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**Vismaya KC**

Department of Agricultural  
Extension Education, University  
of Agricultural Sciences,  
Dharwad, Karnataka, India

**SS Dolli**

Department of Agricultural  
Extension Education, University  
of Agricultural Sciences,  
Dharwad, Karnataka, India

## Impact of natural calamities on socio-economic status and coping strategies: A case of dairy farmers in North Karnataka

**Vismaya KC and SS Dolli**

### Abstract

Livestock contributes to development enormously through nutrition, improved agricultural output, financial and social functions and this sector plays multi-faceted role in socio-economic development of the country. Livestock is the second most impacted subsector after crops, accounting for 36 percent of all damage and losses reported in the post-disaster assessments. This study was undertaken to know the impact of natural calamities (flood and drought) on socio-economic status of the dairy farmers. The *Ex-post-facto* research design was adopted for the study. Belgaum district experienced flood during 2021 and Gadag was affected by drought during 2018-19, therefore these two districts were selected for the study. Purposive random sampling method was employed to select sixty dairy farmers each from flood and drought affected area from Belgaum and Gadag respectively. The interview schedule was developed by consulting experts and referring to the relevant literature. The results revealed that in case of flood affected area, higher percent change was observed in case of fodder availability (62.36%) and farm power possession (41.16%), while change was moderate in case of asset possession (15.28%) and borrowing status (14.83%), farmers experienced unprecedented floods and severe drought which caused loss of assets on one hand and inability to purchase new assets due to financial crisis. This negative impact is due to loss of fodder crop and loss of the stocks stored by the farmers due to floods resulting in fodder scarcity and in case of drought higher percent change was observed in case of fodder availability (15.47%), while change was moderate in case borrowing status (3.86%) and education status (3.11%). Low social participation of the farmers in social institutions like SHGs, milk cooperatives had made it difficult to take loan from them. After the occurrence of natural calamity, 37.50 percent of dairy farmers were found under medium category followed by low (31.67%) and high (30.83%) category of socio economic status. The findings also revealed that the dairy farmers borrowed/purchased food items, fodder, fuel and finance from friends/relatives/neighbours and government aids as coping strategy during natural calamities. The problem of shortage of fodder must be addressed jointly by the government and community. Community managed fodder banks and relief camps should be promoted. A comprehensive system of forecast, warning, monitoring and managing natural calamities by the government in partnership with community is necessary to minimize the impact of natural calamities on dairy farms.

**Keywords:** Natural calamities, socio-economic status, dairy farmers, coping strategies

### Introduction

The total livestock population in India has nearly doubled since 1951 and the cattle population during 2022, is 306.2 million. Livestock provides livelihoods to 8 crore rural households (Anonymous, 2022) [5]. Animal husbandry is always seen as a crucial component in sustaining and improving the socioeconomic status of farmers, since it provides a supplemental and consistent source of income throughout the year. The animal husbandry industry offers unique employment prospects for business owners. India is currently the world's top milk producer, and through milk sales and value addition, milch animals give livestock producers a consistent and reliable source of income. Since livestock can be disposed of in times of emergencies and financial crisis, it is always regarded as a moving bank. (Khushpreet Singh *et al.*, 2020) [10].

Natural calamities cause immense loss and damage to the infrastructure, society and environment. Manure pits and waste lagoons frequently overflow as a result of flooding. The environment, rivers, and the water supply could all be contaminated by this. Animals which have stood in contaminated flood water are more likely to become infected with skin

**Corresponding Author:**

**Vismaya KC**

Department of Agricultural  
Extension Education, University  
of Agricultural Sciences,  
Dharwad, Karnataka, India

and hoof illnesses. Tetanus is more likely to spread to animals with cuts from calamity debris, and contaminated floodwater may carry toxins such botulinum toxin from decaying carcasses (Anonymous, 2019) [4]. The nutritional value of pasture to grazing animals is decreased by prolonged flooding of pastures because the vegetation is destroyed. Flooding also depletes the soil's organic matter, which lowers the soil's ability to retain water. Low organic matter soils are less suitable to plant growth and are more vulnerable to landslides and droughts (Heath *et al.*, 1999) [9].

According to India's National Disaster Management Authority, 94,830 cattle die every year due to flooding. The majority of the time, livestock assists communities in surviving serious crisis conditions. Livestock is frequently the sole means through which disaster-affected communities may survive and support their family (Akash, 2019) [1]. Loss of livestock through natural calamities affects on socio-economic conditions of the livelihoods. Hence, the study was taken up to study the impact of natural calamities on socio-economic status and their strategies to overcome the problem of such situation.

### Methodology

Karnataka is one of the states of India located in southern part of India. The state has 10 agroclimatic zones. The rainfall varies from 500mm to 200 mm different geographic location. Drought is frequently experienced in northern part of Karnataka, while floods rarely experienced in southern part. However, due to climate change, drought and flood are seen regularly.

### Location of the study

The study was carried out in North Karnataka in the year 2021-22. Gadag is one of the districts that comes under northern dry zone with average rainfall of 500mm and it has experienced drought during 2018-19. Belgaum is another district that comes under transition zone with rainfall of 900 mm was affected by flood during 2021, these two districts were considered for the study(Fig.1). The study was conducted in four villages and sixty farmers were selected each from drought and flood affected districts by simple random sampling procedure forming a sample of 120 farmers.

### Socio-economic status

The socio-economic status of dairy farmers was operationalized as a combined indicator of their social and economic situation. The socioeconomic status was measured based on seven indicators that includes education status, social participation, type of house, asset possession, farm power possession, borrowing status and access to basic needs. The status of the selected indicators before the affect of natural calamity and after the calamity was measured by recall method. The structured schedule was used to collect the data by personal interview method. The index of indicators of socio-economic status was measured by using following formula.

$$\text{Index} = \frac{\text{Scores obtained}}{\text{Maximum possible scores}} \times 100$$

The statistical tool 't' test was used to know the impact of natural calamities on socio-economic status of dairy farmers.

## Results and Discussion

### Impact of natural calamities on socio-economic status of the dairy farmers

It can be noticed from the findings in table 1 that, in flood affected area, the educational status had no significant difference in t-value. After the flood, reduction in social participation was observed from 08.58 percent to 07.83 percent and the difference was significant at one percent level. Negative impact was seen in type of house that decreased from 28.81 percent to 26.90 percent and difference was significant at one percent level. Significant difference with respect to access to basic needs was identified (68.69% to 62.38%) at one percent. Difference in borrowing status (61.83% to 52.66%) due to natural calamities was found to be significant at one percent level. Higher deficit was observed in case of fodder availability that decreased from 96.66 percent to 36.38 percent index value followed by farm power possession (10.30% to 06.06%) and asset possession (42.91% to 36.35%). These indicators were found significant at one percent. Higher percent change was observed in case of fodder availability (62.36%) and farm power possession (41.16%), while change was moderate in case of asset possession (15.28%) and borrowing status (14.83%). In case of drought affected area, negative impact was seen in case of fodder availability from 93.33 to 78.89 percent and the change was significant at one percent level of significance. Access to basic needs (77.69% to 76.41%) was found to be significant at one percent. Higher percent change was observed in case of fodder availability (15.47%), while change was moderate in case of borrowing status (3.86%) and education status (3.11%).

Overall higher percent change was observed in case of fodder availability (39.33%) and farm power possession (14.58). Change was moderate in case of borrowing status (9.62%), asset possession (6.52%) and access to basic needs (5.17%). Lower percent change was observed with respect to social participation (4.49%), type of house (3.99%) and education status (3.94%).

The main reason for decrease in possession of farm power could be due to floods which either carried away or damaged farm implements and caused loss of farm power to the farmers. Further, the area under crops was decreased, as well as insufficient water availability throughout the drought period resulted in decreased agricultural activities.

As such there was no provision to get quick loan from government to overcome the crisis. The savings of the farmers was also reduced due to emergency needs. Low social participation of the farmers in social institutions like Self Help Groups (SHGs), milk cooperatives had made them difficult to avail loan. These reasons contributed in decreasing borrowing status of farmers after experiencing natural calamities. Gulsan *et al.* (2016) [8] revealed in their study that to overcome crisis, respondents borrowed money mostly from money lenders at high interest rates in affected area.

The result in table 2 reveals that one third of the farmers (35.00%) were found in low category of socioeconomic status. While, equal percent (32.50%) were found in medium and high category before the occurrence of natural calamity. While, after the occurrence of natural calamity, 37.50 percent of dairy farmers belonged to medium category and about (31.67%) of dairy farmers belonged to low category and 30.83 percent of the dairy farmers belonged to high category of socio economic status. It means that farmers having higher economic status were pushed to medium category due to losses in crisis situation.

Unprecedented floods forces dairy farmers to shift to safer areas resulting in problem of shortage of fodder and these flash floods also caused loss of their assets thereby affecting socio-economic status of the dairy farmers. Whereas, drought has not affected significantly, except affecting fodder availability and access to basic needs. In a study conducted by Mare *et al.* (2018) <sup>[11]</sup>, reported that drought had shown significant impact on livestock feeding and average herd size which is in line with the present study.

Due to the natural calamities, the distressed farmers were not able to actively participate in the organizations. Farmers in flood affected areas lost their houses while some experienced damages to house which was not the same in case of drought affected area where the drought had shown no significant difference in type of house. Similar findings were found in study of Gulsan *et al.* (2016) <sup>[8]</sup> who reported that primary impacts of flood included submergence of houses, the loss and damage of physical assets. The income significantly reduced and same time no income was realized due to natural calamities, farmers were less inclined to invest on house hold assets. Hence, a negative change was seen in the overall asset possession by the affected dairy farmers. Similar results were also seen in study of Younus and Harvey (2013) <sup>[15]</sup>. Negative impact in fodder availability is due to loss of fodder crop and loss of the stocks stored by the farmers due to floods resulting in fodder scarcity. The findings are similar to the results of the study carried out by Mohammad *et al.* (2018) <sup>[12]</sup>. In case of drought, either crops are not sown or dried up due to scarcity of rainfall. In addition to losses in the crop production farmers face problem of acute shortage of fodder. Farmers either borrow from relatives/friends or purchase at higher cost. Similar findings were reported from De Silva and Akiyuki (2018) <sup>[6]</sup>.

#### **Coping strategies adopted by the dairy farmers**

The findings revealed that the farm families purchased / borrowed rice (99.50%), cereals (78.52%), pulses (83.86%), vegetables (63.04%), oils (81.67%) and sugar (98.92%) from the government aid as well as friends/relatives/neighbours during the affected year, while during normal year the quantities purchased from outside were rice (100.00%), cereals (51.41%), pulses (64.51%), vegetables (83.69%), oils (100.00%) and sugar (100.00%) to their requirements. During the flood, the farmers get displaced and they encounter loss of the standing crop, hence they were forced to depend on external assistance for fulfilling food grains requirement for the family. Normally farmers seek help of their relatives and friends, some seek government aid. Government organised aid camps to provide shelter as well as food and fodder to affected families. It is easily accessible to them. However, some seek help of friends and relatives. Drought and flood cause shortage of many essential commodities such as food and fodder. Farmers need to find ways to overcome the problem. Farmers have their own ways of coping with such

stress. The observation on coping strategy is presented in table-3. In case of drought, farmers experience complete crop failure and no income from farming. Therefore, they were forced to take help from relatives, friends as well as government aids and cope up with food items required by the family. Frederick *et al.* (2010) <sup>[7]</sup> reported that the Government of Ghana provided basic needed life saving assistance to the affected populations in the devastated areas. Week and Wizer (2020) <sup>[14]</sup> also reported similar results as the study showed that 75.30 percent of the respondents faced basic food scarcity after the flood. Similar results were found in the study of Amruta (2016) <sup>[2]</sup>.

The results presented in table 4 revealed that, fodder required for the dairy animals during the affected year was purchased or borrowed to the extent of 68.76 percent of green fodder followed by dry fodder (48.42%) and others like oilseed cake, seeds etc. (100.00%). Non- availability of fodder to animals as per requirement attained by the dairy farmers by borrowing from external aids/assistance during the affected year. Buying feed and fodder from outside is more costlier and in such crisis situation, it was difficult for the farmer to invest on such expenditures. Hence, farmer should go for mass stocking of fodder at higher ground by preparing silage/hay individually or at community level. Amruta (2016) <sup>[2]</sup> reported that fodder required for the livestock was purchased during affected year to the extent of 70.59 percent of green fodder followed by dry fodder (61.22%) and other items like seeds, oilseed cake etc. (100.00%) in her study.

It was observed from the findings presented in table 5 that, 57.35 percent borrowed or purchased Liquefied Petroleum Gas (LPG) from government aid followed by 28.18 percent bought or borrowed from their friends/relatives/neighbours and 13.23 percent from other external aids during the affected year while all of it was purchased during normal year. Farmers during flood and drought faced problems to meet fuel requirement due to displacement during flood and lower income during drought, hence they had to depend on the external aids for meeting up the fuel requirements of the family. Under 'Ujwala' scheme, government provided three LPG cylinders as relief material for affected families which helped farmers to meet requirements.

The results in table 6 indicate that the consumption expenditure, agriculture expenditure and education expenditure requirements of the dairy farm families was met by borrowing from banks and friends/relatives. This might be due to the effect of the natural calamities on the financial status of the farmers because of low production, crop failure, reduction in income and displacement. Hence credit institutions must help the affected farmers by providing financial support to them through subsidies, crop insurance, crop loans and education loans. These findings are similar to the results found by Paulik (2021) <sup>[13]</sup> who observed that flood caused economic loss and had impacts on farmer wellbeing in his study of flood impacts on dairy farms at New Zealand.

**Table 1:** Impact of natural calamities on socio-economic status of the dairy farmers (n=120)

Sl. No.	Indicators	Flood affected farmers (n <sub>1</sub> =60)				Drought affected farmers (n <sub>2</sub> =60)				Overall (n=120)			
		Index (%)		Percent change (%)	t-value	Index (%)		Percent change (%)	t-value	Index (%)		Percent change (%)	t-value
		Before	After			Before	After			Before	After		
1	Education status	69.44	66.11	-4.79	1.76 <sup>NS</sup>	71.67	69.44	-3.11	0.53 <sup>NS</sup>	70.56	67.78	-3.94	1.12 <sup>NS</sup>
2	Social participation	08.58	07.83	-8.74	2.05 <sup>**</sup>	06.54	06.60	0.91	1.00 <sup>NS</sup>	7.56	7.22	-4.49	1.82 <sup>NS</sup>
3	Type of house	28.81	26.90	-6.62	3.01 <sup>**</sup>	30.71	30.24	-1.53	1.42 <sup>NS</sup>	29.76	28.57	-3.99	3.28 <sup>**</sup>
4	Asset possession	42.91	36.35	-15.28	5.26 <sup>**</sup>	52.71	53.02	0.58	1.76 <sup>NS</sup>	47.81	44.69	-6.52	4.45 <sup>**</sup>
5	Farm power possession	10.30	06.06	-41.16	2.91 <sup>**</sup>	22.88	22.27	-2.66	1.42 <sup>NS</sup>	16.59	14.17	-14.58	3.13 <sup>**</sup>
6	Fodder availability	96.66	36.38	-62.36	27.29 <sup>**</sup>	93.33	78.89	-15.47	5.13 <sup>**</sup>	95.00	57.64	-39.33	13.56 <sup>**</sup>
7	Borrowing status	61.83	52.66	-14.83	4.85 <sup>**</sup>	55.83	53.67	-3.86	1.75 <sup>NS</sup>	58.83	53.17	-9.62	4.84 <sup>**</sup>
8	Access to basic needs	68.69	62.38	-9.18	5.60 <sup>**</sup>	77.69	76.41	-1.64	2.19 <sup>**</sup>	73.19	69.40	-5.17	5.64 <sup>**</sup>

\*\* - Significant at 1 percent \* - Significant at 5 percent <sup>NS</sup> - Non-significant

**Table 2:** Distribution of farmers based on impact of natural calamities on their socio economic status (n=120)

Sl. No.	Category	Frequency					
		Flood affected farmers (n <sub>1</sub> =60)		Drought affected farmers (n <sub>2</sub> =60)		Overall (n=120)	
		Before	After	Before	After	Before	After
1	Low	18	20	24	23	42	38
		(30.00)	(33.33)	(40.00)	(38.33)	(35.00)	(31.67)
2	Medium	21	22	18	44	39	45
		(35.00)	(36.67)	(30.00)	(73.33)	(32.50)	(37.50)
3	High	21	18	18	16	39	37
		(35.00)	(30.00)	(30.00)	(26.67)	(32.50)	(30.83)
Mean		387.24	294.71	411.37	390.55	399.31	342.63
SD		73.39	77.83	60.38	60.08	68.00	84.31
Mean±0.435*SD		356.05 to 418.43	261.63 to 327.78	385.71 to 437.03	365.01 to 416.08	370.41 to 428.21	306.79 to 378.46

Figures in parenthesis indicate percentage

**Table 3:** Coping strategies adopted for food grains management during natural calamities by the dairy farmer families (n=120)

Sl.no.	Food grains	Avg. qty. req. per annum/family (quintal)	Normal year				Affected year					
			Own		Purchased		Own		Purchased/Borrowed from			
									Friends/Relatives / Neighbours		Govt. aid	
			Q	%	Q	%	Q	%	Q	%	Q	%
1.	Rice	4.91	0.00	0.00	4.91	100.00	0.00	0.00	0.00	0.00	4.91	100.00
2.	Coarse cereals	3.54	1.72	48.58	1.82	51.41	0.84	23.72	1.22	34.46	1.56	44.06
3.	Pulses	0.62	0.22	35.48	0.40	64.51	0.10	16.12	0.15	24.19	0.37	59.67
4.	Vegetables	0.92	0.15	16.30	0.77	83.69	0.09	9.78	0.25	27.17	0.58	63.04
5.	Fruits	0.97	0.44	45.36	0.53	54.63	0.65	45.77	0.00	0.00	0.00	0.00
6.	Oils	1.31	0.00	0.00	1.31	100.00	0.00	0.00	0.29	22.13	0.78	59.54
7.	Sugar	0.93	0.00	0.00	0.93	100.00	0.00	0.00	0.00	0.00	0.92	98.92

Q=Quantity in quintal

% = Percentage

**Table 4:** Coping strategies adopted for meeting fodder requirements for dairy animals during natural calamities (n=120)

Sl. no	Type of fodder required	Avg. qty. req.	Normal year				Affected year					
			Own		Purchased		Own/ Stock		Purchased/ Borrowed from			
									Friends/Relatives /Neighbours		Govt. aid	
			Qty	%	Qty	%	Qty	%	Qty	%	Qty	%
1.	1. Green Fodder (tons)	3.81	2.57	67.45	1.24	32.54	0.75	19.68	0.44	11.54	2.62	68.76
2.	2. Dry Fodder (tons)	1.59	1.59	100.00	0.00	0.00	0.69	43.39	0.13	8.17	0.77	48.42
3.	3. Others (quintal)	1.12	0.93	83.03	0.19	16.96	0.00	0.00	0.00	0.00	1.12	100.00

Qty=Quantity

%=Percentage

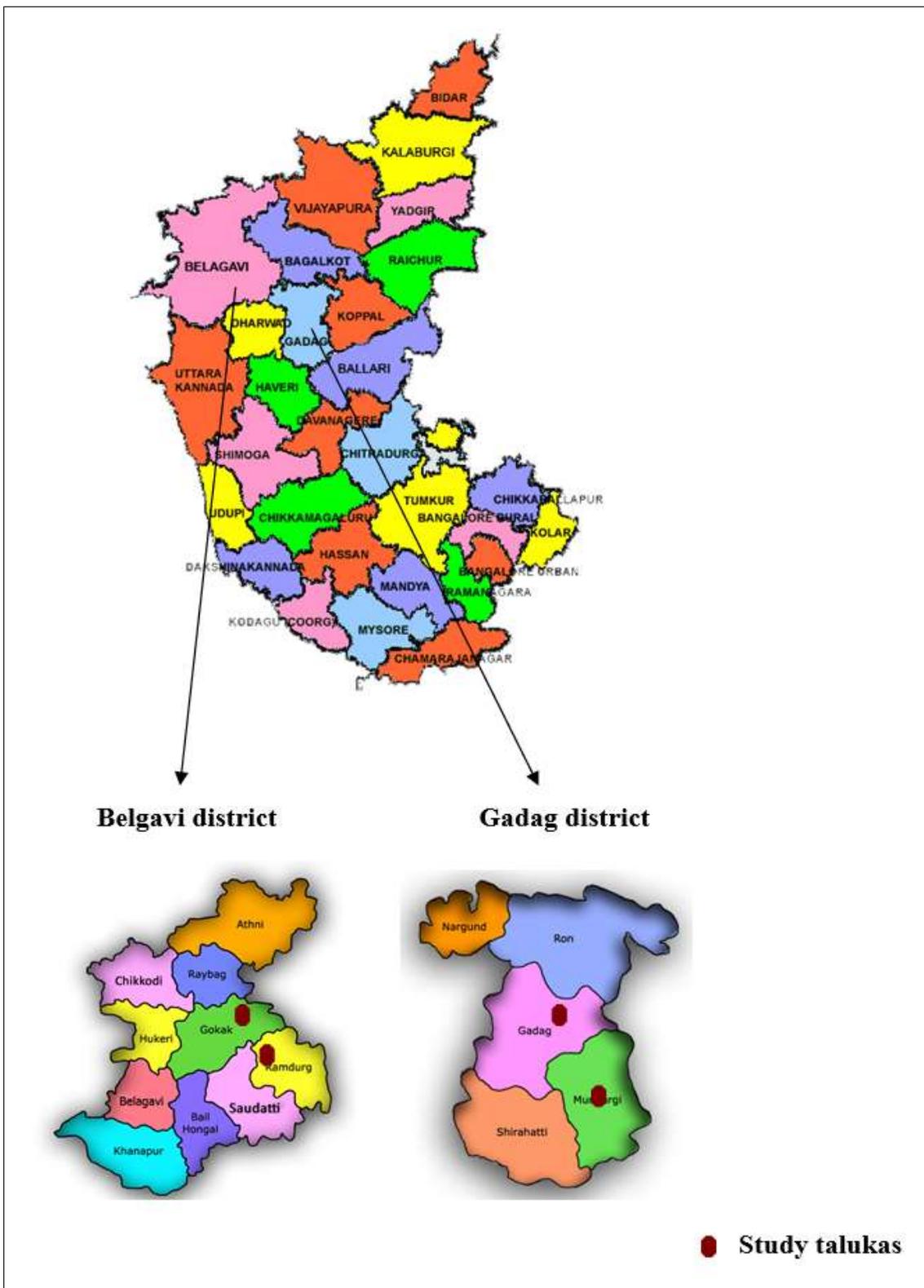
**Table 5:** Coping strategies adopted for fuel requirements during natural calamities (n=120)

Sl. no	Type of fuel required	Qty req.	Normal year				Affected year					
			Own		Purchased		Own		Borrowed from			
									Friends/Relatives /Neighbours		Govt. aid	
			Qty	%	Qty	%	Qty	%	Qty	%	Qty	%
1.	LPG	4.08	0.00	0.00	4.08	100.00	0.00	0.00	1.15	28.18	2.34	57.35
2.	Fuelwood (quintal)	0.60	0.60	100.00	0.00	0.00	0.56	93.33	0.01	1.67	0.00	0.00

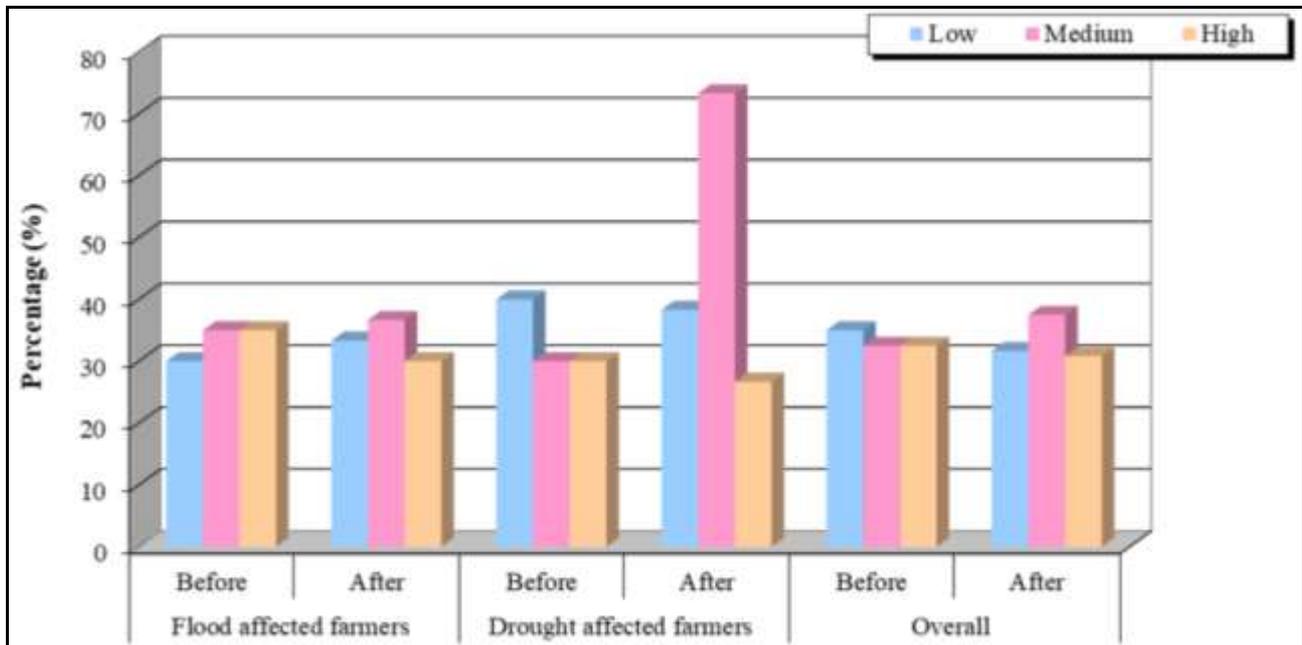
**Table 6:** Coping strategies adopted for financial requirements during natural calamities (n=120)

Sl. no	Expenditure	Normal year				Affected year			
		Own Money required (Lakhs)	Borrowed from			Own Money required (Lakhs)	Borrowed from		
			Friends/ Relatives Rs. (Lakhs)	Banks Rs. (Lakhs)	Local money lenders Rs. (Lakhs)		Friends/ Relatives Rs. (Lakhs)	Banks Rs. (Lakhs)	Local money lenders Rs. (Lakhs)
1.	Consumption	0.67	0.00	0.00	0.00	0.45	0.23	0.00	0.00
2.	Agriculture	1.61	0.00	0.00	0.00	0.74	0.28	0.59	0.00
3.	Education	0.86	0.00	0.00	0.00	0.65	0.29	0.00	0.00

**Karnataka state**



**Fig 1:** Map showing the study area



**Fig 2:** Distribution of farmers based on impact of natural calamities on their socio-economic status

### Conclusion

The impact of natural calamities on socio economic status was in case of drought and flood affected dairy farmers. All the indicators studied had shown negative impact on socio economic status of dairy farmers, except education status indicator which had shown no significant effect from the flood. Fodder availability was severely affected due to the displacement of farm families during natural calamity. There is a need for alternative arrangement to animals such as opening up livestock shelter points in the nearby place. In case of drought, all the indicators had shown non-significant relationship except fodder availability and access to basic needs, which had shown significance at one percent. As the income of the farmers decreased after these natural calamities, they did not invest in improving their access to electricity, fuel and sanitary facilities, which affected on their overall access to basic needs. In drought period either crops are not sown or dried up due to scarcity of rainfall. In addition to the losses in the crop production farmers face problem of acute shortage of fodder. The problem of shortage of fodder must be addressed jointly by the government and community. Community managed fodder banks and relief camps should be promoted.

During calamities farmers were forced to depend on external aids like friends, neighbours, relatives and government aids for food grain requirement as well as fodder. Hence, It is necessary for the farmer to stock or reserve the grains and also save some amount of money for coping up with calamity which keeps a farmer mentally prepared to face such crisis period. Credit institutions can make emergency loans in time of natural calamities.

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