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Socio-economic and technological impact of climate resilient technologies on farm women

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Abstract
The study assessed the perception of climate change and evaluated the adoption of climate-resilient technologies by farm women in Keonjhar district of Odisha, India. The performance of climate-resilient crop varieties and technologies were assessed across different topographies (lowland, midland and uplands) in three blocks of Keonjhar district, a region characterized by rainfed agroecosystems and vulnerability to climatic variability *viz.* cyclones, droughts, and soil degradation. Data on social impact was collected from 300 farm women across 20 villages using structured interview schedule and yield data was collected from experimental fields of 50 farm women in 20 villages. The study identified key barriers in adopting climate-resilient practices, such as a lack of knowledge, unavailability of equipment, and the cumbersome procedures for accessing crop insurance. Adaptation to climate change was facilitated by different crop varieties and technologies. High-performing varieties, such as Field pea (IPFD-12) of field pea and DMRH 1301 of maize, showed significant yield increases (28-30% increase over check), indicating their potential for enhancing agricultural productivity under changing climatic conditions. Overall, the study underscores the importance of large-scale promotion of climate-resilient technologies and crop varieties to mitigate the adverse effects of climate change on agriculture.

Keywords: Climate change, vulnerability, farm women, adaptation

Introduction
Climate change one of the biggest challenges of this century, has the potential to disorder the existence of human civilization. Climate change refers to a change in the state of the climate that can be identified by changes in the mean and/or the variability of its properties and that persists for an extended period, typically decades or longer. Climate change may be due to natural internal processes or external forcings such as modulations of the solar cycles, volcanic eruptions, and persistent anthropogenic changes in the composition of the atmosphere or in land use (IPCC, 2022) [7]. Hence the long-term trend relates to climate change which differentiates it from the short-term *i.e.* natural weather variability. The major dimensions of climate change include extreme temperatures, significant changes in precipitation amount and pattern, and high atmospheric CO_2 concentrations. India's agricultural sector is highly vulnerable to the impacts of climate change, which include increased temperatures, altered precipitation patterns, and increasing frequency of extreme weather events. Therefore, the phenomenon of climate change affect employment and livelihood for almost 60% of the India's total population dependent on agriculture. It is a known fact that producing and transporting food results in greenhouse gas emissions. Various studies show the overall loss in the crop production in various parts of the country in the last few years due to the anticipated rise in the temperature (Zhao *et al.*, 2017) [15]. Extreme temperature and precipitation events affect crop production. Extreme events like floods and droughts harms crops yield, significantly. Climate change can lower the farmers' income between 15 to 18% (Economic Survey, 2018-19) [4]. Addressing these challenges requires the adoption of climate resilient technologies that can enhance productivity and ensure sustainability. Developing and adopting climate resilient crop varieties is primary but critical for adapting to changing climate conditions. Visakh *et al.* (2024) [14] investigated the performance of heat tolerant lines of rice and found encouraging results in their performance across different regions of India. They informed that these varieties exhibit higher resilience to water stress,

contributing to better yields during periods of drought. Maintaining soil health is crucial for sustaining agricultural productivity under changing climate conditions. Jha *et al.* (2023) [8] reviewed the use of biochar and organic amendments for improving soil health and suggested that these amendments can enhance soil fertility, water retention, and microbial activity, thereby improving crop resilience to climate stress. Singh *et al.* (2023) [13] investigated conservation tillage practices, such as minimum tillage and no-till farming, which help in reducing soil erosion and enhancing soil carbon sequestration. In above context, the present study attempts to assess the performance of different climate resilient varieties and technologies in different blocks of Keonjhar district.

Methodology

Locale of the study: The study was conducted in 20 villages of three block of Keonjhar district of Odisha (Fig 1.), representing northcentral and eastern plateau with rainfed agroecosystem and mostly affected by climatic variability like cyclone, intermittent droughts, and poor soil health. The district was selected purposively, as the project has been implemented in the district since its inception (2021). Three hundred farm women were selected covering 20 villages from seven minor irrigation projects (MIPs). For this work a well-reasoned scheme for interview was developed and the information was collected personally by the researcher. This data was quantified and interpreted using suitable statistical tools such as frequency, percentage, mean, standard deviation, weighted mean score and t value.

Research design

To delineate the impact of climate resilient interventions made under different minor irrigation projects (MIPs), *ex-post facto* research design with treatment and control group was used. Both treatments as well as check (control) data was taken for comparative impact assessment of climate resilient technologies. Social data was collected from the respondents using personal interview method with the help of structured interview schedule designed for the purpose. Concurrently, secondary sources like annual reports of agriculture department and Krishi Vigyan Kendras (KVKs) were used to supplement, pay triangulation, and cross checking of primary data. The data was collected using various tools including Focus Group Discussions, gender analysis, key informant, and individual household interviews.

Data Analysis

The demographic characteristics were analysed and explained using descriptive statistical analysis. The selected dependent and independent variables were analysed using a regression model in SAS program (reference) to estimate factors influencing the adoption of different climate resilient technologies. Table 1 and 2 elucidates different varieties and technologies adopted under the project. Impact was studied using several variables and then the values were compared and tested with suitable test statistics. The obtained data was quantitative in nature; hence it was tested with t-statistic to find the significance of differences.

Results

Social perspective: Farm women perception and grading of impacts of climate change on agriculture and allied activities is detailed in Table 3. This analysis provides a depiction of the top-ranked issues among which changes in land preparation and sowing times, decreased soil fertility, and increased water consumption in livestock had the highest impact. On crop production, the foremost impact was change in time of land preparation and sowing as reported by 55.67% respondents with mean score value of 2.41 with rank one. Similar percentage (55%) of respondents apprised there was decrease in soil fertility (mean score 2.39) due to climate change with second rank. Impacts related to livestock health (such as emerging diseases and high temperatures) and agricultural productivity (like soil fertility and pest issues) are prominent. Samuel *et al.* (2022) [11] also recorded a reduction of harvest (15–28%) or total failure of crops. Regarding impact on livestock, it was recorded that there was increased water consumption in animals ranked as 3rd by 52.67% respondents and new disease affects livestock immunity by 52.33% respondents with a rank of four and same mean score value (2.36) for both the statements. Habeeb *et al.* (2018) [5] also elucidated that drought and heat stress would drastically affect livestock production under climate change scenarios. Other relevant impacts under this category are the advent of and number of pests/diseases (51.67%, rank 5), severe weed infestation (49.67%, rank 8), low yield (50.00%, rank 9), and poor quality and taste of produce (50.67%, rank 9). Another impact was high temperature which affects health of livestock as reported by 49.33% farm women who ranked this at 7th spot. Similar impacts on livestock susceptibility to increased temperature and reduced precipitation has been reported by Downing *et al.* 2017 [3] and Balamurugan *et al.* (2018) [1]. As far as human health is concerned, increased incidence of diseases in human (mean score of 2.21 and rank 10) ranks lower in comparison to agricultural and livestock issues.

The table 4 shows the farm women's constraints and reasons with respect to adoption of climate resilient agricultural practices. Under this broad standpoint, the lack of knowledge about climate resilient technologies was given highest mean score of 1.67 with 1st rank. Majority of the respondents (66.67%) reported that there was a lack of knowledge among farm women regarding climate resilient technologies like suitable varieties, conservation agriculture machines, zero tillage etc. The second highest ranked statement was unavailability of equipment of improved technology which was endorsed by 64.33% farmers with mean score of 1.65. Devegowda *et al.* (2021) [2] also emphasized that lack of knowledge on climate resilient varieties, small and medium holdings, lack of demonstration as major hurdles among all constraints for non-adoption. Shehrawat *et al.* (2023) [12] reported that farmers showed less familiarity with schemes promoting the conservation of natural resources *viz.* community tanks (30.83%), and agroforestry systems (35%). The third rank was given to long procedure of bank to avail crop insurance and 'low market price of produce reduces investment in climate adaptation strategies' was felt by about 63% and 62% respondents, respectively who gave them 3rd and 4th rank respectively. The constraints like 'rapid climate change leading to ineffective adaptation strategies' and 'lack of information on weather functions' were ranked 5th and 6th with mean score of 1.62 and 1.60 respectively. Other less influencing factors were decrease in yield with natural/organic farming, high cost of adopting climate resilient strategies, high cost of equipment, unavailability of appropriate crop varieties, lack of contact with extension officers etc. Priyanka *et al.* (2022) [10] also elucidated that lack of awareness about climate resilient technologies (86.6%), lack of technology information on time (80.0%), and lack of weather-based information (60.0%), as major constraints.

Adaptation strategies/ practices to counter the impact of climate change are detailed in table 5. The main strategies were selection of appropriate crop/varieties, alteration in sowing dates, and use of various climate resilient technology like conservation agriculture, zero-tillage etc. which had mean score value of 1.81. These were followed by other important activities towards adapting with natural farming to reduce cost and improve soil fertility, insurance of crops under Pradhan Mantri Fasal Bima Yojna (PMFMY) and intensified rabi crop cultivation during *Kharif* crop failure (score value: 1.80). Adopting water-saving farming methods, inter-cropping system, reducing plant population during stress season and use of labour-saving equipment ranked from 8-15 with mean score value of 1.79 to 1.73. As a long-term strategy to adapt climate change, farmers go for farm diversification and equip themselves for receiving income from non-agricultural sources. Community based preparedness and mitigation planning, drought prediction and monitoring mechanisms are also needed for timely and better mitigation of droughts and other climate change phenomenon (Hansen *et al.*, 2018) [6]. From the present study, it is summarised that impact practices involve selecting appropriate crops, altering sowing dates, and seed treatment, which have high scores. As the rank decreases, practices such as reducing plant population and using labour-saving equipment show lower impact percentages and scores. Additionally, community-based preparedness and mitigation planning, alongside drought prediction and monitoring mechanisms, are essential for timely and effective responses to droughts and other climate change-related challenges.

Yield

The detailed analysis of different climate resilient varieties and technologies with their corresponding yields, yields under farmer practice, or check across different topographies during the *Kharif* and Rabi seasons are given in Table 6. In *Kharif* season on Upland, groundnut cultivation (Dharni variety) yielded 17.1 tha^{-1} a 21.4% increase over the traditional variety (Q/ha.) DMRH 1301 variety of maize shows remarkable performance with a yield of 38.4 Q/ha, which is 28.0% higher than the local check (30.0 Q/ha.) The MR-6 variety of finger millet (ragi) also demonstrates a significant yield improvement, producing 17.5 Q/ha compared to the traditional variety (14.4 Q/ha), resulting in a 21.5% increase.

Upland rice cultivation is of prime importance in rainfed area. Although low in yield potential this topography serves as important source of agriculture to marginal farmers. Sahbhagi variety of rice yields 39.5 Q/ha, a 10.6% increase over the check yield of 35.7 Q/ha. Being a drought tolerant variety, this is an excellent choice for rainfed uplands. Additionally, the practice of summer ploughing with the Bina Dhan 11 variety showed a yield of 33.0 Q/ha, marking a 13.8% hike from the traditional variety (29.0 Q/ha.). In the Midland topography, field bunding with the CR Dhan 100 (Satyabhama) achieved a yield of 36.0 Q/ha, which is 10.8% higher than local check (32.5 Q/ha). Direct Seeded Rice (DSR) technique with *Swarna Shreya* variety showed a substantial improvement, yielding 38.5 Q/ha, an 18.5% increase from the traditional (32.5 Q/ha) variety. For lowland rice, drum seeding with the MTU-1010 (*Cottondora Sannalu*) variety yields 38.0 Q/ha, resulting 11.1% hike over the conventional yield of 34.2 Q/ha. Green manuring with the Swarna Sub-1 variety yielded 38.5 Q/ha, *i.e.*10.0% higher than the 35.0 Q/ha from traditional methods. Additionally, brown manuring with MTU-7029 (*Lal Swarna*) variety achieved a yield of 39.0 Q/ha, an 11.4% increase from the check yield of 35.0 Q/ha.

During the *Rabi* season under rice-fallow systems, pulses and oilseeds demonstration recorded significant yield improvements. The black gram variety PU-31 yielded 10.0 Q/ha, a 17.6% increase over the traditional variety (8.5 Q/ha). Chickpea, (RVG-202 variety), yielded 15.0 Q/ha, which is 20.0% higher than the conventional variety (12.5 Q/ha). Field Pea (variety IPFD-12) stands out with a remarkable yield of 17.5 Q/ha, a 29.6% improvement from the traditional yield of 13.5 Q/ha. Green Gram, Virat variety, produced seed yield of 12.5 Q/ha, which is 17.9% higher over the check variety yield of 10.6 Q/ha. In Rabi, rice-fallow oilseeds, the Tapeswari variety mustard yielded 15.0 Q/ha, showing a significant (25.0%) increase over the traditional yield of 12.0 Q/ha. Similarly, the Suprava variety of til (sesame) produced 10.0 Q/ha, which is 25.0% higher than the conventional practices (8.0 Q/ha). The sunflower variety KBSH-44 also showed a substantial improvement, yielding 15.0 Q/ha, a 25.0% increase from the traditional yield of 12.0 Q/ha. The data demonstrates that across different topographies and crop types, the use of specific varieties and techniques can lead to significant yield increases (10-30%), compared to traditional practices. These improvements not only boost production but also contribute to the sustainability and resilience of systems, especially in regions where traditional methods may no longer be as effective due to changing climate scenario as well as market demands. By selecting appropriate crop varieties and implementing effective farming practices, farmers can achieve higher yields, better profitability, and more efficient use of resources, ultimately contributing to greater food security and economic stability in rural areas.

Economics

Table 7 provides a detailed economic analysis of various crops and technologies employed across different topographical, focusing on the cost of cultivation (CoC) ha^{-1}, gross income, net income per hectare, and benefit-cost (BC) ratio. This data highlights the financial viability and profitability of different agricultural practices during the *Kharif* and Rabi seasons. In the *Kharif u*pland regions, groundnut cultivation incurs a CoC of ₹80,355 per hectare. The net income generated was of ₹38,956 and a BC ratio of 1.48. Maize, on the other hand, has a slightly higher CoC of ₹81,439 per ha and the net income is relatively low at ₹9,502, with a BC ratio of 1.12, indicating lower profitability. Ragi, a staple crop in upland areas, had a CoC of ₹54,445 per hectare with a net income of ₹22,131, resulting in a BC ratio of 1.41. This suggests that ragi is a moderately profitable crop in these regions. Upland rice cultivation, including specific practices like summer ploughing, shows varying economic outcomes. The CoC is consistent at ₹74,993 per ha. For both regular rice and summer ploughing. Regular rice cultivation generates a gross income of ₹99,100, leading to a net income of ₹24,108 and a BC ratio of 1.32. Summer ploughing, however, resulted in a lower gross income of ₹84,150 and a net income of ₹9,158, despite a higher BC ratio of 1.54, which indicates more efficient cost management relative to the returns. In the Midland rice topography, field bunding involved a CoC of ₹74,993 per ha with a net income of ₹16,058, and a BC ratio of 1.32. DSR, another practice in the Midland region, has a lower CoC of ₹47,718 per ha but significantly higher net income of ₹43,082 with a BC ratio of 1.32, making it a highly profitable practice. For *Kharif* lowland rice, practices such as drum seeding and manuring (both green and brown) showed positive outcomes. Drum seeding with a CoC of ₹69,493 per hectare results in net income of ₹26,158, with a BC ratio of 1.39. Green manuring, with a lower CoC of ₹55,806 per hectare, generated a gross income of ₹91,300 and a maintaining a BC ratio of 1.32. Similarly, brown manuring, with a slightly higher cost of ₹56,337 per hectare, produced a gross income of ₹92,450, leading to a net income of ₹36,114 and a BC ratio of 1.32. During the Rabi season, in rice-fallow systems, pulses and oilseeds demonstrated varying levels of profitability. Black Gram, with a CoC of ₹47,922 per hectare resulting in a net income of ₹30,579 and BC ratio of 1.64, indicating good profitability. Chickpea, with a higher CoC of ₹55,402 per hectare and an MSP of ₹5,335 per quintal, produces a gross income of ₹80,025 and a net income of ₹24,624, with a BC ratio of 1.44, making it a profitable crop. Field Pea, with a CoC of ₹49,880 per hectare and an MSP of ₹3,563 per quintal, shows moderate profitability, generating a net income of ₹12,473, with a BC ratio of 1.25. Green Gram stands out with a CoC of

₹47,922 per hectare and a significant net income of ₹60,604 and an impressive BC ratio of 2.26, making it one of the most profitable crops in this analysis. Mustard, with a CoC of ₹64,306 per hectare generated a net income of ₹17,444, with a BC ratio of 1.27. Til (sesame) has a lower CoC of ₹45,813 per hectare but benefits from a high MSP of ₹9,267 per quintal resulting in BC ratio of 2.02, indicating excellent profitability. Sunflower, with CoC of ₹79,838 per hectare showed moderate profitability, generating a net income of ₹16,162, with a BC ratio of 1.20. Overall, the data underscores the importance of cost management and the selection of crops with favourable market prices to achieve higher profitability in agriculture. The BC ratios across different crops and practices range from 1.12 to 2.26, indicating varying levels of financial viability.

Table 1: Details of the selected climate resilient varieties evaluated during 2022-2024 at Keonjhar, Odisha

Sl. No.	Crop	Variety	Yield (q ha^{-1})	Specific characters
1.	Blackgram	Indira Urd 1	12-14	Resistant to powdery mildew
2.	Blackgram	Pant Urd 31	15-17	Resistant to the Yellow Mosaic Virus
3.	Chickpea	NBEG-49	20-22	Rainfed vertisols, abiotic stress
4.	Chickpea	RVG-202	18-20	Resistant to Fusarium wilt and drought conditions
5.	Field pea	IPFD-12	18-20	Highly resistant to powdery mildew and rust.
6.	Green gram	Virat	15-18	Highly resistant to yellow mosaic virus and powdery mildew.
7.	Ground nut	Dharani	40-45	Resistance to late leaf spot and rust.
8.	Ground nut	Kadri Lepakshi	35-40	High oil content and resistance to foliar diseases.
9.	Maize	DMRH-1301	65-70	Resistance to downy mildew and leaf blight.
10.	Maize	NMH-666	70-72	Resistant to rust and turcicum leaf blight
11.	Ragi	MR-6	55-60	High resistance to downy mildew and blast.
12.	Rice	RNR 15048 (*Telangana Sona*)	45-50	Blight resistant
13.	Rice	Kalachampa	18-22	Moderate tolerance to biotic and abiotic stress
14.	Rice	CR 800	45-50	Substitute of Swarna variety and resistance biotic stresses
15.	Rice	Sahabhagi Dhan	45-50	Direct seeding, drought tolerant
16.	Rice	Swarna Sub-1	30-40	143 days, Tolerant to submergence for 14-17 days
17.	Rice	MTU-1210 (Sujatha)	45-50	Non-lodging, tolerant to BPH and BLB
18.	Rice	MTU-7029 (Lal Swarna)	45-50	Non-lodging, tolerant to Brown plant hopper and Blast
19.	Rice	MTU-1010 (*Cottondora Sannalu*)	45-50	High adaptability, Tolerant to BPH and Blast
20.	Sunflower	KBSH-44	20-25	Resistance to downy mildew, both Kharif and Rabi seasons.
21.	Til	Suprava	8-10	Resistance to Alternaria blight.
22.	Sweet corn	HIBRIX-53	15-18	Exceptional sweetness and crisp texture.
23.	Sweet corn	SUGAR-75	18-20	Ideal for both fresh consumption and processing.
24.	Mustard	B-9	20-25	Excellent resistance to both white rust and downy mildew.
25.	Mustard	Tapeswari	15-18	Strong resistance to both white rust and Alternaria leaf spot

Table 2: Details of the climate resilient technologies evaluated during 2022-2024 at Keonjhar, Odisha

Sl. No.	Technologies	Climate resilient characters
1.	Summer ploughing	Summer ploughing in paddy fields improves soil structure and water retention, enhancing resilience against climate variability. This practice reduces soil erosion, optimizes moisture conservation, and supports sustainable yields, contributing to overall climate resilience in farming.
2.	Green manuring	Green manuring in paddy fields enhances climate-resilient agriculture by improving soil fertility and structure, thus reducing erosion and enhancing water retention. This practice supports climate-smart agriculture by increasing crop resilience, sequestering carbon,
3.	Brown manuring	Brown manuring is similar to green manuring, except the fact that rice and Sesbania spp. are both grown together and when these *Dhaincha* plants overtake the rice plants in height at about 25 days of co-culture, a weedicide 2, 4-D is applied to kill these Sesbania plants. This practice minimizes the need for synthetic fertilizers.
4.	Field bunding	Field bunding creates barriers that prevent soil erosion, conserve moisture, and manage runoff. This practice improves soil health and reduces vulnerability to extreme weather events, thus supporting sustainable, climate-smart farming practices and ensuring more stable crop yields.
5.	Direct seeding	Direct seeding of rice promotes resilience against climate variability. By minimizing water usage and reducing methane emissions compared to traditional flooding, it enhances resource efficiency and adapts to changing weather patterns, ensuring sustainable rice production.
6.	Drum seeding	Drum seeding live sowing in rice optimizes seed placement and reduces water usage. This method improves seedling establishment and crop uniformity, contributing to efficient water management and adaptability to variable climate conditions, promoting sustainable rice production.

Table 3: Impact of climate change on agriculture and allied activities as perceived by respondents (n=300)

Impact	Very High	%	Some what	%	No Change	%	Mean Score	Rank
Change in time of land preparation and sowing time	167	55.67	88	29.33	45	15.00	2.41	I
Decrease in soil fertility	165	55.00	86	28.67	49	16.33	2.39	II
Increased water consumption in animals	158	52.67	93	31.00	49	16.33	2.36	III
New disease affects livestock immunity	157	52.33	93	31.00	50	16.67	2.36	IV
Diversity of pest/diseases	155	51.67	94	31.33	51	17.00	2.35	V
Lower nutritional quality of produce	158	52.67	87	29.00	55	18.33	2.34	VI
High temperature affects health of livestock	148	49.33	97	32.33	55	18.33	2.31	VII
Severe weed infestation	149	49.67	94	31.33	57	19.00	2.31	VIII
Low yield of crops	150	50.00	92	30.67	58	19.33	2.31	IX
More crop failures	150	50.00	89	29.67	61	20.33	2.30	X

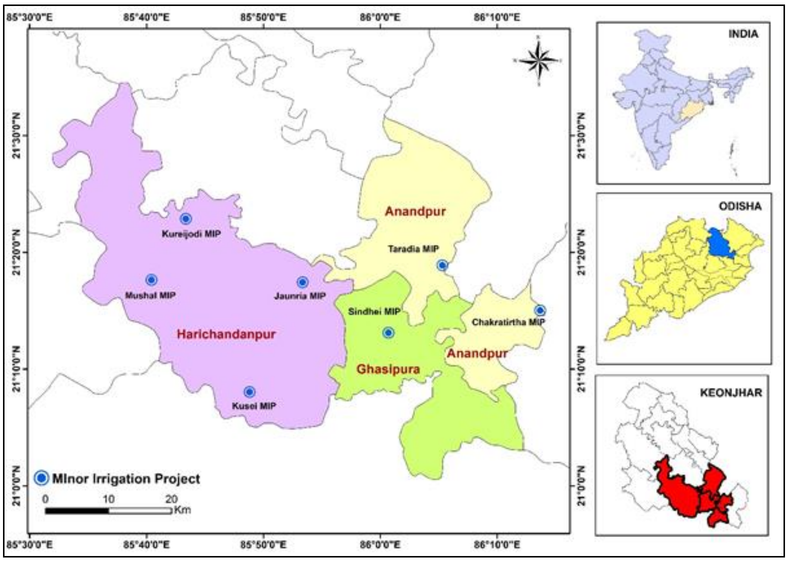

Fig 1: Location of the study

Table 4: Distribution of factors influencing adoption adaptation of climate resilient technology by farm women (n=300)

S. No.		Very High	%	No Change	%	Mean score	Rank
1	Lack of knowledge about climate resilient technology	200	66.67	100	33.33	1.67	I
2	Lack of access to new resilient varieties	195	65.00	105	35.00	1.65	II
3	Unavailability of equipments for climate resilient technology	193	64.33	107	35.67	1.64	III
4	Long procedure of bank to avail crop insurance	190	63.33	110	36.67	1.63	IV
5	Market price of produce is less	188	62.67	112	37.33	1.63	V
6	Climate is changing vigorously; *vis* adaptation strategies fails	185	61.67	115	38.33	1.62	VI
7	Lack of information related to weather function	180	60.00	120	40.00	1.60	VII
8	Decreasing in yield in practicing natural/organic farming	178	59.33	122	40.67	1.59	VIII
9	High cost in adoption of climate resilient strategies	175	58.33	125	41.67	1.58	IX
10	High cost of equipments	173	57.67	127	42.33	1.58	X

Table 5: Adaption strategies followed by farm women in the study area (n=300)

Sl. No.	Parameters	Adopted	%	Not adopted	%	Mean score	Rank
1.	Selection of appropriate crop/varieties	244	81.33	56	18.67	1.81	I
2.	Alteration in sowing dates	243	81.00	57	19.00	1.81	II
3.	Seed treatment before planting	242	80.67	58	19.33	1.81	III
4.	Use of various climate resilient technologies	242	80.67	58	19.33	1.81	IV
5.	Natural farming to reduce the cost of cultivation	241	80.33	59	19.67	1.80	V
6.	Crop insurance	241	80.33	59	19.67	1.80	VI
7.	Intensified the Rabi crop cultivation during Kharif crop failure	240	80.00	60	20.00	1.80	VII
8.	Adopting IPM methods for pest management	238	79.33	62	20.67	1.79	VIII
9.	Recommended spacing between the rows/plants	235	78.33	65	21.67	1.78	IX
10.	Use of water saving technology like sprinkler/drip irrigation	234	78.00	66	22.00	1.78	X

Table 6: Yield evaluation of different climate resilient varieties/ technologies (n=50)

Sl. No.	Topography	Crop/ Technology	Crop variety			Paired differences		
				Yield (q ha^{-1})	Check (q ha^{-1})	Mean	SD	t-value
1	Kharif_Upland	Ground Nut	Dharni	17.0	14.0	3.39	3.69	6.50**
2	Kharif_Upland	Maize	DMRH 1301	38.4	30.0	8.78	3.58	17.33**
3	Kharif_Upland	Ragi	MR-6	17.5	14.4	3.12	3.14	7.02**
4	Kharif_Upland_Rice	Rice	Sahbhagi	39.5	35.7	4.06	3.67	7.82**
5	Kharif_Upland_Rice	Summer ploughing	Bina Dhan 11	33.0	29.0	2.86	4.45	4.54**
6	Kharif_Midland_Rice	Field bunding	CR Dhan 100/ Satyabhama	36.0	32.5	3.85	4.67	5.84**
7	Kharif_Midland_Rice	DSR	Swarna Shreya	38.5	32.5	6.23	4.80	9.18**
8	Kharif_Lowland_Rice	Drum seeding wet	MTU-1010 (Cottondora Sanna)	38.0	34.2	3.92	3.85	7.19**
9	Kharif_Lowland_Rice	Green manuring	Swarna sub-1	38.5	35.0	3.42	3.27	7.39**
10	Kharif_Lowland_Rice	Brown manuring	MTU-7029 (Lal Swarna)	39.0	35.0	4.60	3.62	8.99**
11	Rabi_Rice_Fallow_Pulses	Black Gram	PU-31	10.0	8.5	1.25	1.47	6.03**
12	Rabi_Rice_Fallow_Pulses	Chickpea	RVG -202	15.0	12.5	2.78	3.27	6.01**
13	Rabi_Rice_Fallow_Pulses	Field Pea	IPFD -12	17.5	13.5	4.06	3.62	7.94**
14	Rabi_Rice_Fallow_Pulses	Green Gram	Virat	12.5	10.6	2.88	3.14	6.48**
15	Rabi_Rice_Fallow_Oilseeds	Mustard	Tapeswari	15.0	12.0	3.17	3.45	6.50**
16	Rabi_Rice_Fallow_Oilseeds	Til	Suprava	10.0	8.0	2.08	1.91	7.68**
17	Rabi_Rice_Fallow_Oilseeds	Sunflower	KBSH -44	15.0	12.0	2.59	3.01	5.92**

Table 7: Economics of different climate resilient varieties and technologies (n=50)

Sl. No.	Topography	Crop/ Technology	Yield Q/ha	CoC (Rs ha^{-1})	MSP (Rs ha^{-1})	Gross Income (Rs ha^{-1})	Net Income (Rs ha^{-1})	BC Ratio
1	Kharif_Upland	Ground Nut	17.0	80,355	6783	1,19,311	38,956	1.48
2	Kharif_Upland	Maize	38.4	81,439	2225	90,940	9,502	1.12
3	Kharif_Upland	Ragi	17.5	54,445	4290	76,575	22,131	1.41
4	Kharif_Upland_Rice	Rice	39.5	74,993	2300	99,100	24,108	1.32
5	Kharif_Upland_Rice	Summer ploughing	33.0	74,993	2300	84,150	9,158	1.54
6	Kharif_Midland_Rice	Field bunding	36.0	74,993	2300	91,050	16,058	1.32
7	Kharif_Midland_Rice	DSR	38.5	47,718	2300	90,800	43,082	1.32
8	Kharif_Lowland_Rice	Drum seeding wet	38.0	69,493	2300	95,650	26,158	1.39
9	Kharif_Lowland_Rice	Green manuring	38.5	55,806	2300	91,300	35,494	1.32
10	Kharif_Lowland_Rice	Brown manuring	39.0	56,337	2300	92,450	36,114	1.32
11	Rabi_Rice_Fallow_Pulses	Black Gram	10.0	47,922	7400	78,500	30,579	1.64
12	Rabi_Rice_Fallow_Pulses	Chickpea	15.0	55,402	5335	80,025	24,624	1.44
13	Rabi_Rice_Fallow_Pulses	Field Pea	17.5	49,880	3563	62,353	12,473	1.25
14	Rabi_Rice_Fallow_Pulses	Green Gram	12.5	47,922	8682	1,08,525	60,604	2.26
15	Rabi_Rice_Fallow_Oilseeds	Mustard	15.0	64,306	5450	81,750	17,444	1.27
16	Rabi_Rice_Fallow_Oilseeds	Til	10.0	45,813	9267	92,670	46,857	2.02
17	Rabi_Rice_Fallow_Oilseeds	Sunflower	15.0	79,838	6400	96,000	16,162	1.20

Conclusion

The major barriers to adopting climate-resilient practices by farm women are knowledge gaps, equipment unavailability, and lengthy insurance procedures. Adaptation strategies such as selecting appropriate crop varieties, altering sowing dates, and using climate-resilient technologies are prioritized for mitigating climate impacts. The analysis highlights the significant impact of climate change on agriculture and livestock, particularly as perceived by farm women. The yield and economic analysis of various crop varieties and technologies further emphasize the importance of selecting the right agricultural practices. High-performing varieties like IPFD-12 and technologies like drum seeding significantly boost yields, while crops like Greengram (Virat) and oilseeds (Suprava) are highlighted for their profitability, with high Benefit-Cost (BC) ratios. This detailed economic analysis is crucial for farmers and policymakers to make informed decisions about crop selection and resource allocation, ultimately leading to more sustainable and profitable farming practices. The findings underscore the critical role of informed decision-making in optimizing agricultural productivity and profitability amidst changing climatic conditions, with ongoing research and data analysis essential for guiding sustainable farming practices.

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