**Original Research Article**

**Vulnerability of Climate Change on Livelihood of Tribals**

**ABSTRACT**

In today’s era, climate change is a major concern for livelihood security of tribal communities. In Odisha state, the scheduled tribe constitutes 22.85 percent of the total population. Since last 15-20 years, global warming and vulnerability of climate change has disrupted the livelihood of tribals engaged in agriculture, animal husbandry and Non-Timber Forest Products (**NTFPs**). Against this background, a study entitled “*Vulnerability of Climate Change on the Livelihood of Tribals*” has been undertaken in the Mayurbhanj district of Odisha with the specific objectives (i) to study the vulnerability of climate change in agriculture, animal husbandry and NTFPs, (ii) to find out the perceived causes of climate change and (iii) to analyses the impact of climate change on the livelihood of tribals. The research design was *ex-post facto* survey. Both purposive and random sampling methods were followed for selection of district, blocks, villages and respondents. The total sample size was 120 numbers. The response was collected through a pre-tested interview schedule developed for this purpose. The collected data were processed, analyzed and interpreted with use of suitable statistical tools. It was observed that majority of respondents depended on NTFPs(92%), followed by agriculture (4.5%) and animal husbandry (3.5%). As compared to last ten (10) years, there has been a drastic reduction of agriculture production (75.2%), animal husbandry and milk production (33%) and seasonal collection of NTFPs varies from 30 percent to 45 percent whereas biochar collection has increased to 52 percent. The respondents perceived that deforestation (96.5%)and forest fire (73.5%) were the major causes of climate change and due to vulnerability of climate change, 87.23 percent of tribal people migrate to outside states as bonded labourers for their livelihood security.

*Key Words: Agriculture, Tribals, NTFPs, Vulnerability, Climate change*

**1.INTRODUCTION**

Climate change has grown to be a significant worldwide environmental concern in recent years. Out of all the Indian States and Union Territories, Odisha is one of the coastal states with the largest percentage of impoverished people. The state's climate can be classified as tropical because of its high temperatures, high humidity, medium to high rainfall and short, moderate winters. Odisha is particularly affected by climate change for two reasons: first, because of its location and geophysical characteristics, the state may be disproportionately affected; and second because a significant portion of its population still lacks access to a reasonable standard of living. The term "[Scheduled Tribes](https://en.wikipedia.org/wiki/Scheduled_tribes%22%20%5Co%20%22Scheduled%20tribes)" denotes specific indigenous groups whose class is formally recognized to some extent by the legislation of Indian often colloquially referred to as "[tribals](https://en.wikipedia.org/wiki/Tribe%22%20%5Co%20%22Tribe)" or "[adibasi](https://en.wikipedia.org/wiki/Adivasi%22%20%5Co%20%22Adivasi)." In obedience to the [Constitution of Indian Republic](https://en.wikipedia.org/wiki/Constitution_of_the_Indian_Republic%22%20%5Co%20%22Constitution%20of%20the%20Indian%20Republic) the state of [Odisha](https://en.wikipedia.org/wiki/Odisha%22%20%5Co%20%22Odisha) that is present in the eastern part of India  officially recognizes a total of 64 distinct tribes as Scheduled Tribes. Out of these 64 tribes, 13 hold the designation of "[Particularly Vulnerable Tribal Groups](https://en.wikipedia.org/wiki/Particularly_vulnerable_tribal_group%22%20%5Co%20%22Particularly%20vulnerable%20tribal%20group)" (PVTGs). As per [2011 census](https://en.wikipedia.org/wiki/2011_census_of_India%22%20%5Co%20%222011%20census%20of%20India), there are 9,590,756 Scheduled Tribes are present in Odisha ranking as the third-largest state in India in terms of its Scheduled Tribes population trailing behind [Madhya Pradesh](https://en.wikipedia.org/wiki/Tribals_in_Madhya_Pradesh%22%20%5Co%20%22Tribals%20in%20Madhya%20Pradesh) and [Maharashtra](https://en.wikipedia.org/wiki/Maharashtra%22%20%5Co%20%22Maharashtra) (include reference). These tribal communities jointly make up approximately 22.84% of the state's total population, 9.20% of the nation's [Scheduled Tribes population](https://en.wikipedia.org/wiki/Scheduled_Castes_and_Scheduled_Tribes%22%20%5Cl%20%22Demographics%22%20%5Co%20%22Scheduled%20Castes%20and%20Scheduled%20Tribes), and about 0.79% of the nation's total population (include reference). Climate change has slowed down the rate of economic growth in Odisha. Reduced yield, poor human health, variable rainfall and temperature, altered biodiversity, aquatic response and vegetation changes are some of the effects of climate change. People's economies have been completely destroyed by isolated or simultaneous storms, floods, heat waves, lightning strikes, vector diseases, and droughts in the same or subsequent year (Mishra,2017).Due to their intimate ties to and reliance on the natural environment for their livelihoods, culture, and health, many tribes are at risk from the effects of climate change. The majority of tribes face obstacles to their mobility and freedom to relocate in reaction to future developments because of reservations and treaty rights that are tied to certain locations and resources. In addition, a lot of indigenous groups deal with challenging social and economic issues, which climate change can make worse. In terms of numbers, the Kondha or Kandha tribe is the largest in the state. Their population is approximately one million, and they are primarily concentrated in the districts of Rayagada, Koraput, Boudh, and Balangir, which are next to Kandhamal. The Santals live in the Mayurbhanj area and number about 800,000. The livelihood strategy of tribal households are determined frequently by their demographic, economic,social and cultural settings. Tribal economy is affected by unawareness of efficient technique of exploiting natural resources , poverty of the physical environment and lack of capital for investment that leads to lack of food security which is a major problem for them(Singh and Sadangi,2012).Out of 30 districts of Odisha, Mayurbhanj districts has large forest coverage 4458kmsq with 58.72 percent of Schedule tribes out of the total population. Majority of the tribal population depends on NTFPs as a major source of income followed by agriculture and animal husbandry .The social cultural and religious life of Mayurbhanj has been influenced by tribal traditions. The vulnerability of climate change has degraded the availability and quality of NTFPs and has shown direct impact on NTFPs based livelihoods of tribals by decreasing the productions,quality of products and price. Against this background, this study entitled “*Vulnerability of Climate Change on the Livelihood of Tribals*” has been undertaken in the Mayurbhanj district of Odisha with the specific objectives (i) to study the vulnerability of climate change in agriculture, animal husbandry and NTFPs, (ii) to find out the perceived causes of climate change and (iii) to analyze the impact of climate change on the livelihood of tribals.

**2.METHODOLOGY**

“Ex-post-facto” research design was employed in the study . It is a systematic empirical inquiry in which the independent variables have already occurred and are not directly manipulated by the researcher. This study was undertaken in purposively selected 3 blocks namely Kaptipada, Khunta and Betanati of Mayurbhanj districts in Odisha as in these blocks large number of tribals depend on NTFPs for their livelihood. From each selected blocks two panchayats and from each panchayat 3 villages were selected randomly thus from 18 selected villages 120 tribal respondents were selected by proportionate random sampling techniques. Appropriate interview schedule as per the objective of the study was prepared for necessary data collection. Prior to final administration of the interview schedule it was pre-tested with a sample of 10 percent other than the selected respondents of the study to know how far it would be helpful in collection of relevant, accurate and unbiased information. The data were collected with the help of pre-tested structured interview schedule through personal interview method. The collected data were processed and interpreted with help of suitable statistical measures such as frequency, percentage, mean, standard deviation and rank.

**(FIG-1: Sampling procedure for selection of respondents)**

**Blocks**

**MAYURBHANJ**

**District**

**Grampanchayats**

**Villages**

**BETANATI**

**KHUNTA**

**KAPTIPADA**

**DUKURA**

**JUGAL**

**ANLA**

**DENGAM**

**DEBLA**

**JAMBANI**

SUDSUDIA,DHUMKHET,JAMUBANI

JUGALA,

SALBANI,

UDIPURA

ANLA,

BAGHUA,

RAIKAMA

JADIDAR,

DENGAM,

GOPALPUR

DUKURA,

BETNA,

NUAGAN

DEBLA,

GANDIDAR,

SANKHANA

**3. RESULTS AND DISCUSSION**

The socio- economic profile of the respondents is shown inTable-1.below.

**Table-1 : Socio- Economic profile of respondents (N=120)**

|  |  |  |  |
| --- | --- | --- | --- |
| **Sl No.** | **Parameter** | **Frequency (f)** | **Percentage(%)** |
| **1** | **Gender** |
| Male | 68 | 56.66 |
| Female | 52 | 43.33 |
| **2** | **Age** |
| Young (Up to 35 ) | 43 | 35.83 |
| Middle (36-50 ) | 37 | 30.83 |
| Old (Above 50) | 40 | 33.33 |
| **3** | **Education** |
| Illiterate | 47 | 39.16 |
| Primary | 54 | 45 |
| Upper Primary | 10 | 8.33 |
| High School | 5 | 4.16 |
| Intermediate | 4 | 3.33 |
| Undergraduate | 0 | 0 |
| Graduate and above | 0 | 0 |
| **4** | **Family Size** |
| Below 4 | 37 | 30.83 |
| 5 to 7 | 65 | 54.16 |
| 8 and above | 18 | 15 |
| **5** | **Family Type** |
| Single | 74 | 61.66 |
| Joint | 46 | 38.33 |
| **6** | **Occupation** |
| NTFPs | 36 | 30 |
| NTFPs+Agric. Activities | 41 | 34.16 |
| NTFPs+Animal Husbandry | 30 | 25 |
| NTFPs+Wage earners | 13 | 10.83 |
| **7** | **Land Holding** |
| Landless | 68 | 56.66 |
| < 1acre | 43 | 35.83 |
| 1 acre to 2.5acre | 9 | 7.5 |
| Above 2.5 acre | 0 | 0 |
| **8** | **Annual Income** |
| Up to 50,000 | 83 | 69.16 |
| 51,000 to 1 Lakh | 28 | 23.33 |
| 1Lakh to 1.5 Lakh | 6 | 5 |
| Above 1.5 Lakh | 3 | 2.5 |
| **9** | **Mass Media Exposure** |
| Low | 89 | 74.16 |
| Medium | 26 | 21.66 |
| High | 5 | 4.16 |
| **10** | **Extension Contact** |
| Low  | 85 | 70.83 |
| Medium | 29 | 24.16 |
| High | 6 | 5 |
| **11** | **Risk Bearing Abilities** |
| Low  | 74 | 61.66 |
| Medium | 36 | 30 |
| High | 10 | 8.33 |
| **12** | **Scientific Orientation** |
| Low  | 93 | 77.5 |
| Medium | 16 | 13.33 |
| High | 11 | 9.16 |

 It was observed from the above table that out of the total sample respondents, 56.66 per-cent were found to be male. With regard to age categorization, 35.83% respondents were young followed by Old (33.33%) and Middle (30.83%) respectively. In the field of education it was observed that maximum (45%) number of respondents had gone to primary school followed by Illiterate i.e. 39.16 per-cent whereas not a single person had been identified with graduation or above studies. About 54.16 per-cent of the respondents had medium family size where the family members varied up to 5 to 7 and only 15 per-cent had family members 8 and above . In the case of family type 61.66 per-cent had single family followed by 38.33 per-cent which had joint family system..Apart from that it was found that majority of the respondents (34.16%) had the occupation of collecting Non Timber Forest Products (NTFPs) with other agricultural activities for their livelihood whereas 10.83 per-cent had the occupation of collecting Non Timber Forest Products (NTFPs) with wage earners. About 56.66 per-cent tribal respondents were landless, only 7.5 per-cent respondents were having 1 acre to 2.5acre of land. 69.16 per-cent of the respondents had the annual income of up to 50,000 while only 2.5 per-cent have the annual income of above 1.5 Lakh. Majority (74.16%) of the respondents had low mass media exposure . Majority (70.83%) of the tribal people had low assess to extension contact and majority (61.66%) of respondents had low risk bearing ability whereas majority (77.5%) had low scientific orientation. From above results, it was clear that education is still miles away from them. There were no significant development on their annual income which might be due to lack of education, mass media exposure, extension contact, risk bearing ability and scientific orientation etc. They were mainly focusing on collection of NTFPs along with agricultural activities for their income and livelihood security.The findings of the study are partially corroborated with the findings of Venus, T. E. *et.al.,* (2022).

The vulnerability of climate change for the last 10 years i.e 2013-2014 to 2023-2024 in agricultural production, cattle milk production,seasonal collection of Non Timber Forest Products(NTFPs) and biochar collection in a comparative study with the help of a bar diagram is presented in Fig-2.

The above comparative study on vulnerability of climate change depicted that there has been reduction of agricultural production (13.8 per-cent) followed by cattle milk production (7 per-cent), seasonal collection of NTFPs products (38 per-cent) and the collection of biochar was increased to 12 per-cent during the period 2023-24 as compared to 2013-14.The main reason behind the decreasing of agricultural production, milk production as well as seasonal collection of NTFPs might be due to variation of temperature, on even rainfall, depletion of ground water , drying of natural water bodies and loss of grass lands for grazing animals.

 With regards to perceived causes of climate change, the major causes have been represented in line chart as shown in below Fig-3.

The above figure-3 indicated that the respondents of the study opined that the major causes of climate change was due to deforestation(96.50%) followed by Forest fire (73.50%).The causes of deforestation are due to rapid industrialization, population rise and smuggling of valuable timbers by wood smugglers. Besides this, the main reasons for forest fire might be due to natural causes like lighting and man made causes like shift cultivation and firing of dry leaves for collection of biochar for industrial purpose as well as for domestic use. The findings are in line with the findings of of Kujur and Dhoundiyal (2019) .

 An attempt has been made to find out the impact of climate change on the livelihood of the tribals under seven parameters which has been reflected in Table-2. below.

**Table-2 : Impact of climate change on the livelihood of tribals**

 **(n=120)**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Sl.No.** | **Statements** | **Maximum obtainable score** | **Mean Score obtained** | **Rank** |
| 1 | Reduction in quality food | 3 | 2.17 | IV |
| 2 | Reduction of expenditure in festival seasons | 3 | 2.23 | III |
| 3 | Mental stress | 3 | 2.14 | V |
| 4 | Loss of biodiversity | 3 | 2.26 | II |
| 5 | Spread of fatal diseases | 3 | 2.09 | VI |
| 6 | Rural Migration | 3 | 2.74 | I |

It was observed from the above table that out of six impact parameters rural migration ranked I with mean score 2.74 followed by loss of biodiversity , reduction of expenditure in festival season, reduction in quality foods, mental stress and spread of fatal diseases which ranked II,III,IV,V and VI respectively with mean score 2.26, 2.23, 2.17, 2.14, 2.09 .The findings revealed that majority of the tribal people migrate to other states either as bonded laborers or to near by cities for search of earnings to secure their livelihood. They have also opined that there is loss of biodiversity due to vulnerability of climate change in their locality. Due to vulnerability of climate change the collection of NTFPs decreases which reduces the daily income and creates adverse effect in their quality food intake ,reduction of day to day expenditure particularly in their festive seasons and many of them undergo mental stress for sustenance of their livelihood .The findings of Kolay, *et.al.,(*2015) are partially corroborated with the above findings.

**4. Conclusion**

NTFPs plays a significant role in the socio- economic and cultural life of tribal people and their day to day life can not be ignored without forest. From the study it can be concluded that due to vulnerability of climate change there has been severe effect on the livelihood security of tribal people who primarily depend on NTFPs as a major source of economy and livelihood security. Therefore emphasis must be given to enhance tribal peoples livelihood security on a sustainable basis through development of economic, social infrastructures and employment opportunities round the years to help these vulnerable people to overcome the risks . The policy makers ,planners, administrators ,social workers and extension functionaries should give enough emphasis to mitigate the vulnerability of climate change on livelihood security of tribals.

**REFERENCES**

Arunachalam, R., Arunachalam, A., & Aarthi, S. (2024). Climate Change Impacts on the Livelihood of North Eastern Zone Tribes of Tamil Nadu, India. *Asian Journal of Agricultural Extension, Economics & Sociology*, *42*(2), 31-40.

Behera, D. J., Jena, A. K., Prangya, S., & Swetadipta, S. (2024). A Scientific Research On Socio-Economic Characteristics Of Farmers And Their Problems: A Study In Regulated Market Of Balasore District. *Journal of Advanced Zoology*, *45*(3).

Behera, D., & Modak, S. (2022) Indian Research Journal of Extension Education. Attitude and opinion of the Farmers Towards Regulated Markt, A Case of Balasore District 170-172.

Das, S. K., & Basu, J. P. (2022). Tribal livelihood vulnerability due to climate change: a study across tribes of Paschim Medinipur district of West Bengal. *SN Business & Economics*, *2*(8), 103.

Ghate, U., Nydu, P., Verma, H., & Ashraf, S. Climate Change & NTFP-livelihood implications for the tribal.1-3.

[https://cig.uw.edu/resources/tribal-vulnerability-assessment-resources/why-does-climate- change- matter-to-tribes/](https://cig.uw.edu/resources/tribal-vulnerability-assessment-resources/why-does-climate-%09change-%09matter-to-tribes/)

<https://en.wikipedia.org/wiki/List_of_Scheduled_Tribes_in_Odisha>

Jha, S. K., Mishra, S., Sinha, B., Alatalo, J. M., & Pandey, R. (2017). Rural development program in tribal region: A protocol for adaptation and addressing climate change vulnerability. *Journal of Rural studies*, *51*, 151-157.

Kolay, S. K., Pandey, P., & Mahant, S. D. (2015). Impact of climate change on tribal livelihood and culture. *Asian Man (The)-An International Journal*, *9*(1), 24-34.

Kujur, A., & Dhoundiyal, M.(2019) Climate Change and the Need for Forest Conservation: Deforestation and Forest Fires as Leading Threats in India. *International Journal*, *1*(4).

Mishra, P. K. (2017). Socio-economic impacts of climate change in Odisha: issues, challenges and policy options. *Journal of Climate Change*, *3*(1), 93-107.

Panda, A. (2017). Climate change, drought and vulnerability: A historical narrative approach to migration from Western Odisha, India. In *Climate change, vulnerability and migration* (pp. 193-211). Routledge India.

Patel, A., & Giri, J. (2019). Climate change, migration and women: analysing construction workers in Odisha. *Social Change*, *49*(1), 97-113.

Sinclair, V. G., & Wallston, K. A. (1999). The development and validation of the Psychological Vulnerability Scale. *Cognitive Therapy and Research*, *23*(2), 119-129.

Singh, A., & Sadangi, B. N. (2012). Livelihood Patterns and Resource Base of Tribals in Koraput and Rayagada District of Odisha. *Indian Research Journal of Extension Education*, *12*(1S), 307-12.

Tripathi, V. (2024). Climate Change and Its Impacts: Findings from a Perceptual Survey in a Tribal Population of India. *Sustainability and Climate Change*, *17*(2), 118-129.

Venus, T. E., Bilgram, S., Sauer, J., & Khatri-Chettri, A. (2022). Livelihood vulnerability and climate change: a comparative analysis of smallholders in the Indo-Gangetic plains. *Environment, Development and Sustainability*, 1-29.