

Disasters and Agriculture in Punjab (India): Damage Caused by Floods in 2011

Abstract

Disaster means the occurrence of any mishap due to any natural or manmade causes, which can pose serious threat to human lives at mass level and a huge destruction to environment, property, livestock etc. (DM Act 2005). The main natural disaster endangering the agrarian state of Punjab is floods which cause a lot of damage to cropped area every year. **Aim:** The aim of the present research work is to highlight the crop area damaged due to floods. **Study Area:** The study area taken for this research work includes all the districts of Punjab, where crop area was damaged due to floods in the year 2011. **Methods:** Data on the flood-affected crop area was taken from Statistical Abstract of Punjab for the year 2011. **Findings:** The extent of crops damaged due to floods in Punjab is very immense in areas where the level of groundwater table is high and areas which lie along the course of rivers Beas and Satluj.

Keywords: Agriculture, Disasters, Floods, Crop Area Damaged

Introduction

Disaster means the occurrence of any mishap caused due to any natural or manmade activities, which can pose serious threat to human live at mass level and a huge destruction to environment, property, livestock etc. (DM Act 2005). Natural disasters like earthquakes, floods, landslides etc cause severe damage to community and environment. Sometimes these natural disasters can spread their impact beyond the disaster-hit area to the whole country. So disasters can temporarily or permanently threaten the economic condition of the whole country. Therefore researchers are now engaged in finding an empirical relationship between disasters and economic growth, which can help policymakers to show interest in disaster mitigation and preparedness (Rigolini. J. et.al., 2012). India is primarily an agrarian economy. The occurrence of natural disasters in any part of the country directly impacts the agricultural sector, because agriculture purely depends on the weather and climate. Out of all the natural disasters, floods are most devastating for agriculture. From the literature it has been found that floods sometimes cause negative impact on agriculture, but sometimes they have positive effect as well (Christiaensen. L. et.al., 2012). For instance moderate flooding in any area brings in a lot of fertile alluvium and sediments, which are very useful for increasing production of the crops in that area after flooding. This process reflects the positive impact of floods on agriculture. However, this positive effect is very small as compared to the massive devastation caused by floods. The aim of the present research work is to highlight the crop area damaged in Punjab due to floods in the year 2011. The district-wise data on the damage of crop area due to floods was taken from Statistical Abstract of Punjab for the year 2011. The map showing the spatial extent of crop area damaged was prepared using ArcGIS software.

Statement of Problem

Punjab is an agrarian state. It is the food bowl of the country. This state is one of the largest producers of wheat and rice in India. The economy of is highly dependent on agriculture. Punjab state alone is producing 10.26 % of cotton, 19.5 % wheat and 11% rice of India's. 90% of the land is irrigated by the monsoons. The main rivers flooded almost every year are Ravi, Beas, Satluj and Ghaggar. Regular flooding every year destroys lakhs of acres of agricultural land of the state which directly affects the economic condition of the community, state and country as well. The prime factors increasing the vulnerability of Punjab to floods are



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- i. Punjab gets its maximum rainfall in a short span of three months during monsoon season
- ii. Low forest cover of the state
- iii. Majority of poor population living in flood plains
- iv. Water-logging in some areas
- v. Poor construction of canals

The main problem arising out of this regular flooding every year is damage to agriculture and infrastructure due to drainage congestion and water logging. High rainfall, failure of drainage system and lack of proper measures adopted to lessen the impacts of floods usually enhance the probability of flooding in the state. The present research work examines the extent of crop area damaged due to floods in the state in 2011.

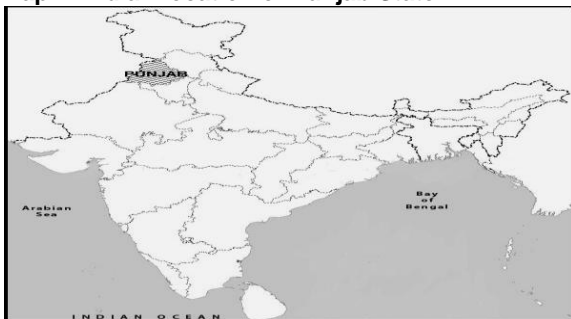
Methodology

The paper has been written by obtaining data from secondary sources. The data on flood damage was taken from Statistical Abstract Punjab, 2012. Many newspaper reports were studied and used for the study.

The Study Area

The study area selected for the present research is the state of Punjab (India). Punjab is located in the north-western parts of India. It shares its international boundary with Pakistan in the west and state boundaries with Jammu & Kashmir in north, Himachal Pradesh in the east and Rajasthan and Haryana in the south. It covers a total area of 50362 sq km. Around 5000 years ago, the famous Indus civilization flourished in and around this state. There is a narrow tract of hills in the north-eastern parts of the state which are known as the Shiwalik hills. The rest of the state is a vast fertile alluvial plain. The three major rivers flowing through the state are Satluj, Beas and Ravi. The climate of the state is of continental monsoon type. Agriculture is the mainstay of economy. Nearly 86% of total geographical area is under cultivation. The main crops produced are wheat, rice, maize, gram and pulses. According to the Census of 2011, the population of the state is 2,77,43,338 persons. The population density is 551 persons per sq. km and the literacy rate is 76.68%. The state comprises of 22 districts and state capital is Chandigarh.

Map 1: India: Location of Punjab State



Discussion

The data obtained from Punjab Statistical Abstract shows that over the years, floods have caused damage to Punjab's farming community in general and agricultural crops in particular (Table 1). In 1970 the number of villages/towns affected in the

state was 176, area affected was 118 sq. km. and the population affected was 7541. Luckily there was no major loss of human life and only 1 person died in floods and 5 cattle heads were lost. The damaged area under crops was 6987 hectares, which was only 0.12% of the total cropped area and the value of the damaged crops was Rs. 3,088,000. In 1980 the damage was greater than 1970. The number of villages affected in 1980 rose to 1191, the area affected was 489 sq. km. and the population affected increased to 85724. In 1980 the death toll also rose to 44 persons and the cattle head lost were 117. The damage caused to areas under crops was 48930 hectares which was 0.72% of the total cropped area. The economic value of the damaged crops was Rs. 6,559,000. In the year 1990, the number of villages affected, area affected, human lives lost and cropped area damaged was lesser than in 1980 but the population affected, cattle head lost, the value of damaged crop and the percentage of damaged area to total cropped area was greater. The number of villages and towns affected were 775, the area affected was 471 sq. km. and the population affected was 90465. Human lives lost were 13 and cattle head lost were 275. Total area damaged under crops was 47048 hectares and it was 9.75 of the total cropped area. Economic loss of Rs. 2,51,086,000 was recorded.

Table 1: No. of villages/towns affected, human lives and Cattle lost due to floods during the Rainy Season in Punjab (1970-2011)

Year	No of villages /towns affected	Area Affected (sq. km.)	Population Affected	Human Lives Lost	Cattle Heads Lost (No.)	Damage Caused to Areas Under Crops (hectares)	% of Damaged Area to Total Cropped Area	Value of Crops Damaged (000 Rs)
1970	176	118	7541	1	5	6987	0.12	3088
1980	1191	489	85724	44	117	48930	0.72	6559
1990	755	471	90465	13	275	47048	9.75	251086
2000	81	127	319	5	88	12620	0.16	77116
2010	1081	1608	62318	37	109	75645	1	2065182
2011	1196	6954	171773	36	133	102828	1.30	2232525

Source: Statistical Abstract Punjab, 2012

In the year 2000 again the damage caused by floods reduced. The total number of villages and towns affected were 81, the total area affected was 127 sq. km. and the population affected was 319 persons. In this year, the number of lives lost was 5 and cattle head lost were 88. The total area damaged under crops was 12620 hectares and was 0.16% of total cropped area. The amount of economic recorded in this year was Rs.77,116,000. In the year 2010 the extent of damage increased. The number of affected villages increased to 1081, the affected area increased to 1608 sq. km. and the population affected was 62318 persons. The total human lives lost due to floods in 2010 were 37 and the cattle heads lost were 109. The damaged area under crops was 75645 hectares which was as much as 1% of the total cropped area and the value of the damaged crops was Rs. 20,65,182,000. In the year 2011, the number of villages and towns affected were 1196, the area affected due to floods was 6954 sq. km. and the number of people affected was 171773, all of which were the maximum figures of last 50 years. The total human lives lost and cattle heads lost in the floods 2011 were 36 and 133 respectively. The total area damaged under crops was 102828 hectares and was 1.30 of the total cropped area. An economic loss of Rs. 22,32,525,000 was recorded, which was again highest in the last five decades.

Table 2: District wise damage due to floods (2011)

S. No.	District	No. of Villages/Towns affected	Area Affected (Sq. Km.)	Population affected by floods	Human Life Lost	Cattle Head Lost	Damage Caused to Area Under Crops	% Damaged Area to Total Cropped Area	Value of Damaged Crops ('000 Rs.)
1	Gurdaspur	25	100	0	0	1	1004	0.2	11190
2	Pathankot	0	0	0	0	0	142	0	7094
3	Amritsar	08	2	0	6	0	230	0.05	2845
4	Tarn Taran	47	101	0	3	11	10078	2.54	195176
5	Kapurthala	90	91	0	2	5	0	0	111720
6	Jalandhar	103	136	3109	6	20	13566	3.33	75121
7	S.B.S Nagar	474	1	0	2	22	95	0.05	4720

8	Hoshiarpur	45	45	0	0	0	0	0	0	1824	0.51	22540
9	Roopnagar	0	57	0	0	0	0	0	0	569	0.39	67020
10	S.A.S Nagar	0	0	1	0	0	0	0	0	0	0	16000
11	Ludhiana	0	0	0	0	0	0	0	0	0	0	0
12	Ferozpur	72	87	23242	0	29	8700	0.98	226050	0	0	0
13	Fazilka	0	0	0	0	0	0	0	0	0	0	0
14	Faridkot	0	0	0	0	0	0	0	0	0	0	0
15	Muktsar	185	6310	145422	3	11	63104	14.47	767378	0	0	0
16	Moga	79	13	0	0	10	2328	0.61	131489	0	0	0
17	Bathinda	56	0	0	0	10	88	0.02	564500	0	0	0
18	Mansa	0	0	0	0	0	0	0	0	0	0	0
19	Sangrur	0	0	0	0	1	0	0	0	0	0	0
20	Barnala	1	0.5	0	0	8	5	0	22000	0	0	0
21	Patiala	0	0	0	0	0	0	0	0	0	0	0
22	Fatehgarh Sahib	11	11	0	0	4	1095	0.59	7682	0	0	0

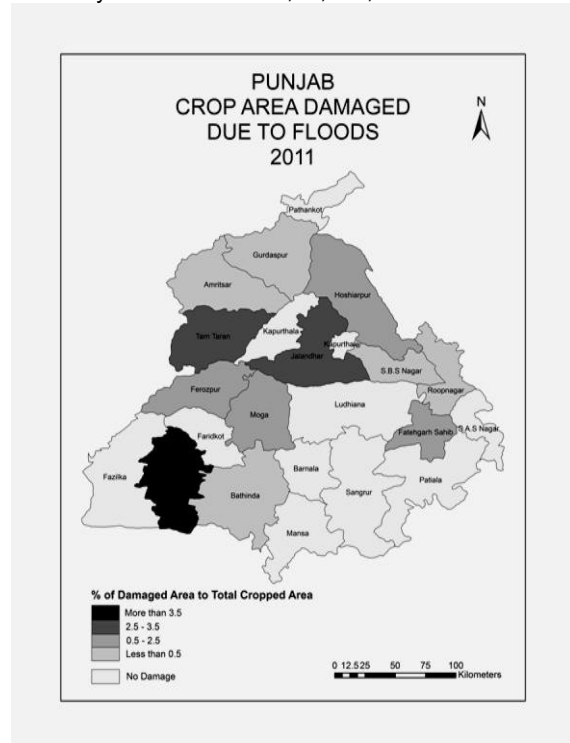
Source: Statistical Abstract Punjab, 2012

The district-wise damage caused by floods in 2011 is shown in Table 2. The spatial patterns of the damage caused to area under crops to the total cropped area by floods are discussed below:

(a.) Districts Having More Than 3.5% Damaged Crop Area to Total Cropped Area

It has been found that district Muktsar has the highest extent of damaged area under crops to the total cropped area (14.47%). Sirhind canal and Rajasthan feeder are the main canals running through this area. Almost all the irrigation in the district is done through canals. There is problem of water logging in the whole area and the main reason of water logging is the seepage of water from these canals. Even a short spell of rainfall causes a flood like situation in this area. Consequently, the water table of the district is very high (i.e. up to 1.5 meters below ground level) (Agriculture Department Punjab, 2010). Moreover, this region is a very fertile region of Punjab where the production of wheat and rice is very high. However, every year floods cause a lot of damage to these crops of wheat and rice and disrupt the economy of the district as well as state. This natural disaster further leads to another disaster. The floodwater

standing in the different parts of the district especially at Lambi and Malout areas act as breeding ground for several vectors which result in dengue. In 2011, a total 186 cases of dengue were recorded in the whole district (The Tribune, Sept 26, 2011). The total number of villages/towns affected by floods was 185 and the area affected was 6310 sq. km. The population affected in the district by floods was 145422 persons. Three persons lost their lives and eleven cattle heads were lost. The total area damaged under crops was 63104 hectares which was 14.47% of total cropped area. The damage of crops in monetary terms was Rs. 7,67,378,000.



(b.) Districts Having 2.5% to 3.5% Damaged Crop Area to Total Cropped Area

After district Muksar, the districts suffering the most damage to crops are Jalandhar and Tarn Taran. The crop area damaged in these two districts to total cropped area was 3.33% and 2.54% respectively. District Jalandhar is surrounded by two rivers Beas and Satluj. This district is vulnerable to floods because of these two rivers. Every year in monsoon season, these rivers are flooded and hence pose a lot of damage to this district. In 2011, the high flowing water in river Satluj was the main cause of floods in the district. With this huge flow of water, a breach occurred in Dhussi Bandh near Phillaur Tehsil, which was around 50 feet wide to begin with, but started widening and caused flooding in ripened paddy fields spread over thousands of acres (The Times of India, August 31, 2011). A total of 35.68 lakh was granted by the state government to the affected families of 2011 floods (Hindustan Times, Nov 1, 2012).

Floods also severely hit district Tarn Taran situated along the river Beas in 2011. The main reason for flooding in the district is river Beas, which threatens the agriculture of Tarn Taran almost every year. In 2011, near about 30,000 acres of the cropped area was damaged. The worst-hit villages were Werowal, Hansawala, Goindwal Sahib, Shabdapur, Khakh, Bhail, Manak, Deke, Johal Dhaye Wala, Munda pind, Kharka, Chamba, Johal, Dhunda, Kamoj Dhaye Wala and Karmowala. Paddy crop was destroyed in the flood-hit areas (Hindustan Times, Aug 9, 2013).

(c.) Districts Having 0.5% to 2.5% Damaged Crop Area to Total Cropped Area

The districts falling in this category are Ferozpur, Moga, Fatehgarh Sahib and Hoshiarpur. District Ferozpur, with 0.98% of cropped area damaged out of the total cropped area, is situated along the Satluj River. In 2011 the district was badly hit by monsoons, which created a flood situation in the district. The total number of villages/towns affected in 2011 floods was 72 and the total area affected was 87 sq. km. These floods affected a total of 23242 persons. Luckily there was no loss of life but 29 cattle heads were lost in the flood. The total damage caused to area under crops was 8700 hectares which was 0.98% of the total cropped area. The monetary value of damage of crops was Rs. 2,26,050,000.

Moga district was also flooded due to the high-flowing water of river Satluj. The areas lying along the boundaries of Satluj were flooded and the standing crops of moong, maize and mint were destroyed. The district administration had a functional Flood Control Room and had identified 34 villages as flood prone and also claimed that the district was ready for any emergency arising out of floods. Despite all these measures, the number of villages affected in 2011 floods was 79 and total area affected was 13 sq. km. Fortunately, no loss of human life occurred. The number of cattle head lost was 10. Around 2328 hectares of land under crops was damaged which was 0.61% of the total cropped area. In financial terms, the crop loss amounted to Rs. 1,31,489,000.

After Moga, the next highest damage recorded was in district Fatehgarh Sahib. A total of 11 villages/towns were affected in the whole district. The flood affected nearly 11 sq. km. area of the district. Two people lost their lives and four cattle heads were lost in 2011 floods. The total crop area damaged was 1095 hectares, which was 0.59% of the total cropped area. The total crop loss recorded in the district was Rs. 7,682,000.

Hoshiarpur district falls at the bottom of this category. The villages/towns affected in 2011 floods were 45 and the area affected was 45 sq. km. The number of people who lost their lives in floods were 5 and 1 cattle head was lost in the district. A total of 1824 hectares of land under crops was damaged, which accounted for 0.51% of the total cropped area. The economic loss of crop damage in the district was Rs 22,540,000.

(d.) Districts Having Less Than 0.5% Damaged Crop Area to Total Cropped Area

The districts having damaged crop area less than 0.5% of total cropped area were Roopnagar, Gurdaspur, Amritsar, S.B.S Nagar and Bathinda. The damage caused by floods in these five districts was very low as compared to the above categories. The damage to crops in districts Roopnagar and Gurdaspur is slightly higher than in Amritsar, Bathinda and S.B.S Nagar, because these two districts are situated along Beas River, which is one of the main rivers flooded during monsoon season in Punjab. The percentage of damaged crop area to total crop area in districts Roopnagar, Gurdaspur, Amritsar, S.B.S Nagar and Bathinda are 0.39, 0.20, 0.05, 0.05 and 0.02% respectively. Thus, floods affected all these areas of Punjab to a very low extent.

Districts Having No Damage Due to Floods

The districts that were not at all affected by floods in Punjab in 2011 were Fazilka, Faridkot, S.A.S Nagar, Ludhiana, Sangrur, Pathankot, Kapurthala, Barnala, Patiala and Mansa.

Conclusion

The extent of cropped area damaged due to floods in Punjab is greater in areas where the level of groundwater table is high and in areas that lie along the course of rivers Beas and Satluj. Therefore, appropriate measures have to be taken to solve this problem of flooding in an agrarian state like Punjab because floodwater causes destruction of crops worth hundreds of crores of rupees every year. In areas having high groundwater table, measures should be taken to purify the underground water and make it fit for irrigation and domestic uses, so that the dependence on canals could be minimized and the use of groundwater could be enhanced. In areas where floods are caused due to the overflow of rivers or canals, structural and non-structural measures must be adopted to strengthen the capacity of the water channels. To prevent breaches in water channels, strong embankments must be made and the overflow water must be diverted or transferred to other canals.

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