on the growth of the crop along with the classes of soil salinity. If the value of EC is calculated between 0 to 2 (dS/m) then that soil is called Non-saline soil which has very negligible effect on the growth of the crop. The second class of soil salinity is called slightly saline soil which contains EC between 2 to 4 (dS/m). It has some effect on the growth of the crops, some sensitive crops may not be cultivated in such type of soil. Then the third class of moderately saline soil which contains EC between 4 to 8 (dS/m) has a strong effect on the growth of the various crops, in which yield of the many crops is restricted. Afterwards the fourth class of soil salinity called strong saline soil group, it contains EC between 8 to 16 (dS/m). In such kind of soil the only tolerant crops which can grow in saline soil also than crops only can be produced. And the very last class of saline soil is called very strong saline soil group. It records EC more than 16 per cent where only a few very tolerant crops may be cultivated or than soil is completely non fertile soil.

5.4.1 Causes of Soil Salinity

Following are some of the main causes of the soil salinity and water logging in the study area. These causes are grouped under two separate heads, these are Natural causes of soil salinity and Man made causes of soil salinity.

A. Natural Causes of Soil Salinity and Water logging

Following are some of the natural causes of the soil salinity and water logging in the study area.

1. Lack of natural drainage

Since the nature tries to maintain the soil quality by having the natural drainage system such as lakes, rivers, *nala* and *Odha*, but in some region the natural drainage are not available or these are not sufficient to drain the all excessive water from the soil, therefore the soil is being stored in the soil for a long period and creates a problem of saline soil.

2. Strong stone layer under the soil

If there is a strong stone layer under the soil layer there is a greater possibility that the excessive water from that soil may not be withdraw and soil contain the water for a long period and thereby the problem of soil salinity is put forward.

3. Geographical condition of the region

If the geographical region is quite flatter (*Pathari Pradesh*) then the problem of soil salinity may occur in very short period than the region whose geographical situation is like hilly area. This kind of geographical condition is having in the Shirol tehsil of Kolhapur district and the Miraj tehsil in the Sangli district which creates the soil salinity problem in that region.

4. Deep black soil

Generally deep black soil contains water for a long period as compare to other types of soil. Hence if the excessive water has used to cultivate the crops like sugarcane which generally requires more water than other crops, in such kind of soil, it creates the problem of soil salinity. The soil in the above mentioned two tehsils are having this characteristic also.

5. Evaporation of water from soil

In the region that have *Ushm & Korde* atmosphere also creates this problem. As we know the evaporation of water from soil leads to pull the saline minerals *(kshar)* to come upward from the bottom of the soil and spread on the upper layer of the soil and made the soil completely non fertile.

6. **Use of saline water for irrigation purpose**

   Most of the farmers doesn't know that the water which has been used by them for irrigation purposes is either safe for the health of the soil or may damage the same. The farmers who uses the irrigation from wells and tube wells water that may face more problem of soil salinity because the water from well contains more saline minerals (*kshar)* than the other sources of irrigation.

7. **Heavy rainfall**

   If the particular region has heavy rainfall every year and most of the moths in a year, then that region may have the problem of soil salinity. But all experts are not considering it as a major cause of the saline soil even some believes that the heavy rainfall helps to washout the saline minerals (*kshar)* from soil which are stored on the upper layer of the soil.

B. Man Made Causes of Soil Salinity and Water logging

Following are some of the natural causes of the soil salinity and water logging in the study area.

1. **Excessive use of water by flood method**

   With the development of irrigation facilities the problem of soil salinity is put forward and badly affected the most of the regions in the western Maharashtra. The farmers from the study area use the water by flood system. There are very few farmers who use drip or sprinkler irrigation system to their farm. The excessive use of water leads to increase in the water table of that soil and further leads to water logging. It is the main cause of soil salinity and water logging in the study area.

2. **Mono-cropping Pattern or Continuous Production of Sugarcane**

   The mono-cropping pattern (especially those crops who requires intensive water supply for a whole year like sugarcane) also creates the problem of soil salinity and the water logging. Being the cash crop sugarcane has popularity among the farmers who have the irrigation facilities. Continuous production of sugarcane year after year leads to increase the water table in the land and further creates the problem of soil salinity and water logging. The sugarcane contributes nearly 25 per cent area under crop in the cropping pattern of Kolhapur district. The rate of growth (CGR) for the area under sugarcane crop during 2000-01 to 2006-07 is calculated 4.15 per cent.

3. Improper or Excessive use of Chemical Fertilisers

Use of indiscriminate, improper and imbalanced doses of chemical fertilizers and unscientific and irregular use of water resources for sugarcane crop is another cause of salinisation. The use of chemical fertilizer in Kolhapur-Sangli region went up to 217.6 kg and 123.3 kg. per hectare which is highest in the state in 1994-95. This has again gone up to 497 Kg. per hectare in Sangli district and 817 Kg. in Kolhapur district during the year 1998-99. Urea is the main chemical fertilizer used in the sugarcane belt (66800 and 42000 M. T. in 1999-2000 is proposed). (Jugale 2002)

4. Excessive building around the farm

Farmers usually made some buildings around their farm (like *Kumpan* or *Pukka* wall) which further lead to obstacles in the natural system of drainage. The whatever water is being used for the cultivation of that farm is going to be store and the water table is being increasing in such land, further creates the problem of saline soil and water logging.

5. Damages to the Natural Drain

Since the natural drainage system which includes lakes, rivers, *nala* and *odha* is not own by any individuals, therefore nobody cares about the maintenance of it. If it is not enough, some people tries to close these small *nala* & *odha*, etc. and uses it for the cultivation purposes. If the natural system of drainage is being blocked how the excessive water can be withdrawn from the soil? Finally, it creates the problem of soil salinity and water logging.

These are some of the main causes of the soil salinity in the region which has converted some fertile land into non-fertile land in last few years.

5.4.2 Status of Soil Salinity in the Kolhapur District

Since, Kolhapur is an agrarian district and also the front runner in the production of some principle crops (like sugarcane, soyabeen, etc.) in the state. In the recent past it is facing the problem of soil salinity and the water logging in its constituency. Situation is more dangerous in the irrigation command area which has been described in the following table.

Table No. 5.8

Saline Land Area in Kolhapur District

Sr. No.	Name of the Village	Length of the Command (K.M.) main drain	Protected Area (Hectares)	Affected Area (Hectares)
A)	Hatkanangale Tehsil			
1	Ingali	1.52	111	42
2	Chavare	2.16	150	95
3	Ichalkaranji	3.36	230	110
	Total	7.04	491	247
B)	Kagal Tehsil			
1	Siddhanerli-1	1.10	40	30
2	Siddhanerli-2	1.34	64	40
	Total	2.44	104	70
D)	Shirol Tehsil			
1	Abdullat(Laxmi)	3.44	237	112
2	Udgaon-2	1.74	87	74
3	Shiradhon-1	2.96	185	75
4	Arjunwad-1	4.54	328	117
5	Shirdhon-2	442	334	140
6	Shirdhon-3	4.42	234	140
7	Shiradwad	2.36	143	124
8	Hasur	2.48	162	55
9	Majarewadi	2.00	71	31
1	Kurundwadi-1	2.10	105	40
11	Kavatheguland	2.78	170	105
12	Kurundwad-2	1.62	76	30
13	Alas-1	2.94	102	50
14	Kutwad 1	86	169	52
15	Gourwad	3.30	195	42

16	Alas-2	1.60	115	25
17	Shedshal	1.52	99	21
18	Kurundwad-3	3.35	134	50
19	Bastwad	1.64	85	11
20	Kothali-1	3.15	110	57
21	Herwad	1.94	110	16.40
22	Bubnal	1.74	53	30
23	Umalwad	1.80	95	40
24	Kotholi-2	1.76	120	52
25	Danoli-1	1.875	126	58
26	Kurundwad-4	1.66	108	37
27	Shirati	2.50	297	70
28	Nandani	2.86	100	56
29	Shirol-2	4.86	183	138
30	Shirol-1	4.48	201	123
31	Akiwat	4.22	141	100
32	Dawali-2	3.30	112	63
33	Danawad	4.24	124	60
34	Datwad	4.35	161	28
35	Shirati-2	2.50	113	21
36	Majarewadi-2	3.00	130	15
37	Tarwad	2.95	101	15
38	Bubnal-2	4.70	200	98
39	Kavatheguland	5.00	195	12
40	Ghalwad-1	3.30	141	18
41	Ghalwd-2	1.88	97	11
42	Akiwad-2	4.15	200	22
43	Shirol-3	2.10	78	15
44	Shirol-4	2.90	117	19
	Total	128.285	6,410	2468.4
	Grand Total	137.336	7,005	2785.4

Source: (Jugale V. B. 2002) IRD, Sub-Division Office, Sangli, April, 1998.

The above table shows the saline land area in the Kolhapur district along with tehsil wise distribution of command area of irrigation project in these villages. It has been noticed that the Hathkanangle tehsil accounts 247 ha land affected by salt, where Kagal and Shirol tehsil accounts 70 ha. and 2,468.4ha. respectively in the various irrigation projects' command area. The grant total area of saline soil in the Kolhapur district is accounted 2,785.4 ha.

5.4.3 Measures to Control Soil Salinity

There are several measures to control the soil salinity in particular and environmental degradation in general has been adopted by the government through various agencies in the concerned district.

Some farmers believe that salts can be removed by scrapping the surface soil. Removal of salt by scrapping is only temporary, and with time salts again accumulated due to capillary rise from saline ground water. There is another thinking that salts can be absorbs by the salt tolerant plants. The amount of salts removed by plants is easily negligible and soil is not sufficiently improved for economical crop growth.

Apart from that following are the some of the measures that can be implemented to control the problem of soil salinity and environmental protection.

a. Organic Farming

Organic farming is a holistic agricultural production management system that sustains and ameliorates the health of agro-ecosystem encompassing bio-diversity, nutrient bio-cycles and soil microbial and bio-chemical activities. It avoids the use of chemico-synthetic fertilizers and pesticides and emphasizes socially and environmental beneficial practices such as intercropping, green manure, use of organic manure, vermi-compost, bio-fertilizers and bio-pesticides in preference to the use of off-farm inputs considering that regional conditions requires locally adopted system. (Kshirsagar K.G., 2008)

The organic farming is the fastest growing sector in both land use and market size in the world. It is being cultivated in more than 120 countries covering about 31 million ha of area in the world (Willer and Yusseff 2007). The global market for organic food products was valued at US$25 billion in 2003, US $ 50 billion in 2006 and is estimated to reach to more than US$100 billion in 2010. Europe is the largest market for organic food products is relatively miniscule; it has great potential to grow in near future.

Organic farming is as old as agriculture in India. But presently it is being cultivated on relatively very small area. For example, the certified area under organic farming was only 76,326 ha during 2003, which is about 0.05 per cent of the total cultivated area in the country (Willer and Yusseff 2007). This is negligible when compared with many other countries in the world. However, organic farming has received better attention in recent years and concerted efforts are being made by the state and central governments, NGOs, farmers and other organisations for the promotion of organic farming in the country. These initiatives may help in boosting the area under organic farming in near future in the country.

Maharashtra is an important organic farming state. It is at the forefront in developing, adopting and spreading organic farming technologies in the semi-arid regions of the country. Recognising the importance and potential of organic farming, Govt. of Mahrashtra (GOM) has implemented the centrally sponsored scheme for promotion of organic farming in the state since 2003-04. These efforts have helped in increasing the awareness about the organic farming, reducing the use of chemicals and enhancing the area under organic farming in the state.

b. Proper use of water

In Maharashtra, the coverage of irrigation for sugarcane crop is 100 per cent (GOI, 2005). However, water is the most limiting resource for sugarcane production in Maharashtra. About 80 per cent of the water is utilised for sugarcane crop alone. The water requirement of sugarcane crop varies from 200 cm to 300 cm depending upon the type of soil and agro climatic conditions. Farmers are virtually mining water from deep aquifers for sugarcane crop. This is a cause of great concern and demands its conservation and judicious use as it has endangered the stability and sustainability of agriculture.

With regard to irrigation status in Kolhapur district, the major source of irrigation is Well irrigation along with lift irrigation in the river basin. There are several co-operative and as well private lift irrigation schemes in the district. Farmers from river basin area use the river water for irrigation purposes though co-operative or private lift irrigation schemes. Agriculture in the district has a assured source of irrigation thus they are interested in the cultivation of cash crops like sugarcane and soyabeen which provides them higher rate of return on their investment in the agriculture.

The cropping pattern of the district is moving towards the mono cultured by sugarcane crop. Continuous production of sugarcane in a particular land, adversely affects the fertility of it and thus the productivity and profitability from that land to the farmer.

c. Proper use of Chemical Fertilisers

Usually, the chemical fertilisers are used to improve the fertility of the land by providing necessary doses of it. The excess use of chemical fertilisers may leads to damage the fertility of that soil. The use of chemical fertilisers should be as per the requirements of that soil which can be come to know from the soil testing reports, provided by the various agencies involved in it. However most of the farmers are not testing the requirements of the soil and using the fertilisers blindly. In such cases there is a great possibility that the excess factor from the sail is not known by the farmers and treatment of fertilisers may harm the fertility of that soil and finally leads to soil salinity.

Hence chemical fertilisers should be used in a proper unit and also as per the requirements of that soil.

d. Change in the Cropping Pattern

There is a great need to change the cropping pattern, so the particular land should be used for different types of crops, which help in the maintaining the fertility of that soil. Cropping pattern should be in favour of environment, it means we have to cultivate those crops which are permitted by the environment considering the natural condition of that region. The same land should not be used for the cultivation of any single crop.

e. Maintenance of Natural Drainage

Since the natural drainage is own on by public, the proper maintenance of it should make by the govt. or collectively by the farmers, to ensure that the excessive water has withdrawn from their farm.

These are some of the major measures to control the problem of soil salinity and ensure the sustainable development in the region.

5.5 Impact of Sugarcane Cultivation on Soil Quality

Soil degradation is recognized widely as a problem in the cultivation of sugarcane, particularly in relation to the effects of the intensive growing of cane as a continuous monoculture, which contributes to yield decline as well as environmental degradation. It is the introduction of such intensive agricultural practices that represents, in general, a particular threat to soils in tropical areas. Past concerns over loss of fertility of tropical agricultural soil have focused particularly on these under annual crops. It has been argued that the characteristics of perennial crops, including their rate of returns of organic material to the soil, ameliorate their impact on soil fertility.

Although cane yields have been maintained on some soils over very long periods of cultivation, a recent examination of the evidence by Cheesan (2005) concludes that the impact of sugarcane on tropical soil fertility, although less than that of annual crops, is greater than that of other perennials and plantation crops and is a significant source of concern.

Soil erosion is a particular threat to long-term productivity in tropical areas, because erosion rates here are usually greater than the rate of soil formation. In addition to environmental impacts, erosion in cane growing areas can have an impact on cane yields and may ultimately limit the sustainability of sugarcane cultivation. (Oliver D. Cheesan, 2005).

Figure No. 5.2

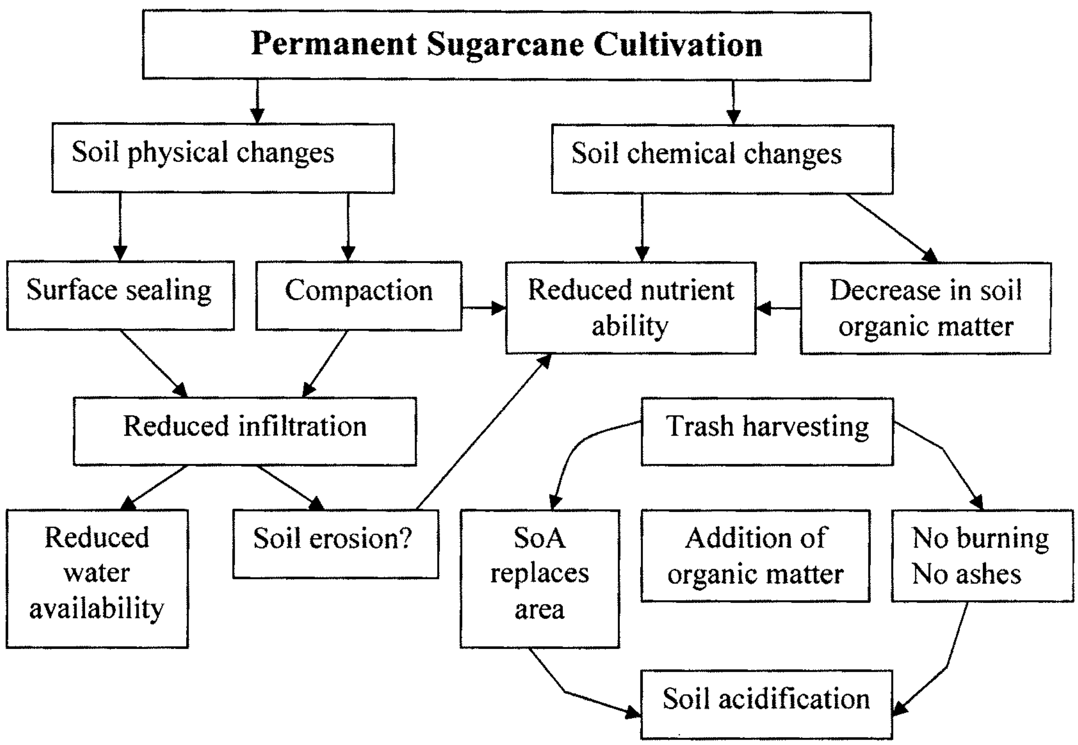

Fig. 6.1 Summary diagrame showing major changes to soils under sugarcane cultivation in Papua New Guinea (Oliver D. Cheesan, 2005)

The demand for water for sugarcane irrigation has led to increased in number of wells and has resulted into the number of wells and had result into the decrease of water table by more than four meters over the past decade in several districts, including the study districts Jalgaon and Kolhapur (World Bank, 2003).

The excess use of water combined with higher doses of chemical fertilizers is observed, to be resulting in enhanced rate of degradation of soil and water resources in certain parts of the state. This is reflected in the secular decline of sugarcane productivity in recent decades in Maharashtra (Samui et al 2005).

5.6 Natural Resource Accounting

Apart from man-made inputs and machines, many economic activities require natural resources and environmental inputs. As long as land, water and air are available in plenty, these are considered as 'free'. We use them and this use, changes the quality of these resources. However, many natural resources regenerate. As long as human activity is at a level below the regeneration capacity of the natural environment, there is no secular decline in the quality of these resources. However, with quality of the environmental resources can no longer be taken for granted.

Degradation of natural resources and a loss in the quality of the environmental resources imposes Burdon on future generations. Depleted soil means less output for the same level of inputs i.e. higher cost of production. One may even have to forgo production for some time to permit natural processes to regenerate the resources. If degradation goes beyond a limit, then such natural regeneration may not even be possible. One may then need to take positive amelioration measures at some additional costs.

Since degradation implies the present generation borrows from the future generation. It may not be wrong to borrow from the coming generation if we leave than richer and more capable of dealing with the problem we leave behind. Thus one needs to know how much of resources we have used up and how much of a Burdon we leave behind. Such accounting of natural resources use does not normally take place in the process of economic activity because, the cost of environmental degradation and resource depletion are not born by the economic actor who cause them. It may not be possible for a poor farmer to leave his land fellow or have access to other measures of soil amelioration, once his soil is degraded owing to inappropriate irrigation or fertilizer use.

5.6.1 Resource Accounting of Soil

Valuation of renewable resources such as land, water, plants and animals require special approaches. The procedure we use should recognise this possibility of restoration in valuating natural resources. It is necessary to estimate the value to see if the benefits from the use of these resources exceed the implicit cost of such use.

The approach of estimating the value of changes in soil quality can be based on loss in productivity and the possibility of restoring soil quality through ameliorative measures as elaborated in Parikh K.S. (1993). The yield input relationship of soil depends on climate, soil characteristics, inputs, genetic quality of seeds and cultivation practices. However, one grows a crop, one not only produces that crop, but also some associated environmental joint products. Some soil many be lost due to cultivation through erosion by wind or water, the addition of fertilizers may change the chemical composition of the soil, water flowing off from the field may contain chemical residues and so on.

Measuring quality by yield input relationship is cumbersome. One would like a simpler index. Operationally one can define it in many ways. Hence, we make a simplifying assumption that the impacts of inputs and soil quality on yields are separable. Thus yield is taken to be a product of a function (f) of inputs and another function of soil quality parameters (g). The function *f* we call input response function and function g we cal soil quality function.

Yield = f (*inputs*) g(*soil quality parameters*)

Our first objective here is to obtain an estimate of the soil quality multiplier in terms of easily observable and measurable parameters. The amount of potential yield or profit forgone due to a lower value of soil quality multiplier is a measure of the cost of depreciation of soil.

5.7 Estimate of the Soil Quality Index

The soil quality index is determined b a set of inherent physical and chemical properties of the soil. There are not under the direct control of the farmer, and can be affected only in the long term; adversely through excessive and improper use of irrigation and other inputs and beneficially through amelioration measures. Some of these are affected by the action of others such as neighbouring farmers, but we will neglect these effects.

The soil quality is affected by these actions; the levels of inputs are chose and the crop he grows. One should also note that farmers adapt their cropping pattern and inputs to changes in soil quality. The economic value of changes in soil quality can be considered as the difference in the present discounted values of two profit streams.

The parameters which determine this inherent soil quality can be categorised under: soil type, soil colour, top soil depth, salinity, drainage characteristics and percolation rate.

TABLE No. 5.9

Composition of Soils in Kolhapur District

Particulars.	Laterite.	Brown.	Medium and deep black.
Local names.	Tambad.	Halki kali	Madhyam or Bhari kali.
Colour	Red to brownish red.	Reddish brown	Gray to deep black.
Depth	3'	3'-5'	5'-8'
Drainage	Good.	Excellent.	Good.
Topography	Undulating.	Undulating.	More or less flat.
Erosion	Nil.	Slightly	Nil.
Sand. (per cent.)	35-40	45-50	10-15
Silt (per cent.)	25-30	20-25	30-40
Clay (per cent.)	25-35	20-25	35-50
Lime (CaCo3) (per cent.)	Nil.	1-3	1-5
pH	4.50 - 6.50	6.50 - 7.50	7.50 - 8.50
Nitrogen (per cent.) Phosphoric acid (mg. per cent.) (P205) available.	0.08 - 0.10 to 0.00 - 5.00	0.05 - 0.08 to 10.00 - 15.00	0.06 - 0.08 to 5.00 - 20.00
Potash (mg. per cent). (K20) available.	15.00 - 20.00	20.00 - 25.00	20.00 - 25.00

Source: District Gazetteers of Kolhapur.

The above table highlights the composition of soil in the Kolhapur district along with its major characteristics and types which are described in the following paragraphs.

a. Lateritic Soils.

In the Kolhapur district the Lateritic soils (*tambad mati*) occur mainly in the western hilly tracts of heavy rainfall, on the hill tops and in the ridges which are not covered by forest, They are found in the western parts of Karvir, Bhudhargad and Ajra and the whole of Shahuwadi, Panhala, Radhanagari and Bavada talukas. They are red to brownish-red in colour, mostly eroded and shallow with good drainage. The soils are acidic with low phosphoric contents and liming has been found to be beneficial. They are not retentive of moisture and hill millets are predominantly taken from them. When terraced, applications of nitrogen and phosphorus are found quite useful and in such cases paddy crop can also be taken from the soil.

In the valleys, lateritic soils are mixed with trap soils. They vary in colour from brown to black, are fairly deep retentive of moisture. Paddy is the main crop of this area and in the *rabi* season *vol* is also grown wherever possible. Due to the deforestation of the forests, the soils are well supplied with nitrogen and organic matter but are very poor in phosphorus and potash. The paddy crop, therefore, responds well to the application of phosphorus and potash.

b. Brown Soils.

Brown soils (*halki kali mati*) are found in the talukas of Hatkanangle, Karvir and Radhanagari and parts of the Bhudhargad and Ajra talukas in the Kolhapur in transition tract. They are mainly derived from trap and are dark brown in colour, with, a reddish tinge. They are rich and fertile with excellent granular structure, almost neutral in reaction and well supplied with calcium. These soils respond well to the application of fertilizers. As this tract receives a guaranteed rainfall of 40"-50", conditions in the tract are optimum for most of the crops. Rice, jowar, and groundnut are grown on these soils in kharif season. Sugarcane and vegetables are taken wherever irrigation facilities are available. Jaggery produced from sugarcane grown in these soils, is well-known throughout India.

c. Medium and Deep Black Soils.

Medium and Deep Black Soils (*madhyam* or *bhari kali mati*) are found in the talukas of Shirol, Hatkanangle, Karvir, Kagal and Gadhinglaj. They are also derived from trap and vary in depth considerably, from place to place. In the river valleys, the soils are deep. Medium deep soils are grey in colour with good granular structure and drainage. The deeper soils are more black in colour and more clayey. Lime nodules occur in plenty and pH value is between 7.5 and 8.0. The soils are quite fertile and good crops of *kharif* jowar and groundnut are obtained. They are fairly rich in phosphorus contents and the crops respond well to the application of nitrogen to these soils. As drainage is good, the soils are amenable to irrigation and consequently paddy, sugarcane and vegetables can be successfully taken from them.

5.8 Need of Sustainable Development

Sustainable development is a pattern of resource use that aims to meet human needs while preserving the environment so that these needs can be met not only in the present, but in the indefinite future. The term was used by the Brundtland Commission which coined what has become the most often-quoted definition of sustainable development as development that "meets the needs of the present without compromising the ability of future generations to meet their own needs. (United Nations, 1987)

Sustainable development does not focus solely on environmental issues. The United Nations 2005 World Summit Outcome Document, refers to the "interdependent and mutually reinforcing pillars" of sustainable development as economic development, social development, and environmental protection. (World Summit Outcome Document, 2005)

With the ever increasing economic growth our biodiversity is facing tremendous challenge to meet the demands of rising population. Destruction of ecosystem with increasing economic growth can be seen all over the world with the extinction of thousands of species, degradation of agricultural land, extreme climatic changes that alarm shrinking of biodiversity of our planet.

The government of India is also an active member of United Nations Environment Programme (UNEP), South Asia Cooperative Environment Programme and various other environmental organisations. However, it somehow has not done anything impressive as far as education policy is concerned. Again though government is funding for eco-regeneration in all states but that goes vague due to the lack of participation of civil society.

As today most of the people of rural areas rely on agriculture and forest resources it is important first to create alternative means of livelihood so that they can cooperate in the process of forestation. So the time is to improve quality of our education with more vocational training and at the same time appropriate subjects that can address ecological concerns in building an equal society for present and future generations.

In fact it's a combine effort of government, non-government organisations, mass media, educational institutions, private bodies and above all the participation of civil society. However, as an individual we also need to take our own steps forward to make our contribution to save our planet.

5.9 Conclusions

This chapter may be concludes with the following remarks.

1. Since there is a trade off between economic development and the environmental quality. The developed countries are more economical than the developing nations.
2. Massive environmental degradation occurred in the developing nations especially in the rural areas where the problems of large-scale soil erosion and water quality deterioration, deforestation and declining soil productivity are occurs. The urban area also experiences seriously diminished air and water quality.
3. The rate of growth of both district income and also per capital district income for Kolhapur district is always higher than the state and national average.
4. Akola district has 34.78 per cent of saline area followed by Amaravati district (16.57%) and Buldhana district (11.30%). Pune (4.2%), Satara (3.26%), Kolhapur (6.3%) and Solapur (9.20%) in Maharashtra are hastily falling into the belt of salinity.
5. The characteristics of problematic soil, along with causes of the soil salinity (both natural and man made causes) is discussed in this chapter.

6. The Hathkanangle tehsil accounts 247 ha land affected by salt, where Kagal and Shirol tehsil accounts 70 ha. and 2,468.4ha. respectively in the various irrigation projects' command area. The grant total value of saline soil in the Kolhapur district is accounted 2,785.4 ha.
7. The measures to control the problem of soil salinity are discussed in the further part of this chapter. Also the impact of sugarcane cultivation on soil quality is identified along with the methodology for accounting the natural resources for soil and then need of sustainable development is also discussed.
8. Area of saline soil in the irrigation command area in Kolhapur district is showing the increasing trend. Since the environmental problems in the concerned district are rising day by day, there is a great need of sustainable development.