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Analytical Study on Resilience to Adverse Weather Events among Tribal and Non Tribal Livestock Farmers: A Livelihood Security Perspective

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Abstract—*With the changing climatic conditions sole dependence on crop farming resulted in vulnerable livelihood situation among farming community in India. Livestock farmers through diversification can ensure much better livelihood security than other farmers who are dependent on crop farming only. On the other hand, different categories of farmers i.e. tribal and non tribal farmers, were also enjoying varied level of livelihood and resilience status against extreme weather events. Varied level of social support, social bonding and customs affects the resilience status of individual farmer against extreme weather events. One 'Resilience Scale' was constructed to measure resilience status of both tribal and non tribal livestock rearers. Parameters for livelihood index were identified and then Livelihood index was developed. Data were collected by using structured interview schedule. Test of homogeneity of variance for both livelihood security index (Levene statistic 2.46) and resilience scale (Levene statistic 2.01) was insignificant and thus one way ANOVA was run and it was found in both the cases significant differences were there between tribal and non-tribal farmer groups. For Livelihood security index, F-value was 458.51 and for resilience scale F-value was 131.98. Correlation value of ranks pertaining to 'Role of Dairying with respect to Resilience to adverse weather events' given by non-tribal and tribal farmers suggested that, ranks were not significantly correlated (Kendall's tau_b=-.467 and Spearman's rho= -.600)*

Keywords*: Resilience, Adverse weather events, livestock farmers*

1. INTRODUCTION

Indian economy has grown manifold during the last seven decades and its economy is now world's sixth largest economy. Though still, more than 50 percent of Indian population depends on agriculture for their livelihood. Only cultivation of field crops is not sufficient to ensure livelihood of Indian farming community. Diversification of crop farming as well as raising livestock, not only increase the livelihood security of the farming community but also increase their ability to cope up the losses due to natural disaster. As Indian agriculture still depends on weather conditions for production as well as productivity of agricultural produce, a thorough investigation is required to understand the resilience status of farmers in case of extreme weather events. Due to vagaries of nature many farmers used to leave agriculture. The resilience status of Indian farming community varies significantly. Timmerman (1981) defined resilience as a system's capacity to absorb and recover from the occurrence of a hazardous event; reflective of a society's ability to cope and to continue to cope in the future. Folke *et al.* (2001) explained, Social–ecological resilience is about people and nature as interdependent systems. Resilience status to extreme weather events can ensure that the farming community's endurance to remain associated with livestock farming even during extreme conditions. The impacts of extreme weather events will depend on interactions between the physical impacts and socio-economic factors (Linnenluecke *et al.*, 2008). Different social group of farming community may show varying level of resilience status than other groups of society. Thus, it is very important to understand the resilience status of livestock farmers and their livelihood security status to formulate proper extension programmes especially for adverse weather situation.

2. RESEARCH METHODOLOGY

The data for the study has been collected from Birbhum and Jhargram district of West Bengal. From each district 20 tribal farmers and 20 non tribal livestock farmers have been interviewed. Thus, the total number of respondents for the study was 80. 'Resilience Scale' developed by Mohammad, et.al. (2018) has been used for collection of data pertaining to resilience status of the livestock farmers. One livelihood index has also been developed for the study. The data has been collected by using one structured interview schedule.

3. RESULTS AND DISCUSSION:

To assess the level of livelihood security of tribal and non-tribal farmers

Table 1: Test of Homogeneity of Variances among different groups with respect to livelihood security

	Levene Statistic	df1	df2	Sig.
Livelihood Index	2.46	3	76	.07

From the table 1 it can be easily seen that, Levene statistics for 'Livelihood Index' is 2.46 which is not significant. This suggested that, there was no significant difference within the groups, i.e. Tribal (Jhargram), Non-Tribal(Jhargram),Tribal (Birbhum) and Non- Tribal (Birbhum). As there was no significant differences one way Analysis of variance was done and the result is given in the Table No. 2.

Table 2: One way Analysis of Variance (ANOVA) with respect to livelihood security

		Sum of Squares	df	Mean Square	F	Sig.
Index	Between Groups	9489.02	3	3163.01	458.51	.00
	Within Groups	524.29	76	6.89		
	Total	10013.30	79			

From the Table 2, it can be said that there was significant difference among groups as the 'F'value for the test was 458.51 which was significant at 1 percent level of significance. In other words it can be said that, there were significant variations in livelihood among different groups; i.e. Tribal farmers from Jhargram, Non-Tribal farmers from Jhargram , Tribal farmers from Birbhum and Non- Tribal farmers from Birbhum. To pin point the difference among the groups Tukey HSD post hoc test was applied.

Table 3: Multiple Comparisons among different groups on the basis of livelihood security

Dependent Variable	Demographic group(I)	Demographic group (J)	Mean Difference (I-J)	Sig.
Livelihood Index	Tribal (Jhargram)	Non-Tribal (Jhargram)	-3.37*	.001
		Tribal (Birbhum)	-1.68	.185
		Non- Tribal (Birbhum)	-26.68*	.000
	Non-Tribal (Jhargram)	Tribal (Jhargram)	3.37*	.001
		Tribal (Birbhum)	1.68	.185
		Non- Tribal (Birbhum)	-23.31*	.000
	Tribal (Birbhum)	Tribal (Jhargram)	1.68	.185
		Non-Tribal (Jhargram)	-1.68	.185
		Non- Tribal (Birbhum)	-25.00*	.000
	Non- Tribal (Birbhum)	Tribal (Jhargram)	26.68*	.000
		Non-Tribal (Jhargram)	23.31*	.000
		Tribal (Birbhum)	25.00*	.000

The table no. 3 represents the Tukey HSD Post Hoc test. A perusal of the table suggested that Tribal farmers of Jhragram varied significantly from Non-tribal farmers from Jhragram and Non-Tribal farmers from Birbhum district, whereas, no significant differences were found in case of the livelihood security of Tribal farmers from Jhargram and Tribal farmers form Birbhum district. Moreover the sign of the differences suggested that the livelihood of tribal farmers were much more insecure than their non tribal counterpart. Interestingly, the mean difference of Non tribal farmers from Jhargram and Birbhum district was 23.31 which are significant at 1 percent level of significance. This suggested that, the livelihood security of non-tribal farmers from Jhragram is more insecure than non-tribal farmers from Birbhum. Thus, the overall livelihood scenario of both tribal and non-tribal livestock farmers from Jhargram district was poor when compared with the livelihood scenario of non-tribal livestock rearers from Birbhum district.

Table 4: Homogeneous Subsets of different groups of farmers in connection with livelihood security

Demographic group	N	Subset for alpha = 0.05		
		1	2	3
Tribal (Jhargram)	20	41.36		
Tribal (Birbhum)	20	43.05	43.05	
Non-Tribal (Jhargram)	20		44.74	
Non- Tribal (Birbhum)	20			68.05

From the above table 4 it can be easily understood that, the livelihood scenario of tribal from both Jhargam and Birbhum districts were similar, whereas, interestingly, the scenario of tribal farmers from Birbhum Distrcit was comparable with the non-tribal farmers from Jhargarm district. The Non Tribal livestock farmers from Birbhum district were in better position than the other groups in terms of livelihood security.

To enumerate the degree of resilience to adverse weather events among the respondents

Table 5: Test of Homogeneity of Variances among different groups of livestock farmers with respect to resilience status

	Levene Statistic	df1	df2	Sig.
Resilience	2.01	3	76	.12

The test of homogeneity of variance with respect to resilience is given in the table no 5. The Levene Statistics was 2.01

which was non significant. It suggested that, there was no significant difference within the groups i.e. Tribal farmers from Jhargram, Non-Tribal farmers from Jhargram, Tribal farmers from Birbhum and Non- Tribal farmers from Birbhum. To understand that, whether there was any significant differences among the groups, One way Analysis of Variance was used.

Table 6: One way Analysis of Variance (ANOVA) with respect to resilience status

		Sum of Squares	df	Mean Square	F	Sig.
Resilience	Between Groups	1645.54	3	548.51	131.98	.000
	Within Groups	315.85	76	4.16		
	Total	1961.39	79			

The table no 6 is showing the one way Analysis of Variance. The F-value was 131.98 which was significant at 1 percent level of significance. It implied that there was significant variation among different groups i.e. Tribal farmers from Jhargram, Non-Tribal farmers from Jhargram, Tribal farmers from Birbhum and Non- Tribal farmers from Birbhum, with respect to resilience to Adverse weather events.

Table 7: Multiple Comparisons among different groups on the basis of resilience status among different groups of livestock farmers

Dependent Variable	Demographic group (I)	Demographic group (J)	Mean Difference (I-J)	Sig
Resilience	Tribal (Jhargram)	Non-Tribal(Jhargram)	8.25*	.000
		Tribal (Birbhum)	-.30	.966
		Non-Tribal(Birbhum)	9.50*	.000
	Non-Tribal (Jhargram)	Tribal (Jhargram)	-8.25*	.000
		Tribal (Birbhum)	-8.55*	.000
		Non- Tribal (Birbhum)	1.25	.221
	Tribal (Birbhum)	Tribal (Jhargram)	.30	.966
		Non-Tribal (Jhargram)	8.55*	.000
		Non- Tribal (Birbhum)	9.80*	.000
	Non- Tribal (Birbhum)	Tribal (Jhargram)	-9.50*	.000
		Non-Tribal (Jhargram)	-1.25	.221
		Tribal (Birbhum)	-9.80*	.000

Multiple comparison among different groups viz. Tribal farmers from Jhargram, Non-Tribal farmers from Jhargram, Tribal farmers from Birbhum and Non- Tribal farmers from Birbhum was done by Tukey HSD post Hoc test and the results are given in the table no 7. From the table it can be said that there was no significant difference were observed in case of tribal farmers from Jragram and Birbhum districts but significant difference were observed in case of Non-tribal farmers from both the district with respect to resilience status. Moreover, it can be seen that that the resilience status of tribal farmers were more than that of non tribal farmers as the tribal farmers managed to survive the negative impact of adverse weather events due to their age old practices.

Table 8: Homogeneous Subsets of different groups of farmers in connection with resilience status against extreme weather events

Demographic group	N	Subset for alpha = 0.05	
		1	2
Non- Tribal (Birbhum)	20	50.45	
Non-Tribal (Jhargram)	20	51.70	
Tribal (Jhargram)	20		59.95
Tribal (Birbhum)	20		60.25

From the table no 8, it can be clearly said that, on the basis of resilience to adverse weather events, Non-tribal farmers from Birbhum and Jhargram, can be classified in one group and tribal farmers from both the districts can also be classified in the same group. The values also suggested that mean score of resilience in case of tribal farmers were higher than non tribal farmers. This was due to the fact that, tribal farmers were accustomed with the adverse weather situation with their social support mechanism and their traditional knowledge also helped them to cope up with the adverse weather events than their non-tribal counterparts. This finding is in the line of Southwick et al. (2016), who found that social support appears to be associated with resilience via a number of psychological and behavioral mechanisms, including appraisal of potentially stressful events as being less threatening.

To evaluate the role of dairying in resilience to adverse weather events

Table 9: Ranking of Roles of Dairying with respect to Resilience to adverse weather events as perceived by the different groups of livestock farmers

Role component for enhancing resilience	MPP (Tribal)	Rank (Tribal)	MPP (Non-Tribal)	Rank (Tribal)
1. Providing nutritional security during adverse weather events	76.67	IV	75.83	IV
2. Providing economic security during adverse weather events	78.33	III	84.17	I
3. Integration in the social norms/ folkways	87.50	I	70.83	VI

4. Engagement/ Pschychological attachment	83.33	II	74.17	V
5. Risk reduction (CDR)	70.83	V	83.33	II
6. Returns/ Repayment capacity	70.00	VI	77.50	III

According to the Table no 9, tribal respondents from both the districts, dairying are integrated with their social norms and helped them to survive during the adverse weather scenario. According to non-tribal farmers, providing economic security during adverse events was the prime role of dairying. This difference of opinion pertaining to dairy farming among tribal and non tribal farmers were due to the fact that, non-tribal farmers used to rear animals due to profit motives whereas, tribal farmers were rearing livestock due their beliefs and age old tradition. This was also supported by the fact that according to tribal farmers 'Returns/ Repayment capacity' was got the lowest rank while considering role of dairying with respect to resilience to adverse weather events.

Table 10: Correlation of ranks of perceived Roles of Dairying with respect to Resilience to adverse weather events among different groups of livestock farmers

			Tribal	Non-tribal
Kendall's tau_b	Tribal	Correlation Coefficient	1.000	-.467
		Sig. (2-tailed)	.	.188
		N	6	6
	Non-tribal	Correlation Coefficient	-.467	1.000
		Sig. (2-tailed)	.188	.
		N	6	6
Spearman's rho	Tribal	Correlation Coefficient	1.000	-.600
		Sig. (2-tailed)	.	.208
		N	6	6
	Non-tribal	Correlation Coefficient	-.600	1.000
		Sig. (2-tailed)	.208	.
		N	6	6

The correlation values (Table 10) of ranks given by tribal and non tribal farmers revealed that, there was difference in ranking pattern given by tribal farmers and non-tribal farmers, as Kendall's tau_b value was -.467 which was not significant, as well as the Spearman's rho was also not significant as the value was -.600. This difference was due to the perceived differential role of dairying with respect to dairying by tribal and non tribal farmers.

4. CONCLUSION

The study revealed that there was significant difference in terms of resilience to adverse weather events among different groups of livestock farmers. Though, the resilience status of tribal farmers was better than non tribal farmers whereas tribal farmers' livelihood status was poorer than that of non-tribal farmers. This finding suggested that, livelihood security cannot be the only one indicator of resilience of a particular farming community. Group cohesion among different farming community, social structure also influences the overall resilience status of livestock farmers. Interestingly, role of dairy farming in building resilience to extreme weather events also varied according to the social group of the farmer. In a nutshell, it can be said that for developing any kind of development project, the group structure as well the social pattern of target farming community should be taken in to account, particularly to enhance the resilience status of farming community against adverse weather events.

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