

Alternative Skills and Livelihood Need and Opportunity for the Tea Tribe¹ and Adivasi Women to Mitigate Environment and Climate Change Impacts in Assam: A Pilot Study



August 2024



¹ In Assam, a sizable portion of the population prefers to refer to themselves as "Adivasi" and is known by that name, while the Scheduled Tribes of Assam are known as Tribe. This is especially true for those who have Scheduled Tribe status in other states of India and live primarily in village areas other than tea gardens.

Abstract

India's economy heavily depends on tea, with the state of Assam being the world's top producer of black tea. Millions of people's lives depend on the tea industry. There is a dearth of documentation that offers thorough spatial insights into the alternative livelihoods, in case their conventional source of livelihoods like tea plucking are threatened, primarily due to climate change. Hence, a thorough examination is necessary to determine vulnerability faced by those whose livelihoods depend on the tea landscape due to climate change. Therefore, by using a sustainable livelihoods method to examine the tea landscape of Assam's Jorhat area, this pilot research attempts to overcome this knowledge gap. Responses from women's sections of the tea tribe community were documented through semi-structured interviews, participant observations and Focus Group Discussion (FGD) techniques. In the face of climate change, findings within the tea industry segment show the level of readiness with alternative sustainable skills and livelihood options for the tea workers, who are majorly women. The study's conclusions emphasise the necessity of flexible and climate resilient initiatives, along with proactive assistance from stakeholders with development of necessary Indigenous and Traditional Skills (hereafter, ITS) and resource support, in order to ensure long-term socio-environmental sustainability and alternate livelihood sources in the face of incoming changing climate circumstances.

Key words: Tea, Tea Tribe, Climate change, Livelihoods, Women, Sustainability, Assam



I. Introduction

India is the world's largest consumer of tea (*Camellia sinensis*) as well as the second-largest producer of tea plantations. The tea industry is of considerable importance in the national economy in terms of revenue generation, earning foreign exchange, generating employment. In India, Assam, West Bengal, Kerala, and Tamil Nadu produce the most tea. During India's colonial era, the majority of tea workers descended from tribes and schedule castes that were sent from several Indian states to the tea estates as forced or bonded labour. In present times, the primary source of income for the majority of people living in tea gardens (workers and dependents) is tea garden wages. It is customary for tea plantation jobs to be passed down from generation to generation. After water, tea is the beverage that is consumed the most worldwide. One of the most extensively produced cash crops worldwide, it is planted in 58 nations on all five continents. With an estimated \$20 billion in value, the sector is vital to food security, poverty alleviation, and rural development. Tea is one of the most important cash crops worldwide and plays a significant role in rural development, poverty reduction and food security in developing countries²

Tea workers are heavily reliant on their employers because they have no access to alternatives for employment or education outside of the estates. The community of tea workers, also known by several nicknames as "tea garden coolie," "tea tribe," "drunkards," and so on, is made up of people whose primary source of income is labour from tea plantations. Because of their over-reliance on meagre and unstable income, dwindling social services, and a diminishing employment market, tea garden workers are afraid and apprehensive about their basic subsistence.

The state of Assam is the world's largest regional producer of black tea, and tea plays a significant part in India's economy. Assam, a state in northeast India, is the single largest tea growing region in the world, producing approximately 57% of India's tea (Tea Board of India, 2017) and providing some of the world's finest black tea (FAO, 2016)³. The tea industry in Assam has taken a significant hit due to the adverse effects of climate change, with provisional statistics from the Tea Board of India revealing a 36.99 million kg shortfall in tea production during the 2023-24 season compared to the previous year

² <https://www.fao.org/3/i5743e/i5743e.pdf>

³ FAO, 2016. Report of the Working Group on Climate Change of the FAO Intergovernmental Group on Tea.

(Businessworld, 2024). Assamese tea is registered as a ‘Geographical Indication’⁴ tagged product signifying the quality and importance of tea produced in this region. Millions of people depend on the tea business for their livelihoods, yet a number of socio-environmental issues are endangering the industry's ability to produce tea. Comprehensive spatial insights into the methods used in tea cultivation and the related lifestyles of tea dependent workers are scarcely documented. Furthermore, there has been no multi-level approach of the vulnerability of those livelihoods reliant on the tea landscape due to climate change. Due to climate change, serious ramifications are being felt within the Tea industry, such as by tea growers, and communities who depend on it for their own habitation. Climate change poses a major threat to the socio-environmental resilience of agricultural systems, which includes the tea landscape of Assam, particularly the production of premium tea products (FAO, 2016). Climate change impact could be experienced with variations in temperature as well as erratic and harsh weather conditions including severe rain, drought, hail, and frost. Climate change and global warming have adversely affected tea plantation in Assam for last few years⁵. It has reached to such a level that without irrigation, tea plantations are finding it difficult to survive.

Impact of climate change proves vulnerable to the tea dependent community and threatens their livelihood security. It is crucial to increase the incomes and resilience of tea garden communities to climatic shocks by providing support from various stakeholders to help them diversify their sources of income, create chances for savings, and hone their business acumen. The non-profit Council on Energy, Environment and Water has produced a climate vulnerability index in 2021, which shows that Assam is the most climate susceptible state in the nation. It ranks first with a vulnerability index score of 0.616, followed by Andhra Pradesh (0.483) and Maharashtra (0.478).

In a briefing paper on climate change and tea, the Ethical Tea Partnership (ETP)⁶ stated that the industry, as well as the farmers and communities that depend on it for their

⁴ A geographical indication is a designation applied to goods that originate in a certain area and have characteristics or a reputation unique to that area.

⁵ [assam global warming: Assam tea planters flag effects of climate change. global warming - The Economic Times \(indiatimes.com\)](https://www.indiatimes.com/assam-global-warming-Assam-tea-planters-flag-effects-of-climate-change-global-warming-The-Economic-Times/indiatimes.com)

⁶ The ETP is a membership organization that collaborates with governments, development agencies, and tea corporations to enhance the conditions of growers, laborers, and the environment.

livelihood, are presently facing/ face significant consequences. Consequently, this paper goes towards addressing sustainable means of alternative life skills and livelihood scope and opportunity for the women sections of tea tribe community to mitigate climate change impacts in Jorhat District, of Assam.

II. The Context

The population of Tea Tribe & Adivasi community is estimated to be around 7 million (70 lakhs) or nearly 20% of the total population in Assam (2011, Census)⁷. The community is one of the most marginalised and underprivileged communities in Assam and in India, who essentially work as labourers in the tea industry. The settlements are based in isolated locations which deepen backwardness and enable 'tea owners nay lords' to take advantage of the community. Various socio-environmental factors are threatening tea production and the livelihoods of millions of people reliant upon the industry (Biggs et al., 2018). Studies in Assam have found that an additional one degree above an average temperature of 28°C reduces tea yields by around 4%.⁸

Climate change and its impact on livelihoods of tea workers has been documented by researchers from time to time. Biggs et al. (2018) in their study find that many tea workers also identified climate change vulnerability issues threatening their ability to adequately sustain their livelihoods. It is further noted that these were not exclusively climate stresses (e.g. reduced rainfall and soil moisture; increase in occurrence of drought), but also associated increase in pest attacks to both crops (e.g. looper; trampling or consumption by wildlife) and human security (e.g. wildlife attacks on population), an increase in the prevalence of plant disease, and a biodiversity threat from deforestation.

There is research that looks into likely future climate change projections for northeast India, predicting further increases in temperature and uncertain variation in precipitation (Dash et al., 2012). Tea growers and their families run the risk of having less money and living in poverty if they solely rely on tea as a source of income as tea-growing regions

⁷ Census of India, 2011.

⁸ ⁹ https://www.researchgate.net/publication/309556078_Observing_climate_impacts_on_tea_yield_in_Assam_India

become less suitable. Therefore, diversifying their sources of food and revenue is another way tea dependant community can adjust to climate change. Research conducted by ETP and Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) in Kenya has identified alternative crops including passion fruit, banana and pea that could thrive in traditional tea growing areas, even under predicted levels of climate change⁹. By planting cash crops that can better withstand the impact of climate change, farmers can diversify their income streams and build resilience against extreme weather events¹⁰

In another study, Bigs et al. (2012) in their field research investigated the livelihoods of rural communities in Nawalparasi District, Nepal. Technique of assessment was used to assess community perceptions regarding factors which affected their livelihoods. Research findings indicated that important factors across communities included those related to water resources, education, health and roads. In their study, climate and environmental change were found to be impacting on livelihoods, and results indicated that education and environmental awareness were two key factors affecting a community's ability to adapt to change.

Because of the unique enviro-climatic niche conducive for tea production, , there are worries that climate variability and change may have a major influence on productivity, necessitating more flexible land management. Drought, for instance, might result in lower yields and a higher vulnerability to pest infestations (Dikshit and Dikshit, 2014). Maximum, minimum, and mean temperatures all show increasing trends, particularly for northeast India (Dash et al., 2007; Jain et al., 2013; Jhajharia and Singh, 2011). According to Jhajharia and Singh (2011), there has been a notable intra-regional decrease in the diurnal temperature ranges in South Bank and Upper Assam, but an increase in Cachar and North Bank. According to Duncan et al. (2016), in their study on 4 major Assam tea growing regions , it was found that longer stretches without precipitation have been linked to lower tea yields, while higher temperatures have been linked to higher production. Temperature rises are expected to be the primary way that future climate changes will affect tea production, necessitating adjustments to management strategies (Dutta, 2014).

⁹ <https://drive.google.com/file/d/1xUuPbBrJtaBmP82cRq-9u79q3kYCxmB/view>

¹⁰ Ibid

According to Biggs et al. (2018), tea growers are aware that climate change is having an effect on the tea landscape and endangering the livelihoods of tea workers. They contend that long-term tea sustainability requires a landscape-scale strategy. Han et al. (2016) assessed climate change globally in a sample of Chinese tea-producing cities at different latitudes, including Haikou, Kunming, Hangzhou, and Jinan. Climate change poses a major threat to the socio-environmental resilience of agricultural systems, which includes the tea landscape of Assam, particularly the production of premium tea products (FAO, 2016). Biggs et al.(2018) finds that the economic foreign exchange earnings of tea are under threat from adverse climate impacts which threaten productivity margins. Temperatures, precipitation variability, and the frequency of extreme weather events are likely to increase globally, including over the Indian subcontinent (Mathison et al., 2013).

Climate change disproportionately affects Tea Tribe/ Adivasi community in the North East Indian state of Assam. Their traditional livelihoods sources i.e., tea plucking, and other associated ancillary activities in tea garden plantations are being proved vulnerable to changing weather conditions and patterns. A society's or community's economic development still depends heavily on the idea of livelihood security. A community's social and economic development is under stress due to threats to livelihood prospect. This in turn contributes to their vulnerability in the absence of other viable means of subsistence. Tea garden earnings are the primary source of income for the majority of tea garden inhabitants (workers and dependents), although they provide secondary jobs for many more (Arjunan et al.,2018). Tea is one of the world's most important cash crops and contributes significantly to food security, poverty reduction, and rural development in developing nations. The tea plant, which scientists generally refer to as "self-adapting," has been severely impacted by a number of factors, including climate change, unpredictable rainfall, high temperatures, and high carbon dioxide levels. Since tea is mostly cultivated in rain-fed monocropping systems, where ideal growth is determined by weather, climate change is a significant environmental concern that has an impact on tea production and growth(Li et al., 2018). Biggs et al.(2018) asserts that little documentation exists which provides comprehensive spatial insights into tea production practices and associated livelihoods. Furthermore, they claim that there have been little multi-level

stakeholder solutions to the vulnerability of the tea landscape to climate change for those whose livelihoods depend on it.

Plantation work is a gendered space with females employed to pluck tea leaves, and males engaged in maintenance of estates (including pruning), factory work, pesticide application and weed removal (Duara and Mallick, 2012). Although the gender employment split in plantations is roughly equal, women are often in lower paid, irregular and informal employment (Mishra et al., 2011). With increased climate and market vulnerability, there is every possibility that women work force will be the first line of vulnerability with their garden work and jobs getting cut and reduced, thereby affecting their self and households adversely.

III. The Context of Field Study

The present pilot study explores and maps alternative skills, livelihood scope and opportunity for the Tea Tribe & Adivasi women in order to mitigate climate change impacts in Jorhat District of Assam in India's Northeastern Region. The research *initiative focuses on developing essential alternative sustainable livelihood skills and opportunities, ITS among the women from tea tribe community.*

Area of Study: The pilot study is conducted in the Jorhat district of Assam, located in the North Eastern Region of India. Located in the middle of the Brahmaputra Valley, Jorhat is an administrative district of the Indian state of Assam. Majuli to the north, Nagaland state to the south, Sivasagar to the east, and Golaghat to the west define the district's borders. The world's largest riverine island is formed by the Brahmaputra River and lies to the district's north. Formerly, the district of Sivasagar was divided into Jorhat. Jorhat was created as a distinct district in 1983 after being divided from Sivasagar District, Map 1.

MAP 1: JORHAT DISTRICT, ASSAM



Source: Maps of India

Jorhat is the hub of the tea business and is renowned for its vast tea gardens. The renowned Tocklai Tea Research Centre is located in Jorhat. Research is done here on the potential health benefits of green tea as well as novel tea types. There are total 88 tea estates in the Jorhat district.¹¹Demographic composition of these estates are of mixed nature comprising of Scheduled caste, Scheduled tribes, and tea tribes. For this study, 5 tea estates were selected. These are, Debrapara Tea Estate, Bahoni tea garden, Rajabari Tea estate, Dhopatbari Tea Garden and Kharakatia Tea Estate.

Objectives

- i. To map the understanding and preparedness of climate change and its impact on livelihood for the women from Tea Tribe & Adivasi community.
- ii. Map the alternative livelihood skills, ITS opportunities for the Women to build sustainable economic resilience against impacts of environment and climate change on tea cultivation, production and industry.

¹¹ [List of Tea Garden at Assam | Directorate of Tea Tribes and Adivasi Welfare | Government Of Assam, India](#)

Key Questions for Study

- i. What is the perception and understanding of the effects of environment and climate change on tea production and cultivation amongst women in tea gardens and within the tea sector in Assam?
- ii. How the incoming and impending changes in environment and climate have or will affect livelihood of the Tea Tribe & Adivasi community in general and women in particular?
- iii. What are the existing livelihood opportunities and scope of alternative sustainable options to explore, inclusive of traditional skills and activities for women.
- iv. How to build capacities and enhance skills to build resilience against environment and climate change within the tea sector and economy?

This study will provide valuable insights for a larger study by designing targeted interventions that economically empower women of the tea tribe community besides providing insights on the ways in which impact of climate change can be mitigated.

Methodology

The pilot survey is based on qualitative analysis. Data is collected by employing tools of Focus Group Discussions (FGDs) in order to explore collective knowledge about Indigenous and Traditional Skills (ITS) and potential livelihood options; Semi-structured Interviews and Participant Observation technique. Data Analysis is done by using Qualitative Analysis to identify key skills, knowledge areas, and potential livelihood pathways; and Skills Mapping for creating a visual representation of the skills and their potential connections to alternative livelihoods.

Sample Size: Each of the tea garden estates has several self-help groups (SHGs), and for this pilot study, 44 SHGs were identified. From these SHGs, respondents were selected for the pilot study.

The study chose 80 women members from the 44 SHGs for data collection. Purposive sampling¹² is used for data collection. The chosen women belonged to different age groups representing tea tribe community.

¹² In qualitative research, purposeful sampling is a technique used to choose a certain set of people or units for study. It is a random sampling methodology where the sample group is targeted to have specific attributes.

The 80 women members belonged to age group from 25-50 years. The entire women group is high school dropout. They live with their spouses and children and the family income level ranges from Rs 5000-10000 annually.

Findings

The pilot study has helped to map key aspects of the study objectives / questions, as stated above. The following discussion provides an analysis of the impact of environment and climate change on livelihood for the women from tea tribe community. A localised understandings of the vulnerabilities posed by climate change to the tea landscape and livelihood are captured in the following sections.

A. Prevailing perspectives on climate change affecting production and livelihood

Climate change poses a major threat to the socio-environmental resilience of agricultural systems, which includes the tea landscape of Assam, particularly the production of premium tea products (FAO, 2016)¹³. Due to the impact of climate change, production of tea leaves has gone down. Participants are also aware that because the cultivation of tea requires a particular enviro-climatic niche, climate variability and change may have a substantial impact on productivity, necessitating more adaptable land management. They believed that future climate impacts could affect tea production through temperature increases, and so their livelihood sources may become at stake. Participant group reported that altered rainfall patterns with respect to onset and increased intra-seasonal variability resulted in (i) altered yields as tea crops grew more slowly, which in turn affected the harvest of higher-value crops (first and second flush) as the growing season was shortened, (ii) waterlogging, which inhibited root development and increased soil erosion. Tea leaf growth was seen to recover poorly and slowly after section pruning, due to increased crop stress brought about by variations in temperature and rainfall. This had an impact on the timing and quality of the harvest. In this context, a woman participant says,

The tea cultivation has seen impacts posed by the unpredictable climate change. Rainfall pattern keeps on changing that in turn effects the quality of the soil and harvesting is not

¹³FAO, 2016. Report of the Working Group on Climate Change of the FAO Intergovernmental Group on Tea

done in a timely manner. Such pattern affects our involvement in the tea gardens as delay in harvesting of tea affects our livelihood security as we are dependent on tea for our daily wages.

B. Livelihood Landscape and Scope

It is observed that most of the women are housewives and some of them work as temporary workers in the tea gardens and other mini gardens which are privately owned. Their husbands work in the tea garden as daily wage workers. Since most of the women are housewives, their knowledge about alternate livelihood sources is limited. They have a desire to work and want to contribute to the household management but the resources including finances are limited to support them. They lack the opportunity to earn although they aspire to improve the living conditions of their families. They are keen to engage in alternative livelihood skills such as tailoring beautician course and so on. And they look forward to supportive measures and encouragement for such skills enhancement. All women in the study are high school dropouts and believe that they can be trained well in alternative livelihood skills with their little qualifications and knowledge about computer.

Earlier, women had voluntarily joined training session on tailoring and acquired skills. However, they couldn't continue it as a full-time profession due to the unavailability of capital and resources. They expressed their eagerness to start this work and business of tailoring as a group, if they get any infrastructural and financial assistance. Additionally, a small section of the women has acquired experience and knowledge in making pickle and incense sticks. They believed that their skills about different livelihood means would be beneficial if they expand in the form of business group, which may not fully support their families but would increase their financial independence and empowerment.

For instance, Parijat SHG which is in Borhula have 12 members in their group and eight of them are housewives. Others are tea garden workers. They had formed the SHG group in 2017. and actively work. Due to lack of resources, they couldn't progress much as a group. Each of the member in the group is trained and has acquired skills in making pickles, wafers, soap, incense sticks, holi colours made with flowers and other vegetables. Rakhi making and mushroom cultivation are recently added into their list of skills. They also sell their products in the markets and occasional trade fairs held in the

town. Such participation through various activities of the group have enhanced motivations and instilled a desire to contribute towards upliftment of the members as well as the community as a whole. Their consistent effort has also developed awareness and empowered to raise their voice on various social issues such as child marriage, school dropouts, domestic and other forms of violence etc. Each member of the group has different set of skills and look forward to start something in common which would encourage community spirit besides motivating them to work for a better future. They are looking out for support to establish and transform their different set of skills into business set ups.

Most of the groups have received financial assistance through different sources for development of their SHGs. From the interviews, it is found out that the women group had planned for starting animal husbandry but it did not materialise due to different hazards. A woman from the group, thus, says,

We are very much interested in learning new skills because it would not only utilise our time but would enable us to be efficient and become self-reliant financially in times of need. We have received a little financial support to develop animal husbandry skills. However, other factors like taking care, supervisions and space poses as hazards in realising goal.

Based on observations, it is found out that there is lack of activeness among the members of the groups and only a few women have the enthusiasm to do and learn about other livelihood skills. However, these women are also keen to be part of any livelihood training programme if only, it is provided to them at a free cost.

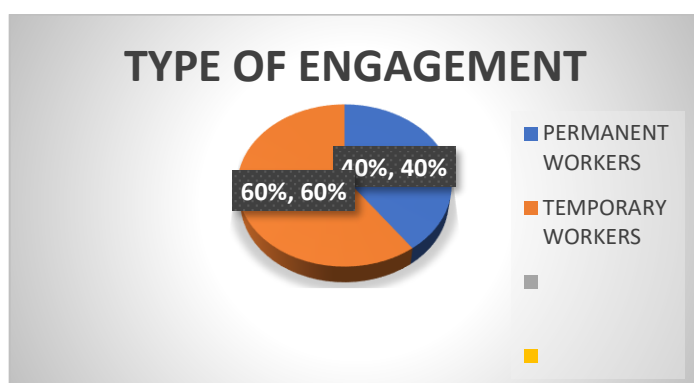
The female group representing the tea estate works and engages in farming on their own land. Besides, they participate in buying vegetable from the wholesale market and sell the same in daily and weekly markets like Rajabri market and Titabor Sunday market. A female member from one of the SHG owns a small hotel in the Rajabari Tiniali and makes items like sweets and bakeries to sell in her hotel. Furthermore, this participant also goes to the vegetable market to sell vegetables. The remaining women work in small private tea gardens. Most of them want to continue with their animal husbandry farming practice. They are keen to acquire and learn skills related to farming so that they can increase their production and sell it in big markets to earn profit to further a sustainable life.

Jyotirupa SHG which is in Bokahola was formed in the year 2016. Previously they used to get a sum of rupees 10,000 and 15,000 occasionally from welfare division of the tea estate. Most of the women are found to be working in the tea garden and do not find the time to engage in any other livelihood work. Like the other SHG groups, women also have livestock which they want to expand but lack the required support like training to expand them.

C. Diversification status according to type of work

Tea garden labor is without a doubt the primary employment in tea garden areas. These workers are separated into two categories: temporary and permanent employees. All year long, permanent employees are involved in the tea garden's operations. Conversely, casual laborers are only employed during the peak plucking seasons. The minimum is three months, and the maximum is nine months. They spend only six months a year, on average, participating in tea garden-related activities. To maintain their standard of living and stable their income, they engage in various activities throughout the lean seasons. These jobs could be in construction, retail, animal husbandry, agriculture and related fields, or wage-earning occupations. It's not like permanent employees don't have a variety of jobs. To support their families or to look for a better wage, they have also diversified. However, they have limited opportunities to diversify because they cannot spend too much time engaging in other activities. Given below in figure 1 is the structure of work engagement by the women in the tea gardens.

Figure 1



Source: Author's survey

As shown in figure 1 above it is observed that female work participation in the tea gardens is structurally divided with 40 per cent seems to be engaged permanently and majority of

them, i.e., 60 per cent are temporarily involved in the tea garden activities. They mostly work in group and their tasks includes plucking tea leaves which is the primary task for many. Under the supervision of the garden manager, they also perform tasks like weeding, and applying fertilizers or pesticides.

The permanent workers work in the tea garden throughout the year. During the harvesting season their main work is to pluck leaves along with cutting, weeding, and cleaning. There are different works that they need to do. They get paid leaves like the maternity leave. The temporary workers work for 6 months that is only during harvest season. These workers do not have any fix work in a particular garden. Their engagement depends on need based work in the gardens. They mostly work in the mini tea gardens that are privately owned. These workers get paid leaves, excluding the maternity leave. They leave their work during that time and start working whenever the season of harvesting arrives.

D. Diversification status according to type of work

Field observations justify the involvement of women in multi-tasking activities besides conventional engagement in tea gardens. Since figure 1 above proves that majority of the workers are temporary, it gives them immense space to engage in other sources of livelihood means. Various observations of the studied Tea estates points to the existence of diversified skills among the women. A few SHGs has provided them the platform to explore and promote their alternative livelihood skills. However, a systematic training programme in the relevant skills set would possibly empower them in every sphere. Developmental interventions would raise their socio-economic status in a timely manner and many alternative skills possessed by women could be strengthened to make an economically sustainable living. With regards to the livelihoods, all Tea estates reported some or the other form of diversified incomes. Animal husbandry emerged as the most common source of this income in two estates. For them, alternative livelihood activities are important within the tea landscape of Assam as tea cropping is under increasing external pressures, including climate change.

E. Diversification status according to type of work

In order to diversify income, field study reflected upon the desires of women group for learning new skills or developing their incomplete skills. To find a solution to such initiatives, they urge for setting up of skill development centres within or near tea garden. In such centres, communities can be provided vocational training on computer courses, entrepreneurship and so on to the women seekers. Such engagement would supplement their income with other activities in due process. Therefore, diversified livelihood practices would lead to adoption of various occupations by individual or households in search of better income, improved standard of living and reduced risk. A women head of a SHG, thus, cites,

Typically, one family member works as a permanent labourer on the tea plantation, while one or two additional family members work as seasonal labourers during periods of increased demand for labour. The permanent employees are paid INR 232 per day and often work 275–290 days a year. A maximum of 200 days of employment may be assigned to seasonal employees based on the needs of the garden. Most of the time, a household's income is less than INR 6,000. Such amount is very less to maintain a family. However, the changing climatic situations has altered the livelihoods as the work in the tea gardens dwindles due to low production or bad quality. There are reduced works and so does the wages gets reduced, which at times becomes difficult for a family to survive. In such a scenario, there are needs to diversify our income sources and it is better that we equip ourselves with other livelihood skills.

This explanation reveals that there is emphasis on capacity building programs that build capacity for women including marketable skills, entrepreneurship, financial literacy, and digital enablement. The women group opted for dairy-based livelihood options which may be a good fit for tea garden areas, improved agricultural technologies and practices that may help to bring out agriculture-based enterprises, Alternative crop cultivation such as rubber plantations, spices and orchards, and sanitary napkin production. Knowledge about digital platforms like mobile or Facebook among the women sections exists. However, they lack deeper knowledge about computer usage and the significance of the digital platforms. They look forward to support for skilling themselves in the same platform so that they find it as a sustainable medium of their livelihood in the future.

IV. Recommendations

This study requires multi-stakeholder insights into livelihood practices of the identified tea estates located in the Jorhat district of Assam. Field observations based on localised knowledge have highlighted the impacts that climate change may be having on livelihoods. With regards to the alternative livelihoods, all women reported some form of diversified incomes. However, they require sustainable approach of their alternative livelihood sources to fight against climate change impact on their regular sources of income.

There is evidence of prevailing alternative skills and it should be used to make more informed future strategies regarding best practice for alternative livelihood skills management under a changing climate condition. Facilitating alternative livelihood would enable the women community to diversify their income in difficult circumstances and empower them to face any challenges with confidence.

A coordinated approach whereby multiple actors within the tea sector can work together to facilitate climate-smart livelihood and adaptation measures will be essential to ensure the long-term socio-economic development of the women community.

V. Limitations of the Study

This study has been done for pilot observations, and hence one district is selected for the purpose. Evidence suggests that climate change has an impact on the tea production pattern which indirectly threatens livelihood of tea garden workers. In such situations, their knowledge of alternative livelihood sources is crucial to provide them a sustainable platform to meet their basic needs. Their understanding and approach and mapping in a single district may not introduce a wholistic picture to corroborate the underlying factors. Hence, a broader approach at policy level would be significant to realise the potential of elaborate research insights on the selected theme. These can be done by including more tea estates located in other districts of the region and engaging with a broader sample size, that would prove to be having a significant impact and justification to the given theme.

Furthermore, this brief study may not capture all ITS due to time constraints and study durations. Due to time constraints, the attempted study did not capture all ITS. Further

in-depth research is needed to validate findings and designing a comprehensive developmental intervention.

VI. Conclusion

This paper has presented a socio-economic development insights into women group from tea tribe community in Jorhat district of Assam. This pilot research has also highlighted the impacts that climate change may be having on tea production through localised knowledge, and the subsequent effects this is having on livelihoods. The delineated insights provide indicative evidence as to prevalence of climate change impact on tea cultivation and livelihood sources. However, women are attempting to sustain themselves by honing their ITS, which indirectly prepares them for taking constructive measures towards mitigating environment and climate change impact. The information provided in our article should be put to use in order to guide policy assistance towards improving sustainable livelihoods in northeast India and to help shape future policies about best practices for managing alternative livelihoods in the face of climate change.

References

- Arjunan.,Dr.R Arjunan ., Gayathri.P ., 2018. Livelihood Security of tea plantation workers, IJRAR December 2018, Volume 5, Issue 04. www.ijrar.org (E-ISSN 2348-1269, P- ISSN 2349-5138)
- Biggs, E.M., Watmough, G.R., 2012. A community-level assessment of factors affecting livelihoods in Nawalparasi District, Nepal. J. Int. Dev. 24, 255–263. <http://dx.doi.org/10.1002/jid.1844>.
- Biggs,E.M., Guptac,Niladri , D,Sukanya. Saikiad, M.A.,John, Duncana, 2018. The tea landscape of Assam: Multi-stakeholder insights into sustainable livelihoods under a changing climate, Environmental Science and Policy, [Volume 82](#), April, Pages 9-18
- Bussinessworld ,2024 (online).Climate Change Sparks 36.99 Mn Kg Tea Shortfall In Assam's 2023-24 Production .[Climate Change Sparks 36.99 Mn Kg Tea Shortfall In Assam's 2023-24 Production \(businessworld.in\)](https://businessworld.in)

- Dash, S.K., Sharma, N., Pattanayak, K.C., Gao, X.J., Shi, Y., 2012. Temperature and precipitation changes in the north-east India and their future projections. *Glob. Planet. Change* 98–99, 31–44. <http://dx.doi.org/10.1016/j.gloplacha.2012.07.006>.
- Dash,S.K.,Jenamani,R.K.,Kalsi,S.R., Panda.,S.K.2007.Some evidence of climate change in twentieth-century India *Clim. Change*, 85 , pp. 299-321, [10.1007/s10584-007-9305-9](https://doi.org/10.1007/s10584-007-9305-9)
- Dikshit,K.R., Dikshit.,J.K,2014,North-East India: Land, People and Economy, *Advances in Asian Human-Environmental Research* Springer, Netherlands, Dordrecht , [10.1007/978-94-007-7055-3](https://doi.org/10.1007/978-94-007-7055-3)
- Duara, M., Mallick, S., 2012. Tea industry in Assam (India): issues of migration and gender discrimination. *Int. Proc. Econ. Dev. Res.* 54, 174–177.
- Duncan,J.M.A.,Saikia,S.D.,Gupta,N.,Biggs,E.M 2016.Observing climate impacts on tea yield in Assam, India.*Appl. Geogr.*, 77 pp. 64-71, [10.1016/j.apgeog.2016.10.004](https://doi.org/10.1016/j.apgeog.2016.10.004)
- Dutta.,R .2014.Climate change and its impact on tea in Northeast India *J. Water Clim. Change*, 5 , p. 625, [10.2166/wcc.2014.143](https://doi.org/10.2166/wcc.2014.143)
- FAO, 2016. Report of the Working Group on Climate Change of the FAO Intergovernmental Group on Tea.
- Han, W. Y., Li, X., Yan, P. and Ahammed, G. J. 2016. Impact of Climate Change on Tea Economy and Adaptation Strategies in China. Report of the Working Group on Climate Change of the FAO Intergovernmental Group on Tea. Food and Agriculture Organization of the United Nations, Rome, pp 61–77
- Jain,S.K.,Kumar,V.,Saharia.,M 2013.Analysis of rainfall and temperature trends in northeast India.*Int. J. Climatol.*, 33 (2013), pp. 968-978, [10.1002/joc.3483](https://doi.org/10.1002/joc.3483)
- Jhajharia,D, Singh.,V.P.2011.Trends in temperature, diurnal temperature range and sunshine duration in Northeast India *Int. J. Climatol.*, 31 (2011), pp.1353-1367, [10.1002/joc.2164](https://doi.org/10.1002/joc.2164)
- Mathison, C., Wiltshire, A., Dimri, A.P., Falloon, P., Jacob, D., Kumar, P., Moors, E., Ridley, J., Siderius, C., Stoffel, M., Yasunari, T., 2013. Regional projections of North Indian climate for adaptation studies. *Sci. Total Environ.* 468–469. <http://dx.doi.org/10.1016/j.scitotenv.2012.04.066>. S4-S17.

- Mishra, D.K., Sarma, A., Upadhyay, V., 2011. Invisible chains? Crisis in the tea industry and the unfreedom of labour in Assam's tea plantations. *Contemp. South Asia* 19, 75–90. <http://dx.doi.org/10.1080/09584935.2010.549557>.
- Tea Board of India, 2017. Statistics Section [WWW Document]. Accessed 29 November, 2017. <http://www.teaboard.gov.in>.
