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Sangli flood 2019: The profile of the flood affected respondents and effect of flood on cropping pattern of affected farmers

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Abstract

Sangli region is prone to severe flooding due to its location in the upper Krishna basin and the catchment area of the Koyna and Almatti dams, experienced one of its most destructive floods in 2019. The flood was a result of an unprecedented 400% increase in rainfall within four days in the catchment areas of the Krishna and Warna rivers. This excessive precipitation, coupled with the inadequate discharge capacity of the Krishna River downstream of the Koyna dam, led to severe flooding, caused extensive damage to crops, livestock, and infrastructure, significantly affecting the local agricultural and dairy sectors.

This study was carried out to know the effect of 2019 flood on rural agriculture in the terms of cropping pattern and land utilization pattern of the flood affected land and was conducted in Miraj, Palus and Walwa tehsils of Sangli district as they were the worst flood-affected tehsils in the district. The data was collected through the personal interviews of the respondents. The study revealed that, majority of the farmers belongs to middle age group, completed their education till secondary education, having medium size of family, low experience in farming, low experience in dairy enterprises, medium social participation and marginal landholding, low livestock possession, medium annual income, low flood affected area, and has high extension contact and medium risk orientation and decision-making ability.

The findings shows that majority of the farmers have reported complete loss of crop. Sugarcane is cultivated as a major crop even after flood with increase in cultivation of rice and intercrops and about one-third of the farmers reported their land to be unsuitable for cultivation.

Keywords: Flood, Sangli, cropping pattern, respondents, effect, damage

Introduction

Sangli district lies on the upper basin of river Krishna and also on the bank of river Warna and also in the catchment area of Koyna and Almatti dam. The two major rivers flowing through Sangli district are the Krishna and Warna. Typically, both catchment areas receive more rainfall in July and August compared to the downstream free catchment. Despite proper reservoir management, heavy discharges from major dams like Koyna, Warana, Dhom, and several medium-sized dams are often necessary during severe floods. This combination leads to a significant inflow into the rivers, causing flooding in the Sangli town area and nearby talukas, including Shirala, Walwa, Miraj, Palus, and Tasgaon.

2019 flood was major in Sangli district because 2019 overall rainfall in free catchment area was 569.20 mm and maximum gauge recorded was 57 ft 6 inches. Most of Sangli city was surrounded by water due to continuous rains from August 5 to 8, 2019, resulting in approximately 900 mm of rainfall. This was over 400.00 percent above normal, according to official data from the India Meteorological Department. In 2019, about 73,000 ha. crops were damaged in Sangli district. Apart from damage to crops, farm infrastructure like drip irrigation, pipeline, electricity supply, bore wells has been destroyed to a large extent. Extensive damage was done to standing crops such as sugarcane, paddy, soybeans, and vegetables. There was death and displacement of many livestock, leading to a loss of income for farmers dependent on dairy and animal husbandry.

Methodology

The current study was conducted to know the effects of flood on cropping pattern and land utilization pattern of the flood affected area in Sangli district. Ex-post facto design of social research was used for the present investigation. Miraj, Palus and Walwa talukas were selected on the basis of area affected by the 2019 flood.

Total 15 villages selected from Miraj tehsil, Palus tehsil and Walwa tehsil which were affected by the flood were selected. Farmers were selected with the help of Talathi of that particular village. Total sample of 150 respondents were taken for study randomly. The data from selected 150 respondents was collected by contacting them directly utilizing an interview schedule.

The variables for the present study were identified through a comprehensive review of the relevant literature pertaining to the research objectives and their categorization was made by using Garrett's ranking method except for age, education and size of land holding which were made as per government norms.

While Risk orientation was calculated using scale developed by Patel, M. C and Chauhan, N. B (2009) [9]. This scale is made up of nine statements having response scale of five quantum i.e., 'strongly agree', 'agree', 'undecided', 'disagree' and 'strongly disagree' with scoring pattern of 4,3,2,1 and 0 respectively.

Decision-making ability was calculated using scale developed by J.K. Sharma (2018). This scale is made up of ten statements having response scale of five quantum i.e., 'strongly agree', 'agree', 'undecided', 'disagree' and 'strongly disagree' with scoring pattern of 4,3,2,1 and 0 respectively.

Profile of the flood affected respondents

The profile of the farmer studies the personal, economical, communication and psychological characteristics of the respondent farmer which includes age, education, size of family, experience in farming, experience in dairy enterprises, social participation, land holding, livestock possession, annual family income, flood affected area, extension contact, risk orientation, and decision-making ability of the flood affected farmers in the study area.

From the Table 1, it is observed that the majority (51.33%) of the respondents belongs to the middle age group of 35 to 52 years, which is followed by old age group (53 and above) i.e. 40.00%. The findings were found similar to Gyana (2016) and Rasool (2018) [10].

Table 1 revealed that, one-third of the farmers (31.33%) have completed their secondary education i.e. up to 8th to 10th Std.

The 27.33% farmers have completed Higher Secondary education, while, 25.33% farmers have completed their Graduation. In Table 1 it is revealed that, nearly half (43.33%) of the respondent farmers have medium size family (five to seven) with 51.34% followed by small size i.e. up to four members with 43.33%. The results are similar to Rubina (2022) [11].

In the table 1, it is observed that, nearly half (45.33%) of the farmers have low experience in farming up to 23 years followed by medium experience from 24 to 41 years with 38.00%. While nearly half (46.00%) of the farmers have low experience in dairy enterprises i.e. up to 22 years which is followed by medium (32.00%) dairy experience.

The current investigation revealed that, majority (52.67%) of the flood affected farmers have medium level of social participation followed by low level (44.00%) of social participation. Also, the study indicated that, nearly half of the respondents' falls in marginal land category with 48.67%. This result aligns with the findings of Rubina (2022) [11].

It is noted that, the majority of the farmers (96.00%) has low animals up to 6. About 02.00% of the respondents have medium animals between 7 to 11 animals. The results are similar to the findings of Rubina (2022) [11]. Also, according to the table 1, nearly one-fourth (21.33%) of the respondents possess only buffalo while 19.33% of respondents possess both buffalo and cow. The 05.33% of the respondents possess buffalo and their calf

The results revealed that, maximum number of farmers have medium annual income with 54.00% followed by 44.67% of farmers in low annual income. The results are in conformity with Dinh et al. (2021) [6]. The table 1 reveals that, the 74.00% of the respondents have low flood affected area from their actual landholding. It is followed by medium affected area by 22.00%

The table 1 describes that, most of the respondents i.e. 96.00% exhibit high extension contact. It is followed by medium extension contact (46.00%). This result is in coordination with Rubina (2022) [11]. The results show that majority (49.33%) of the respondents have medium level of risk orientation followed by low level (28.00%). The results given are in coordination with Rubina (2022) [11]. The findings from the study indicated that half (50.67%) of the respondents have medium decision-making ability followed by 34.00% of farmers having low decision-making ability the results reveal to be similar to Sharad (2016) and Chunera (2019).

Table 1: Personal, economical, communication and psychological characteristics of the flood-affected respondent farmers

Sr. No.	Variable	Category	Frequency N=150	Percentage (%)
1	Age	Young (Up to 34 Years)	13	08.66
		Middle (35 to 52 Years)	77	51.33
		Old (53 and above)	60	40.00
		Max: 85 Min: 22		
2	Education	Illiterate (Can't read /right)	1	00.66
		Primary Education (1 st to 7 th Std)	18	12.00
		Secondary Education (8 th to 10 th Std)	47	31.33
		Higher Secondary (11 th to 12 th Std)	41	27.33
		Graduation	38	25.33
		Post-Graduation	5	03.33
		Max: 18 Min: 4		
3	Size of family	Small (Up to 04)	65	43.33
		Medium (05 to 07)	77	51.34
		Large (08 and above)	8	05.33
		Max: 11 Min: 2		
4	Experience in farming	Low (Up to 23)	68	45.33
		Medium (24 to 41)	57	38.00
		High (42 and above)	25	16.67

		Range= 18.33 L= 5 H = 60		
5	Experience in Dairy Enterprises	Low (Up to 22)	69	46.00
		Medium (23 to 38)	48	32.00
		Large (39 and above)	33	22.00
		Range= 16.67 L=5 H = 55		
6	Social Participation	Low (Up to 5)	66	44.00
		Medium (6 to 8)	79	52.67
		High (9 and above)	5	03.33
		Range= 3 L= 3 H = 12		
7	Size of Land holding	Marginal	73	48.67
		Small	46	30.66
		Semi-medium	28	18.67
		Medium	3	02.00
		Large	0	00.00
		Max= 8 Min= 0.15		
8	Livestock Possession			
a)	Number of livestock possessed	Low (Up to 6)	144	96.00
		Medium (7 to 11)	3	02.00
		High (12 and above)	3	02.00
		Range=5.67 L= 0 H = 17		
b)	Types of livestock possessed	Buffalo	32	21.33
		Cow	6	04.00
		Buffalo + Cow	29	19.33
		Buffalo+ Goat	4	02.00
		Buffalo +Cow +Goat	3	02.67
		Buffalo+ bull	2	01.33
		Buffalo +Cow + Bull	1	00.67
		Buffalo+ Calf	8	05.33
		Cow+ Calf	2	01.33
		Buffalo+ Cow + Calf	6	04.00
		Goat	1	00.67
		No animals Possessed	56	37.33
9	Annual Family income	Low (Up to Rs. 2,66,667)	67	44.67
		Medium (Rs. 2,66,668 to Rs. 4,58,332)	81	54.00
		High (Rs. 4,58,333 and above)	2	01.33
		Range= 1,91,666.66 L= 75,000 H = 6,50,000		
10	Flood Affected Area	Low (Up to 1.3)	111	74.00
		Medium (1.4 to 2.45)	33	22.00
		Large (2.46 and above)	6	04.00
		Range= 1.15 L= 0.15 ha. H = 3.6 ha.		
11	Extension Contact	Low (Up to 7)	8	05.33
		Medium (8 to 10)	46	30.67
		High (11 and above)	96	64.00
		Range=3.67 L= 3 H = 14		
12	Risk Orientation	Low (Up to 19)	42	28.00
		Medium (20 to 23)	74	49.33
		High (24 and above)	34	22.67
		Range= 4.67 L= 14 H = 28		
13	Decision making ability	Low	51	34.00
		Medium	76	50.67
		High	23	15.33
		Range=3 L= 29 H = 38		

Effect of flood on cropping pattern

This section of the study indicates damage to the standing crops, change in average yield of the crops in the succeeding year, changes in cropping pattern and crop selection and changes in land utilization pattern caused due to flood in 2019.

a) Damage to Standing Crops during Flood

The percentage of the crops completely and partially damaged are given below in table 2. The finding from the current investigation indicated that, about 95.17% of the respondents reported that their crops were completely destroyed due to flood which includes crops like sorghum, sugarcane, groundnut, soybean, vegetables, banana, and also includes turmeric.

According to the table above, 94.74% of sugarcane was

completely damaged. The crops like soybean, groundnut, banana, vegetables, sorghum and turmeric were completely damaged. For paddy, 66.67% of paddy was completely damaged.

b) Change in Average yield of the crop grown during the flood and after the flood in Percentage

This section provides the average decrease in the yield of crops cultivated in the next/following year given in table 3. Table 3 reveals the findings that, about 38.00% of farmers faced up to 42.00% loss in yield, while 26.00% of farmers revealed that their land became unsuitable for the cultivation and thus, they faced complete loss of the crop. 26.00% of the farmers experienced medium loss.

Table 2: Distribution of the flood affected respondents according to damage of the crops during flood

Crops cultivated in 2019	Completely damaged		Partially damaged	
	Frequency	Percentage	Frequency	Percentage
Sole crop				
Sugarcane	90	94.74	5	05.26
Soybean	9	100.00	0	00
Banana	5	100.00	0	00
Groundnut	8	100.00	0	00
Paddy	4	66.67	2	33.33
Vegetables	4	100.00	0	0
Sorghum	15	100.00	0	0
Turmeric	8	100.00	0	0
Intercrops				
Soybean	19	100.00	0	0
Groundnut	9	100.00	0	0
Vegetables	8	100.00	0	0
Others	2	100.00	0	0

Table 3: Distribution of respondents according to decrease in the average yield of land in succeeding year

Sr. No.	Categories	Decrease in yield (%)	Frequency (N=150)	Percentage (%)
1.	Low	Up to 42	57	38.00
2.	Medium	43 to 71	39	26.00
3.	High	72 and above	15	10.00
4.	Complete Loss	100	39	26.00
Total			150	100.00
Range= 29.17 L= 12.5 H = 100				

c) Changes in cropping pattern and crop selection

The results from table 4 confronts that, before flood maximum number of the farmers (63.33%) cultivate Sugarcane as major crop in the study area. The sugarcane is followed by sorghum as a next major crop with 10% of farmers cultivating it in the study area.

After the damage of the crops during the 2019 flood, the farmers didn't change the cropping pattern but change in the area was made. Nearly half of the farmers (44.00%) still cultivate sugarcane but it was reduced by 19.33% after flood. There was increase in the cultivation of the paddy in the affected area with 24.00% of farmers cultivating it which was upgraded by 20.00% as compared to 2019. Cultivation of vegetables was increased by 0.67%. Fodder crops were cultivated on the partially converted

pasture land and barren land with 16.00% cultivation and with same increase in%.

For intercrops, the cultivation of the soybean was increased 01.33% and is cultivated by 14.00% farmers. Groundnut cultivated is cultivated by 08.67% farmers with increase in cultivation of 02.67% while vegetables with 02.00% increase in cultivation after flood. Thus, cultivation of intercrops was increased by 04.67% farmers.

d) Change in Land Utilization Pattern after flood

From the table 5, it is revealed that about 74.00% of farmers land has no changes and is used for cultivation even after affected by flood. The remaining 26.00% farmers land became unsuitable for cultivation.

Table 4: Distribution of the respondents according to change in cropping pattern and crop selection

Sr. No.	Cropping Pattern	Before Flood (2019)		After Flood		Increase / Decrease in Area After flood (%)
		Frequency (N=150)	Percentage (%)	Frequency (N=150)	Percentage (%)	
As a Sole Crop						
1.	Sugarcane	95	63.33	66	44.00	-19.33
2.	Soybean	9	6.00	0	00.00	-06.00
3.	Banana	8	5.33	3	02.00	-03.33
4.	Groundnut	5	3.33	0	0.00	-03.33
5.	Paddy	6	4.00	36	24.00	+20.00
6.	Vegetables	4	2.67	5	03.33	+00.67
7.	Sorghum	15	10	4	02.67	-07.33
8.	Turmeric	8	5.33	0	0.00	-05.33
9.	Fodder crops	0	0	24	16.00	+16.00
Total		150	100	138	100	
Intercrop						
1.	Soybean	19	12.67	21	14.00	+1.33
2.	Groundnut	9	06.00	13	08.67	+2.67
3.	Vegetables	8	05.33	11	07.33	+2.00
4.	Others	2	1.33	0	0	-1.33
Total		38	25.33	44	30.00	

In this, 10.00% of the farmers kept their land as barren land which means no crop can be grown there and is of no use and remaining 08.00% of the farmers have converted their land in farm ponds which can be used for water storage, irrigation etc.

Table 5: Distribution of the respondents according to change in land utilization pattern of flooded area after 2019 flood

Sr. No.	Categories	Frequency (N=150)	Percentage (%)
1.	For Crop Cultivation	111	74.00
2.	Converted into Farm Pond	12	08.00
3.	Kept as Barren Land	15	10.00
4.	Converted into Pasture land	12	08.00
	Total	150	100

Conclusion

The study concluded that majority of the farmers belongs to middle age group, have completed their education till secondary education, having medium size of family between members 5 to 7, having low experience on farming and low experience in dairy enterprises, having medium social participation and marginal landholding, having low livestock possession and medium annual income with low flood affected area up to 1.33 ha, and has high extension contact and medium risk orientation and decision-making ability.

The findings concluded that 95.17 percent of the respondents reported that their crops were completely destroyed while in cropping pattern, there no specific change in the pattern in which sugarcane is the major crop with 44.00 percent followed by paddy with 36.00 percent. In all other crops there seems to be reduction. Average decrease in yield in succeeding year having maximum no. of farmers faced loss up to 42 percent. 10.00 percent of the flood affected land was kept barren due to flood.

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