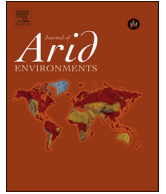




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Vulnerability of women to climate change in arid and semi-arid regions: The case of India and South Asia

S.S. Yadav ^{a, b}, Rattan Lal ^{b, *}^a Department of Botany, Maharshi Dayanand University, Rohtak, 124001, Haryana, India^b Carbon Management and Sequestration Centre, The Ohio State University, Columbus, 43210, Ohio, USA

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ABSTRACT

This article is a collation and synthesis of the literature review with the focus on the vulnerability of rural women in developing countries to climate change on the one hand and being pro-active in adapting to climate change on the other. The geographic coverage of the literature is global but with specific examples from India. The information presented in this paper is derived from diverse sources including journal articles and thematic books, and indicates severe adverse impacts not only on women's livelihood opportunities but also on exacerbating the workload and fatigue while decreasing their self esteem and forcing them to undertake some high risks and hazardous activities. The literature indicates that poverty, gender inequality, insecure land rights, heavy reliance on agriculture, less access to education and information are among the principal reasons for their vulnerability to climate change. The vulnerability is also confounded by the meager asset base, social marginalization, lack of mobility and exclusion from the decision-making processes in response to a disaster. However, the literature also shows that women are not only the passive victims of climate change but are also pro-active and agents of hope for adaptation to and mitigation of abrupt climate change. They utilize their experience and expertise to reduce the adverse impacts by adopting prudent strategies. They are also concerned about environmental issues, and are highly supportive of policies regarding environmental restoration. Large knowledge gaps exist regarding the vulnerability of women to changing and uncertain climate especially in arid regions. Authors of this article suggest some action plans and strategies to minimize vulnerability to climate change such as empowering women economically and educationally, organizing training and outreach programmes, and involving them in formal climate change mitigation and adaptation policies and programmes. Authors also outline research needed in order to identify and implement strategies regarding climate change. Collective and continuous efforts are critical to finding the sustainable solutions for this global phenomenon which is adversely impacting the most vulnerable but critically important members of the society.

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1. Introduction

Climate change is defined as 'a change of climate which is attributed directly or indirectly to human activity that alters the composition of the global atmosphere and which is in addition to natural climate variability observed over comparable time periods' (UNFCCC, 2011). It refers to the long-term changes in the components of climate such as temperature, precipitation, evapotranspiration along with intensity and frequency of extreme events such as

drought and floods. Being a significant anthropogenic environmental challenge, it is a common topic of discussion, study and research. Though climate change has occurred throughout Earth's history, the recent rate of warming far exceeds that of any previous episode in the past 10,000 years and perhaps far longer (Blois et al., 2013). The years 2014–2016 were the warmest since the records were first documented in 1890. The recent anthropogenic emissions of greenhouse gases (GHGs) such as CO₂, CH₄ and N₂O are the highest in magnitude since approximately 800,000 B.C. (IPCC, 2014). Increased energy consumption driven by an affluent life style is believed by many to be primarily responsible for global climate change. Other contributing activities include cement manufacture, deforestation, expansion and intensification of

* Corresponding author.

E-mail addresses: ssyadavindia@rediffmail.com (S.S. Yadav), lal.1@osu.edu (R. Lal).

agriculture and numerous human developmental activities.

Global climate change has observable effects on the environment and its components. The atmosphere and oceans have warmed, glaciers have shrunk, and the sea level has risen (IPCC, 2014). Deserts are becoming hotter and drier, extreme and violent weather events are becoming more frequent and agricultural land is becoming less productive (Elsner et al., 2008; Christiano, 2014; Gentle et al., 2014). Since the 1950s, many of the observed climatic changes are unprecedented and have severe negative impacts on all ecosystems, economies and enterprises (Dankelman et al., 2008; IPCC, 2014). Some of the most vulnerable sectors include agriculture, forestry and energy (European Commission, 2009). Climate change also distorts natural habitats and is likely to become the dominant driver for the loss of biodiversity and other natural resources by the end of this century (WRI, 2005). Agricultural production, fuelwood supply and water security is threatened by adverse impacts of climate change (Piao et al., 2010; Wheeler and von Braun, 2013). Climate change is also regarded as 'the biggest global health threat of the 21st century' (Costello et al., 2009).

According to the literature, the adverse effects of climate change cannot be compartmentalized within the boundaries of a region, religion, caste, creed and gender. However, different stakeholders in different regions perceive the impacts of climate change differently. Furthermore, the extent of vulnerability depends on different rights, roles and responsibilities. Indeed, climate change is not a gender-neutral phenomenon. Women of the underprivileged and labour class living in arid regions, such as in India and elsewhere in South Asia, tend to be more affected by the adverse impacts of climate change than men because of more poverty, less education and training, less access to institutional support and information, and less participation in decision making bodies (Goh, 2012). Further, diverse behavioral, customary, attitudinal, economic and many other socio-cultural prohibitions make their lives more miserable during and after the climate change induced disasters (Nellemann et al., 2011; Yavinsky, 2012).

Literature shows that women are not only first observers but also among the first victims of adverse impacts of the climate change by virtue of their roles in looking after the family and responsibilities of collecting fodder, fuel wood and water (Nellemann et al., 2011; Nwoke and Ibe, 2014). They are the first to observe the decreased productivity of farmland as crop yields decline, soils degrade, and water reservoirs deplete, contaminate or pollute. When the rural area is unsustainable, it is the women whose lives are the most disrupted because of the scarcity of fuel wood, water and fodder. None-the-less, women are also the effective agents of change as they often cope and adapt to climate change differently than men by using their particular knowledge and livelihood strategies (Israel and Sachs, 2013). Alas, the tough life of women in arid and semi-arid countries is getting tougher and more torturous with every increment of anthropogenic climate change, with gender being a critical factor in women's vulnerability. Thus, it is necessary to have a gendered focus to the global understanding of climate change.

The objective of this article is to deliberate the differential impacts of climate change on women living in arid regions, explain various causes of their vulnerability, and outline possible ways to reduce their vulnerability. The literature is specifically focused on girls (10–15 year) and young mothers in the rural communities of South Asia and other developing countries in general but of India in particular. The rationale for focus on India is because it represents a region with a large population density and a complex social structure where women are underprivileged and resource-poor. India, with 17.6% of the world population (1.34 out of 7.6 billion, U.N., 2017) has 2.4% of world's land area and 4% of the fresh water

resources. The water crisis will be exacerbated by the climate change and women of the rural India will be worst hit (Lal, 2016). India also provides an example where several initiatives have been undertaken to adapt to climate change. Thus, this article is also aimed at learning from past initiatives, identifying knowledge gaps, and describing the issues of climate change in the context of women's vulnerability under harsh conditions of India and South Asia. It also deliberates the contribution of women towards climate change adaptation and mitigation.

2. Methodology

This article is based on literature review of peer-reviewed and generic literature. The information was taken from different sources such as a worldwide accepted scientific database (Scopus (<http://www.scopus.com>), Pubmed (<http://www.ncbi.nlm.nih.gov/pubmed>), Science Direct (<http://www.sciencedirect.com>), Springerlink (<http://www.springer.co.in>), Google Scholar (<http://www.scholar.google.co.in>) and Wiley (<http://www.onlinelibrary.wiley.com>)), theses, acknowledged books, abstracts, conference proceedings and non-impact and non-indexed journals. The advance search option was adopted for the literature survey from web sources with keywords viz. 'climate change', 'women vulnerability' and 'arid environments'. Specific emphasis was placed on studies conducted in developing countries in drylands in the 21st century. The retrieved information is presented in form figures viz. confounding effects of climate change on women (Fig. 1), women's role in climate change adaptation and mitigation (Fig. 5). Social, economic and cultural factors making women more vulnerable to climate change and some probable solutions to reduce women's vulnerability and enhance adaptation are also presented.

3. Factors affecting women's vulnerability in arid and semi arid region

It is recognized that women in general and those living in arid parts of India and South Asia in particular are disproportionately more vulnerable to climate change and the ecological crisis because numerous interacting factors. Their heightened vulnerability is rarely due to any single reason, rather, it is the product of diverse and interacting social processes that result in inequalities in socio-economic status on the basis of gender, class, ethnicity, age, and (dis)ability (IPCC, 2014). Socially, economically, culturally, politically, institutionally, or otherwise marginalized women; are especially more vulnerable to climate change. The confounding effects of climate change on women are depicted in Fig. 1 and described below.

Workload and long working hours hinder education: Literature shows that women in rural India and South Asia have low education and high poverty. This is especially true for the teenage girls and young mothers of underprivileged classes. The female literacy rate in rural India (%) was 4.9 in 1951, 10.1 in 1961, 15.5 in 1971, 21.7 in 1981, 30.2 in 1991, 46.7 in 2001 and 58.8 in 2011 (Census of India, 2011). In 1991, less than 40% of the 330 million women aged 7 and over were literate. It means that there were more than 200 million illiterate women in India, and most of these were in rural areas. In six out of the 24 states in 1998, only 25% or less of the women in rural areas were literate (Velkoff, 1998). In the desert state of Rajasthan, only 12% of the rural women were literate. As many as 45% of the girls dropout of the school between grades 1 and 5. Thus, only 13% of all Indian women have more than primary education and only 1% have college education. A study conducted by Kookana et al. (2016) showed that in Gujrat, 41% of the mothers of interviewed students did not receive any school education, 38% had received primary education, 18% had received secondary level

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