Asian Journal of Agricultural Extension, Economics & Sociology

38(7): 34-44, 2020; Article no.AJAEES.58746
ISSN: 2320-7027

Impact of Altitude on the Livelihood of the Tea Garden Workers of North Bengal

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Authors' contributions

This work was carried out in collaboration between both authors. Author DJ wrote the first draft of the manuscript, collected data and done the statistical analysis. Author SKA designed the study, helped in interpretation and supervised the work. Both authors read and approved the final manuscript.

Article Information

DOI: 10.9734/AJAEES/2020/v38i730373
Editor(s):
(1) Dr. Mohammad Aslam Ansari, G. B. Pant University of Agriculture & Technology, India.
Reviewers:
(1) Maiwada, Zebulun Dauma, Abubukar Tafawa Balewa University, Nigeria.
(2) Mamudu Hamidu, Kumasi Technical University, Ghana.
Complete Peer review History: http://www.sdiarticle4.com/review-history/58746

Original Research Article

Received 01 May 2020
Accepted 06 July 2020
Published 17 July 2020

ABSTRACT

A spectrum of variance has been observed in the dynamics of ecology, economy and sociology, while perceiving the difference in altitude of Himalayan terrains. Every level of elevation and slope, it has got its distinctive narratives and demeanor that shapes its economic progress and social interventions. The tea industry is sensitive to climate and geography, and with every drop in the elevation from the high-altitude Darjeeling district tea garden (2042 m) to the mid-elevation Kalimpong district tea gardens (1247 m) to the foothills of the Dooars tea garden (90 -1750 m), each has a distinctly unique story to unravel. The present study takes a look into the socio-ecological aspects along with climate change to observe the topographical terrains in the 3 distinctive altitudinal zones of Darjeeling, Kalimpong and Dooars, beyond its structural aspects thereby offering a cluster interpretation on its pattern of change in livelihoods by selecting the operating variables: Age, Family size, Formal education, Status of home, Nutritional status, Wage, Income, Per capita income, Diet, Mobile use, Interaction with office personnel, among other things, as variable of interest. It is observed that the wages, diet, status of home are the governing factors affecting the livelihood choices at most of the altitudinal zones. Therefore, the study shows the effect of these variables on each of the zones uniquely to understand the grave issues of the tea gardens concerning the livelihood of the garden workers.

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Keywords: Altitude; livelihood; status of home; wage; diet.

1. INTRODUCTION

A difference in the topography and altitude is not just a geographical or physical characteristic of a region, but it characterizes the social, economic and cultural aspects of the inhabitants of the people living in that particular region. The distinct features discerning the change in altitude are high, middle or low altitude that can be observed in all walks of life and helps in better understanding the scenario and the on-ground reality of the region [1]. Livelihood plays a determining role in molding the identity of an individual in a society. Without a better livelihood, it is impossible to aim for a better quality of life. Livelihoods may be defined as the means by which households obtain and maintain access to the resources necessary to ensure their immediate and long-term survival. The factors essential for livelihood can be classified into six categories: physical, natural, human, financial, social and political [2]. The ecology of the tea garden basks in the glory of having a discernibly idiosyncratic geographical features, biological setting and social configuration. The contrasting geographical and ethno-social aspects of the Darjeeling tea ecology and the Dooars tea ecology tell a unique story about the tea industry of the two distinct regions. Regardless of the difference in the region, the niche areas of tea gardens have a natural water network, the river and riverine systems, the pool of floral and faunal populations and the rich legacy of multilingual ethnic and cultural diversities. The plantation of tea has been an anthropogenic phenomenon and has been triggered by new processes, ecological change mutation as well as transformation [3]. Tea plantations are one of the many kinds of plantations, such as coffee, Cinchona, rubber, banana and others, providing livelihood to the rural poor. But, perhaps no other plantations are as well organized as the tea plantation; also no other plantation provides as many employments as does the tea plantation. The tea industry has played a pivotal role in India's economy by providing livelihood to thousands of households through direct employment as well as indirect sustenance in the form of ancillary jobs [4].

Livelihood has been thought of as a parameter that has been aloof from the geospatial arena but the livelihood changes that we have observed over the years has a lot to do with the respective altitudinal zones especially concerning tea which has a unique microclimate of its own, the changing wave of livelihood shift from the ongoing tea plantation has been a topic of discussion in the tea industry. Geo-ecological stability of a place has an important role in contributing to the livelihood security of its people. A disturbance to the geo-ecology of a region jeopardizes the livelihood resources of the population and creates pressures for livelihood security [5]. The shift from the traditional agricultural occupational space to other services has been an excruciating sight to witness, to observe the root cause of the paradigm shift we need to regard each of the ecosystems as a unique one that is intertwined with its respective physical, biological, ecological and sociological factors, thereby apprehending the stimulus that led to the current livelihood changes.

2. METHODS

2.1 Respondents

Respondents included in the survey have been 90 tea garden workers from different altitudinal zones of Darjeeling district, Kalimpong district and Dooars. Precisely, 30 respondents from each altitude region. Systematic random sampling was followed to select the respondents.

2.2 Research Locale and Sampling

Table 1 presents the sampling technique and sampling design for the study wherein Darjeeling, Gorubathan from the Kalimpong district and Dooars - all belonging to the north Bengal region - were purposively selected for the study. The tea gardens located at the different regions like the Risheehat tea estate, orange valley tea estate and Chong tong tea estate were randomly selected from the Darjeeling district whereas the Badafagu tea estate, Ambiok tea estate and Mission Hill tea estate were randomly selected from the Kalimpong district, Lastly, the Chota fagu tea estate, Rungamuttee tea estate and Meenglass tea estate were selected randomly from the Dooars region. The area had been selected due to:

- The appropriate scope for collecting relevant data for the present study.
- Acquaintance with the local people as well as the local language.

- The concerned area was easily accessible to the researcher in terms of place of Residence.
- The area was very easily accessible to the researcher in terms of transportation.
- The closure familiarities of the student researcher with the area, people, officials and local dialects.

Purposive as well as simple random sampling techniques have been followed for the study. For the selection of state, district, purposive sampling technique was adopted because the area was ideal for studying the altitudinal dimensions of tea garden as the study area ranges from the highest elevation of 2042 m to lowest elevation of 90 m; also the convenience factor for the researcher in terms of accessibility and infrastructural facilities was taken into consideration, whereas for the selection of tea gardens and respondents simple random sampling technique was taken up.

2.3 Pilot Study

Before taking up actual fieldwork a pilot study was conducted to get an insight into the area, its people, institution, functioning, communication and extension system and the knowledge, perception and attitude of the people towards sociological and ecological changes. An outline of the socio-economic background of the tea estate and its workers, deeper knowledge about their perception on biodiversity, climate, nutritional aspects, production and income aspects etc., helped in the construction of reformative working tools.

2.4 Preparation of Interview Schedule

Based on the findings of the pilot study a preliminary interview schedule was formed with the help of the literature and by the assistance of Chairman of Advisory Committee.

2.5 Pre-testing of Interview Schedule

The objective of pretesting is to detect the discrepancies that have emerged and to remove them after necessary modification in the schedule. It also helps identify whether the questions are logically organized, the replies could properly be recorded in the space provided for or there is any scope for further improvement. After conducting pretesting appropriate changes and modification of the interview schedule have been made. The individuals who responded in pretesting have been excluded in the final sample selected for the study.

2.6 Techniques of Field Data Collection

The respondents were personally interviewed from October 2018 to June 2019 and November 2019. The items were asked in Nepali and Hindi version in a simple language so that the members could easily decipher. The entries were done in the schedule by student investigator herself at the time of interview.

Table 1. Sampling technique and sampling design (N=90)

Step	Items	Level	Approach
1	State	West Bengal	Purposive
2	District	➢ Darjeeling	Purposive
		➢ Kalimpong	Purposive
		➢ Jalpaiguri(Dooars)	Purposive
3	Tea gardens	Darjeeling district	
		a. Orange Valley tea estate	Random
		b. Risheehat tea estate	Random
		c. Chong tong tea estate	Random
		Kalimpong district	
		a. Ambiok tea estate	Random
		b. Badafagu tea estate	Random
		c. Mission Hill tea estate	Random
		Jalpaiguri district(Dooars)	
		a. Chotafagu tea estate	Random
		b. Meenglass tea estate	Random
		c. Rungamuttee tea estate	Random
4	Respondents	90	Random

2.7 Variables and Their Empirical Measurements

Several researchers pointed out that the behaviour of an individual has been understood more in-depth if one has the knowledge of some variables, which is comprised of elements of reality. The socio personal, agro-economic, socio-psychological and communication variables are such type of variables, which determine the behaviour of an individual. Appropriate operationalization and measurement of the variables help the researcher to land upon the accurate conclusion. Therefore, the selected variables for this study had been operationalised and measured in the following manner.

Variables in the present study have been categorized into two main categories.

- Independent variables.
- Dependent variables.

Independent variables:-The variables and their empirical measurements.

Age (x_1): In all societies, age is one of the most important determinants of social status and social role of the individual. In the present study, the number of years rounded in the nearest whole number the respondent lived since birth at the time of the interview, was taken as a measure of the age of the respondent.

Family size (x_2): The number of members in the family helps determine the viability and ability of the respondent's income towards the fulfilment of their family member's needs and desires.

Formal education(x_3): Formal education is a parameter that determines the formal educational level of an individual; thereby determine the literacy levels of the respondents.

Status of home (x_4): Home provides security, control, belonging, identity, and privacy, among other things. The status of home determined via the kaccha or pakka house status also the number of rooms, the floor space and the size of the homestead helps in analyzing the economic stature of the respondents.

Nutritional status (x_5): The nutritional status of an individual is usually a result of multiple factors that interact with each other at different levels. Recognizing the role of diet at the onset of many diseases and assessing the nutritional status of an individual, family and community are important for public health. The nutritional assessment is done to obtain information about the prevalence and geographic distribution of nutritional disorders within a community or a specified population group. The nutritional status is judged in terms of the food intake the proportionality of the carbohydrates, proteins, vegetables and fruits in one's diet.

Wage (x_6): Wage is an important parameter that always is a part of the discussion in the tea industry. One of the most important aspects of a job for most workers is the wage it pays. Wages allow workers to make a living from their labour. They also provide incentives to be productive and loyal to an employer. In a broader sense, the wages workers earn fuel the economy.

Income (x_7): Income is money (or some equivalent value) that an individual receives, usually in exchange for providing a good or service. Income for the respondents is the overall source of income for them including all the other sources besides tea.

Per capita income(x_8): Per capita income concerning the respondents is the ratio of the total amount of income earned by the respondent divided by the total number of family members. It assists to evaluate the standard of living and quality of life of the population

> Per capita income=Total income/Total no of family members

Diet(x_9): Diet as a parameter is categorized under the expenditure every month to get a deeper insight into the dietary expenses of the respondents, as diet is an important element which is essential for one's survival. Hence the expenditure on diet is a necessity but how much is being spent is the question of privilege and financial accessibility.

Treatment(x_{10}): Treatment is dealt with as an expenditure aspect i.e. the amount of income that the respondent spends on himself and his family's treatment every month. This gives an insight into the obligatory financial responsibilities of the respondents, which throws light onto his financial stability.

Mobility(x_{11}): The financial expenses on transportation on a day to day basis for the respondents. The cost of mobility in a month for the respondents can be huge or negligible depending on his financial security

Entertainment (x_{12}): The expenditure of the respondents on Entertainment on a monthly basis gives an insight into the financial well being of the respondents as entertainment is not a necessity but a matter of privilege for many.

Garments(x_{13}): The amount of expenditure the respondents spend on the garments highlights the financial well being of the respondents. It is judged as per the monthly expenditure of the respondents on the garments.

T.V. watching (hrs) (x_{14}): The amount of time that the respondents spend in their leisure time of watching television determines the ease of living of the respondents that are mostly female. It is expressed in terms of hours per day.

Mobile use (hrs) (x_{15}): This total amount of time the respondents spend on their mobile phones, determining the technological up-gradation of the respondents. It is expressed in hours per day.

Interaction with office personnel (hrs) (x_{16}): It determines the amount of time that the tea workers interact with their office and managerial personnel. It is expressed in hours per day.

Interaction with others (hrs) (x_{17}): It determines the amount of time that the tea workers interact with their others besides their colleagues and tea estate workers. It is expressed in hours per day.

Perceived change in livelihood (y): A livelihood is a means of making a living. It encompasses people's capabilities, assets, income and activities required to secure the necessities of life. A change in is likely observed in the tea industry that has complained of high absenteeism and labour shortage. Livelihood is sustainable when it enables people to cope with and recover from shocks and stresses and enhance their well-being and that of future generations without undermining the natural environment or resource base. The perceived pattern of change in livelihood, the causes and repercussions faced are unique for every ecosystem.

3. RESULTS

3.1 Correlation Analysis

The co-efficients of correlation were computed to first assess the linear relationship between Perceived change in livelihood(y) and 17 exogenous variables. Table 2 presents:

- Family size (x_4) has been recorded to have the highest r-value for the high altitude region in association with the Perceived change in livelihood (y).
- Status of home(x_4) has been recorded to have the highest r-value for the mid-altitude region in association with the Perceived change in livelihood (y).
- Nutritional status (x_5) has been recorded to have the highest r-value for the low altitude region in association with the Perceived change in livelihood (y).
- Garments(x_{13}) have been recorded to have the highest r-value for the pool data i.e. for the amalgamation of the entire region in association to the Perceived change in livelihood (y).

3.2 Regression Analysis

Table 3 presents the Multiple Regression Analysis wherein 17 causal variables have been regressed against the consequent variable y (Perceived change in livelihood).

- The R^2 value being 54.7 per cent for the Darjeeling region, we can infer that with the combination of these 17 causal variables, 54.7 per cent of variance embedded with consequent variable y has been explained.
- The R^2 value being 58 per cent for the Kalimpong region, we can infer infer that with the combination of these 17 causal variables, 58 per cent of variance embedded with consequent variable y has been explained
- The R^2 value being 74.7 per cent for the Dooars region, we can infer infer that with the combination of these 17 causal variables, 74.7 per cent of variance embedded with consequent variable y has been explained
- The R^2 value being 23.1 per cent for the pool data, we can infer infer that with the combination of these 17 causal variables, 23.1 per cent of variance embedded with consequent variable y has been explained.

Inclusion of more number of variables or higher level of consistency in the variable selected could have contributed to a higher level of variance explained.

Table 2. Comparative study of the co-efficient of correlation (r)

Serial number	Variables	Darjeeling (r-value)	Kalimpong (r-value)	Dooars (r-value)	Pool data (r-value)
1	Age (x_1)	-0.077	-0.072	0.304	-0.006
2	Family size (x_2)	0.402*	0.260	-0.228	-0.048
3	Formal education (x_3)	0.173	-0.100	-0.243	0.076
4	Status of home (x_4)	0.077	-0.439*	-0.478**	-0.115
5	Nutritional status (x_5)	-0.348	-0.038	-0.488**	-0.102
6	Wage (x_6)	-0.038	-0.047	-0.271	0.026
7	Income(x_7)	-0.126	-0.047	-0.271	0.172
8	Per capita income (x_8)	-0.350	-0.253	0.054	0.108
9	Diet (x_9)	-0.126	0.000	-0.217	0.065
10	Treatment (g) (x_{10})	0.223	-0.072	0.128	0.141
11	Mobility (x_{11})	-0.093	-0.129	0.144	0.204
12	Entertainment(x_{12})	-0.045	-0.112	-0.158	0.201
13	Garments (x_{13})	0.053	-0.049	-0.351	0.271**
14	T.V. watching (x_{14})	0.254	-0.047	-0.240	-0.103
15	Mobile use(x_{15})	-0.080	-0.283	-0.209	0.068
16	Interaction with office personnel (x_{16})	0.053	-0.034	-0.288	0.180
17	Interaction with others (x_{17})	0.074	0.351	0.285	0.181

**Correlation is significant at the 0.05 level; **Correlation is significant at the 0.01 level*

Table 3. Comparative study of the multiple analysis

Serial. no	Altitude	R^2 value	Standard error of estimate
1	High altitude	54.7%	13.33
2	Mid-altitude	58%	13.33
3	Low altitude	74.7%	9.49
4	Pool data	23.1%	14.04

3.3 Stepwise Regression Analysis

Table 4 presents the stepwise regression wherein

- Family size (x_2) and Nutritional status (x_5) have been recorded to be the retained variable and has contributed 16.2 per cent of the total variable explained for the high altitude region in association to the Perceived change in livelihood(y).
- Status of home(x_4) has been recorded to be the retained variable and has contributed 19.3 per cent of the total variable explained for the mid-altitude region in association to the Perceived change in livelihood (y).
- Nutritional status(x_5) has been recorded to be the retained variable and has contributed 23.9 per cent of the total variable explained for the low altitude region in association to the Perceived change in livelihood (y).
- Status of home (x_4) and Garments(x_{13}) has been recorded to be the retained variable for the pool data i.e. for the amalgamation of the entire region and has contributed 11.5 per cent of the total variance explained, in association to the Perceived change in livelihood (y).

Table 4. Comparative study of the stepwise regression analysis

Sl. no	Altitude	Variables	Reg. Coef. B	S.E. B	Beta	t value	R^2
1	Higher altitude	a)Family size(x_2) b)Nutritional Status (x_5)	4.839 -.002	1.945 .001	.405 -.351	2.488 -2.15	16.2%
2	Mid altitude	Status of home (x_4)	-9.379	3.626	-.439	-2.58	19.3%
3	Low altitude	Nutritional status(x_5)	-.407	.138	-.488	-2.96	23.9%
4	Pool data	a)Garments(x_{13}) b)Status of home (x_4)	.019 -3.474	.006 1.733	.332 -.211	3.153 -2.00	11.5%

Table 5. Comparative study of direct, indirect relationship of perceived change in livelihood (y) vs.17 independent variables (x_1-x_{17}) for the Darjeeling, Kalimpong, Dooars and an amalgamation of all the tea gardens of the difference altitudinal zones

Variables/	Darjeeling		Kalimpong		Dooars		Pool data	
Effect	**Direct**	**Indirect**	**Direct**	**Indirect**	**Direct**	**Indirect**	**Direct**	**Indirect**
Age (X_1)	-0.085	-0.045	0.444	-0.516	0.002	0.195	-0.003	-0.003
Family size (X_2)	-0.012	-0.125	0.843	-0.583	-0.004	0.164	0.005	-0.053
Formal education (X_3)	0.412	-0.267	0.659	-0.758	-0.003	0.191	0.043	0.033
Status of home(X_4)	-0.147	0.211	-0.513	0.074	-0.017	0.539	-0.122	0.007
Nutritional status (X_5)	-0.29	-0.056	0.072	-0.11	-0.004	0.370	-0.077	-0.025
Wage (X_6)	0.143	0.03	0.304	-0.305	-0.231	0.232	-0.107	0.133
Income(X_7)	0.283	0.091	-0.260	0.259	0.232	-0.231	0.36	-0.188
Per capita income(X_8)	0.013	0.34	0.086	-0.111	-0.039	-0.302	-0.069	0.177
Diet(X_9)	-0.314	0.629	-0.240	0.240	0.004	0.372	-0.478	0.543
Treatment (X_{10})	0.102	0.338	-0.827	0.755	0.432	0.506	-0.019	0.16
Mobility(X_{11})	0.881	-0.53	-0.107	0.094	0.029	0.456	0.169	0.035
Entertainment(X_{12})	-0.119	0.140	-0.8	0.688	0.029	0.195	0.134	0.067
Garments(X_{13})	0.824	-0.439	-0.925	0.876	0.039	0.681	0.266	0.005
T.V. watching (X_{14})	-0.208	0.243	0.186	0.139	-0.002	0.116	-0.006	0.109
Mobile use(X_{15})	-0.155	-0.237	-0.499	0.216	-0.008	0.130	-0.15	0.218
Interaction with office personals (X_{16})	-0.33	0.504	-0.682	0.648	-0.009	0.359	-0.127	-0.053
Interaction with others(X_{17})	-0.044	-0.081	-0.453	-0.102	-0.128	0.006	0.235	-0.054

3.4 Path Analysis

In Tables 5,6 the Path analysis decomposes the total effect into direct, indirect and residual effect of Perceived change in livelihood (y) vs. 17 exogenous variables.

- Wage (x_6) has been recorded to have the highest direct effect and indirect effect for the high altitude region in association to the Perceived change in livelihood (y) with a residual effect of 37.56 per cent.
- Garments(x_{13}) have been recorded to have the highest direct effect and indirect effect for the mid-altitude region in association to the Perceived change in livelihood (y) with a residual effect of 41.6 per cent.
- Treatment (x_{10}) and status of home (x_4) has been recorded to have the highest direct effect and indirect effect for the low altitude region in association to the Perceived change in livelihood (y) with a residual effect of 25.3 per cent.
- Diet(x_9) has been recorded to have the highest direct effect and indirect effect for the pool data i.e. for the amalgamation of the entire region in association to the Perceived change in livelihood (y) with a residual effect of 76.92 per cent.

Table 6. Comparative study of residual effect of perceived change in livelihood (y) vs.17 independent variables (x_1-x_{17})

Altitude	Highest direct value	Highest indirect value	Residual effect
Darjeeling(high)	Wage	Wage	37.56%
Kalimpong(mid)	Garments	Garments	41.6%
Dooars(low)	Treatment	Status of home	25.3%
Pool data	Diet	Diet	76.92%

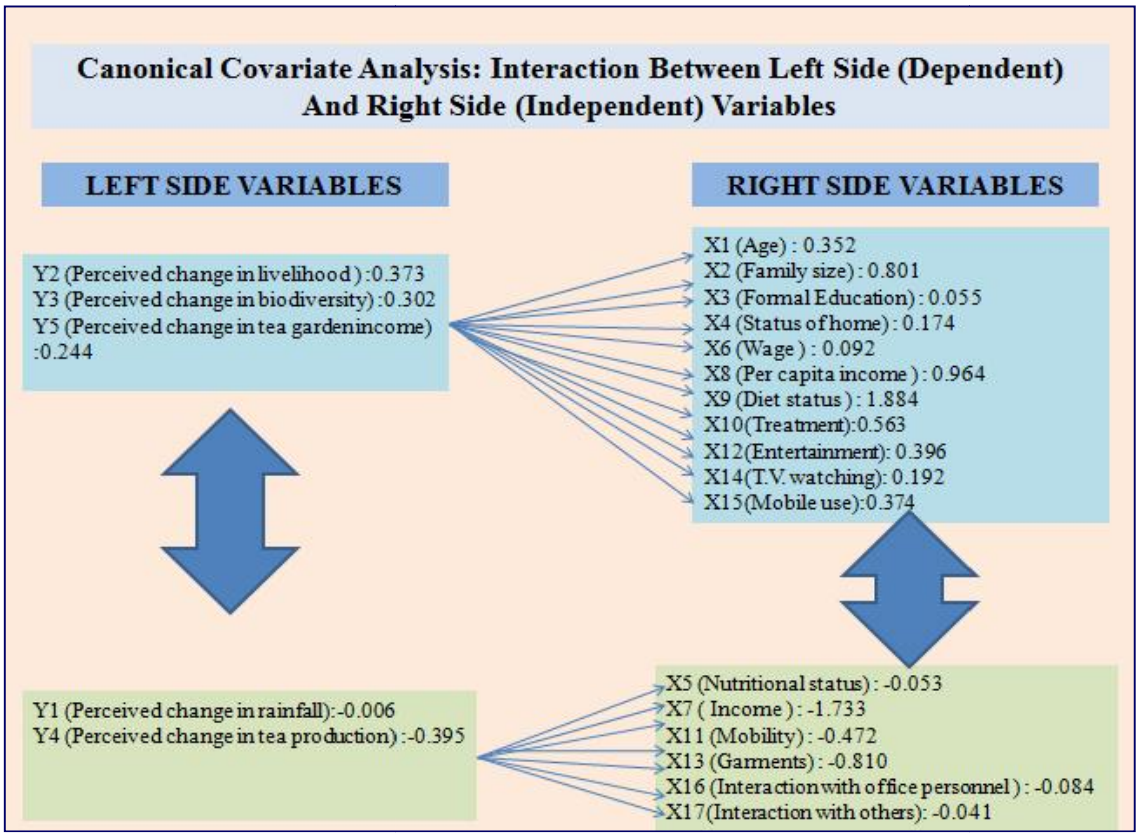

Fig. 1. Canonical discriminant function coefficients for x_1-x_{17}

3.5 Canonical Discriminant Function Analysis with Critical Variables

Fig.1 presents the Canonical covariate analysis to derive into the interaction pattern between two sets of variables based on mutual and reciprocal regression between two sets of the variable.

The table envies that three dependent variables Perceived change in livelihood(y), Perceived change in biodiversity (y_3),Perceived change in tea garden income(y_5)are moving together and they are dovetailed to the following right side independent variables Age (x_1), Formal Education(x_2), Family size(x_3), Status of home(x_4), Wage(x_6), Percapitaincome(x_8) Diet(x_9), Treatment(x_{10}), Entertainment(x_{12}), T.V.Watching (x_{14}) and Mobile use (x_{15}). To scale up Perceived change in livelihood(y_2), Perceived change in biodiversity (y_3),Perceived change in tea garden income(y_5) the functionality of dependent variable viz., Age (x_1), Formal Education(x_2), Family size(x_3), Status of home(x_4), Wage(x_6), Per capita income(X_8) Diet(x_9), Treatment(x_{10}), Entertainment(x_{12}),T.V. Watching (x_{14})and Mobile use (x_{15}) are quite discernable.

Similarly, the other one dependent variables Perceived change in rainfall (y_1) and Perceived Change in tea production (y_4) is dovetailed to the following right-side variables Nutritional Status(x_5), Income (x_7), Mobility(x_{11}), Garments(x_{13}), Interaction with office Personnel (x_{16}) and Interaction with others(x_{17}).To scale up the Perceived change in rainfall (y) and perceived change in tea production (y) the functionality of dependent variables Nutritional Status (x_5), Income (x_7), Mobility(x_{11}), Garments(x_{13}), Interaction with office Personnel (x_{16}) and Interaction with others(x_{17}) are quite discernable.

4. DISCUSSION

The result unveils the unique dynamics between family size and livelihood; the family size can be regarded as a pivotal factor in judging an individual's livelihood choices, especially the respondents having a larger family size are more susceptible to livelihood change as they have more mouths to feed; hence their legit quest for a more stable income source leads to high migration of the people from the high altitude region (Darjeeling) to the cities as shown by the r value and the retained value of regression for the high altitude. This growth in population has resulted in increased unemployment in tea plantations while the gradual decline of the Darjeeling tea industry has affected the sustainable livelihoods of all plantation workers. To add to their woes, the tea plantations in the Darjeeling District find themselves at the crossroad in the brewing tea market crisis resulting from stiff competition from other tea producing countries, steady decline in tea-price and increasing costs of production in India. This situation has led people to search for other means of livelihood support including the tapping and depletion of other natural resources such as forest, vegetation and land. Due to lack of money to buy fuel, people are targeting adjacent forests for fuel wood and slope land is being used for cultivation; thereby, accentuating damages to the local ecology [6]. The gradual decline of the Darjeeling tea industry from strong international competition, increasing production and labour costs, and declining productivity, and other factors, has affected the sustainable livelihoods of plantation workers [7]. In dealing with the enhanced livelihood options in the hills, Gardner notes that in western India the growth of the tourism industry has brought increased employment and enhanced the local economy through a blossoming of the hotel and transport industries. Similarly, in the last decade, the growth of tourism in Darjeeling District has provided both skilled and unskilled jobs to a growing number of unemployed people in the area, besides creating ancillary jobs in hotels, tourist travel, trekking, transport, etc. In the last three decades, the increasing population and unavailability of work on the tea plantations have compelled many plantation residents to search for new livelihood options [8]. Wage is a factor having the highest direct and indirect effect, as the livelihood stability goes parallel with the wage (income stability) in the long run for the survival. Wages have stagnated while living costs have increased sharply. Workers' savings are almost non-existent, increasing their insecurity and vulnerability, and many are forced to take on extra work to supplement their wages [9].

The status of home throws light into the vulnerability of the individual's engaged in low-income livelihood as shown by the r value and the retained value of regression for the mid-altitude region. Insufficiency of the current livelihood status to meet the day to day needs increases the labour migration, moreover, the mid-altitude region does not possess the tourism opportunities and beneficiaries like its counterparts. The other variable Garments have

the highest direct and indirect effect, as the garment implies to the status quo of the respondents, the frequency of purchase of the garments dovetails the financial capability of their current means of livelihood. With a large portion of their earnings going to procure bare necessities, workers find that they have little money left for expenditures such as clothing, healthcare and school fees. Hence better access to these showcases their better livelihood status [9].

The low Nutritional status(x_5) has got the highest contribution as the physiological needs like food, shelter etc are the preliminary need to be met up as per the Maslow's hierarchy of need. Hence, the dire need for better nutritional status acts as a driving force for the change in livelihood. This is observed predominantly in the tea industry where the majority of workers are female, as their male counterparts are engaged in other means of livelihood to suffice their basic needs like nutritional status. The ways to attain daily household needs have been very limited due to their poor skills and health conditions. High dependencies on insecure means of living are making them more vulnerable in the long run [10]. The hot and humid weather of the Dooars along with the unsatisfactory living conditions undermines the health conditions of the people, thereby, raising the expenditure on treatment, which shows the highest direct effect. Futures of the tea dependent family today in Dooars have been in absolute darkness. Rapid dropouts and poor health conditions have further pushed these future population groups in more insecure livelihood vulnerabilities. The need for immediate attention from the concerned authorities and providing them with the livelihood opportunities is of prime importance to protect their present and future generations to come [10]. As per the Plantation Labour Act of 1951, the tea owners are required to provide the works with basic facilities like housing, health, nurseries and crèches, primary education to the children of the workers, weekly ration etc. At present the housing facilities are available, but other facilities like health, weekly ration consumption, education etc needs to be bought by spending their amount. An increase in the household income due to engagement of more family members in earning process has been noticed by dropping out children from education, cutting up expenses, enrolling women's to government schemes like MGNREGA(Mahatma Gandhi national rural employment guarantee act) [11]. The other variable status of home reveals the financial vulnerability of the respondents, thereby assisting to determine an individual's changing livelihood pattern. Dooars is also the most productive of the three tea-producing areas. As per the West Bengal Government Survey Report, "the standard average yield of tea estates in Dooars area should be 2,000 kg/hectare or more but only 40 out of 150 tea estates have yields of 2,000 kg/hectare or more." Most of the tea in Dooars is for domestic consumption. While the domestic market has been growing in India, the same cannot be said for the estates in the Dooars, many of which are crisis-ridden and often in the headlines for that reason [12].

The variable acquiring the highest r value and retained value of regression, Garments and Status of home, apprehends the income fragility of the current livelihood source which turns sore and stringent if the status of home is not robust enough to withstand the financial crisis, the main rationale for the change in livelihood goes common for three altitude regions. Also, the garments can be observed as a parameter for the economic well being and sound monetary status of the livelihood source. Diet is a parameter having the sustenance. Additionally, the rise in food prices over the past decade has forced a reduction in the amount of food consumed because workers simply cannot afford to buy what they need. As a result, there is widespread malnutrition, and medical studies have found that a majority of the children living in tea estates are underweight. Hence, the failure of their livelihood to sustain their basic needs [9].

5. CONCLUSION

The ecology of any hill terrain is deeply orchestrated and profoundly inter-mingled with the socio-economic function of people dwelling therein. So, the episode of empirical research delineates that, we need to take precise and specific intervention plan for each of the terrains and we have got some common factors, equally applicable for all the three altitudes and operating ecosystem. Therefore the livelihood opportunities and securities of each of the altitudinal zones can be met with specificity and accuracy. For example- The same volume of income is meaningless unless it is relegated to the respective ecosystems. So, the episode of empirical research delineates that, we need to take precise and specific intervention plan for each of the terrains and we have got some common factors, equally applicable for all the three altitudes and operating ecosystem. No

extension strategies, perhaps, can be or should be delineated without considering its geospatial ecology. The same 1000 rupees earned by a tea garden worker from Dooars tea garden can speak differently over the same amount earned by a tea garden worker in Darjeeling ecosystem. Alongside the slope, the biodiversity, the mobility, climate behaviour with differentials, the culture and folkways are so closely interwoven, so much so, altitude extension has gone ubiquitous across these variabilities as well.

CONSENT

As per international standard, respondents' written consent has been collected and preserved by the author(s).

COMPETING INTERESTS

Authors have declared that no competing interests exist.

REFERENCES

1. Devi CV, Adhikary MM. Altitude extension: an imperative to transfer of technology in North-East hill ecosystem. Journal of Crop and Weed. 2013;9(1):128-131.
2. USAID. Report on Livelihood and Conflict Tool Kit for Intervention; 2005.
3. Bera S, Acharya SK. Transforming social ecology of tea garden in India: The change, impact and direction; 2011.
4. Sarkar R and Lama M. Tea plantation workers in the eastern Himalaya: A study on wages, Employment and Living standards, New Delhi: Atma Ram and Sons; 1986.
5. Tirkey Lalit P, Nepal P. Tea plantations in the Darjeeling Hills geo-ecological impact and livelihood implications. Hydro Nepal. 2012;10:53–59.
6. Khawas V. Socio-economic conditions of Tea garden labourers in Darjeeling hills.Council for Social Development, New Delhi; 2006.
7. Bhutia S. Economic development and environmental issues in Darjeeling Himalaya of West Bengal, India: A Theoretical Perspective. International Journal of Humanities and Social Science Invention. 2014;3(7).
8. Gardner JS, 'Natural hazards risk in the Kullu District, Himachal Pradesh, India, The Geographical Review. 2002;92(2): 282-306.
9. Dhar S. Labour and its discontents. Himal Southasian.2015;28(1).
10. Chettri B, Kasemi N. Livelihood Dilemmas among the Tea Workers of Dooars, West Bengal. International Journal of Research in Social Sciences; 2018;8(2): 54-62
11. Dutraj S. Tribals issues and challenges in the closed tea garden of Dooars: A case study of Dheklapara tea garden. 2016;2: 200–204.
12. FIAN International et al. A life without dignity – the price of your cup of tea. Global Network for the Right to Food and Nutrition; 2016.

Peer-review history:
The peer review history for this paper can be accessed here:
http://www.sdiarticle4.com/review-history/58746