



Decoding Resilience Status of Dairy Farmers against Extreme Weather Events: A Demographic Perspective

Asif Mohammad^{1*} and Anupam Chatterjee²

¹Eastern Regional Station, ICAR- National Dairy Research Institute, Kalyani, INDIA

²Eastern Regional Station, ICAR- National Dairy Research Institute, Kalyani, INDIA

*Corresponding author: A Mohammad; Email: mail.asif.m@gmail.com

Received: 7 May, 2018

Revised: 10 Aug., 2018

Accepted: 17 Aug., 2018

ABSTRACT

Extreme weather events like prolonged dry spells or prolonged phase of rainfall adversely affect dairy farming. Resilience status against extreme weather events varies in different demographic groups. A study has been conducted by taking the responses from 100 respondents who participated in the training programme organized by Eastern Regional Station of ICAR- National Dairy Research Institute. Responses were collected from 4 demographic groups namely; tribal male, tribal female, non-tribal male and non-tribal female. One resilience scale was developed to measure resilience status of the respondents. From the study, it was found that the resilience trait of the respondents were associated with social support (chi-square value 105.42) and stress status (chi-square value 88.19) of the respondents. Highest mean score of 65.20 ± 17 with respect to resilience was obtained by the female tribal respondents, whereas, they got the lowest stress score of $.18 \pm 0.004$. In general tribal respondents were having highest resilience score with higher social support score with lower stress score than non-tribal respondents. From, the study it can be concluded that, higher social support and lesser stress scores attributed to higher resilience of respondents against extreme weather events.

Keywords: Resilience, Extreme weather events, Social Support, Stress score

Indian agriculture still can be considered as ‘Complex, Diversified and Risk Prone’ because of its extreme dependence on weather. Timely and adequate rainfall can enhance the agricultural productivity, whereas; extreme of scanty rainfall can result in severe damage in the productivity of crops as well as dairy farming. Secondary agriculture like animal husbandry can be considered as a good option to avert the risk arising from these extreme weather events but still dairy farmers are affected by these extreme weather events. In this circumstance, study of interrelation between resilience of people against extreme weather events and their social system becomes very important. 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 their animal husbandry activities even during extreme conditions. 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. The coping mechanism of farmers varies significantly in different social system during extreme weather event situation. The impacts of extreme weather events will depend on interactions between the physical impacts and socio-economic factors (Linnenluecke *et al.*, 2008). Some social race may be more resilient towards some external threats like natural disaster due to age old customs, indigenous knowledge and belief, whereas, others may be relatively more vulnerable towards the same disasters. In the rapidly developing area of research on ecosystem services and the people who depend on them, the term “resilience” is often used to describe the characteristic features of a system that are related to sustainability (Carpenter *et al.*, 2001). Sustainable social system and coping strategies generated from age old



social texture and on the same time variations in social support systems in different demographic groups can be an effective indicator in predicting the resilience status of a particular social group. Thus, for analyzing one social system which is sustainable against natural disasters and extreme weather events, interpretation of different demographic groups in the light of their respective resilience status should be taken in to account.

MATERIALS AND METHODS

The data has been collected from tribal male and female and non-tribal male and female respondents who have participated in the training programmes organized by ICAR- National Dairy Research Institute, Eastern Regional Station at Kalyani West Bengal. A total of 100 respondents have been interviewed by taking the responses of 25 respondents from each of the four demographic groups namely; tribal male, tribal female, non-tribal male and non-tribal female respondents. One resilience scale (Mohammad, *et al.*, 2018) having 5 continuums with 14 items was developed to measure the resilience status of the respondents towards the extreme weather events. On the basis of mean and standard deviation respondents were classified in three groups namely; low (resilience score less than 47), medium (resilience score in between 47 to 65) and high (resilience score more than 65). Social support of the respondents was measured by the Multidimensional Scale of Perceived Social Support developed by Zimet *et al.* 1988. Respondents were classified in to three categories on the basis of mean and standard deviation. The groups were named as; Low social support group (Score less than 56), Medium social support group (Score from 56 to 77) and High social support group (Score more than 77). Stress status of the respondents was measured by ‘Standard Stress Scale’ (SSS) developed by Gross and Seebaß (2014) with 11 statements and the score were obtained by adding the values of 11 items. After that, 11 was subtracted and divided by 44 to get the Standardized Stress Index. Then, the respondents were grouped in to three groups namely, low (Standardized stress score less than .18), medium (Stress index score from .18 to .48) and high (Stress index score more than .48). A structured interview schedule was developed to record the responses from the respondents. Data were analyzed by using SPSS 20 software.

RESULTS AND DISCUSSION

Distribution of respondents with respect to demography vis-à-vis resilience, social support and stress

A perusal of the table 1 can reveal that, tribal female got the highest mean score with respect to resilience (65.20±.17) where as their stress index score (.18±.004) was lowest among all the categories. Tribal females’ mean social support score with respect to social support (77.52±.25) was highest among all the categories.

Table 1: Distribution of respondents with respect to demography vis-à-vis resilience, social support and stress (n=120)

Variables	Category	Mean
Resilience Score	Tribal male	64.68±.21
	Tribal Female	65.20±.17
	General Male	46.80±.21
	General Female	47.24±.22
	Total	55.98±.91
Social support Score	Tribal male	77.20±.30
	Tribal Female	77.52±.25
	General Male	57.16±.18
	General Female	55.92±.25
	Total	66.95±1.05
Stress Index Score	Tribal male	.19±.01
	Tribal Female	.18±.004
	General Male	.48±.004
	General Female	.49±.01
	Total	.34±.02

This suggested that, lower stress index score and higher social support score actually increased the resilience status of respondents. Non-tribal female were having the highest stress index score (.49±.01) among all the categories, this may be due to the lower social support as they were enjoying lowest social support score among all the category (55.92±.25). Both tribal male and female were having higher resilience score than nontribal respondents as their social support score were higher than them and on the other hand stress scores were less than the nontribal male as well as female. It can be concluded that, higher resilience score was characterized by lower stress index score which enable the respondents to cope up with the challenges faced by them due to less internal discontent. On the other hand, higher social support resulted in the

higher resilience among the respondents as the social cohesiveness actually helped the respondents to face the natural calamities in more positive and collective way. McLaren and Challis (2009) also found that, Increasing social support and sense of belonging may benefit the mental health of farmers. As the tribal respondents were having more social cohesiveness due to their age old practice and belief their resilience score was higher than those of nontribal respondents.

Resilience status vis-à-vis social support and stress

From the table 2, it can be said that no respondents with low social support score fell in high resilience score category. On the other hand no respondents with low resilience score fell in high social support category. This suggested that, there was some sort of association with resilience and social support and it was proven by the value of chi-square (105.42), which is significant at 1 percent level of significance. 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. This may be explained as, with high degree of social support, respondents got the strength to face the challenges of life as well as the threat incurred by extreme weather events, in turn, this fact also developed their resilience towards extreme weather events. The strong we feeling among the respondents and cooperation in the social system can enhance the resilience status. From the same table it can be noticed that, no respondent with low resilience score fell in low stress index score category. The chi-square value (88.19) which suggested that, there was a significant association between resilience score and stress index score. All the respondents with high resilience score (18% of total respondents) fell in low stress index score category and on the contrary, the respondents with low resilience score either fell in medium (10% of total respondents) or high (15% of total respondents) stress index score category. This indicated that, the respondents with high stress score tend to fall in low resilience score category and vice-versa. Climate variation may be expected to impact especially to those groups, activities or regions that under 'normal' climate conditions are already stressed (Kates, 1985). Higher stress damaged the capability of coping and as a result of that, the resilience scores were decreased.

Table 2: Resilience status *vis-à-vis* social support and stress (n=120)

Scores	Category	Resilience score			Chi-square value
		Low (<47)	Medium (47-65)	High (>65)	
Social Support	Low (<56)	13 (13.00)	7 (7.00)	0 (0.00)	105.42*
	Medium (56-77)	12 (12.00)	48 (48.00)	0 (0.00)	
	High (>77)	0 (0.00)	2 (2.00)	18 (18.00)	
Stress Index Score	Low (<.18)	0 (0.00)	13 (13.00)	18 (18.00)	88.19*
	Medium (.18-.48)	10 (10.00)	42 (42.00)	0 (0.00)	
	High (>.48)	15 (15.00)	2 (2.00)	0 (0.00)	

* Significant at 1 percent level of significance (Figures in the parenthesis indicates percentage).

Test of Homogeneity of Variances within different demographic groups

The table 3 is showing the results of Levene Statistic and it can be understood that, Levene Statistic with respect to Resilience and Stress was non-significant and eligible for one way ANOVA. There was no significant variation within the groups in resilience status and stress status which indicated that there was homogeneity in the groups but in case of Social Support there was heterogeneity in the group thus, one way ANOVA couldn't be run. In case of social support, variation was there within the group which implied that, within same group members enjoyed different level of social support.

Table 3: Test of Homogeneity of Variances within different demographic groups

Variables	Levene Statistic	df 1	df 2	Significance
Resilience	2.43	3	96	.07
Social support	3.81	3	96	.01
Stress	1.15	3	96	.33



Testing variations among demographic groups by using ANOVA

From the table 4 it can be said that, there was a significant difference in different groups i.e. tribal male, tribal female, non-tribal male, non-tribal female with respect to resilience (F-value 2623.33) and stress (F value 1248.85). This was due to the fact that resilience can be considered as psychological trait and it varied among different groups as the psychological make-up of different groups are also different. Similarly, the stress status as well as the perception of stress among different groups also varied significantly.

Table 4: One way ANOVA

		Sum of squares	df	Mean square	F value	Significance
Resilience	Between Groups	8033.960	3	2677.99	2623.33	.00
	Within Groups	98.000	96	1.02		
	Total	8131.960	99			
Stress	Between Groups	2.208	3	.74	1248.85	.00
	Within Groups	.057	96	.00		
	Total	2.264	99			

Assessing mean differences among different demographic groups

From the post Hock Test of Tukey HSD (Table 5) it can be said that, tribal male and tribal female didn't showed any significant difference from the each other in terms of score pertaining to resilience to extreme weather events. Though, tribal respondents showed significant difference when compared with their non tribal counterparts. From the table another interesting fact can be seen, as the tribal female were more resilient than tribal female as the mean difference was .52. Similarly, non-tribal male were less resilient than their female counter part with the mean difference in the score was .44, though the mean difference was not significant. Thus, from the findings it can be said that, tribal male and tribal female were more resilient than non-tribal male and non tribal female. On the other hand female of tribal and non-tribal denomination of

farmers were more resilient than their male counterparts. This may be due to the fact that, female could share their agony and pain among themselves more easily than their male counterparts and they are more tolerant due to the age old tradition and customs defined by the society. Tribal respondents showed more resilience as they were having stronger social bonding which helped them to show more resilience towards extreme weather events. In case of social support, scores of tribal male and female were significantly more than non-tribal counterparts, which suggested higher social bonding among tribal respondents. On the similar line, stress score of tribal (both male and female) were significantly lower than non-tribal respondents faced much more stress condition in their life. Bruijin *et al.* (2017) opined that, in order to improve the capacity to adapt, institutions may have to change their culture and the way they are organised in order to enhance their ability to learn from previous experiences, to change and to improve themselves. Similarly, compatible attributes of one culture which is adaptive and resilient to extreme weather events can be imbibed in other systems to make them more resilient.

Table 5: Post Hock test (Tukey HSD) for assessing mean differences among different demographic groups

Dependent Variable	(I) Category	(J) Category	Mean Difference (I-J)
Resilience	Tribal male	Tribal Female	-.52
		Non-Tribal Male	17.88*
	Tribal Female	Non-Tribal Female	17.44*
		Tribal male	.52
	Non-Tribal Male	Non-Tribal Male	18.40*
		Non-Tribal Female	17.96*
Non-Tribal Female	Tribal male	Tribal Female	-17.88*
		Non-Tribal Female	-.44
	Tribal Female	Tribal male	-17.44*
		Non-Tribal Male	-17.96*

Social Support	Tribal male	Tribal Female	-.32
		Non-Tribal Male	20.04*
		Non-Tribal Female	21.28*
	Tribal Female	Tribal male	.32
		Non-Tribal Male	20.36*
		Non-Tribal Female	21.60*
	Non-Tribal Male	Tribal male	21.60*
		Tribal Female	-20.36*
		Non-Tribal Female	1.24*
	Non-Tribal Female	Tribal male	-21.28*
		Tribal Female	-21.60*
		Non-Tribal Male	-1.24*
Tribal male		.01	
Non-Tribal Male		-.28*	
Non-Tribal Female		-.30*	
Stress	Tribal male	Tribal Female	.01
		Non-Tribal Male	-.28*
		Non-Tribal Female	-.30*
	Tribal Female	Tribal male	-.01
		Non-Tribal Male	-.29*
		Non-Tribal Female	-.31*
	Non-Tribal Male	Tribal male	.28*
		Tribal Female	.29*
		Non-Tribal Female	-.02
	Non-Tribal Female	Tribal male	.30*
		Tribal Female	.31*
		Non-Tribal Male	.02

* Significant at 5 percent level of significance.

Demography wise categorization of respondents with respect to Resilience, Social support and Stress

From the table 6 it is evident that, tribal male with high social support (7 out of 9 respondents) fell in high resilience status category whereas 16 out of 18 of them with medium resilience status fell in medium social support category and rest (2 respondents) fell in high social support category.

Similar trend was also seen in case of tribal female respondents as all the 11 of them with high resilience fell in high social support category and all the 14 female tribal respondents with medium resilience status fell in medium social support category.

Table 6: Demography wise categorization of respondents with respect to Resilience, Social support and Stress

Variables	Category	Classification	Resilience			Total
			Low	Medium	High	
Social support	Tribal male	Medium	0	16	0	16
		High	0	2	7	9
		Total	0	18	7	25
	Tribal Female	Medium	0	14	0	14
		High	0	0	11	11
		Total	0	14	11	25
	Non-Tribal Male	Low	3	1	0	4
		Medium	12	9	0	21
		Total	15	10	0	25
	Non-Tribal Female	Low	10	6	0	16
Medium		0	9	0	9	
Total		10	15	0	25	
Stress	Tribal male	Low	0	6	7	13
		Medium	0	12	0	12
		Total	0	18	7	25
	Tribal Female	Low	0	7	11	18
		Medium	0	7	0	7
		Total	0	14	11	25
	Non-Tribal Male	Medium	10	10	0	20
		High	5	0	0	5
		Total	15	10	0	25
	Non-Tribal Female	Medium	0	13	0	13
High		10	2	0	12	
Total		10	15	0	25	

On the contrary none of the non tribal male and non tribal female fell in the high resilience status category. Out of the 15 non-tribal male with low resilience status, 12 of them fell in medium social support category and rest 3 of them fell in low social support category. All the 10 non tribal female respondents with low resilience status fell in low social support category whereas, 6 out of 15 non tribal female respondents with medium resilience status fell in low social support category. These facts indicated that, the tribal respondents (both male and female) were much more resilient than their non tribal counterpart as they



were enjoying more social support which helped them to face the challenges of extreme weather events collectively. On the other hand, as the non tribal respondents were having less social support they were also having low resilience status. Thus from the study it can be concluded that the farmers with low social support tend to have low resilience towards extreme weather events.

All the 7 tribal male respondents with high resilience status fell in low stress category whereas, out of 18 tribal male respondents with medium social status 12 of them fell in medium stress category and rest of them fell in low stress category. All the tribal female respondents with high resilience (11 respondents) fell in low stress category. On the contrary all the non tribal female respondents (10 respondents) with low resilience fell in high stress category. Similar trend was also found in case of non tribal male respondents as none of the non tribal male fell in low stress category and 10 of them with low resilience fell in medium stress category and 5 of them with low resilience fell in high stress category. This suggested that, the tribal farmers were feeling less stress than their non tribal counterpart and as a result of that, they have exhibited more resilience towards extreme weather events. On the contrary the non tribal farmers (both male and female) were in high to medium stress condition and fell in either medium or high resilience status. Thus, it can be concluded that stressful situations reduce the resilience status against the extreme weather event situations.

CONCLUSION

Resilience against extreme weather events getting more and more importance in modern day agriculture as incidences of extreme weather events are becoming very commonplace in the changing global climate conditions. Technology alone cannot solve all the problems as the inherent psychological strengths can give farmers capacity to face vagaries of nature. Reduced level of stress and higher social support can enhance the resilience status of farmers. In this circumstance, the society with more social bonding can have inherent capability to face the vagaries of nature collectively. Thus, the positive aspects of group cohesiveness possessed by one social group can be showcased to other social groups / demographic groups to make a society more resilient against extreme weather events at community level.

REFERENCES

- Bruijna, D.K., Buurman, J., Mensa, M., Dahma, R. and Klijnac, F. 2017. Resilience in practice: Five principles to enable societies to cope with extreme weather events. *Environ. Sci. Pol.*, **70**: 21-30.
- Carpenter, S., Walker, B., Anderies, J.M. and Abel, N. 2001. From metaphor to measurement: resilience of what to what? *Ecosystem*, **4**: 765-781.
- Folke, C., Carpenter, S.R., Walker, B., Scheffer, M., Chapin, T. and Rockström, J. 2010. Resilience thinking: integrating resilience, adaptability and transformability. *Ecol. Soc.*, **15**(4): 20.
- Gross, C. and Seebaß, K. 2014. The Standard Stress Scale (SSS): Measuring Stress in the Life Course (NEPS Working Paper No. 45). Bamberg: Leibniz Institute for Educational Trajectories, National Educational Panel Study.
- Kates, R.W. 1985. The interaction of climate and society. In: Climate impact assessment: studies of the interaction of climate and society. Kates, R.W., Ausubel, J.H. and Berberian, M., 1st Ed., John Wiley, Worcester, Massachusetts: 3-36.
- Linnenluecke, K., Griffiths, A. and Winn, M.I. 2008. Organizational adaptation and resilience to extreme weather events. Paper presented at the Annual Meeting of the Academy of Management, Anaheim, California.
- McLaren, S. and Challis, C. 2009. Resilience among men farmers: the protective roles of social support and sense of belonging in the depression-suicidal ideation relation. *Death Stud.*, **33**(3): 262-276.
- Mohammad, A., Chatterjee, A., Bhakat, C. and Dutta, S. 2018. Determining the dimensions affecting resilience status of livestock farmer against extreme weather events by developing one resilience scale. *Int. J. Curr. Microbiol. App. Sci.*, **7**(1): 3247-3253.
- Southwick, S.M., Sippel, L., Krystal, J., Charney, D., Mayes, L. and Pietrzak, M. 2016. Why are some individuals more resilient than others: the role of social support? *World Psychiatry*, **15**(1): 77-79.
- Timmerman, P. 1981. Vulnerability, resilience, and the collapse of society: A review of models and possible climatic applications. Environmental monograph no 1. Institute of Environmental Studies, University of Toronto. Toronto.
- Zimet, G.D., Dahlem, N.W., Zimet, S.G. and Farley, G.K. 1988. The multidimensional scale of perceived social support. *J. Pers. Assess.*, **52**(1): 30-41.