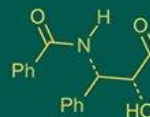


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Assessment of farm women's knowledge regarding climate change and its impact on biological systems over the last decade

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Abstract

Climate change poses significant challenges to agriculture and rural livelihoods, particularly affecting farm women who play a crucial role in agricultural production. The present study was conducted to assess farm women's knowledge regarding climate change and its impact on biological systems. A descriptive and exploratory research design was adopted. The study was carried out in Chittorgarh and Pratapgarh districts of Rajasthan, representing two agro-climatic zones. A total of 240 farm women were selected as respondents. Data were collected using a pre-coded interview schedule. The study indicated that most farm women perceived noticeable changes in climatic conditions over the last decade, particularly in temperature, rainfall patterns, and windstorms. They generally reported rising summer temperatures, declining rainfall, and increased occurrences of windstorms. Farm women also perceived significant impacts of climate change on biological systems, including changes in flowering and fruiting patterns, delayed crop ripening, increased incidence of crop diseases and pest infestations, greater use of agricultural chemicals, and declining crop yields. In addition, changes in wildlife interactions with agricultural fields were reported. The study concludes that farm women possess considerable awareness of climate change and its effects on agricultural and biological systems. The observed changes highlight the vulnerability of farming communities and emphasize the need for climate-resilient agricultural practices, capacity-building programmes, and targeted extension interventions to strengthen the adaptive capacity of farm women. The statistical analysis stated a significant association with independent variables (age, education) and farm women's knowledge regarding climate change.

Keywords: Climate change, farm women, biological systems, knowledge, agriculture, Rajasthan

Introduction

Climate change has emerged as one of the most significant global environmental challenges of the twenty-first century. It refers to long-term changes in temperature, precipitation patterns, humidity, and the frequency of extreme weather events resulting from natural processes and human-induced activities. The increasing concentration of greenhouse gases in the atmosphere has accelerated global warming, leading to substantial impacts on agriculture, natural resources, ecosystems, and human livelihoods. Developing countries like India are particularly vulnerable to the adverse effects of climate change due to their dependence on climate-sensitive sectors such as agriculture. Agriculture is closely linked with climatic conditions, and any variation in climate directly influences agricultural productivity and sustainability. Farm women constitute a major portion of the agricultural workforce and play a vital role in crop production, livestock management, seed preservation, fodder collection, and household food security. Their extensive involvement in agricultural activities makes them highly vulnerable to the impacts of climate change. At the same time, their knowledge and understanding of climate-related issues are crucial for adopting appropriate adaptation and mitigation strategies. Climate change significantly affects biological systems, including crops, livestock, forests, biodiversity, soil organisms, and natural ecosystems. Climate change has caused widespread impacts on terrestrial, freshwater, coastal, and marine ecosystems. Rising temperatures, irregular rainfall patterns, prolonged droughts, floods, and increased incidences of pests and diseases have altered the growth, reproduction, distribution, and productivity of various biological components (IPCC 2023) ^[4].

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Crop yields may decline due to heat stress and water scarcity, while livestock health and productivity can be affected by changing climatic conditions. Biodiversity loss and ecosystem degradation further threaten agricultural sustainability and food security. Knowledge regarding climate change and its impacts on biological systems is essential for farm women to make informed decisions and effectively respond to environmental changes. Understanding their level of knowledge can help identify existing gaps and design suitable educational, extension, and capacity-building programmes. Therefore, assessing the knowledge of farm women regarding climate change and its impact on biological systems is important for enhancing their adaptive capacity and promoting sustainable agricultural development. In this context, the present study was undertaken to evaluate the knowledge level of farm women and identify factors associated with their understanding of climate change and its biological consequences.

Methodology

The study employed a descriptive research design to investigate the farm women's knowledge regarding climate change. Purposive sampling was used for the selection of specific areas focusing on Chittorgarh and Pratapgarh districts, representing two agro-climatic zones of Rajasthan state. A total of 240 respondents were chosen through random sampling. Data collection was carried out through personal interaction with the help of a well-structured interview schedule designed to assess knowledge of farm women regarding climate change and its impact on biological systems. The data was analyzed using the statistical tools like frequency, percentages and chi-square test.

Results and Discussions

Women working in agriculture have deep, observation-

based knowledge of local climate trends (such as erratic rainfall, sudden temperature increases, and delayed monsoons), but they often lack scientific awareness of the global causes of climate change. Due to their vital role in agriculture, they are disproportionately affected by climate change and rely heavily on indigenous knowledge and traditional adaptation strategies. Impact of climate change triggers extreme weather events, threatens ecosystems, devastates food and water supplies, and severely impacts human health through the spread of diseases and heat stress. A study on knowledge of farm women in Manipur reported that 71 percent of the respondents had a medium level of knowledge regarding the causes and effects of climate change, while 21 percent had low knowledge and only a small proportion had high knowledge. Education was positively associated with knowledge levels (Devi *et al.* 2023) [2].

The study revealed that a majority of the respondents perceived noticeable changes in climatic factors during the last 10 years. Almost all respondents (96.2%) reported changes in summer temperature, and among them, 86.7 percent observed an increasing trend. Similarly, 95.4 percent perceived changes in winter temperature, with 62.1 percent reporting an increase and 24.1 percent reporting a decrease. Regarding rainfall, 96.2 percent of the respondents noticed changes, while 84.5 percent perceived a decreasing trend in rainfall. Further, 97.1 percent reported changes in windstorms, and an equal proportion observed an increasing trend in their occurrence. These findings indicate that farm women were highly aware of changes in temperature, rainfall, and windstorm patterns, reflecting the perceived impacts of climate change in the study area. Access to information and communication technologies (ICTs) plays an important role in enhancing farmers' adaptive capacity to climate risks (Chetri *et al.* 2021) [1].

Table 1: Distribution of Respondents' Knowledge about Climate Change over the last 10 years

N = 240

Factors of Climate Change	Last 10 years		Trend of the effects			
	Yes	No	Increased	Decreased	No change	Can't say
Temperature in summer	96.2	3.8	86.7	2.5	3.8	7.1
Temperature in winter	95.4	4.6	62.1	24.1	4.6	9.2
Rainfall	96.2	3.8	2.5	84.5	3.8	9.2
Windstorm	97.1	2.9	97.1	0.83	2.1	-

Impact of climate change on Biological Systems during last 10 years

Climate change impacts every stage of agricultural production. Rising temperatures, erratic monsoons, prolonged droughts, and unseasonal rainfall cause heat stress in crops, disrupt flowering and pollination, and damage grain during ripening, directly reducing crop yields. Crops like wheat, rice, and maize, considered the backbone of India's food system, are particularly affected (IDR, 2025). Climate change could expose thousands of species to unprecedented climatic conditions, increasing the risk of biodiversity loss and ecosystem disruption (Trisos *et al.*, 2020) [5]

The study revealed that respondents perceived significant impacts of climate change on various biological systems during the last 10 years. About 33.3 percent of the respondents reported an increase in changes in flowering and fruiting time, while 16.6 percent observed a decrease and 29.2 percent reported no change. Nearly half of the

respondents (48.3%) perceived a decrease in fruit/crop ripening, indicating delayed maturity of crops. Regarding crop health, 48.3 percent of the respondents reported an increase in crop diseases, while 35.4 percent observed an increase in insect and pest incidence. A substantial majority (79.2%) perceived an increase in the use of chemicals in agriculture, reflecting greater dependence on agrochemicals to manage climate-related challenges. More than half of the respondents (57.1%) reported a decrease in crop yields, indicating the adverse effect of climate change on agricultural productivity. Further, 42.1 percent perceived an increase in wildlife attacks, whereas an equal proportion (42.5%) reported no change in such incidents. Overall, the results indicate that farm women were aware of the biological impacts of climate change, particularly in terms of increased crop diseases, pest infestation, chemical use, and reduced crop yields, highlighting the vulnerability of agricultural systems to changing climatic conditions.

Table 2: Distribution of Respondents' Knowledge about the Impact of Climate Change on Biological Systems during the Last 10 Years

N = 240

Variables	Percentage				
	Can't say	Increased	Decreased	No	Can't say
Changes in flowering & fruiting time	18.3	33.3	16.6	29.2	20.9
Changes in fruit/crop ripening	37.5	15.8	48.3	6.3	29.6
Incidents of disease in crops	31.6	48.3	16.2	6.7	28.8
Increases the incidence of insects & pests in crops	1.7	35.4	32.9	22.5	9.2
Increase yields	5.8	13.3	57.1	20.4	9.2
Increases the use of chemicals in agriculture	16.6	79.2	4.2	5.4	11.2
Increases the incidents of wildlife attacks	11.7	42.1	3.3	42.5	12.1

Statistical Analysis

Chi-square tests revealed significant associations between independent variables and knowledge of farm women about climate change. Education (chi-square = 29.06, $p = 0.010$) and age (chi-square = 14.01, $p = 0.007$) were found to significantly influence farm women's knowledge of climate change.

Conclusion

The study concluded that farm women possessed a high level of awareness regarding changes in climatic conditions over the past decade. The majority perceived increasing summer and winter temperatures, decreasing rainfall, and a rise in the occurrence of windstorms, indicating a strong recognition of changing climate patterns in the study area. These perceptions reflect the direct experiences of farm women with climate variability and its consequences on agricultural activities. The study further revealed that farm women were aware of the adverse impacts of climate change on biological systems. Respondents reported changes in flowering and fruiting patterns, delayed crop ripening, increased incidence of crop diseases and pests, greater use of agricultural chemicals, and reduced crop yields. Many also perceived an increase in wildlife attacks on crops. Statistical analysis revealed significant associations between independent variables and knowledge of farm women regarding climate change. Overall, the study highlights that climate change is significantly affecting agricultural and biological systems, and farm women are able to recognize these impacts through their day-to-day farming experiences. Strengthening their knowledge and adaptive capacity through training, extension services, and climate-resilient agricultural practices is essential for enhancing the sustainability of farming systems and reducing climate-related vulnerabilities.

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