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LAND DEGRADATION IN GUJARAT: AN OVERVIEW

***PRIYANKA, **HEMANT SHARMA, #MEERA AND #M. K. LAKHOTIYA**

* MPUAT, Udaipur, ** Agro Economic Research Centre,
Vidyanagar, Anand (Gujarat), # CoA, SKRAU, Bikaner (Rajasthan), India

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ABSTRACT

Land degradation can be considered in terms of the loss of actual or potential productivity or utility as a result of natural or anthropic factors; it is the decline in land quality or reduction in its productivity. Gujarat is the one of the fastest growing states of India. The state has adopted a novel pattern of progress with the strategic development of the key sectors like energy, industry and agriculture for which it has achieved ambitious double digit growth rate since 10th Five Year Plan period. The state constitutes about 6.2 per cent of total geographical area and 4.99 per cent of total population of India. As per Census 2011, about 3.47 crores people of the state live in rural areas forming about 57.4 per cent of its total population (GOI, 2011). Agriculture in Gujarat is characterized by natural disparities. A large and growing population has placed a great deal of stress on the topsoil resources of this region. Much of the land used for agriculture in the state is of a very marginal nature. This, combined with the intensive nature of the agricultural practices of this region, has placed its soil resources face a constant danger of depletion. Currently, the heavy application of fertilizers is required to maintain basic productive capacity. Rapid urban and industrial development, deforestation, inadequate soil conservation, the cultivation of steep slopes and overgrazing have all had a devastating impact. The resultant effects of the degradation are massive unemployment, migration of labour, regional and intergenerational disparities, loss of natural resource base and ecological imbalance.

INTRODUCTION

Land degradation may have significant adverse effects, particularly in developing countries (Scherr and Yadav, 1996; Rosegrant and Ringler, 1997). The few in-depth analysis of soil erosion that has been done in temperate areas indicates that the consequences are not large for aggregate agricultural productivity, although they are a concern for susceptible soils. Land degradation is the reduction in the capacity of the land to provide ecosystem goods and services and assure its functions over a period of time for the beneficiaries of these. Land degradation affects large areas and many people in dryland regions. Increased population pressures and excessive human expansion into drylands during long wet periods leave an increas-

*** Corresponding author's email :** priyankasharma.rca@gmail.com (* Ph.D. Scholar, MPUAT, Udaipur,
**Asstt. Prof., # M.Sc scholar,)

ing number of people stranded there during dry periods. In India the cost of land degradation is increasingly felt in terms of declining crop production, productivity, land use intensity, changing cropping pattern from conventional crop, high input use and declining profit (Bownder and Ravi, 1984; Joshi and Agnihotri, 1984; Joshi *et al.*, 1987; Chopra, 1989; Parikh and Ghosh, 1995 and Reedy, 2003).Various micro and macro level of study show that the cost of land degradation is very high in india. In Kheda district of Gujrat due to salinity productivity losses ranges from 70% in the case of local paddy and wheat to 25% in the case of Potato. Productivity losses range from 10% in the low salinity to 85% in the case of high salinity for paddy (Joshi, 1987). In In sultanpur district area paddy and wheat yield went down by more 15% and 56% respectively on salt affected area (Joshi and Jha, 1992).

Land degradation seriously undermines the livelihood opportunities, thus leads to poverty, migration and food insecurity. Such loss occurs mainly because of various forms of erosion (by wind and water) and of chemical and physical deterioration. (a) Erosion,The most common form of erosion is the loss of topsoil under the action of water or wind. Water runoff carries the topsoil away; this occurs under most climatic and physical conditions. Displacement of topsoil by wind action is more widespread in arid and semi-arid climates than under more humid conditions. The loss of topsoil reduces fertility because [a] as the soil becomes denser and thinner, it is less penetrable by growing roots and may become too shallow for them; [b] the capacity of the soil to retain water and make it available to plants is reduced; and [c] plant nutrients wash away with soil particles.(b) Chemical deterioration,may consist in: (a) The loss of soil nutrients (mainly nitrogen, phosphorus and potassium) or organic matter. In part, nutrients are lost through erosion: "in the humid tropics, many nutrients are leached during the intense rainstorms, especially on unprotected land"; in addition, they can be "depleted by the crops themselves, particularly if the same crops are grown on the same land year after year". (b) Salinization has "a deleterious effect on soil productivity and crop yields" in extreme cases, " damage from salinization is so great that it is technically unfeasible or totally uneconomic to reverse the process". (c) Acidification, which may occur either because of excessive application of acidifying fertilizer or because of drainage in particular types of soil; and (d) Pollution of various origins (waste accumulation, excessive use of pesticides or manuring, oil spills etc.), can strongly reduce the agricultural potential of lands.(c) Physical deterioration are recognized: (a) Soil compaction, usually resulting from the use of heavy machines on unstable soils or from cattle trampling; sealing and crusting, usually caused by the impact of raindrops. These conditions make tillage more costly and impede seedling emergence. Also, by restricting water infiltration, they cause faster run-off and water erosion. (b) Waterlogging, i.e. the rise of the water table to the root zone of plants, caused by an excessive input of water with respect to drainage capacities. (d) Desertification, is "the reduction or destruction of the land's potential, finally resulting in the appearance of desert conditions. The desertification "is only one extreme aspect of the widespread deterioration of ecosystems under the combined pressure of adverse climate and agricultural exploitation".

Gujarat is the one of the fastest growing states of India. The state constitutes about 6.2 per cent of total geographical area and 4.99 per cent (60.43 million) of total population of India (GoI, 2011) .The 19th Livestock Census (2012) of India has placed total livestock population at 512.05 million and total of poultry birds at 729.2 million (GoI, 2014), out of which, there are 271.28 lakhs livestock (5.29%) and 150.03 lakhs poultry (2.06%) in the state of Gujarat.

Thus, looking to population pressure of human beings and livestock and their activities in addition to climatic wind and water effects, an attempt was made to measure the extent of land degradation and sustainable agriculture in Gujarat.

LAND USE PATTERN

At present, to meet the over-growing demand for food, farmers are left only with intensive agriculture as the land available for cultivation is decreasing. The trend not only accelerates the land degradation but also narrows down the chances for increasing the food production.

The state of Gujarat occupies the northern extremity of the western sea-board of India. It has the longest coast line of 1290 kms. The state comprises of three geographical regions. The peninsula, traditionally known as Saurashtra, is essentially a hilly tract sprinkled with low mountains. Kutch on the north-east is barren and rocky and contains the famous Rann (desert) of Kutch, the big Rann in the north and the little Rann in the east. The mainland extending from the Rann of Kutch and the Aravalli Hills to the river Damanganga is on the whole a level plain of alluvial

soil.The average rainfall in Gujarat varies from 33 to 152 cms. The southern region of the state has an average rainfall ranging from 76 to 152 cms, Dang district have the highest average of about 190 cms. The northern district have a rainfall ranging from 51 to 102 cms. The rainfall in the southern highlands of Saurashtra and the Gulf of Cambay is approximately 63 cms while the other parts of Saurashtra have a rainfall less than 63 cms. The semi-desert area of Kutch has a very low average rainfall. Certain areas in Ahmedabad, Mehsana, Banaskantha, Panchmahal, Surendranagar, Jamnagar and Kutch districts receives very less or no rains. As the Tropic of Cancer passes through the northern border of Gujarat, the state has an intensely hot or cold climate. But the Arabian sea and the Gulf of Cambay in the west and the forest covered hills in the east soften the rigors of climatic extremes. The present geographical area of the state is 19.6 million hectares. The broad land use patterns vary remarkably across regions and districts. The detail of land use classification from 2006-07 to 2010-11 and overall for this period is shown in Table 1.

In order to have proper eco-system balance, one third of the geographical region is required to be under forest cover. The forest cover in the state is 9.36 per cent. Only 5.97 per cent of the geographical area is put under non-geographical purposes such as buildings, roads, rail, canal and other permanent structures. The typographical features often put large share of area under hills, mountains, rocks and so on (classified on barren & uncultivable land) which is 13.06 per cent in the state. With the proper planning, this land can be put under proper use. About 4.34 per cent area of the state is under permanent pastures and grazing lands which is mainly used for grazing purpose to the livestock. The negligible area is under tree crops and groves. Due to various regions like soil and water quality problems including acute desert cover or permanent water logging condition, 10.02 per cent area of Gujarat state is under culturable waste land. The scientific reclamation of land use planning strategy is a matter of grave importance in those regions where

Table 1. Land Utilization in Gujarat

('000 hectares)

S.No.	Classification	2006-07	2007-08	2008-09	2009-10	2010-11	Quinquennial Average
1.	Geographical area (for the land utilization purpose)	19602	19602	19602	19602	19602	19602 (100)
	Reporting area for land utilization	18866	18866	19069	19069	19069	18987.8 (96.87)
	(i) Forest	1833	1834	1834	1834	1834	1833.8 (9.36)
	(ii) Land put to non Agricultural uses	1163	1171	1171	1171	1171	1169.4 (5.97)
	(iii) Barren & un-culturable land	2595	2552	2552	2552	2552	2560.6 (13.06)
	(iv) Permanent Pastures & other grazing land	853	851	851	851	851	851.4 (4.34)
	(v) Land under misc. Trees crops & groves	4	4	4	4	4	4 (0.02)
	(vi) Culturable waste	1976	1960	1960	1960	1960	1963.2 (10.02)
	(vii) Current Fallow	623	510	379	379	379	454 (2.32)
	(viii) Other fallow land	19	19	16	16	16	17.2 (0.09)
	(ix) Net area sown	9801	9966	10302	10302	10302	10134.6 (51.70)
2.	Area sown more than once	2007	2246	1335	783	1946	1663.4 (8.49)
3.	Total cropped area	11807	12211	11637	11085	12247	11797.4 (60.18)

Note: Figures in parentheses are percentage of Total Geographical Area (TGA)

culturable waste land is high. The fragile nature of land and other socio-economic reasons make it necessary to put part of culturable and fallow lands for a whole year. The share of current fallow lands at state level is 2.32 per cent and decreasing over the years. Similarly the other fallow lands which is cultivable lands put fallow for 2 to 5 years to improve the quality of soil is also negligible. The net sown area which is most important class of land use out of nine classes (as mentioned above is about 10134.6 thousand hectare (51.70%). In fact this part of the land plays a vital role in determining the agricultural prosperity in a sustainable manner.

The net sown area also increased marginally over the years. Too large share or too small share of net sown area to geographical area is detrimental to sustainable agricultural development of a state/region. Unless we keep out natural resources intact, the sustainable development of the state in general and that of agricultural sector in particular would pose serious challenges in the years to come. The area sown more than once is only 8.49 per cent which shows the poor irrigation or input facility in the state. As a whole, 11797.4 thousand hectare is the total cropped area of the state.

A large and growing population has placed a great deal of stress on the topsoil resources of this region. Much of the land used for agriculture in the state is of a very marginal nature. This, combined with the intensive nature of the agricultural practices of this region, has placed its soil resources face a constant danger of depletion. Currently, the heavy application of fertilizers is required to maintain basic productive capacity. Some estimates have placed India's use of arable land resources at 120%, which means that fully one the land currently under cultivation is unable to

Table 2. Degraded and Wastelands statistics of Gujarat (Area in ' 000 ha)

District	Degraded and Wastelands classes								Total of Classes	Others**	Total
		2	3	4	5	6	7	8			
Ahmedabad	0	0	159	0	0	96	0	0	255	549	884
Amreli	26	5	7	0	0	0	1	0	39	704	743
Anand	18	0	7	0	0	0	0	0	25	270	295
Banaskantha	55	0	47	0	0	42	0	0	144	935	1079
Bharuch	114	0	20	0	0	0	1	0	135	519	654
Bhavnagar	0	0	77	0	0	14	0	0	91	905	996
Dahod	57	3	0	0	0	0	0	0	60	307	367
Dangs	84	0	0	0	0	0	0	0	84	94	178
Gandhi Nagar	0	0	0	0	0	0	0	0	0	217	217
Jamnagar	9	0	185	1	0	0	1	0	196	1206	1402
Junagarh	42	6	29	0	0	0	0	0	77	809	886
Kachchh	0	0	519	0	60	11	5	0	595	3948	4543
Kheda	35	0	0	0	0	0	0	0	35	388	423
Mahsana	0	0	9	0	0	10	0	0	19	420	439
Narmada	27	3	0	0	0	0	0	0	30	246	276
Navasari	66	0	5	0	0	0	1	0	72	150	222
Panchmahal	24	0	0	0	0	0	0	0	24	500	524
Patan	0	0	63	0	0	253	0	0	317	269	586
Porbandar	67	0	10	3	0	0	0	0	80	151	231
Rajkot	9	0	106	0	0	0	0	0	115	999	1114
Sabarkantha	5	0	0	0	0	0	0	0	5	737	742
Surat	156	4	29	0	0	0	3	0	192	587	779
Surendranagar	62	0	222	0	0	119	1	0	404	637	1041
Vadodara	41	0	0	0	0	0	0	0	41	716	757
Valsad	82	11	1	0	0	0	0	0	95	210	305
Total	979	32	1495	4	60	545	12	0	3129	16473	19683

Classes: 1 Exclusively water erosion (>10 tonnes/ha/yr); 2 Water erosion under open forest; 3 Exclusively saline soils; 4 Er oded saline soils; 5 Saline soils under open forest; 6 Exclusively sodic soils; 7 Mining/Industrial waste; 8 Waterlogged area (Permanent). Others**: Normal agricultural lands, water-bodies, rivers, lakes and habitats etc.
Source : NBSS &LUP

sustain agriculture in the long term. Several factors contribute to the growing stress that has been placed on this regional agricultural land. Rapid urban and industrial development, deforestation, inadequate soil conservation, the cultivation of steep slopes and overgrazing have all had a devastating impact.

The study conducted by NBSS&LUP, shows that Total degraded area in the state is 3,129 thousand ha (about 16% of TGA). The highly affected districts are: Kachchh (595 thousand ha), Surendranagar (404 thousand ha), Patan (317 thousand ha),Ahmedabad (255 thousand ha), Jamnagar (196 thousand ha) and Surat (192 thousand ha) . Among districts affected by water erosion, Surat ranks first with 156 thousand ha, followed by Bharuch (114 thousand ha), Dangs (84 thousand ha), Valsad (82 thousand ha), Porbandar (67 thousand ha), Navasari (66 thousand ha), Dahod (57 thousand ha) and Banaskantha (55 thousand ha). This includes erosion in open forest area also. Saline soils account for 1495 thousand ha (8% TGA); of which 519 thousand ha is found in Kachchh. Other areas affected by salinity are Surendranagar (222 thousand ha), Jamnagar (185 thousand ha), Ahmedabad (159 thousand ha) and Rajkot (106 thousand ha). Sodicity is also a major problem in Gujarat. Sodicity affected areas account for 545 thousand ha and highly affected districts are Patan (253 thousand ha), Surendranagar (119 thousand ha), Ahmedabad (96 thousand ha) and Kachchh (60 thousand ha),). Wind erosion is observed in Patan district.

CONCLUSION

A qualitative weighting of the plausible global economic effects of future soil degradation suggests that the greatest problems for food security in the developing countries will be found in the densely populated marginal lands. These areas also have the highest probability of significant degradation without policy action, because combating degradation will require mobilizing long-term investment and new technology development. Degradation of irrigated lands through salinization and waterlogging poses the second greatest threat, because these lands play a central role in commercial food supply. Degradation in marginal lands that are lightly populated is unlikely to impose major global economic costs (as distinct from the likely and significant global environmental costs), though many of the poorest of the poor may farm in these regions. National policy priorities will vary widely and must be determined by each country's resource endowment, the structure of agricultural supply, the geographic distribution of poverty, and the principal agricultural sources of economic growth

The problem of soil degradation is therefore, posing and serious threat to the sustained agricultural production and jeopardizing food security not only for the present generation but also for the future generations. Degradation of the ecosystem particularly the land component and the consequential loss of productivity of this scarce resource would severely affect the livelihood of majority of human and livestock population. The resultant effects of the degradation are massive unemployment, migration of labour, regional and intergenerational disparities, loss of natural resource base and ecological imbalance.

- Agricultural areas coming under arid and semi arid regions are more prone to erosion and degradation problems therefore more emphasis should be given to these areas.
- Economically feasible techniques should be formed to tackle land degradation problems.
- More projects related with groundwater development such as water harvesting, watershed management, formation of artificial recharge facilities with wastewater and rainwater should be implemented.

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