

## RESEARCH NOTE

## Awareness about the Impact of Climate Change on Agriculture in Traditional Agriculture: A Gender Based Comparative Study

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### ABSTRACT:

*Climate change has been appeared as a major concern to the people directly involved in agricultural practice in developing countries. In recent years, the mean temperature of the earth is increased significantly and it is causing significant negative impact on the agricultural productivity of several nations. Because of climate change, economic growth of the countries heavily dependent on their agricultural system is getting compromised. Climate change is causing far-reaching impact on not only the socio-economic domain of the nations but also dampening the age-old socio-cultural and demographic systems of those countries. Understanding about the impact of climatic change on agriculture is varied between male and female agricultural workers and entrepreneurs in many other countries, but in India such kind of study is not done so far. So, this study was carried out to see the impact of gender of the people actively engaged in agriculture on their level and quality of understanding of climatic change. This study was carried out on 200 individuals belonging to two administrative blocks of Dhanbad district of the Jharkhand state. At the onset, 200 households (100 each from two administrative blocks, i.e. Balliyapur Block and Tundi Block of Dhandbad District) were selected randomly. Thereafter, one adult male and one adult female were selected from each household as the subjects of the study. Tools like socio-demographic data sheet, questionnaires for measuring awareness about climatic changes on agriculture and changing of agricultural patterns were used for data collection. Gender had not been found to have significant impact on the understanding related to the climate change.*

**Key words:** *Climate change; Gender; Agriculture;*

Climatic change has become a major concern for modern agricultural sector. Despite, remarkable progress in agricultural science, climate related factors like 'solar radiation', 'temperature', and 'precipitation' still has significant influences on crop growth and production; therefore agriculture has always been highly dependent on climate patterns and variations. Since the industrial revolution of 18<sup>th</sup> Century, indiscriminate uses of natural resources and emission industrial toxic wastes and by-products in the environment have caused extensive deleterious impact on mother earth or environment. For the last few years, the world has been witnessing a massive crisis in food crops because of dramatic changes in climatic condition; this caused dramatic increase in food price and, for some, dire food scarcities. The imminent consequences of climate

change are 'decrease in crop and livestock production', 'problem in hydrologic balance', 'reduction in input supplies and other primary components of agricultural systems' and 'significant decline in primary agro-based industries'. Nonetheless, the nature of these biophysical effects and the human responses to them are indeed very complex and uncertain. Climate change may also change the types, frequencies, and intensities of various crop and livestock pests; the availability and timing of irrigation water supplies; and the severity of soil erosion. Numerous past studies had portrayed that without natural environmental resources crop production cannot be at desirable level, no matter how artificial or synthetic elements are supplemented to it. Plant systems and crop yields are highly influenced by environmental factors moisture and temperature. Livestock production

is also deeply affected by climatic changes. Specifically, livestock production can be affected by two distinctive ways by climate change: the quality and amount of forage from grasslands may be affected directly and there may be direct effects on livestock due to higher temperatures. There are few studies which showed impact of climate change on livestock production. Increase in summer temperature is estimated to have a suppressing effect on livestock appetite, which leads to lower weight gain. Climatic conditions like higher temperatures, reduced rainfall, cyclonic storm and increased rainfall variability reduce crop yield and cause threat to food security in low income and agriculture-based nations. Therefore, the impact of climate change is highly noxious to countries that depend on agriculture as the main source of livelihood and economy (Dixon J et al. (2001), Houghton JT et al. (2001), IAC (2004). Apart from climatic changes, other factors responsible for the low agricultural productivity in those nations are reliance on traditional underdeveloped farming techniques, soil degradation and erosion caused by overgrazing and deforestation, poor agricultural support or complementary services such as extension, credit, marketing, and infrastructure. Cumulatively, these factors tend to cause marked reduction in the adaptive capacity or increase the vulnerability of farmers to future changes, including climate changes, which negatively affect the performance of the already weak agricultural systems of the nation. The matter of concern is that, climate has changed in the past and it will continue to change in the future, so there is an ardent need to understand how farmers perceive and adapt to climate change<sup>7</sup>. Past studies assessing the 'perceptions' and 'awareness' about climate change and its impact on agriculture showed that, different socio-demographic factors affect the perception and awareness of climate change in farmers. Semenza JC et al. (2008) concluded that individuals with higher incomes are more likely to have better knowledge about climate change than individuals with lower incomes. Additionally, other socio-demographic and environmental factors like gender, ethnic background, and membership of environmental groups, newspaper readers (Leiserowitz A., 2006) education, and access to extension services, geographical site and soil types Maddison D. (2006) and Gbetibouo GA. (2009) may influence perceptions of climate change. In developing countries, the common

approach to studying the perception of farmers to climate change is based on comparing farm survey or farm group discussion results with data records from meteorological stations (Vedwan N, Rhoades RE. (2001), Hageback J, et al. (2005), Thomas DSG, et al. (2007) and Arbuckle JG., et al. (2015). Although, it is advisable to use multiple means to understand the level of awareness of farmers (Deressa TT et al. 2011). The present study is carried out 200 individuals belonging to two administrative blocks of Dhanbad district of the Jharkhand state. Purpose of present study was to assess as well compare the level of awareness of individuals based on agriculture about the climate change and adjusting the agricultural practices with the changed climatic conditions as per their gender.

## METHODOLOGY

For the purpose of the present study 200 households (100 each from two administrative blocks, i.e. Balliyapur Block and Tundi Block of Dhandbad District). The Balliyapur Block comprises of six villages, namely Bero Niyamatpur, Sheetalpur, Salpatra, Sahishakundi, Salmisal and Balliyapur, whilst, the Tundi block comprises of seven villages namely Rampur, Harlatand, Purbi Tundi, Nawadih, Tundi, Sathitand and Rekon. Approximate total populations of these two blocks are 40,000. From each villages of Balliyapur Block, 40 households were selected randomly, and in Tundi block 35 each households were selected from five villages and from the Rekon village 25 households were selected. Only those households were selected who have been found to be mainly depending on agriculture and livestock rearing. From each household one adult male and one adult female were selected as the subjects of the study. After selection, those people were explained about the purpose of the study by the researchers for securing their written consents. Tools like socio-demographic data sheet, questionnaires for measuring awareness about climatic changes on agriculture and changing of agricultural patterns as per the changed climatic situation were used for data collection. These three tools were developed specially for this study.

## RESULTS AND DISCUSSION

*Socio-demographic Profile of the Participants :* Table 1 is showing the socio-demographic information of the selected participants. In present study participants

were divided equally as male and female (n=200 each). Mean age of the participants was found to be 41.75 years. Mean ages of the males and females were enumerated to be 43.01 and 40.55 years respectively. In terms of family type, majority of the respondents were from joint family background, followed by nuclear family background; only a few respondents were from extended families. Coming to educational status of the selected respondents (N=400), most of them were found to be either illiterate or minimally educated (primary level), only 55 of them have middle level or more level of education. Majority of the participants have been living in their respective villages for more than 5 years. Most of them had reported to be earning more than Rs. 50,000/- annually. With regards to family size, most of the participants have 4 or more members in the families. Coming to ownership of land, least numbers of the selected participants stated that they have 0-5 acres of land and most of them had reported to have more than 5 acres of land and some of them even reported more than 10 acres of land. In terms of land used in active cultivation, most of them had reported to have 0-10 acres of land, only a few reported more than 10 acres of agricultural lands. Coming to agricultural crops grown by the selected participants, most of them were found to be traditional cereal crop growers, distantly followed by fruit and vegetable and other crop growers. Least of them were found to be engaged in multiple crops.

This Table 2 is showing the comparison of educational status of the selected participants (N=400) as per their gender. Since education happens to be an important parameter in determining the level and quality of awareness about climatic changes and importance of changing the agricultural pattern, this variable was compared between males and females. Significant difference was noted between selected males and females in terms of their educational level. Among males a sizeable proportion were found to be having primary or more level of education. But among females, more than half of the participants were illiterate (n=125), which was followed by number of participants with primary level of education (n=69) and only 6 of them reported to have middle and more level of education. Among males 49 respondents had middle and higher level of education. Because of those things very significant difference was seen between these two groups.

**Table 1. Socio-demographic Profile of the Participants (N=400)**

Variable	No.	Mean±S.D/ %
<i>Age</i>		
Male	100	43.01±13.02
Female	100	40.55±13.17
<i>Gender</i>		
Male	100	50.0
Female	100	50.0
<i>Family Type</i>		
Nuclear	134	33.5
Joint	240	60.0
Extended	26	6.50
<i>Educational Status</i>		
Illiterate	177	44.3
Primary	168	42.0
≥ Middle Class	55	13.8
<i>Duration of Living in the Village</i>		
<5 years	90	22.5
In 5-10 years	106	26.5
>10 years	77	19.3
For many generations	127	31.8
<i>Annual Income</i>		
<Rs. 50,000/-	64	16.0
Between 50,000-1 lakh	157	39.3
>1 lakh	179	44.8
<i>Family Size</i>		
4 members	102	25.5
In between 4-8 members	218	54.5
More than 8 members	80	20.0
<i>Ownership of Total Land by Family</i>		
0-5 acres	60	15.0
5-10 acres	242	60.5
>10 acres	98	24.5
<i>Ownership of Total Cultivable Land by Family</i>		
0-5 acres	129	32.3
5-10 acres	158	39.5
>10 acres	113	28.3
<i>Agricultural Products</i>		
Staple Cereals	230	57.5
Fruits & Vegetables	98	24.5
Other Commercial Crops	60	15.0
Multiple Crops	12	3.0

This Table 3 has been showing the comparison of the level of awareness between the selected males and females about their understanding and level of awareness about global as well as national level climatic changes. In order to measure their awareness level, a questionnaire was developed by the researchers of the

**Table 2. Comparison of educational status of the selected participants as per their gender (Chi-Square Test)**

Variables	Group (N=400)		
	Male (n=200)	Female (n=200)	
<i>Educational Status</i>			
Illiterate	52	125	
Primary	99	69	
Middle & Higher	49	6	
<i>df</i> =2;	$\chi^2=69.083$ ;	<i>P</i> =.000***;	*** <i>Sig</i> <0.01

study and applied on the selected participants (N=400). Each item has three points for measuring the level of awareness of the selected participants, i.e. 'yes', 'no'

and 'don't know'. Gender of the participants was not emerged as important determining factor in the level of awareness about recent climatic changes. In any question of the questionnaire no significant difference was seen between males and females.

This Table 4 has been showing the comparison of the level of awareness between the selected males and females about their understanding changing the agricultural patterns. Gender of the participants was not emerged as important determining factor in the level of awareness about doing appropriate changes in agricultural practices.

**Table 3. Comparison of the Level of Awareness of the selected participants on Climatic Changes as per their Gender (Chi-Square Test)**

Variables	Reply by percipients	Group (N=400)		$\chi^2$	<i>P</i>
		Male	Female		
Do you think that climate change is occurring?	Yes	62	71	0.957	.631 <sup>NS</sup>
	No	86	82		
	Don't Know	52	47		
Do you think that there is not sufficient evidence for climatic changes in India?	Yes	86	94	0.700	.715 <sup>NS</sup>
	No	62	56		
	Don't Know	52	50		
Do you think that climate change is occurring, and it is caused equally by natural changes in the environment and human activities?	Yes	60	71	2.069	.344 <sup>NS</sup>
	No	102	88		
	Don't Know	38	41		
Do you think climate change is occurring, and it is caused mostly by human activities?	Yes	120	117	0.112	.955 <sup>NS</sup>
	No	59	62		
	Don't Know	21	21		
Do you think that in recent days climate of your area has become unpredictable?	Yes	94	94	0.341	.854 <sup>NS</sup>
	No	73	69		
	Don't Know	33	37		
Do you know climate of India is tropical?	Yes	86	94	0.700	.715 <sup>NS</sup>
	No	62	56		
	Don't Know	52	50		
Do you know rains are unpredictable due to climate change these days?	Yes	60	71	2.069	.344 <sup>NS</sup>
	No	102	81		
	Don't Know	38	41		
These days seasons are very extreme, do you agree with it?	Yes	120	117	0.112	.955 <sup>NS</sup>
	No	59	62		
	Don't Know	21	21		
Due to climate change, some parts of our country experience heavy rains whereas some parts experience drought like situation, do you agree with it?	Yes	86	94	0.700	0.715 <sup>NS</sup>
	No	62	56		
	Don't Know	52	50		
Due to climate change snow are melting and by which sea level is increasing which adversely affect the weather, do you agree with it?	Yes	80	71	2.069	0.344 <sup>NS</sup>
	No	102	88		
	Don't Know	38	41		

N.S. – Not significant; *df*=2

**Table 4. Comparison of the Level of Awareness of the selected participants on changes agricultural patterns as per their Gender (Chi-Square Test) (df=2)**

Variables	Reply by percipients	Group (N=400)		$\chi^2$	P
		Male	Female		
Do you think this climate change is affecting our agriculture?	Yes	120	117	0.112	.955 <sup>NS</sup>
	No	59	62		
	Don't Know	21	21		
Do you think due to climate change we have to change our agricultural system?	Yes	78	83	0.699	.712 <sup>NS</sup>
	No	75	67		
	Don't Know	47	50		
Do you think due to climate change yield has been affected?	Yes	86	94	0.700	.715 <sup>NS</sup>
	No	62	56		
	Don't Know	52	50		
Do you think due to climate change the cost of production has been increased?	Yes	60	71	2.069	.344 <sup>NS</sup>
	No	102	88		
	Don't Know	38	41		
Do you think due to climate change no. of irrigation has been increased?	Yes	120	117	0.112	.955 <sup>NS</sup>
	No	59	62		
	Don't Know	21	21		
Do you think to combat climate change we have adopted some different agricultural techniques?	Yes	94	94	0.341	.854 <sup>NS</sup>
	No	73	69		
	Don't Know	33	37		
Due to different agricultural techniques we get crops round the year, do you agree with it?	Yes	107	105	0.053	.99 <sup>NS</sup>
	No	58	60		
	Don't Know	35	35		
Do you think scientific method of agriculture is better than traditional method of agriculture for getting more yield?	Yes	86	94	0.700	.715 <sup>NS</sup>
	No	62	56		
	Don't Know	52	50		
Do you think scientific method of agriculture is better than traditional method of agriculture to combat climate change?	Yes	60	71	2.069	.344 <sup>NS</sup>
	No	102	88		
	Don't Know	38	41		
Do you think chemical fertilizers are used excessively in scientific method of agriculture?	Yes	120	117	0.112	.955 <sup>NS</sup>
	No	59	62		
	Don't Know	21	21		
Do you think the quality of product of the crops is better when we use less chemical fertilizers?	Yes	86	94	0.700	.715 <sup>NS</sup>
	No	62	56		
	Don't Know	52	50		
Do you think the organic farming is better in terms of quality of the product of the crops?	Yes	60	71	2.069	.344 <sup>NS</sup>
	No	102	88		
	Don't Know	38	41		
Do you think organic farming system can combat climate change for maintaining proper yield of crops?	Yes	120	117	0.112	.955 <sup>NS</sup>
	No	59	62		
	Don't Know	21	21		

## CONCLUSION

In present study it was seen that most of the participants were traditional crops (e.g. rice, wheat, maize, pulses) growers and some of them grow crops like 'fruits and vegetables'. Least numbers of people are engaged in multiple crop production. In terms of education, males were found to be significantly higher

educated than females. In terms of annual income, most of them have more than Rs. 50,000/- earning in a given year. Agriculture happens to be the main or even only source of livelihood of these people. In terms of awareness about climatic changes, respondents of either group had reported fairly good level of information about the global as well as national level of climatic changes

and the both males and females had almost same level of understanding about this issue. Same thing also observed in the level of understanding about the importance of changing the agricultural pattern, i.e. selection of heat and moisture resilient crops, how to use the natural resources like, water, soil and land

contour for instituting positive changes in agricultural practice. In present study gender of the selected individuals did not have any significant impact on their disposition on knowledge and information about the importance of changing agricultural pattern and using of organic or natural means in agricultural practices.

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