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Developing Resources

Land & Water Conservation & Management

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ABSTRACT

This paper examines the impact of management practices on conservation of land and water resources in Kenya. Some of the influences that affect these resources include farming, the tourist industry, irrigation and hydraulic power development, soil and water conservation practices and international involvement.

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I. INTRODUCTION:

For many centuries the world's capital of natural resources the minerals, forests, water and the soils, was only required to yield a very modest interest which was sufficient to provide for man's requirements. With the current, world's fast increasing population it has become necessary first to extract for the basic human requirements from the natural resource stock base, before turning to the available capital resources. The rate of the world's population growth of 2-4% especially in the developing world and the actual absolute numbers shows an ever-increasing upward trend whereas the available natural resources are depleted at an alarming rate e.g.

The rate of deforestation is more than ten times that of tree planting as can be seen from the table below (UNEP, 1985).

REGION	FOREST AREA MILLIONS OF HA.	RATE OF DEFORESTATION (MILLIONS OF HA PER YEAR) .	RATE OF PLANTING (MILLIONS OF HA. PER YEAR)
Tropical America	896	5.6	0.535
Tropical Africa	703	3.7	0.126
Tropical Asia	336	2.0	0.438
TOTAL	1935	11.3	1.099

At the same time desertification i.e. intensification and extension of desert conditions leading to reduced biological productivity, continues to expand significantly.

Dregne (1983) has concluded that of the total 4100 million hectare of productive land in arid and semi-arid zones 3272 million hectares or 80 percent should be judged to be moderately to very severely desertified. In his continental breakdown, Dregne noted that whereas percentage of moderately desertified lands were consistently high every where , what identified the drylands of Africa, Asia and South America

was the extent of severely desertified lands which amounted overall to 870 million hectares or 18.5 per cent of all productive lands.

The loss of soil is not only confined to the developing countries but affects even developed countries e.g. over a third of cropland areas in the United States loses more than 13 tonnes of top soil per hectare per year, with an estimated global loss of 15.3 billion tonnes a year (Brown 1984). It is estimated that the mass of materials moved annually by all the rivers to the ocean is about 9.3 billion tonnes, and the actual global volume of accelerated erosion is about 24 billion tonnes (Brown). There are evident regional differences. Asian rivers contribute the largest share, estimated at 14.53 billion tonnes per year followed by North America (1.78), South America (1.09), Africa (0.48) Europe (0.30) and Australia (0.21) (Robinson). At the current rate of excessive erosion, soil is being depleted at 0.7 per cent per year (7 per cent each decade).

In effect the world is mining much of its cropland because of the shortsighted way one third to one half of the world's croplands are being mismanaged, thereby converting them from renewable to non-renewable resources.

The prevailing conditions of population increase and improper management of resources have forced many people to migrate from the high potential areas to the urban areas and the arid and semi-arid areas. The urban areas have been constrained in their efforts to provide extra social amenities for the extra influx of the people. The migration to the arid and semi-arid areas with introduction of inappropriate technology interalia has also been instrumental in further deterioration of an already fragile ecology.

This paper aims at highlighting some of the important aspects related to land and water conservation and their implication and relevance to development.

2. Impact of Improper Management of Land and Water Resources On Development

In developing countries national development is synonymous with rural development. This is because the bulk of the population is to be found in the rural areas. The economies of these nations are based primarily on agriculture and agro-based manufacturing and industries.

The basic resources on which their economy is hinged are land and water. The dependence of many developing countries on agriculture tourism and to some extent on agro-based industries can be illustrated by the case of Kenya. Kenya is a tropical country in the eastern part of Africa. It has an area of 585,000 Km² with a population of 20 million people. At about 3.8% growth rate it has one of the highest birth rates in the world. Of the total surface areas only about 20% is high potential, and the rest 80% is arid or semi-arid. The potential then for increasing food production lies in the latter arid and semi-arid zones.

Over 80% of Kenyas' population live and derive their livelihood in the rural areas. However, in the recent past there has been a trend for young people to migrate to the major urban centres in search of employment.

(i). Agricultural Occupation: (See 4A and 4B next sheets)

However, Agriculture production continues to give the highest marketed production as shown below:

TABLE I

RECORDED	MARKETED PRODUCTION AT CURRENT PRICES IN MILLIONS KE				
	1980	1981	1982	1983	1984
Crops	297	307	357	461	691
Livestock products	56	80	92	94	98
TOTAL	353	387	449	556	789

(4A):

(i). Farming constitutes the main occupation of the majority of the people from where subsistence and export crops are grown. As population rise and the terms of exchange for the raw materials worsen so does the need for more production either by increase per unit area, by opening new lands in less suitable areas or by introduction of irrigation become necessary.

(4B).

Kenya to-day is characterised by heavy influx of rural population into urban areas in search for gainful employment. On the other extreme we have another lot of the people migrating from the high potential to low potential, semi-arid lands in search for additional cultivable land.

In most cases improper land management is the cause for lowered production and consequent migration of people to the urban areas and to the less potential areas. This in turn affects the supply of the raw materials for the agro-based industries which lead to less employment opportunities in the urban areas.

(ii). Tourist Industry

Kenya also earns substantial foreign exchange from its tourist industry. The number of visitors on business and tourism has remained at a high level and contributes significantly to the economy of the country.

TABLE II NUMBER OF VISITORS/TOURISTS 1980-1984

Year	1980	1981	1982	1983	1984
Visitors	339600	321900	353100	324700	328500

The visitors came to view our game animals, plant species and coastal beaches. Huge populations of game animals in our game parks have accelerated desertification. At times, we have lost rare animal species due to food shortage and others have even migrated to other countries.

Poor management of the water catchment areas is causing increased silt loads in our rivers and subsequent siltation of attractive coastal beaches. If unchecked, these land practices would lead to reduced tourism, lowering of the valuable foreign exchange, and low rates of national development.

(iii). Water Conservation Dams - For Irrigation and Hydroelectric Power

The power utilized by our agro-based industries is from man-made lakes inland of the country. These man-made lakes also provide the basis for local fishing industry which provide employment as well as a relatively cheap source of protein for the rural population. The main dams along the biggest river in Kenya, the Tana river, have a combined storage capacity of 3058 million cubic meters of water and a potential electricity generation of 313 megawatts. Large commercial and industrial consumers uses 65 per cent of the total power produced. (Economic survey, 1985). These reservoirs are also used for irrigation schemes which have been established in conjunction with these reservoirs where landless people from the high potential areas and pastoralists are settled.

These man made lakes are now threatened with serious siltation due to poor land management practices at their high potential water catchment areas. We are making all possible efforts with assistance of some donor countries to intensify conservation works at the water catchment areas to reduce the rate of siltation. Unchecked siltation of these dams would certainly disrupt important national irrigation programmes, human settlements, fishing industry and the important national power source for our agro-based urban industries.

Apart from the very large dams along big rivers for irrigation and hydroelectric purposes, there are numerous smaller farm based dams. These are used for the irrigation of important cash crops such as coffee, pineapples horticulture and French beans which contribute significantly to the economy of Kenya's economy.

Without much elaboration, the impact of improper land and water conservation policies would lead to lowered land productivity, inadequate food supply, reduced employment and slowed national development as much resources would be channelled into land reclamation, desertification control, desilting of dams etc, at the the expense of other priority national developments such as roads, schools hospitals etc.

3. The Practise of Soil and Water Conservation as a Land Management Tool for National Development

It is recognized fact that soil and water and forests are finite resources, and that continuously increasing demands are being placed on them to feed, clothe, house and provide worldwide ecological balance.

The nations of the world should therefore put more efforts in utilisation of these resources on the basis of sound principles of resource management to enhance soil productivity, higher and sustained water yields from catchment areas and subsequent conservation, conservation of forests and reduction of loss of good farmland to non-farm purposes. This would lead to sustained increased production per unit area.

The techniques for better land and water resource management are numerous and appropriate methods for varying conditions of soil, rainfall, slopes, crops and cropping patterns and social set up will have to be adapted.

(a). Soil Conservation

We have two broad types of land and crop management practices

- (i). The Land Management practices comprising of the mechanical protection works, which are earth moving and soil shaping measures, and
- (ii). The crop management practices or the biological measures comprising of carefully selected cropping patterns and improved crop husbandry.

The Mechanical measures include cut off drains; to remove large water flows coming from outside from getting into the arable farm. Terraces of various types e.g. bench, channel, ridge and the Kenyan 'Fanya Juu' formed by digging a channel and throwing the soil uphill; these decrease the length of slope. Artificial and natural waterways are used to discharge water from cut off drains and terraces etc. into non-erodible areas at non-erosive velocities.

The Biological measures includes contour farming, trash lines grass strips, crop rotation, mulching, mixed cropping and the use of appropriate and adequate organic and inorganic fertilizers.

(b). Water Conservation

Water is conserved and stored in situ in the soil and in ground water by good soil conservation methods. This water is then available to feed the crops and to slowly feed the rivers and streams through underground seepage.

On the other hand, surface and subsurface storage is encouraged to store the excess run off water for use during the dry season for irrigation, human and livestock consumption.

For purposes of flood control, irrigation or power generation, water is stored in large dams which take advantage of favourable sites. For small scale farm development, farm level small dams, water holes and pans are constructed. They can be sited nearer to where the water is required to store excess run off water from the farm and they can be built more cheaply with less equipment and less engineering skills. The most common water conservation structures are earth and rock fill dams, sub-surface dams and weirs, boreholes and wells.

A more cultural/biological water conservation technique involve planting of trees and woodlots at farm level, river bank protection measures and preservation of water catchment forests.

There are many technical aspects applicable for better resources management but the local land users must be convinced of the advantage of not taking more out of the land than can be returned.

4. Land and Water Conservation. An Important Farm Management Technique

Farm management aims at optimising on all available resources i.e. land labour capital and skills. Soil and water conservation must be seen as a farm management tool for improved and sustained farm productivity.

- (i). It is recommended that all farm plans for both animal and crop production should be based on sound soil and water conservation layouts.
- (ii). Optimum combinations of crop and animal enterprises at the farm will ensure that crop residues are utilised for beef or dairy production and may constitute to improved soil texture and fertility.
- (iii). The use of both open and cover crops during conservational crop rotations and strip cropping is often a recommended farm management practice which lead into reduced disease incidence and improved soil texture and fertility.
- (iv). In soil and water conservation, we recommend planting of various grasses on the embankments of soil conservation measures and grass strips as pure conservation measures. Such grasses are used as livestock feeds to enhance mixed farming for improved farm yields.
- (v). In grazing lands optimum animal population is the most effective conservation measure which leads to reduced soil erosion ensuring increased forage and pasture production and consequently increasing beef or milk production.

This is done through sound management practices where watering points are placed at strategic points to minimise erosion and hence increase fodder production.

- (vi). A farm management system that is gaining importance in the Kenyan high potential areas is zero grazing system. In this system one of the major causes of erosion i.e. cattle trampling on soil is altogether eliminated by enclosing the animals in appropriate sheds and feeding them there. This results to minimal erosion and increased fodder production and hence higher milk yields from the animals.

5. Problems in Land and Water Management

The constraints in land and water management are many but vary from country to country. Many of these are of technical financial and socio-economic in nature. The most common of these include:-

- (i). Awareness: The implication of poor land and water management in certain communities is not fully appreciated. This has negative effect on the rate of adaption of recommended conservation practices.
- (ii). Technology; In some cases appropriate conservation measures have not been developed. The recommended technology in such instances is either borrowed or not adequate with low conservation values. In some of these practices recommended to the farmers are beyond the normal resources of the farmer i.e. skills, knowledge and equipment.
- (iii). Socio-economic; The social set up of certain communities have been such that land and water management practices may not be easily acceptable to them e.g. communal ownership / be of land.
- (iv). Financial; Since most of the resource conservation problems are national in nature and taking into consideration that financial capability of many nations is low, there is need for external financing to facilitate undertaking of these tasks.

INTERNATIONAL COOPERATION

It would be unfair to conclude this paper without highlighting the necessity for accelerated international cooperation in this field. There is need to maintain an up to-date information on the global land degradation situation as it affects the entire human development.

This should lead to a comprehensive international plan of action on environmental preservation.

The main issues to be tackled here are inventory of all soil and water resources, financial and technical assistance to developing countries in implementing land and water management policies, coordination of effective research into Land and Water Management for different environments and improved international awareness of resource degradation and conservation.

In Kenya we have a national soil and water conservation programme supported by the Swedish International Development Agency - SIDA, and a number of regional conservation programmes supported by various donors such as the Danish International Development Agency - DANIDA for Mutomo area in Kitui District, the United States Agency for International Development - USAID for Kitui district, the European Economic Community - E.E.C. for Machakos district, the British Overseas Development Administration - O.D.A. for Embu Meru and Isiolo districts, and the Canadian International Development Agency for Kisumu District etc.

We do appreciate this assistance and feel that it offers good demonstration of what should be happening in other developing countries.

The challenges facing the efforts towards conservation of the global land and water resources are enormous but with full cooperation of the entire international community, useful developments can be achieved to make the world a better place to live in for all.