Journal of Agroecology and Natural Resource Management
p-ISSN: 2394-0786, e-ISSN: 2394-0794, Volume 6, Issue 3; April-June, 2019, pp. 134-137

http://www.krishisanskriti.org/Publication.html

Impacts of Cloud Bursts on Horticultural Production in Kashmir Valley

Waseem Ahmad Bhat[1], Fayaz Ahmad Lone[1], Shafkat Ahsan[1*] and, Shahbaz Rasheed Bhat

[1]Department of Geography and regional development
E-mail: [2]shafkatwani52@gmail.com

Abstract—*Climate change is a serious environmental concern faced by small farmers in the state of Jammu and Kashmir. Being located in the mountainous ecosystem, the study area is very prone to extreme weather events such as cloud bursts. The frequency of such weather extremes have increased in the recent past owing to global changes in the environment. However, the most sensitive economic sector which has been affected is the agriculture especially in the developing regions such as Kashmir valley. The present study has been undertaken to analysis the effects of clouds bursts on the agricultural production in the research area. The study is based on the questionnaire survey of 300 farmers which were chosen randomly during the period 2017. Descriptive statistics was used to analysis the data. The study reveals that the farmers in the study area have been badly affected by the cloud bursts which have serious bearings on their farm income as well as availability of food supply. Majority of farmers (91.25%) have witnessed an increase in cloud burst activity in the region. The study calls for policy intervention with respect to dissemination of weather forecasting, adaptive capacity, financial support and crop insurance.*

Keywords*: climate change, cloud bursts, agricultural production, policy intervention.*

INTRODUCTION

Cloudbursts in the Himalayas are elusive in terms of their specific location and time of occurrence. Most of them are reported in the interior valleys which trigger rapid upward movement of air columns, creating high instability and increasing droplet size up to 7mm.As such, their observations are limited and they are reported only when the disastrous effects in the lower riparian areas are known. The Kashmir valley is particularly prone to vagaries of severe weather claiming casualties every year. Owing to its unique geographical position, the Himalayan mountain range in the study area influences the weather and climate by acting as a strong physical barrier for the circulation pattern, as a heat source in summer and heat sink in winter. Its varying snow cover and vegetation affects the monsoon rainfall and other atmospheric conditions. The surface boundary conditions of the Himalayas determine the performance of the monsoon rainfall, which has immense impact on water resources and agricultural production. In Kashmir Valley, average annual loss of life due to weather extremes is huge and the total property damage is equivalent more than 100 million rupees. On an average, about more than 50people are killed and while as considerable areas get affected annually from various types of disasters. Severe weather has calamitous effect in the mountainous region as the terrain is complex, development is poor and economy is fragile (Sharma et al., 1999; Maikhuri et al., 2017). There are several types of weather hazards, which can affect life of people living in the mountains (Dimiri et al., 2016). They are (a) torrential rain, accompanied by landslides, overflowing dams, lake outbursts; (b) cloud bursts accompanied by lightning damage, flash floods, hailstorm and windstorm; (c) heavy snowfall accompanied by avalanches, surging glaciers and, (d) droughts causing damage to agriculture and horticultural productions.

Though all possible outcomes of the environmental disaster are yet to be ascertained but it has being considered as a major factor for increasing the vulnerability of communities, especially of the poor, women, and marginal communities living in disaster prone areas. These sections of the societies are relatively more susceptible on account of greater dependence on climate-sensitive sectors like agriculture and forestry for their livelihoods or limited adaptive capacity (Chalise, 1997). In recent years frequency of natural and anthropogenic catastrophes has increased in the entire Kashmir region making it one of the most vulnerable and fragile regions of the world.

In Indian meteorological parlance, though, particularly cloudburst events are frequently referred across in numerous researches, but are not well defined and lack in their assessment and understanding. These events are governed by much unknown complex convective and orographic processes (Dimiri et al., 2016). Hence, so far no set definition leading to cloudburst is provided. It is primarily linked to the high precipitation event over much localized area in very short time span. As per the IMD, cloudburst phenomenon characterized by high intensity precipitation, usually N100 mm/h, within a short span of time, over a small area. But then this definition remains to be very qualitative and associated dynamics and thermodynamics in correspondence with orographic

interactions over the Indian Himalayas remain missing (Dimiri, 2016).

The Himalayas as considered to be youngest mountain is tectonically active and hence geologically known to be inherently vulnerable to hazards. In the recent decades fury and vagaries associated with the secondary impacts of cloudburst events are reported across the Himalayan regions (Haritashya et al. 2006). Most of outfall of these catastrophic events leads to deaths of people, cattle, damaged to crop, property, infrastructure etc. 13 Sep 2013 cloudburst over the Ukhimath (Rudraprayag) killed almost 66 people and damaged land and property (Rana et al. 2012)

Study area

Kashmir valley is a longitudinal depression in the great northwestern complex of the Himalayan ranges. It constitutes an important relief feature of tremendous geographic significance. Carved out tectonically, the valley has a strong genetic relationship with the Himalayan complex, which exercises an all-pervading influence on its geographic entity. Territorially, it forms the interior part of the Jammu and Kashmir. The latitudinal extent of thestate is 32.17°N–37.6°N, whereas the longitudinal extent is 73.26°E–80.30°E (Fig. 2). The state of Jammu and Kashmir is situated in subtropical latitudes, but owing to orographic features and snow clad peaks, the climate over greater parts of the state resembles to that

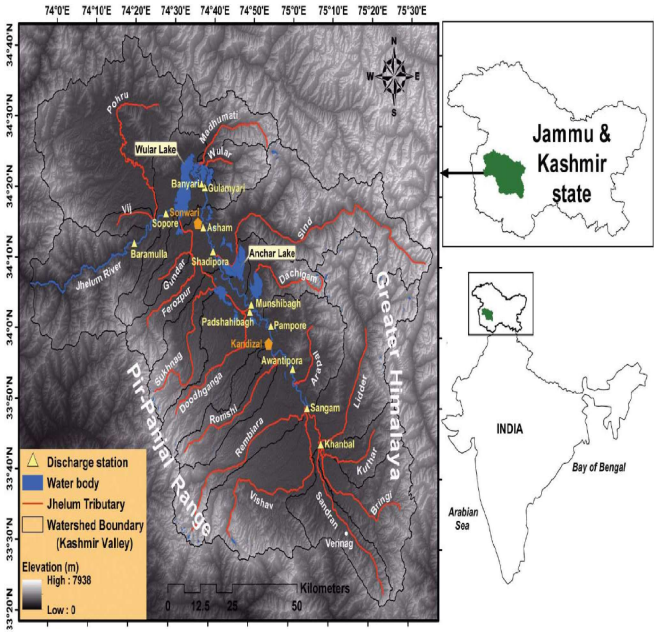

Figure 1: Showing the study area map

of mountains and continental parts of the temperate latitudes. Climate of Kashmir falls under Sub-Mediterranean type with four seasons based on mean temperature and precipitation (Bagnolus and Meher-Homji 1959). However, micro level variations in general weather and climatic conditions of the state do exist. Due to the large variations in altitude from 300 m in the south to 8500 m in the north, the climate of the state of Jammu and Kashmir varies from tropical to arctic. However, authors maintain that the climate of Kashmir is highly variable and do not conform to any definite type, and presents a fresh classification of the seasons of Kashmir based on Hadlow's world scale for mean monthly temperature (Kaul and Qadri 1979). The general climate of the state can be understood easily by describing the weather conditions of different seasons of Jammu division, Kashmir Valley and Ladakh division separately. In general, the valley has fairly long period of winter and spring. On the basis of temperature and precipitation, a year in the whole Kashmir valley is divisible into the following four seasons:

1. Winter Season (November–February),

2. Spring Season (March–Mid-May),

3. Summer Season (Mid May–Mid-September),

4. Autumn season (Mid-September–October).

The local weather classification however, recognizes the following six seasons with duration of 2 months each:

1. Sonth (Spring): Mid-March–Mid-May

2. Grishm (summer): Mid May–Mid-July

3. Wahrat (Rainy): Mid July–Mid-September

4. Harud (Autumn): Mid-September–Mid-November

5. Seshur (Season of severe cold): Mid-January–Mid-March

This classification is based is based on empirical experiences of the people about temperature and precipitation conditions in different parts of the year, which is scientific and gives a more reliable picture of the weather conditions of the valley of Kashmir (Lone et al. 2015).

Methodology

The present study is primarily based on the field data collected from 300 farmers in the research area. Prior knowledge pertaining to areas experienced frequent cloud burst activity was obtained through new papers, published articles and consultation with local people. The data was systematically collected using questionnaire as a basic data collection tool. Since the study aimed to collect framers perception

component of cloud burst activity in the last 25 years, only those farmers were selected which were aged above 45 years. The data analysis was performed in the MS excel. The analysis was confined to descriptive or tabular analysis. Importantly, likert scale was incorporated in the questionnaire to obtain farmer opinion with respect to cloud burst activity and their impact on the horticulture production in the study area. Ten statements/ constructs were used to which farmers were asked to mention their agreeness or disagreeness on five-point likert scale. Apart from this, basic information was also acquired pertaining to losses in terms of horticultural production and other assets from last five years due to cloud burst activity.

Results and Discussions

This section summarises the results of ten constructs that were used in the questionnaire survey to analyse the general opinions of farmers in the study area regarding various dimensions of cloud burst activity and its implication on the horticulture system in the research area. As per the results, the construct i.e, "cloud bursts are closely associated with the growing season of the horticultural crops" was most highly agreed item in terms of mean perception score (see table1). The very construct suggest the vulnerability of horticultural crops to cloud bursts such as apple, walnut, pear, cheery and so on. These crops are widely grown in closed valleys which naturally favour the cloud bursting process because of conducive meteorological conditions critically required for development of cumulonimbus clouds and thunderstorm activity. It was followed by mean perception score of 4.12 acquired by construct that farmers in the study area are concerned about the cloud burst activity. This is partly due to the reason that farmers are among the vulnerable section of the society owing to their financial insecurity and capital scarcity required for adaptation behaviour.

Interestingly, farmers agreed highly on the statement pertaining to vulnerability of horticultural crops to cloud bursts and were equally agreed with second ranked construct. The dependence of farmers on horticultural production makes cloud bursts serious environmental concern in the study area. The situation gets further aggravated given to increasing frequency of such disasters in recent past. So the early warning system is the need of the hour(MPS=4.07). However, it may be pointed out that the mitigation strategies to curb the financial losses cannot be achieved individually so role of government can prove vital in two keys area. First of all, cloud burst prone areas needs to be prioritised in disaster management policies and secondly, there is strong need of crop insurance policies to compensate the financial losses. The results also highlighted the role of government and other authorities in mitigating the losses which incur from such hazards. Farmers were of the opinion that government can and should play the pivotal role in strengthening the observational data network and its dissemination, early warning signals, awareness, and policy based interventions. Thus there is a need for proper vulnerability and risk analysis for better disaster warning and management linked to cloudburst events.

Table 1: Showing the results for various constructs used in the questionnaire on likert scale.

Constructs/ items	1	2	3	4	5	MPS	Rank
Farmers in the kashmir valley are concerned about the cloud bursts.	9	5	51	110	125	4.12	2
Cloud bursts are serious natural disasters in the study area.	7	15	38	127	113	4.08	4
Cloud bursts are localised in nature and hence, complete crop losses are endured by the farmers.	14	18	59	140	69	3.77	9
The frequency of cloud bursts have increased from last 25 years.	10	29	80	75	106	3.79	7
The cloud bursts are closely associated with the growing season of the horticultural crops.	5	14	21	123	137	4.24	1
The horticultural production is more vulnerable to cloud bursts	15	18	29	93	145	4.12	3
Early warning systems can help in minimising the losses	10	17	42	105	126	4.07	5
There are no proper and accessible crop insurance schemes.	23	37	15	142	83	3.75	10
The role of government can be significant in mitigating the losses due to such disasters	21	19	17	150	93	3.92	6
The cloud burst prone areas needs to be prioritised in disaster management policies.	18	45	25	110	102	3.78	8

1= strongly Disagree 2= Disagree 3= Neutral 4= Agree 5= Strongly Agree MPS= Mean perception score.

Damage caused by cloud bursts in the study area

This section deals with the results of impacts of cloud bursts on the sampled farmers in the study area (Table 2). The results clearly indicate that the horticultural losses have been witnessed by the farmers in the recent past. The partial horticultural losses are 20% while as complete horticultural losses exceed up to 25%. On the other hand, cloud bursts have also resulted in livestock casualty (5%), human loss (0.33%), partial house damages (2%), complete house damage (1%) and other damages (4%). It may be concluded that the effects on horticultural crops is equivalent to millions of Indian currency and sustain numerous families with horticulture almost a prime source of income and livelihood.

Table 2: Damage caused by cloud bursts in the study area.(n=300)

Human loss (%)	Partial Horticulture crop damage (%)	Complete Horticulture damage (%)	Livestock deaths (%)	Partial house damage (%)	Complete house damage (%)	Other damage (%)
0.33	20	25	5	2	1	4

Source: Field survey 2017

Conclusion and policy intervention

The Kashmir valley is considered geologically youngest geomorphic feature which was tectonically created and hence it is inherently vulnerable to hazards. In the recent past fury of extreme weather events have been reported in the Himalayan region, causing complete havoc though the impacts were limited to both space and time. From this research it is clearly evident that cloud bursts in Kashmir Valley are the results of global climate change. It is apparent that cloud bursts are emerging a serious problem which has rumpled a large number of people and washed away various villages in the research area. The fragile development coupled with geographic limitations has given path to such disasters in last few decades. Among the serious hit are the local farmers who have in the receiving end as far the consequences of cloud bursts are concerned. The results of our study provide deeper insights by eliciting stakeholder's participation in the ultimate goal of disaster risk reduction and management. NO doubt, cloud burst are the natural disasters but all depends on what we have done in the recent past to mitigate the impacts of cloud bursts especially on the horticultural sector which is the life line for farmers in terms of survival and livelihood options. The cloud burst events in the Kashmir valley have showed, like never done before, that we desperately require a development plan for vulnerable zones to ensure safety for weaker sections of the society such as farmers. The results of the study are going to be significant since it is the preliminary venture based on stakeholder participation. However, it may be pointed out that the results of the study should be carefully done since it is qualitative in outlook and would have achieved better results under large representative samples. Still further research can be extended to other areas thrusting on the mechanism process and other location specific factors that largely define their occurrence and magnitude. With this understanding, more modelling studies over the research area are very essential to better understand the full spectrum of these deep convective events. The study calls for policy intervention so that the lessons learnt here are given the practical shape in the form of sound disaster management policy with prioritization on those areas which are more sensitive to weather extremities such as horticulture.

References

1. Bagnolus F, Meher-Homji VM (1959) Bioclimatic types of South East Asia. Travaux de la Section Scientific at Technique. Institute Fran-scis de Pondicherry, p 227.
2. Chalise, S. R., Prevention and management of environmental hazards in the Hindu Kush Himalayas – HKH friends. Integrated Water Management and Future, ICIMOD, 1997, pp. 27–30.
3. Dimri, A. P., Chevuturi, A., Niyogi, D., Thayyen, R. J., Ray, K., Tripathi, S. N., &Mohanty, U. C. (2017). Cloudbursts in Indian Himalayas: a review. *Earth-science reviews*, *168*, 1-23.
4. Haritashya, U.K., Singh, P., Kumar, N., Singh, Y., 2006. Hydrological importance of an unusual hazard in a mountainous basin: flood and landslide. Hydrol.Process. 20: 3147–3154.http://dx.doi.org/10.1002/hyp.6397
5. Kaul V, Qadri BA (1979) Seasons of Kashmir. Geogr Rev India 41(2):123–130
6. Lone PA, Bhardwaj AK, Shah KW (2015) PrenanthesviolaefoliaDecne (Asteraceae)—a new report from Kashmir Himalaya, India. Asian Pac J Trop Biomed 5(7):552–554
7. Maikhuri, R. K., Nautiyal, A., Jha, N. K., Rawat, L. S., Maletha, A., Phondani, P. C., ... & Bhatt, G. C. (2017). Socio-ecological vulnerability: Assessment and coping strategy to environmental disaster in Kedarnath valley, Uttarakhand, Indian Himalayan Region. *International journal of disaster risk reduction*, *25*, 111-124.
8. Rana, N., Sundriyal, Y.P., Juyal, N., 2012. Recent cloudburst-induced landslides around Okhimath, Uttarakhand.Curr. Sci. 103, 1389–139
9. Sharma, V. K., Goals and strategies for disaster management in India.The Himalayan Experiment (eds Dash, S. K. and Bahadur, J.), 1999,pp. 290–299.