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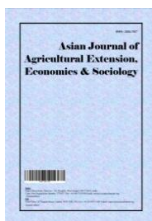
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Diverse Role of Women for Natural Resource Management in India

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Authors' contributions

This work was carried out in collaboration between both authors. Author SS designed the study, performed the statistical analysis, wrote the protocol and wrote the first draft of the manuscript. Author SD managed the literature searches. Both authors read and approved the final manuscript.

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ABSTRACT

Natural resources are means to satisfy human wants which exist in natural environment and which are available without any type of human endeavour. The degradation of natural resources such as land, water, forest etc. may have an adverse impact on livelihood of rural people. The present review paper determines diverse roles of women for management of various natural resources in India. Vigorous participation of women in decisions and activities related to conservation and well-organized utilization of renewable and non-renewable natural resources is solution of this world wide issue i.e., natural resource degradation. Over exploitation and botched utilization of natural resources can be protected in India through involvement of women in policies and programs made for natural resource management. They will also serve as a treasure of indigenous information for conserving natural resources.

Keywords: *Women empowerment; natural resource management; overexploitation.*

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1. INTRODUCTION

Natural resources are means to satisfy human wants which exist in nature and which are available without any type of human endeavour. These natural resources are elementary for human life and have economic value also. Resources supplied by the nature such as land, water, forest, fisheries etc. have utmost significance for human survival and livelihood. The pressure on these natural resources is continuously increasing due to various factors such as rapid economic growth, over population, industrialization and climate change. Sufficient natural resource has an impact on the growth of any country if it is appropriately managed/ exploited.

Natural resources for population should be in sufficient amount for growth of any country. Due to uneven consumption and over population, it will be difficult to fulfil demand of future generation with the available natural resources. The untenable and irregular consumption levels had resulted in a progressively strained environment and there is challenge of protecting degradation of natural resources to meet continuously increasing demands [1]. India is known for its bio diversity and jewels of distinct natural sources and it has four identified bio-hotspots, viz. the Himalaya hotspot, the North East of India, the rainforests of the Western Ghats and the Andaman & Nicobar Island chain [2]. In spite of that, country is facing various issues related to natural resources such as water scarcity, degradation of soil and deforestation.

Natural Resource Management (NRM) refers to the viable exploitation of major natural resources, such as land, water, air, minerals, forests, fisheries and wild flora and fauna. It has been seen since centuries that women have greater role in managing natural resources as they exploit these resources for fulfilling their family needs [3]. Participation of women and their knowledge enhancement regarding sustainable natural resource utilization and management can be only way to resolve the issues related to natural resource degradation. There is an urgent need to modify policies and programmes in this direction.

2. MAIN CONCERNS IN NATURAL RESOURCES MANAGEMENT

A major portion of population in India lives in rural environment and depends on natural

resources for their livelihood such as farmers, fishermen and agricultural wage workers (more than 1.3 billion people). They rely on the availability of cultivable soil, water and livestock for their source of revenue [4].

Degradation of these natural resources may have an adverse impact on livelihood of rural people. Climate change, improper management of natural resources, increasing demand and scarcity are the major causes of natural resource deprivation. Other than that gender issues are essential to address for proper management and conservation of natural resources, in particular-

- i. Lack of knowledge and awareness of managing resources amongst women
- ii. Gender differences regarding rights and access to natural resources
- iii. Gender differences in decision making
- iv. Gender differences regarding use of technologies

Women are mainly responsible for collecting food, fuel and water while men have their control over land use, agriculture, irrigation, fisheries etc. Besides, in most of the communities women have lesser rights than men. Men use natural resources for commercial purpose while women play role in managing natural resources for households. Gender equality in policy decision making for natural resource management will widen the scope for better and sustainable use of natural resources. Role of women in managing and conserving natural resources is very significant. This paper will review the roles of women in managing various natural resources.

3. WOMEN AND WATER RESOURCE MANAGEMENT

Water management has been a matter of concern in India and poor management of water led to water scarcity. Ground water level is decreasing at an alarming rate in many parts of the country. Government policies and institutional framework is unable to deal with the current problem. Following table shows the per capita annual water availability. A per capita availability of less than 1700 cubic meters (m^3) is termed as a water-stressed condition while per capita availability below 1000 m^3 is termed as a water scarcity condition. It can be seen in the table that projected water availability till the year 2050 is scarce. While currently it is under stressed condition. Hence, it is indispensable to save

Table 1. Per capita water availability

Year	Population (Million)	Per capita average annual availability (m ³ /year)
2001	1029 (2001 census))	1816
2011	1210 (2011 census	1545
2025	1394 (Projected)	1340
2050	1640 (Projected)	1140

Source: *Water in India - situation and prospects* [5]

water otherwise water scarcity will be immense to cope up with.

Role of women is exemplary in this direction. A research was conducted based on participatory approach in 10 villages situated in the arid region of Vidarbha in the state of Maharashtra, India which had a persistent problem of adequate and safe drinking water. The street plays and protests organized by the women and their consistent efforts for creating awareness about water management, sufficient safe drinking water was available in seven villages during the summer months of 1997. Women of these villages also initiated programmes for social forestry and rain water harvesting to protect the environment [6].

Women play crucial role in utilizing and conserving natural resources such as forests, water, land and wildlife in Himalayas to fulfil basic needs for their families [7]. The close association between women and natural resources was found in rural context especially among women of rural areas. Women performed social and economic role over many generations to acquire food, water, fuel, fodder and income from surroundings resource base [8].

The extent and nature of the involvement of women in participatory institutions in eastern India showed that their inclusion was very low and the concerns of women are usually not being taken into account. Women were taking decisions related to agriculture and water jointly with men. Research was further indicating the fact that if women participate formally in water user associations, it would expand their awareness and contribution for water management [9].

It has been concluded in another study that policies and reform should be formulated to increase women's participation in water management which would benefit ultimately to the society and conservation of resources because women are primary users of water [10].

Women's role is important for the success of water projects through changing the negative

social traditions to protect effective participation of women, raising their self-confidence and improving their participation and volunteering [11].

Considering the findings of these studies, it can be inferred that women participation is must for water management. They should take active participation in decision making for sustainable use of water and formulation of water management projects at community level.

4. WOMEN AND FOREST MANAGEMENT

About one billion population (with more than 68 million tribal) of India are partially or wholly dependent on forest resources for their livelihoods that cover almost one fifth of the national land area of India [12].

Women in hilly areas of India perform various day to day activities which are related to forestry. They collect fuel, fodder and herbs from the woods. Forests have been called as mother's home for women who are living in hilly counties of Himalaya [7]. Women's engrossment in forest management schemes is utmost important. Men were mostly engaged in planting, maintaining and harvesting trees for commercial purposes, while women mainly used to take care of products for subsistence use, such as food, medicines, fuelwood, fodder, and those for soil fertility improvement [4].

Women were more aware about joint forest management programme in areas of Chattisgarh with good forest cover. It was revealed in the research that more than 70 percent women were aware about the forest management programmes while hundred per cent women were dependent on forest for collection of fuel, fodder and other forest products [3].

So, women can be ambassador of forest management and proper utilization of forest resources, if their knowledge and services are used properly. They should have key role in making strategies for forest management and resource conservation.

5. WOMEN AND AGRICULTURAL LAND RESOURCE MANAGEMENT

About two-third of Indian population depends on agriculture for their livelihood. Hence, land can be categorized as one of the most important natural resource for human survival along with water. According to International Labour Organization (2019), almost fifty six per cent women are employed in agriculture. Hence, women have an obligatory role for agricultural land management [12].

It is evident from researches that women are major workforce in agriculture; still they are lagging behind land owing rights, crucial decision making and marketing of agricultural produce. It was indicated in a study that women's involvement was more than 90 per cent in most of the agricultural operations but they were not involved in decision making as well as lacking technical guidance [13]. Mostly agricultural extension and information on new technologies are designed exclusively for men, even when women are increasingly responsible for farm work [14]. As a result, women are not aware about new technologies and developments in agriculture such as improved dry land farming techniques and new varieties suitable for unfavourable soil and moisture conditions [15]. This is the need of hour to strengthen the capabilities of rural women in agriculture production through their active participation agriculture related decision making and technical training programmes.

Indigenous knowledge also has an overwhelming effect on appropriate land resource management. There is a need to explore

indigenous knowledge base of women for land management [16].

6. WOMEN AND FISHERIES

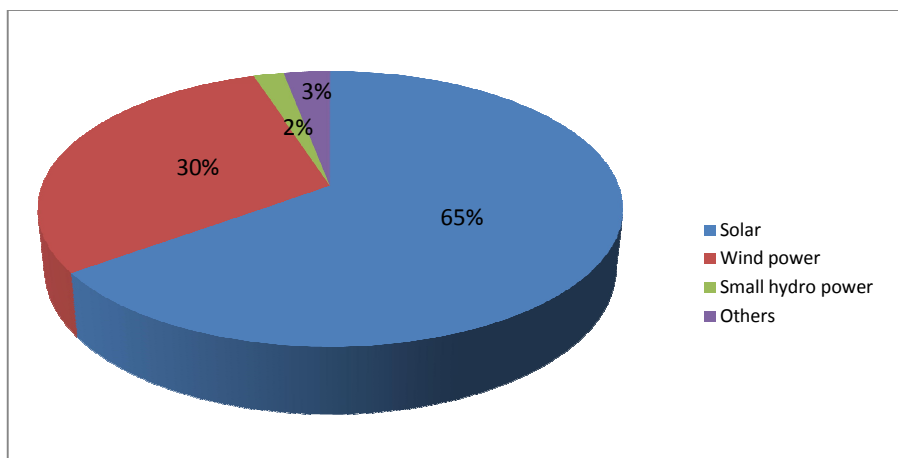
There are 5.4 million people fully engaged in fisheries activities, and in this population, 3.8 million are fishermen and 1.6 million are fisherwomen. However, there is a significant difference between the incomes earned by them as the former one gets high income as compared to their counterpart [17].

Mainly women are involved in the activities before and after fishing. Their role is more prominent in marketing of fish. There is a need of gender equality in fisheries sector.

7. WOMEN AND RENEWABLE ENERGY SECTOR

India has huge potential for renewable energy. Use of renewable energy sources has become only alternative to save depleting non-renewable natural sources. Renewable energy is a dynamic sector with ample of opportunities such as reducing adverse health effects of conventional energy sources, meeting increasing energy demands, employment generation and livelihood security. Following graph shows various renewable energy sources-

Employment generation in renewable energy has reached 10.3 million in 2017 and expected to reach many folds till 2050. Gender equality is an important concern in growing renewable energy sector in India. Women are major user of renewable energy at household level and



Graph 1. Estimated potential of renewable energy sources in India

renewable energy sources improve their quality of life. Their drudgery at household and farm level can be reduced by using solar, wind and other renewable energy equipment. Other than that, women also play role as producers and managers in renewable energy sector [18]. Keeping in mind women's role as primary energy consumers, their preferences should be given priority and they should be part of planning and implementing policies related to renewable energy policies.

8. WOMEN'S INVOLVEMENT: AN APPROACH FOR ECOLOGICAL NATURAL RESOURCE MANAGEMENT

Vigorous participation of women in decisions and activities related to conservation and well-organized utilization of renewable and non-renewable natural resources is solution of this world wide issue. Following approaches are needed in this regard-

- ❖ Gender equality should be maintained in every sphere of natural resource management such as programme planning, implementing, policy making and in work force.
- ❖ Conducting training programmes for creating awareness and skill development especially for women related to technical and non-technical aspects will be a way forward towards sustainable natural resource management.
- ❖ Efforts should be made to explore livelihood opportunities for women in untouched areas such as finances and marketing.
- ❖ Role of women in natural resource conservation and management should be well recognized and they should be projected as representatives of social and economic development through their active involvement in natural resource management and other related employment.

9. CONCLUSION

Women are closely related to utilization and management of natural resources. They are active in getting water, food, energy for meeting their family demands. Their workforce in various sectors is regularly increasing such as agriculture, livestock and fisheries also. Despite

this, women remain largely excluded from owning land, benefiting from resource wealth or participating in decision-making about resource management. This exclusion of women is worsening the condition of natural resources. Over exploitation and botched utilization of natural resources can be protected in India through involvement of women in policies and programs made for natural resource management. They will also serve as a treasure of indigenous information for conserving these resources.

10. RECOMMENDATION

- Women should be trained in sustainable management of water and they should be imparted knowledge about methods of conserving and reutilizing water.
- Women might be game changer to protect land degradation if their involvement and awareness regarding land management will be increased.
- Advanced technologies should be easily accessible to women and equipment should be designed keeping in mind women's requirement.
- Women should be trained to conserve and manage forest resources. Promotion of agro forestry, farm forestry, eco-restoration etc. is one of the alternatives to preserve resources and guard forest deprivation.
- Modern technologies should be accessible to women and they should also be trained. Women may also bear noteworthy responsibility in fisheries management and administration.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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