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Nagma Halima Saik
Professor, College of Agriculture, OUAT, BBSR, Bhubaneswar, Odisha, India

Dr. Bishnupriya Mishra
Professor, College of Agriculture, OUAT, BBSR, Bhubaneswar, Odisha, India

Corresponding Author:
Nagma Halima Saik
Professor, College of Agriculture, OUAT, BBSR, Bhubaneswar, Odisha, India

Assessment of the relative vulnerabilities of farmers due to climate change in coastal agriculture in Odisha

Nagma Halima Saik and Dr. Bishnupriya Mishra

Abstract
Climate change is already affecting agriculture, with effects unevenly distributed across the world. As climate change continues to exert increasing pressure upon the livelihoods and agricultural sector of many developing and developed nations, a need exists to understand and prioritise at the sub national scale which areas and communities are most vulnerable. The present investigation was aimed at assessing the relative vulnerabilities of farmers due to climate change. The study was conducted in the Marsaghai and Rankala village of Kendrapara district and Sampur and Tirtol village of Jagatsinghpur district of Odisha state with a total sample size of 200. As this is a gender perspective research study, out of the total respondents 100 are men and 100 are women who are selected by the process of random selection. The relative vulnerability of farmers about climate change was assessed through a well-structured interview schedule by the process of personal interview and focus group discussions. 31% of men farmers and 36% of women farmers agree that they are dependent on the available natural resources for agriculture. Furthermore, 54% of women respondents and 49% of men respondents are moderately vulnerable to climate extremities. Various reasons like less awareness and knowledge and more pressure of work and family make women more vulnerable to climate change. With giving special attention to them, awareness camps and adequate training programmes along with social protection programmes in that area can help them prepare, adapt and empower against climate extremities.

Keywords: Adaptation, awareness, egalitarianism, fatalism, vulnerability

Introduction
Agriculture is the most fundamentally life-sustaining of all human activities. In low and middle income countries, nearly 3 billion people live in rural areas and of those, 2.5 billion people depend on agriculture for livelihood Climate change is already affecting agriculture, with effects unevenly distributed across the world. As climate change continues to exert increasing pressure upon the livelihoods and agricultural sector of many developing and developed nations, a need exists to understand and prioritise at the sub national scale which areas and communities are most vulnerable. Multifaceted climate change impacts on agriculture vary in different parts of the world and the overall picture is very complex in coastal areas. Low-lying agricultural land is highly vulnerable to severe soil salinity, storm surge, coastal erosion and stagnant flood water problems. Simultaneously, the rapid and overwhelming changes to the climatic environment and associated factors have intensified the vulnerability of agricultural production in coastal areas. Beginning in the early 1990s, scientific consultative groups commissioned by the United Nations, including the Intergovernmental Panel on Climate Change (IPCC), began to study the causes, likely impacts, and possible mitigations of climate change in a systematic way, assembling and sifting world scientific opinion to arrive at an informed consensus. The Intergovernmental Panel on Climate Change (IPCC) is considered to be the leading scientific international body for the assessment of climate change, and consequently the starting point for this paper is vulnerability as defined by the IPCC. According to the IPCC (2007) definition, vulnerability in the context of climate change is "the degree to which a system is susceptible to, and unable to cope with, adverse effects of climate change, including climate variability and extremes. Vulnerability is a function of the character, magnitude, and rate of climate change and variation to which a system is exposed, its sensitivity, and its adaptive capacity". Thus, agricultural vulnerability to climate change can, for example, be described in terms of exposure to elevated temperatures, the sensitivity of crop yields to the elevated temperature and the ability of the farmers to adapt to the effects of this exposure and sensitivity by, for example, planting crop varieties that are more heat-resistant or switching to another type of crop.

Methodology

The study was conducted in the Marsaghai and Rankala village of Kendrapara district and Sampur and Tirtol village of Jagatsinghpur district of Odisha state with a total sample size of 200. As this is a gender perspective research study, out of the total respondents 100 are men and 100 are women. The men and women respondents are selected by the process of random selection. The respondents' awareness and perception about climate change was assessed through a well-structured interview schedule by the process of personal interview. Vulnerability is the degree to which a system is susceptible to, and unable to cope with, adverse effects of climate change, including climate variability and extremes. For the purpose of the study, Vulnerability is operationally defined as the inability of individuals or social groups to cope up with or adapt to climate change induced stresses placed on their livelihoods and well-being. Climate change vulnerability assessments can, for example, vary with respect to the methodological approach (e.g. experimental, modelling, meta-analysis, survey-based), the integration of natural and social science, policy focus, time horizon (short- to long-term), spatial scale (farm, local, national, regional, global level), consideration of uncertainties, and the degree of stakeholder involvement. In this section, general methods applied for assessing vulnerability to climate change are highlighted, focusing briefly on the use of indicators, modelling approaches and stakeholder involvement. Over the past decade a growing number of vulnerability assessments have emerged from the scientific literature that focus on assessing the vulnerability of various sectors, including agriculture to climate change.

Considering the various individual and social dimensions, level of dependency on resources and other livelihood support systems an attempt was made to develop an index to measure vulnerability of men and women farmers. A composite vulnerability index was worked out drawing from the approaches of UNDP (2007). As per that index, the respondents were categorized into highly, moderately and less vulnerable. Sub-indices like awareness and perception about climate change, level of dependency on natural and social capital, value orientation like fatalism and egalitarianism were worked out for each component of vulnerability. The values of each indicator were normalized to the range of values in the data set by applying the following formula.

$$\text{Index Value} = \frac{(\text{Actual Value} - \text{Minimum Value})}{(\text{Maximum Value} - \text{Minimum Value})}$$

For the indicator with negative connotation, index value was reversed (1- index value). The overall index was formed from weighted average of the sub-indices, with the weights derived from theoretical understanding. The aggregated figure ranged from 0 to 1, where 0 signified highest level of vulnerability. The respective weights for sub-indices were drawn from literature and experts' opinion. The overall equation for the model employed for the study was:

$$VI = \sum_{i=1}^{n} (I_i \times W_i)$$

I_i = Sub-index and W_i = Weights of the sub-index.

$VI = I_1 \times 32.5 + I_2 \times 18.2 + I_3 \times 14.3 + I_4 \times 11.7 + I_5 \times 23.4$

I_1 = Awareness

I_2 = Perception

I_3 = Fatalism

I_4= Egalitarianism

I_5= Level of dependency

Results and Discussion-

Fatalism

Fatalism was operationally described as "a philosophical doctrine holding that all events are predetermined in advance for all time and men and women are powerless to change them." Fatalism refers to believe in fate. People believe in fatalism generally due to lack of education where they attribute to the process and its outcome to the fate in any event. Fatalism was measured in a five point continuum where the subjects were asked to express their agreement and disagreement with a set of five statements drawn from the modified scale of Leiserowitz (2006).

Table 1: Distribution of men farmer respondents according to value of Fatalism (N=100)

Statements	SA *f* (%)	A *f* (%)	UD *f* (%)	D *f* (%)	SD *f* (%)	Mean
The future is too uncertain for a person to make serious plans	23	48	2	21	6	3.61
Whether you elect one political candidate or another, it does not make much of difference.	38	46	0	12	4	4.02
I feel that life is like a lottery	36	38	3	15	8	3.79
A person is better off if he or she does not trust anyone.	45	47	0	7	1	4.28
I have very little control over my life	11	45	9	21	14	3.18
It is no use worrying about public affairs; I cannot do anything about them anyway.	39	49	1	9	2	4.14
I feel women's life are more difficult	17	28	6	38	11	3.02
I feel that farmers lives are more tougher	47	48	1	4	0	4.38

(SA-Strongly Agree, A-Agree, UD-Undecided, D-Disagree, SD-Strongly Disagree *f* – Frequency, %- Percentage)

The above table clearly indicates that about for about 48% of men farmer agree that future is too uncertain to make serious plans and about 46% of them agree that it did not make much of a difference whether they elect one political candidate or another. 38% of the men respondents agree to the statement that life is like a lottery and 47% of them agree that they are better off if they do not trust anyone. Majority of the respondents.i.e.45% agree that they have very little control over their life.

For 49% of men respondents agree that there is no use in worrying about public affairs; as they cannot do anything about it anyway. 38% of the men farmers disagree to the fact that women's life is more difficult and 48% of them agree that farmers' lives are more tougher. Affirmation with these statements by a majority of men farmers reveals prevalence of value of fatalism which retards the development process. It is very essential to bring about change in value orientation of men farmers to carry on to the path of progressiveness. There should be sufficient trainings to train and motivate the farmers to take initiatives and to have control over the respective processes and outcomes. Farmers' knowledge, skill and attitude will be enhanced if they will be exposed to the climate resilient technologies.

Table 2: Distribution of women farmer respondents according to value of Fatalism (N=100)

Statements	SA *f* (%)	A *f* (%)	UD *f* (%)	D *f* (%)	SD *f* (%)	Mean
The future is too uncertain for a person to make serious plans	37	32	7	20	4	3.78
Whether you elect one political candidate or another, it does not make much of difference.	39	49	2	9	1	4.16
I feel that life is like a lottery	21	26	13	31	9	3.19
A person is better off if he or she does not trust anyone.	38	45	3	10	4	4.03
I have very little control over my life	47	48	0	5	0	4.37
It is no use worrying about public affairs; I cannot do anything about them anyway.	48	49	1	2	0	4.43
I feel women's life are more difficult	41	56	3	0	0	4.38
I feel that farmers lives are more tougher	37	54	4	3	2	4.21

(SA-Strongly Agree, A-Agree, UD-Undecided, D-Disagree, SD-Strongly Disagree *f* – Frequency, %- Percentage)

About 37% of the women respondents strongly agree that future is too uncertain for a person to make serious plans and 49% of them agree to the statement that it does not make much of a difference if people elect one political candidate or another. 31% of the women farmers do not agree that life is like a lottery and 45% of them agree that it's better not to trust anyone. Furthermore, 48% agree that they have very little control over their life and 49% of them agree that it is no use worrying about public affairs as they cannot do anything about them anyway. A majority of the women respondents' .i.e. 56% agree that women's life is more difficult and 54% of them agree that farmers' lives are tougher. Affirmation with these statements by a majority of men farmers reveals prevalence of value of fatalism which retards the development process. It is very essential to bring about change in value orientation of men farmers to carry on to the path of progressiveness. There should be sufficient trainings to train and motivate the farmers to take initiatives and to have control over the respective processes and outcomes. Knowledge about modern technologies and drudgery reducing techniques can motivate the women farmers to work in a more productive way.

Egalitarianism

Egalitarianism refers to value orientation to reality. It is measured with the five point continuum modified scale of (Leiserowitz, 2006). The obtained mean values of more than 4 for most of the statements amply indicate the affirmation of the majority of the men respondents about egalitarianism. 52% of the men respondents agreed that we would have fewer problems if people were treated equally. Similarly the statement with negative connotation with respect to egalitarianism "We have gone too far in pushing equal rights" the mean score was 1.74 which indicates most of the respondents disagree to it. It can be assumed from the above mean score that a large majority of them held a high value of equality. This positive response is highly appreciable as it shows equal accessibility and distribution of common goods among the society. At the time of crisis such value of efforts will facilitate the efforts and approach of people in due to adverse effects of climate change.

Table 3: Distribution of men farmer respondents according to value of Egalitarianism (N=100)

Statements	SA *f* (%)	A *f* (%)	UD *f* (%)	D *f* (%)	SD *f* (%)	Mean
What this world needs is a more equal distribution of wealth	34	47	3	12	4	3.95
I support Government effort to get rid of poverty	25	53	2	15	5`	3.78
I support affirmative action	38	46	5	9	2	4.09
Firms and Institutions should be so organized that everybody can influence important decisions	18	42	16	15	9	3.45
If people were treated more equally we would have fewer problems	45	52	0	3	0	4.39
The world would be a more peaceful place if its wealth were divided more equally among nations.	39	42	6	10	3	4.04
We have gone too far in pushing equal rights	8	2	0	48	42	1.74
If men and women were treated more equally we would have a more improved and balanced society	32	39	1	25	3	3.72
If wealth and other productive resources were equally distributed among men and women there would be more prosperity.	21	35	3	31	7	3.23

(SA-Strongly Agree, A-Agree, UD-Undecided, D-Disagree, SD-Strongly Disagree *f* – Frequency, %- Percentage)

Measured with the fivepoint continuum modified scale of (Leiserowitz, 2006). The obtained mean values of more than 4 for most of the statements amply indicate the affirmation of the majority of the women respondents about egalitarianism. 48% of the women respondents agreed that we would have fewer problems if people were treated equally. Similarly the statement with negative connotation with respect to egalitarianism "We have gone too far in pushing equal rights" the mean score was 2.61 which indicate most of the respondents disagree to it. It can be assumed from the above mean score that a large majority of them held a high value of equality. This positive response is highly appreciable as it shows equal accessibility and distribution of common goods among the society. At the time of crisis such value of efforts will facilitate the efforts and approach of people in due to adverse effects of climate change.

Table 4: Distribution of women farmer respondents according to value of Egalitarianism (N=100)

Statements	SA *f* (%)	A *f* (%)	UD *f* (%)	D *f* (%)	SD *f* (%)	Mean
What this world needs is a more equal distribution of wealth	14	37	11	20	18	3.09
I support Government effort to get rid of poverty	35	41	4	16	4	3.87
I support affirmative action	32	41	5	17	5	3.78
Firms and Institutions should be so organized that everybody can influence important decisions	18	25	19	21	17	3.06

If people were treated more equally we would have fewer problems	48	46	0	6	0	4.36
The world would be a more peaceful place if its wealth were divided more equally among nations.	51	49	0	0	0	4.51
We have gone too far in pushing equal rights	24	35	6	26	9	2.61
If men and women were treated more equally we would have a more improved and balanced society	42	53	1	4	0	4.33
If wealth and other productive resources were equally distributed among men and women there would be more prosperity.	46	48	0	5	1	4.33

(SA-Strongly Agree, A-Agree, UD-Undecided, D-Disagree, SD-Strongly Disagree *f* – Frequency, %- Percentage)

Table 5: Distribution of men farmer respondents on the basis of their level of dependency (N=100)

Statements	level of dependency of Men (N= 100)					Mean
	SA	A	UD	D	SD	
	f (%)	*f* (%)	*f* (%)	*f* (%)	*f* (%)	
Income Sources	39	37	5	13	6	3.90
Educational Qualification	26	45	2	20	7	3.63
Available Resources(Natural, physical, Social)	16	31	23	17	13	3.20
Exposure to climate change	43	33	4	18	2	3.97
Social variable	28	29	12	25	6	3.48
Communication variable	24	38	3	26	9	3.42
Lack of Infrastructure	49	45	0	6	0	4.37
Lack of warning system	32	43	7	12	6	3.83
Lack of Knowledge	21	46	0	13	20	3.35
Lack of sense of empowerment	12	34	15	26	13	2.94

(SA-Strongly Agree, A-Agree, UD-Undecided, D-Disagree, SD-Strongly Disagree *f* – Frequency, %- Percentage)

The above table indicates that 39% of the men respondents strongly agree to the fact that their income depends on farming and majority of them (45%) agree that to have knowledge about climate change, education is needed. 31% farmers agree that they are dependent on available resources and 49% of them strongly agree that infrastructural facilities are needed to store the harvest products and livestock properly. 43% agree that there is lack of warning system and 34% agree that people lack the sense of empowerment in that area. Hence, people need to be educated to have knowledge about climate change reasons and risks involved in these and to self motivate themselves to be empowered. Knowledge earning can also help them in judicious use of natural and available resources for sustainable use. Also they need to be sensitized for building up social capital with networking, reciprocity and linkage for better cohesiveness and collective action for better preparedness and adaptation for climate change crises.

Table 7: Distribution of women farmer respondents on the basis of their level of dependency (N=100)

Statements	Level of dependency of Women (N= 100)					Mean
	SA	A	UD	D	SD	
	f (%)	*f* (%)	*f* (%)	*f* (%)	*f* (%)	
Income Sources	33	49	7	9	2	4.02
Educational Qualification	32	35	13	11	9	3.70
Available Resources(Natural, physical, Social)	29	36	18	7	10	3.67
Exposure to climate change	36	42	5	10	7	3.90
Social variable	55	41	1	3	0	4.48
Communication variable	43	39	2	15	1	4.08
Lack of Infrastructure	37	48	6	7	2	4.11
Lack of warning system	16	34	18	22	10	3.24
Lack of Knowledge	38	47	5	10	0	4.13
Lack of sense of empowerment	28	46	11	13	2	2.15

(SA-Strongly Agree, A-Agree, UD-Undecided, D-Disagree, SD-Strongly Disagree *f* – Frequency, %- Percentage)

The above table indicates that 49% of the women respondents strongly agree to the fact that their income depends on farming and 35% agree that to have knowledge about climate change, education is needed. 36% women farmers agree that they are dependent on available resources and 48% of them strongly agree that infrastructural facilities are needed to store the harvest products and livestock properly. 34% agree that there is lack of warning system and 46% agree that people lack the sense of empowerment in that area. Hence, people need to be educated to have knowledge about climate change reasons and risks involved in these and to self motivate themselves to be empowered. Knowledge earning can also help them in judicious use of natural and available resources for sustainable use. Also they need to be sensitized for building up social capital with networking, reciprocity and linkage for better cohesiveness and collective action for better preparedness and adaptation for climate change crises.

Table 8: Distribution of men farmer respondents according to their level of vulnerability (N=100)

Vulnerability Index Intervals	Frequency (*f*)	Percentage (%)
Highly vulnerable (<.383)	20	20
Moderately vulnerable (.383-.329)	49	49
Less vulnerable (>.291)	31	31

From the above table it is clearly seen that, most of the men respondents'. i.e 49% belong to moderately vulnerable followed by 31% were in less vulnerable group and 20% of them were highly vulnerable category. Majority of the men farmers in that area were having moderate level knowledge

and awareness regarding risks and uncertainties relating to climate change which clears the fact that they have less knowledge and skill to climate change adaptation measures. So there is need to arrange adequate awareness campaigns and training programmes in the area to empower them for better preparedness and adaptation of farmers to climate change extremities.

Table 9: Distribution of women farmer respondents according to their level of vulnerability (N=100)

Vulnerability Index Intervals	Frequency (*f*)	Percentage (%)
Highly vulnerable (<.379)	37	37
Moderately vulnerable (.379- .326)	54	54
Less vulnerable (>.230)	9	9

It is evident from the above table that majority of the women respondents (54%) belong to the moderately vulnerable group followed by 37% belonging to highly vulnerable and only 9% of them are of less vulnerable group. As compared to men farmers, women farmers are more vulnerable to climate change extremities. Various reasons like less awareness and knowledge and more pressure of work and family make them more vulnerable to climate change. With giving special attention to them, awareness camps and adequate training programmes along with social protection programmes in that area can help them prepare, adapt and empower against climate extremities.

Conclusion

Majority of the women farmers are more vulnerable to climate extremities as compared to men farmers. More percentage of women is may be due to lack of knowledge and awareness about climate change, adaptation skills, more load of work and lack of sense of empowerment. To develop adaptation strategies among women farmers, it is necessary to give special emphasis on socio- psychological empowerment of farmers. To do it, women farmers must be given psychological, motivational, and attitudinal and infrastructural support which will help in developing their capabilities for better adaptive mechanisms along with developing their competency skills. Their adaptive capacity must be strengthened in a holistic and productive manner.

References

1. Agriculture and climate change Challenges and opportunities at the global and local level Collaboration on Climate-Smart Agriculture, Food and Agriculture Organization of the United Nations Rome, 2019.
2. Climate Change, Agriculture, Water, and Food Security: What We Know and Don’t Know, Massachusetts Institute of Technology.
3. Climate Change Adaptation in Indian Agriculture-Assessing Farmers’ Perception and Adaptive Choices, Jha CK, Gupta V, Research Gate.
4. Daleen KV, Jung L, Dhatt R, Phelan AL. Climate Change and Gender based Health.
5. Gregor Mac, Sherilyn. A Stranger Silence Still: The Need for Feminist Social Research on Climate Change. The Sociological Review 2010;57:124-140. Web. 25 Oct. 2014.
6. Pasupalak S. Climate Change and Agriculture in Orissa, Orissa Review 2009.
7. Reddy J Women Role In Agriculture, Aquaculture, Livestock., Agri Farming Voicing Silence - Experience of Women with Disasters in Orissa, OSDMA 2002, 3.