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Sustainable Resource Management in India's Dry land Region: An Analytical Study

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Abstract

Dry lands in India are one those areas which need a different approach for sustainable management. Since these areas are devoid of good amount of rainfall and hence they are more prone to problems like soil degradation, desertification and water and loss of humidity. These areas might experience less rainfall compared to other regions of the country but still they are home to millions of people. To make these dry lands livable for the people it is very important to make it resourceful by applying various types of management techniques in different fields. These fields belong to water management, agriculture, protecting soil degradation and most importantly prevention from desertification. It is very crucial to manage resources sustainably. The sustainable management can help in making dry lands of India more productive without harming the environment.

Keywords: Sustainable Resource Management, Dry Land Region, Water Management, Agriculture in Dry Land, Watershed Management

Introduction

The growth of agriculture and natural resources worldwide is based on available soil and water resources. Expanding populations in many developing nations put growing pressure on land and water, mostly in an effort to increase food production, with little thought given to the long-term effects. Despite the availability of water, people are establishing themselves in drylands due to favorable weather. In all circumstances, however, sustainable economic development depends on the prudent use and management of soil and water resources. The potential to attain food security, reduce poverty, and enhance human health is threatened by freshwater shortage, a worldwide issue that is most acute in arid countries. Droughts exacerbate water scarcity and frequently result in overuse of natural resources. Long-lasting droughts cause starvation in the world's poorest nations. In contrast, many drylands can periodically encounter extreme rainfall that can result in flash floods and, as a result, damage to property and loss of life. Land scarcity exacerbates the issues caused by water shortage, increasing human vulnerability to drought and flood extremes and encouraging broad resource exploitation. Intensive human development and resource exploitation, such as urbanisation or grazing and agriculture on hill slopes, can accelerate soil erosion. The issue of poor productivity is made worse by surface and gully erosion, which also affects the future productivity of the land by further depleting soil resources. When combined with high sediment levels, poor water quality limits the development of sustainable water resource management (Swaminathan, Balan Siva, 2013 and Jain, 2019).

There are many reasons for the responsible for the decaying quality of dry lands in India. The main characteristic that makes up the drylands is the low, poorly distributed, highly erratic, and unpredictable rainfall, which ranges from 375 mm to 1125 mm. It is less productive to grow crops in drylands since they are heavily reliant on the quantity and quality of rainfall. The chemical deterioration of soil, loss of soil texture and structure, and loss of natural vegetation all contribute to land degradation and soil erosion. Another significant issue is the sequestration of carbon, which further damages the soil and reduces its productivity. In drylands, there are more severe climate threats because the soils are fragile and more susceptible to environmental stress, which worsens already existing land degradation. In drylands, drought is a frequent occurrence since there is less water availability, which further contributes to low production. These problems need urgent solutions. The solution is watershed management. A concept known as watershed management acknowledges the prudent management of the three fundamental resources of soil, water, and vegetation on a watershed basis in order to accomplish a specific goal for the welfare of the population. It covers the best biological and technical methods for treating the land. A method that evaluates resource utilisation alternatives and environmental implications together is necessary to tackle the problems of sustainability and watershed management (Vijayan, 2016 and Singh, & Kumar, 2015).

Literature Review

In a research it was found that Dry lands, which are characterized by a lack of water, are an essential component of the ecosystem. These lands are the product of climate change and human activity, yet they are extremely important since they provide a living for millions of people worldwide. Since potential evaporation and transpiration outpaces rainfall in drylands and rainfall is very irregular and low, water scarcity is a major issue. It is very important to preserve water in dry regions of the country. Due to low and unpredictable rainfall, limited water supplies, ineffective water management techniques, and poor soil texture, water is the most precious resource in drylands. Therefore, one of the biggest challenges in dryland agriculture is increasing the availability of water for crop production. Another major worry is the degradation of natural resources brought on by over-exploitation. In addition to these, the majority of dryland soils lack organic matter, total nitrogen, and phosphorus as a result of high temperatures, limited plant cover, and coarse soil texture. As a result, crop production is frequently partially or totally unsuccessful due to low and extremely variable rainfall, high potential evapotranspiration, poor soil fertility, along with inadequate water holding capacity. Due to this unpredictability in crop output, drylands have the biggest difficulty in addressing food and livelihood insecurity (Patode, & Nagdeve, Gajjala, & Reddy2017).

In a research it was observed that many weed species in dry areas have the ability to adapt to conditions of moisture stress in order to survive. The composition of weed species in drylands is greatly influenced by a variety of variables, including climate, geography, cropping pattern, crop diversification, soil conditions, and management techniques. Successfully surviving in arid environments requires plants to be able to withstand moisture stress, desiccating conditions, and edaphic variables, all of which are crucial for the survival and abundance of weed flora. Due to particular traits, weeds are extremely tenacious in harsh climates and fiercely fight with crop plants for vital growth elements in dryland agriculture. The most significant pests in agriculture are weeds, which significantly reduce crop output by reducing the availability of vital growth components

including moisture, nutrients, light, and carbon dioxide. The main cause of reduced water availability for producing crops in dryland agriculture is weeds. Due to competing for moisture in moisture-stressed situations, weeds alone can lower crop output by more than 50%. Keeping the weed population below the threshold level is difficult to achieve, but doing so will maximise crop output and the effectiveness of resource utilisation. The weeds in dryland agriculture can be controlled by a variety of weed management techniques, including preventative, cultural, mechanical, biological, and chemical treatments, either alone or in combination (Singh, Das, , Kaur, Raj, & Shekhawat, 2018).

In a research it was estimated that agro forestry and aforestation can help in reducing soil degradation in dry region of India. Around the world, agroforestry is a common practise in drylands. Agroforestry can contribute to the improvement of dryland habitats' resilience. Agroforestry systems are more robust than the majority of the currently used agricultural production methods because they feature several production components and are complicated in their structure and operation. The functioning of the other species more than makes up for the vulnerability of one species to environmental pressures like pest and insect assaults since there are several other tree and shrub species involved. Development strategists have prioritised applying agroforestry technology to combat desertification and enhance dryland production systems because they recognise the value of agroforestry. Wide-ranging environmental advantages of agroforestry systems include soil erosion control and watershed services, which lead to soil conservation and water management. Agroforestry improves soil fertility and climate change resistance, among other aspects of economic and ecological sustainability (Roy, 2016, Kulkarni, and, Umarfarooque, 2012).

In a research it was found that poor quality of soil is the major issue faced by the people living in dry lands areas especially the farmers. The most effective tool in the battle against soil degradation and guaranteeing the sustainability of agriculture in dryland areas is maintaining or improving the soil quality. To provide long-term cropping systems that enrich the soil with organic matter, there is a need to adjust and improve crop and soil management practices. Application of organic fertilisers and plant nutrients, as well as the inclusion and cultivation of legumes, improve soil fertility and sustainability. This has a direct bearing on preserving the amount of soil, which is essential to soil production. However, farmers in dryland areas with limited resources only apply a small number of nutrients, which causes crops to have multi-nutrient deficiencies. The most advantageous choice appears to be combining organic manure produced by farms with inorganic fertilisers. The greatest strategy for maintaining the productivity of soil over the long term is to use a combination of inorganic fertilisers and organic manures. Adoption of soil and water conservation strategies can improve soil fertility in addition to preventing loss of fertile top soil and managing soil erosion. Multinutrient deficits affect crops. The optimum choice appears to be the combination of organic manure produced by farms and inorganic fertilisers. The main goal of this method is to lessen or avoid soil erosion caused by wind or water while preserving soil moisture for crop growth (Srinivasarao, Venkateswarlu, Lal, Singh, & Kundu, 2013).

In a study it was observed that Cloud seeding, desalinization of seawater, groundwater development, reservoir storage, evaporation suppression, and vegetation management are just a few of the technologies that can boost a region's water resources. New technologies are being developed, but most of them are expensive and can have unintended environmental effects. Effective and efficient water resource projects needs to be developed within the context of

competent watershed management. A topographically defined area that is drained by a stream system is called a watershed. The physical, hydrological, and human resources of a watershed are all interconnected. Thus, managing a watershed involves using land and water resources judiciously to maximise production while posing the fewest risks to other natural and human resources. In order to offer desired products and services without negatively damaging soil and water resources, watershed management is the process of directing and organising land use and usage of other resources in a watershed. This idea acknowledges the connections between uplands and downstream regions as well as the interactions between land use, soil, and water. The idea of managing a watershed is as ancient as the idea of crops cultivated under irrigation, and this idea sparked the creation of tanks and reservoirs for boosting output in order to fulfil the demands of an ever-rising population. In order to fulfil the demands of the population and the need for food, many rulers in various regions realised and carried out projects based on the resources they had at their disposal, the requirements of the populace, the local natural resources, etc (Koch, & Missimer, 2016).

Methodology

This study is descriptive in nature in which data is obtained from 175 respondents who live in dry regions of India and adopted Sustainable Management of Practices. A checklist question was used to analyze and interpret the data. In a checklist question respondents choose “Yes” or “No” for all the questions.

Table1. Sustainable Resource Management in India’s Dry land Region

	Sustainable Resource Management in India’s Dry land Region	Yes	%Yes	No	%No	Total
1	Watershed Management decreases land degradation in dry regions of India	144	82.29	31	17.71	175
2	Agro-forestry reduces soil degradation in dry regions of India	139	79.43	36	20.57	175
3	Weed management increases the soil fertility in dry regions of India	152	86.86	23	13.14	175
4	Organic Fertilizers or manures increases soil quality in dry regions of India	159	90.86	16	9.14	175
5	Agro forestry depletes the chances of drought and floods in dry regions of India	166	94.86	9	5.14	175
6	Watershed Management increases the quality of water in n dry regions of India	138	78.86	37	21.14	175
7	Sustainable Management of resources in dry regions ensures food security	149	85.14	26	14.86	175
8	Sustainable Management of resources in dry regions fights climate change	157	89.71	18	10.29	175

Table and Figure 1 show that 94.86% respondents agree that Agro forestry depletes the chances of drought and floods in dry regions of India while 90.86% respondents agree that Organic Fertilizers or manures increases soil quality in dry regions of India. 89.71% respondents agree that Sustainable Management of resources in dry regions fights climate change while 86.86% respondents agree that

Weed management increases the soil fertility in dry regions of India. 85.14% respondents agree that Sustainable Management of resources in dry regions ensures food security while 82.29% respondents agree that Watershed Management decreases land degradation in dry regions of India. 79.43% respondents agree that Agro-forestry reduces soil degradation in dry regions of India while 78.86% respondents agree that Watershed Management increases the quality of water in n dry regions of India.

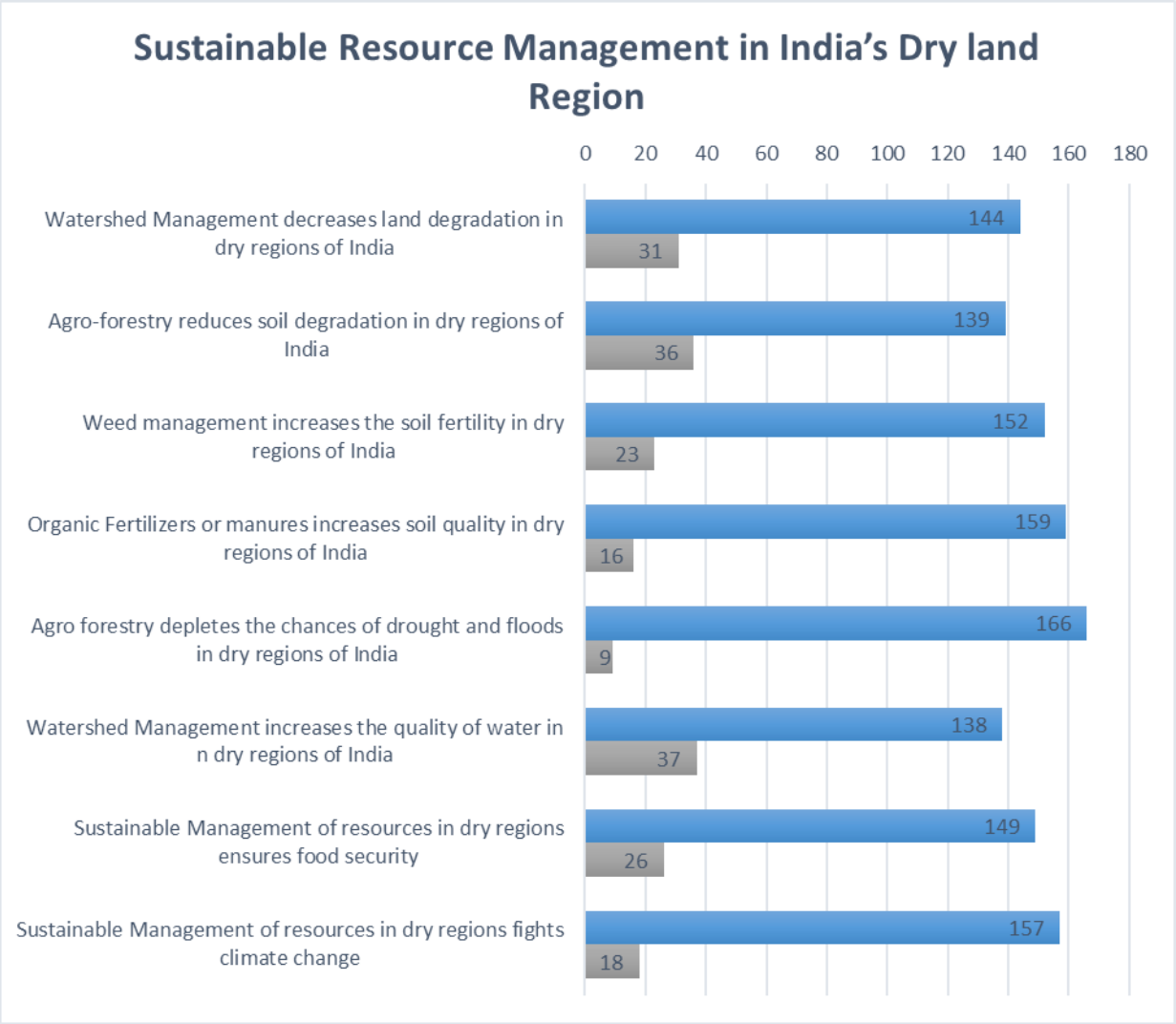

Figure 1 Sustainable Resource Management in India's Dry land Region

Conclusion

According to the studies mentioned above, arid areas in India require a long-term solution to their issue. These issues must be addressed since they may have an impact on the livelihood of the people living there. The most important aspects of resource exploitation, natural resources, water resources, and dry lands are the pressure on land and water resources to increase food production, the potential for food security, poverty reduction, and human health, as well as the effects of water scarcity and excessive use of natural resources. Water shortages brought on by droughts can lead to severe rainfall, property damage, and even fatalities. Future output may be impacted by land erosion, which can further worsen soil erosion. Water quality is a major issue in dry lands since rainfall is scarce, irregularly distributed, highly variable, and unexpected. As a result, soil has

eroded, degraded, and trapped carbon. In order to address these issues, watershed-level management of the three essential resources of soil, water, and vegetation is required. This includes the most efficient biological and technical methods for treating the land, as well as a method that concurrently takes into account the consequences on the environment. The proper management of resources like soil, water and land can led to sustainability. To achieve the sustainable goals there are methods that needs to be implemented like agroforestry. It can help in reducing soil degradation and improving soil quality. Removing weeds from dryland can improve the productivity of agricultural land and remove the main competitors of crops.

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