Effectiveness of Flood Early Warning System to Reduce Economic Loss at Four Communities

Integrated Flood Resilience Programme

Ministry of Foreign Affairs
Republic of Korea

KOICA
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IFRC

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Message from BDRCS

It is my pleasure to proclaim that Bangladesh Red Crescent Society, in cooperation with Korean Government, KOICA and the International Federation of Red Cross and Red Crescent Societies (IFRC), has been implementing "Integrated Flood Resilience Programme (IFRP)" at four flood-prone communities in Nilphamari and Lalmonirhat districts. The Programme is contributing towards increasing the capacity of the targeted communities to respond to flood and reduce disaster risk and enhance BDRCS's capacity to implement resilience interventions in future. Under Integrated Flood Resilience Programme, a lot of significant software and hardware activities have been implemented focusing the components like disaster risk reduction, resilience, climate change adaptation, shelter, WASH, health and livelihoods to increase the resilience of the community people and volunteers of BDRCS.

Community Based Flood Early Warning System (CBFEWS) was one of the mechanisms developed by BDRCS at the four communities under the Programme in collaboration with Community Disaster Management Committee (CDMC), Community Disaster Response Team (CDRT), Unit Disaster Response Team (UDRT), District Water Development Board, BDRCS Units and concerned Programme staff. The study assessed the effectiveness and results of the flood early warning system to reduce the economic loss of the community people and measured the capacity of CDRT and CDMC volunteers to respond and work for communities during flood in 2019. The developed flood early warning system was very helpful for the community people to have reduced economic loss of flood in 2019 comparing the flood in 2017.

I expect that the study report will be very inspiring for audience to know about the benefits among the community people through implementing the Programme and making the flood early warning system effective to reduce flood loss. Now, the community people know better about their preparedness to act before flood, respond during flood and recover as soon as possible after flood. They can save their assets and preserve at safer places with the support of BDRCS Community level volunteers during the flood period. Besides, the reputation of BDRCS volunteers increased at the communities as they have been significantly contributing and working for the community people for pre, during and post disaster situations.

I am optimistic that BDRCS will keep continuation of implementing community-based resilience programmes considering the importance of disaster risk reduction and community resilience. I hope that Korean Government, KOICA and IFRC would continue accompanying BDRCS in such interventions.

Md. Feroz Salah Uddin
Secretary General
Bangladesh Red Crescent Society

KOICA
Korea International Cooperation Agency

Message from KOICA

It is my pleasure to learn that International Federation of Red Cross and Red Crescent Societies (IFRC) and Bangladesh Red Crescent Society (BDRCS) have produced this substantial study on the "Effectiveness of Flood Early Warning System to Reduce Economic Loss at Four Communities" under the programme titled "Integrated Flood Resilience Programme (IFRP)", supported by the Ministry of Foreign Affairs (MoFA), Republic of Korea (RoK).

IFRC's close monitoring and BDRCS's smooth implementation to achieve the outcomes as per the programme goals are commendable. I sincerely hope IFRC's auxiliary status in Bangladesh continues to give them an unparalleled access to all-encompassing authorities required to achieve the set objectives.

I have no doubt that IFRC, together with Korea International Cooperation Agency (KOICA), will accomplish yet another impactful programme targeting the most vulnerable flood-prone communities of Nilphamari and Lalmonirhat.

I would also like to congratulate the entire team of IFRC, including Planning, Monitoring, Evaluation and Reporting (PMER) team of BDRCS, for their dedicated effort in materializing this programme, in particular for their contribution in putting together this study aimed at reaching out to a larger audience.

On behalf of the Korean government, I would like to reassure Korea's commitment, in partnership with our long-trusted partner IFRC, to helping the people of Bangladesh to successfully overcome the immense challenges posed by natural disasters.

허강일

Hu Kang-il
Ambassador
Embassy of the Republic of Korea to Bangladesh

Message from IFRC

I am delighted that the International Federation of Red Cross and Red Crescent Societies (IFRC) and Bangladesh Red Crescent Society (BDRCS) have conducted a study together to assess the effectiveness of the Flood Early Warning System (FEWS) to reduce economic loss at four communities under Integrated Flood Resilience Programme (IFRP). IFRP is a Community Based Disaster Risk Reduction (CBDRR) programme which is being implemented in Nilphamari and Lalmonirhat districts with the support of Ministry of Foreign Affairs (MoFA), Government of the Republic of Korea (RoK) and Korea International Cooperation Agency (KOICA). The findings of the study will help different stakeholders and researchers in the field of Climate Change Adaptation (CCA), Disaster Risk Reduction (DRR) and resilience to get an impression of how the developed flood early warning system under IFRP had a significant influence to minimize the economic loss of the community people during the flood in 2019.

Globally, Bangladesh is ranked as one of the most disaster-prone countries and flood is a recurrent disaster that affects the country almost every year. The intensity of damages caused by floods has increased in many areas of Bangladesh, especially in the northern parts due to climate change and other disastrous phenomenon in the last few years. The country has faced mega floods in 2017 and 2019 which caused huge damages. More than 7 million people in Bangladesh were affected by the flood in 2019 and the numbers of flood-affected people in 2017 were about 6 million. The objectives of IFRP are to build the capacity of communities to reduce the loss of life and livelihoods in recurrent flood and disasters through community-based approaches. Identifying the vulnerability and initiating different interventions for the community people help them to cope with flood and disaster risk. Considering this, flood early warning system was developed at four communities under IFRP to make the community people resilient and minimize their economic loss and damages on livelihoods and properties.

IFRC is committed to work closely with the National Red Cross/Red Crescent Societies to reduce the impacts of disasters through implementing different CBDRR programmes. IFRC has always been focusing on the community resilience to prevent and mitigate the losses resulting from disaster. IFRC's "One Billion Coalition for Resilience" is an initiative to scale-up community-based action on resilience across the globe that was developed in November 2014. IFRC has recently developed its Strategy 2030, which will be guiding the humanitarian actions throughout the coming decade and will include different issues of climate change and disasters into the Strategy. Through the Strategy 2030, IFRC proposes an urgent shift of leadership and decision-making to the most local level placing local communities at the very centre of change. We strongly believe that IFRP is effectively contributing to the visions and goals of the Strategy 2030.

IFRC focused and emphasized the development of community-based mechanism like flood early warning system by engaging the community people through establishing effective networking with government and other stakeholders. This type of mechanism should be popularized both locally and

globally and good practices accumulated from it should be widely disseminated considering the geo-physical and cultural context. In this regard, I would like to express our sincere gratitude to RoK, MoFA and KOICA for their assistance for implementing Integrated Flood Resilience Programme which has effectively used the community-based mechanism like flood early warning system and working to ensure community resilience.

Azmat Ulla
Head of Country Office
International Federation of Red Cross and Red Crescent Societies (IFRC), Bangladesh

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Acknowledgements

Bangladesh Red Crescent Society (BDRCS) and International Federation of Red Cross and Red Crescent Societies (IFRC) would like to acknowledge to the respondents and the community people of four communities for providing necessary and relevant information for conducting the study. It is acknowledged to Community Disaster Response Team (CDRT) and Community Disaster Management Team (CDMC) volunteers for working for the community people during the flood and making the flood early warning system effective which helped to reduce economic loss of the communities. It is also acknowledged to the Dimla, Nilphamari; Kaunia, Rangpur and Lalmonirhat Water Development Board Representatives and District Relief and Rehabilitation Officer (DRRO) of Lalmonirhat for producing necessary information that made the study successful. Beside this, high appreciation goes to Hon'ble Unit Secretaries, Unit Level Officers, Assistant Programme Officers and Community Organizers of BDRCS Nilphamari and Lalmonirhat Unit for their cooperation and support. Thanks go to the Unit Disaster Response Team (UDRT) volunteers of both Units for collecting data from households. Finally, BDRCS and IFRC express its earnest gratitude to the Ministry of Foreign Affairs (MoFA), Republic of Korea (RoK) for funding and to Korea International Cooperation Agency (KOICA) for providing monitoring support to implement Integrated Flood Resilience Programme.

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Acronyms

BWBD	Bangladesh Water Development Board
BDRCS	Bangladesh Red Crescent Society
CBHFA	Community Based Health and First Aid
CDMC	Community Disaster Management Committee
C-DREF	Community Disaster Emergency Response Fund
CDRT	Community Disaster Response Team
CO	Community Organizer
DRR	Disaster Risk Reduction
DRRO	District Relief and Rehabilitation Officer
FEWS	Flood Early Warning System
FFWC	Flood Forecasting and Warning Centre
FGD	Focus Group Discussion
GDP	Gross Domestic Product
GOB	Government of Bangladesh
HI-AWARE	Himalayan Adaptation, Water and Resilience
IDDRR	International Day for Disaster Risk Reduction
IFRC	International Federation of Red Cross and Red Crescent Societies
IFRP	Integrated Flood Resilience Programme
IR	International Relations
KOICA	Korea International Cooperation Agency
KII	Key Informant Interview
MoFA	Ministry of Foreign Affairs
NDPD	National Disaster Preparedness Day
NHQ	National Head Quarter
PMER	Planning, Monitoring, Evaluation and Learning
RCRC	Red Cross and Red Crescent
RoK	Republic of Korea
SPSS	Statistical Package for Social Science
UDRT	Unit Disaster Response Team
UN	United Nations

Terms and Glossary

Adaptation	Adaptation is practical steps to protect countries and communities from the likely disruption and damage that will result from effects of climate change. Adaptation actions are taken to help communities and ecosystems to cope with changing climate conditions
Capacity	The combination of all the strengths, attributes and resources available within a community, society or organization that can be used to achieve agreed goals or targeted actions
Capacity Building	Process of developing technical skills, institutional capability and personnel resources
Char	Chars in Bangladesh are considered a 'by-product' of the hydro-morphological dynamics of its rivers. In the dynamics of erosion and accretion in the rivers of Bangladesh, the sand bars emerge as islands within the river channel
Climate Change	Change of climate, which is attributed directly or indirectly to human activity that alters the composition of the global atmosphere and which is in addition to natural climate variability observed over comparable time periods
Climate Variability	Variations in the mean state and other statistics (such as standard deviations and the occurrence of extremes) of the climate on all temporal and spatial scales beyond that of individual weather events. Variability may be due to natural internal processes in the climate system (internal variability), or to variations in natural or anthropogenic external forcing (external variability)
Dharla river	The Dharla river is one trans-boundary rivers of Bangladesh. It originates in the Himalayas and flows through the Jalpaiguri and Cooch Behar districts of West Bengal, India. The river enters to Bangladesh through the Lalmonirhat district and empties into the Brahmaputra river
First Aid	First Aid is the assistance given to any person suffering a sudden illness or injury, with care provided to preserve life, prevent the condition from worsening and promote recovery
Flood	The inundation of a normally dry area caused by rising water in an existing waterway, such as a river, stream, or drainage ditch is called flood. Flood is a longer-term event than flash flooding: it may last days or weeks
Forecast	Forecast Definite statement or statistical estimate of the likely occurrence of a future event or conditions for a specific area

Ganges-Brahmaputra-Meghna (GBM) river basin	The Ganges-Brahmaputra-Meghna (GBM) River Basin is a trans-boundary river basin with a total area of just over 1.7 million km, distributed among India, China, Nepal, Bangladesh and Bhutan. The GBM river system is one trans-boundary river basin, even though the three rivers of this system have distinct characteristics and flow through very different regions for most of their lengths. The GBM river system is the third largest freshwater outlet to the world's oceans
Hazard	Hazard is a dangerous phenomenon, substance, human activity or condition that may cause loss of life, injury or other health impacts, property damage, loss of livelihoods and services, social and economic disruption, or environmental damage
Hyogo Framework for Action	The 10-year Hyogo Framework for Action came out of the World Conference held in Kobe, Hyogo, Japan, from 18 to 22 January 2005. The "Hyogo Framework for Action 2005-2015: Building the Resilience of Nations and Communities to Disasters (HFA)" is the first plan to explain, describe and detail the work that is required from all different sectors and actors to reduce disaster losses. The HFA outlines five priorities for action, and offers guiding principles and practical means for achieving disaster resilience
Impacts	Impacts refer to the way in which human or natural systems are affected by climate change
KoBo Toolbox	KoBo Toolbox is a free open-source tool for mobile data collection, available to all. It allows to collect data in the field using mobile phones or tablets, as well as with paper or computers
Livelihoods	Livelihoods comprise the capabilities, assets, and activities required for a means of living. It is considered sustainable when it can cope with and recover from stresses and shocks and maintain or enhance its capabilities, assets, and activities both now and in the future, while not undermining the natural resource base
Mitigation	Mitigation is lessening or limitation of the adverse impacts of hazards and related disasters
Preparedness	The knowledge and capacities developed by governments, professional response and recovery organizations, communities and individuals to effectively anticipate, respond to, and recover from, the impacts of imminent or current hazard events or conditions
PASSA	Participatory Approach for Safe Shelter Awareness (PASSA) is a participatory method of disaster risk reduction related to shelter safety. The aim of PASSA is to develop local capacity of people to reduce shelter related risk by raising awareness and developing skills in joint analysis, learning and decision-making at community level

Recovery	The restoration and improvement where appropriate, of facilities, livelihoods and living conditions of disaster affected communities, including efforts to reduce disaster risk factors
Resilience	Resilience refers to absorb stresses and maintain function in the face of external stresses imposed upon by climate change. Community resilience allows for the adaptation and growth of a community after disaster strikes
Risk	Risk is the combination of the probability of an event and its negative consequences
Sendai Framework	The Sendai Framework was adopted by UN Member States on 18 March 2015 at the Third UN World Conference on Disaster Risk Reduction in Sendai City, Japan. The Sendai Framework is a 15-year, voluntary, non-binding agreement which recognizes that the State has the primary role to reduce disaster risk, but that responsibility should be shared with other stakeholdersincluding local government, the private sector and other stakeholders. The framework has four priorities of actions
Teesta river	The Teesta is a long river flowing through the Indian states of West Bengal and Sikkim through Bangladesh. It carves out from the verdant, flows through the cities of Rangpo, Jalpaiguri and Kalimpong and joins in the Brahmaputra river in Bangladesh
Union Parishad	Union Parishad is the smallest rural administrative and local government unit in Bangladesh
Upazila	The Upazila is the second lowest tier of regional administration in Bangladesh
Vulnerability	Vulnerability is the susceptibility of groups or individuals to harm because of climatic changes

EXECUTIVE SUMMARY

Bangladesh is ranked as one of the most disaster-prone countries in the world and flood is a recurrent disaster that affects the country almost every year. The intensity of flood damages increased in many parts of Bangladesh, especially in the northern parts, in the last few years due to climate change and other disastrous phenomenon. The country had faced two mega floods in 2017 and 2019 which made huge damages among the affected communities. A total of 7 million people in Bangladesh were affected by the flood in 2019 and the numbers of flood affected people in 2017 were about 6 million. Considering the flood vulnerability, Bangladesh Red Crescent Societies (BDRCS) is implementing community-based resilience programmes to enhance the capacity of the flood vulnerable people to cope with flood and other small-scale disasters. Integrated Flood Resilience Programme (IFRP), one of the interventions of BDRCS, is being implemented at four communities of Nilphamari and Lalmonirhat Districts supported by Ministry of Foreign Affairs (MoFA), Republic of Korea (RoK) and Korea International Cooperation Agency (KOICA). The programme was launched in March 2018 and will be phased out in February 2021. International Federation of Red Cross and Red Crescent Societies (IFRC) has been providing technical support to implement the programme. The goal of the programme is to strengthen community resilience for effective and efficient response to multi-hazards and climate-induced phenomena of the targeted community people. The objectives of the programme are to build the capacity of communities to reduce the loss of life and livelihoods in recurrent disaster through community-based approaches. Identifying the vulnerability and initiating different interventions for the community people help them to cope with future disaster and flood situations For that, Flood Early Warning System (FEWS) was developed by BDRCS at the four communities under the programme in collaboration with Community Disaster Response Team (CDRT), Community Disaster Management Committee (CDMC), Unit Disaster Response Team (UDRT), Community Organizer (CO) and Upazila and District Water Development Board. The FEWS was introduced as a necessary step to minimize the flood loss of the community people and their livelihoods and properties.

The study was conducted to examine the effectiveness of developed flood early warning system under IFRP to reduce the economic loss during the flood in 2019 at the four communities. The study included the objectives to assess the effectiveness and results of the FEWS in reducing the impacts on assets and income of the community people, measure the capacity of CDRT and CDMC volunteers in disseminating the early warning messages and assisting communities to respond to flood. Additionally, the study accumulated some practices and key learning of the community people, Red Crescent volunteers and other stakeholders for reducing flood vulnerability of the four communities. The study was done to demonstrate the flood early warning system be as exemplary and replicable in other flood-prone areas so that the loss of flood can be reduced, and community resilience is achieved in future. The study was conducted after the period when the community people just experienced the impacts of flood and recovered from the flood situation. The study was collaboratively conducted by BDRCS and IFRC with the supports of two Units. Both quantitative and qualitative research methods were used. Two surveys; one household survey and another survey on CDRT volunteers were conducted for the study. Beside this, some FGDs and KIIs were also conducted.

It was found that around 78% of the households of the four communities were inundated by the flood in 2019. The study identified that the CDRT volunteers got different types of trainings from the inception of the programme that made them capable to respond to flood and other types of disasters. The CDRT volunteers received trainings and orientations on First Aid, search and rescue, gender sensitivity, mock drill, contingency plan, VCA and PASSA/making flood resilient houses etc. All the CDRT volunteers received trainings on flood early warning dissemination mechanism which

made them efficient in taking measures for the community people before and during flood. Beside this, some of the CDRT volunteers got trainings on community engagement and accountability, disaster risk management and constructing flood resilience latrines. From the beginning of the programme, it was attempted to enhance the capacity of CDRT volunteers so that they can play a significant role for community people during flood and disaster period. About 70% of the CDRT volunteers helped women, children and people with disability in taking preparation for flood in 2019. During the flood, all the CDRT volunteers of four communities worked for their own community. During the situation, about 54% of the CDRT volunteers did miking to make community people alert. They also helped pregnant women, maternity women and elderly people and people with disability before and during flood so that they could take safe shelter and other necessary preparation.

About 98% and 93% of the community people received flood early warning messages from CDRT and CDMC volunteers respectively. It was found that the developed FEWS and endeavours of CDRT and CDMC volunteers had significant impacts to reduce the loss of flood to community people's assets and lives. Being frequently informed by the CDMC and CDRT, about 83% of the community people were able to shift their valuable properties to safer places which significantly helped them to reduce the loss of flood. The community people preserved and shifted assets like cloth, rice and food before the flood. About 59% of the households preserved and shifted money whereas 51% did the same work for saving important documents and papers. About 32% of the households preserved and shifted utensil for cooking and domestic cattle at safer places before the flood. Beside this they shifted corn, dry straw/food of domestic cattle, medicine, fuel for cooking, bicycle, seeds, TV, motorcycle, auto and van at safer places before the flood within their own houses and other places where flood water did not affect. The study revealed that the average household loss by the flood in 2017 at four communities were BDT 41,705, which was reduced to BDT 14,327 during flood in 2019 due to the contribution of establishing FEWS and endeavours of BDRCS volunteers and IFRP team. The study identified that at every community, the loss was not as much of than the previous big flood (2017). About 66% of the economic loss reduced as the result of introducing the FEWS at four communities.

It was found that 41% of the households needed 6 to 7 days to recover after the flood in 2019. Only 30% of the households came back to their normal life and income generating activities within 1 to 3 days. Beside this, a significant portion of the households needed 4 to 5 days and 8 to 14 days to recover from the flood situation. The CDRT volunteers mentioned that their reputation at the communities increased as they had greatly contributed for the community people during the flood in 2019. Now, the people at the communities treat them especially as the dedicated volunteers. The community people now think that the CDRT volunteers have the skill to work during flood that they got through different trainings, orientations and programmes arranged by BDRCS. This type of recognition also motivated the CDRT volunteers of four communities. The CDRT volunteers informed that they want to work the same way for the community people in future. The CDRT volunteers will continue their endeavours pre, during and post period of flood to make the community people alert and reduce the level of loss from floods.

Some significant recommendations were accumulated from the study so that the FEWS can be made more effective and replicable in future at the programme areas for building community resilience. The recommendations suggested on some the issues like implementing Contingency Plan effectively, providing more logistics supports, ensuring effective response and better coordination and more advocacy network in future programme activities. Finally, the study revealed and concluded that flood warning system is a key mechanism for ensuring community resilience.

The system should be introduced at the areas where the programmes on community resilience are implemented. Through the FEWS, the community people are more aware to take preparation before flood, respond during flood and recover as soon as possible after flood. Through the mechanism, the economic loss due to flood can be reduced as the community people will protect their assets and shift these to safer places by getting right time information. So, introducing and replicating the early warning system is highly recommended for the flood-prone communities around the world.

INTRODUCTION

1.1 Background and Rationale of the Study

The geo-graphic location and geo-morphological conditions of Bangladesh have made it one of the most vulnerable countries to climate change. Two-thirds of its territory is less than five meters above the sea level. The combination of frequent natural disasters, high population density and growth, and low resilience to economic shocks makes the country more vulnerable to climatic risks. Flood is a recurrent event in Bangladesh. Most of its land mass consists of floodplains and up to 30% of the country experiences annual flood during the monsoon season, while extreme flood events tend to affect over 60% of the country. Almost 80% of the annual rainfall occurs during the monsoon period (between June and September) across the river basins. The monsoon rains cause the rivers to overflow and spread vital nutrient rich sediment across the low-lying agricultural and Char lands (Majumdar, S. 2013). As an impact of climate change, flood has become a common fact of Bangladesh, which occurs almost every year during monsoon after continuous and heavy rainfall. The northern Bangladesh is situated in Teesta, Dharla and Brahmaputra rivers basin along with other 30 rivers, where community people face flash flood every year. Normally, the flood affected areas are inundated for about one to two weeks causing severe damage to the crops, properties and livelihoods. Every year, loss on life and livelihoods leads people in insecurity in northern Bangladesh (BRAC, 2017).

Bangladesh has already been experienced severe damages during the flood-events of 1988, 1998, 2004, 2007, 2017 and 2019. The country is gradually becoming more vulnerable to flood disasters not only for change in nature but also for the rapid increase of population in the floodplains and for the pervasive poverty, that force people to live in floodplains. Poverty is a significant contributor to people's vulnerability to flood and frequent flood impact leads to increase in poverty and hence vulnerability. Land resources being scarce in this densely populated country and due to growing population pressure people, especially rural poor, are forced to settle in the flood-prone areas. Flood deteriorates the normal functions of life, affecting homesteads, agricultural land, daily income generating activities, shelter, livestock, water supply and sanitation conditions and economic structure. Along with the numerous vulnerabilities, problems related to water supply, sanitation and health become acute during a flood (Impacts of Floods and Possible Solution, 2019, Pusan National University, South Korea).

Integrated Flood Resilience Programme (IFRP) is being implemented in Nilphamari and Lalmonirhat Districts by BDRCS, supported by RoK, MoFA. It is a comprehensive DRR programme aimed to enhance community resilience through reducing the vulnerability of flood of four communities of Nilphamari and Lalmonirhat. IFRC is providing guidance and technical support to implement the programme while Ministry of Foreign Affairs (MoFA), Republic of Korea (RoK) is providing fund. Beside this, KOICA is working as the liaison and monitoring partner of this programme. The programme was started in March 2018 and will be phased out in February 2021. The goal of the programme is to strengthen community resilience for effective and efficient response to multi-hazards and climate-induced phenomena of the targeted community people. The objectives of the programme are to build the capacity of the communities to reduce the loss of life and livelihoods through community-based approaches. The programme has following four outcomes:

- Communities are capable to effectively respond to flood and adapt to climate change
- Most vulnerable households have improved livelihoods and shelter to withstand small scale flood

- Community people have increased access to appropriate and sustainable water, sanitation and hygiene practice
- BDRCS capacity is enhanced to deliver scaled up DRR programme for disaster risk reduction.

The number of direct beneficiaries of the programme are 8,770 (4,463 males and 4,307 females) including the people of 1,675 households and the students under 13 schools. Beside this, there are targeted 16,000 indirect beneficiaries under the programme. The programme includes components like disaster risk reduction, climate change adaptation, livelihoods, shelter, water, sanitation and hygiene, health and capacity enhancement of the people of targeted communities. The delivery of programme intervention aims to increase the capacity of the communities to reduce life and livelihoods risk of the vulnerable community people including women, children, elder people and people with disability. The programme approach ensures participation of stakeholders in every aspect of the programme management cycle including planning, implementation and monitoring. Both hardware and software supports are being provided under the programme at four communities and 13 schools to achieve community resilience.

Taking into account the experience gained through the implementation of the Hyogo Framework for Action, and in pursuance of the expected outcome and goal, there is a need for focused action within and across sectors by states at local, national, regional and global levels in the four priority areas understanding disaster risk; strengthening disaster risk governance to manage disaster risk; investing in disaster risk reduction for resilience and enhancing disaster preparedness for effective response, and to “Build Back Better” in recovery, rehabilitation and reconstruction were prioritized (Sendai Framework for Disaster Risk Reduction, 2015-2030). Under the enhancing disaster preparedness for effective response of the Sendai Framework, it was suggested to develop early warning systems and train the community people and volunteers to respond disasters as well as to strengthen technical and logistical capacities to ensure better response during the disaster period. The importance of having effective early warning systems is widely accepted as one of the valuable preparedness measures to manage disaster risk.

As the part of achieving community resilience; under IFRP, community-based flood early warning system was established by BDRCS at four communities so that the targeted community people can take proper early action to face the flood risk with the support of COs, CDMC, CDRT, UDRT, Bangladesh Water Development Board (Dimla and Lalmonirhat Sadar Upazila), and Local and District Administration. Also, the capacity of community people and CDRT volunteers were boosted by providing disaster response training and equipment for search and rescue, First Aid etc.

According to the Emergency Operation Centre of the Department of Disaster Management, “Bangladesh, a total 7 million peoples of Bangladesh were affected by the flood in 2019. About 321,939 hectares of agricultural lands were submerged in flood water of 18 Districts under 4 divisions across the country. At least 1,434 kilometres of embankments and 4,968 kilometres of roads were damaged and made it extremely difficult for the people to commute. People suffered from a crisis of safe drinking water, as 50,430 tube-wells were out of work due to the flood across country. During flood, the torrential rains damaged more than 580,000 houses. The death toll from drowning and other flood-related reasons reached 140 that year. The people of northern and eastern Districts were mostly sufferers by the flood in 2019”.

In July 2019, the water of Teesta river significantly increased due to incessant rain and flood water coming from upstream Bangladesh (from Indian province). According to the Flood Forecasting and

Warning Centre (FFWC), Bangladesh Water Development Board (BWDB) information; the water level of Teesta river in Nilphamari and Lalmonirhat District was above danger level (up to 1 meter) which was treated as the flood situation in nearby Districts. It was reported in media (TVs and newspapers) that the water of Teesta river inundated many villages and areas of Lalmonirhat and Nilphamari Districts. Out of four communities of IFRP, two communities of Nilphamari and one community in Lalmonirhat (Sheikh Para) were inundated by flood water.

On the other hand, the Shiber Kuti community, Lalmonirhat got flooded as the water of Dharla and Ratnay rivers started increasing. According to the information of FFWC, BWDB the water of Dharla river was flowing 1 meter above the danger level. After the situation, community contingency plans were activated at four communities developed under IFRP. The loss of the flood in 2019 was comparatively lower than the previous big flood occurred in 2017 at the four communities under IFRP. It was assumed that the application of FEWS and the endeavours of the community volunteers greatly played role in this regard. The CDRT and CDMC volunteers alerted the community people and rescued and shifted the proprieties and cattle to the safer places from the affected households.

Figure 1: Affected households of the communities under IFRP by flood in 2019

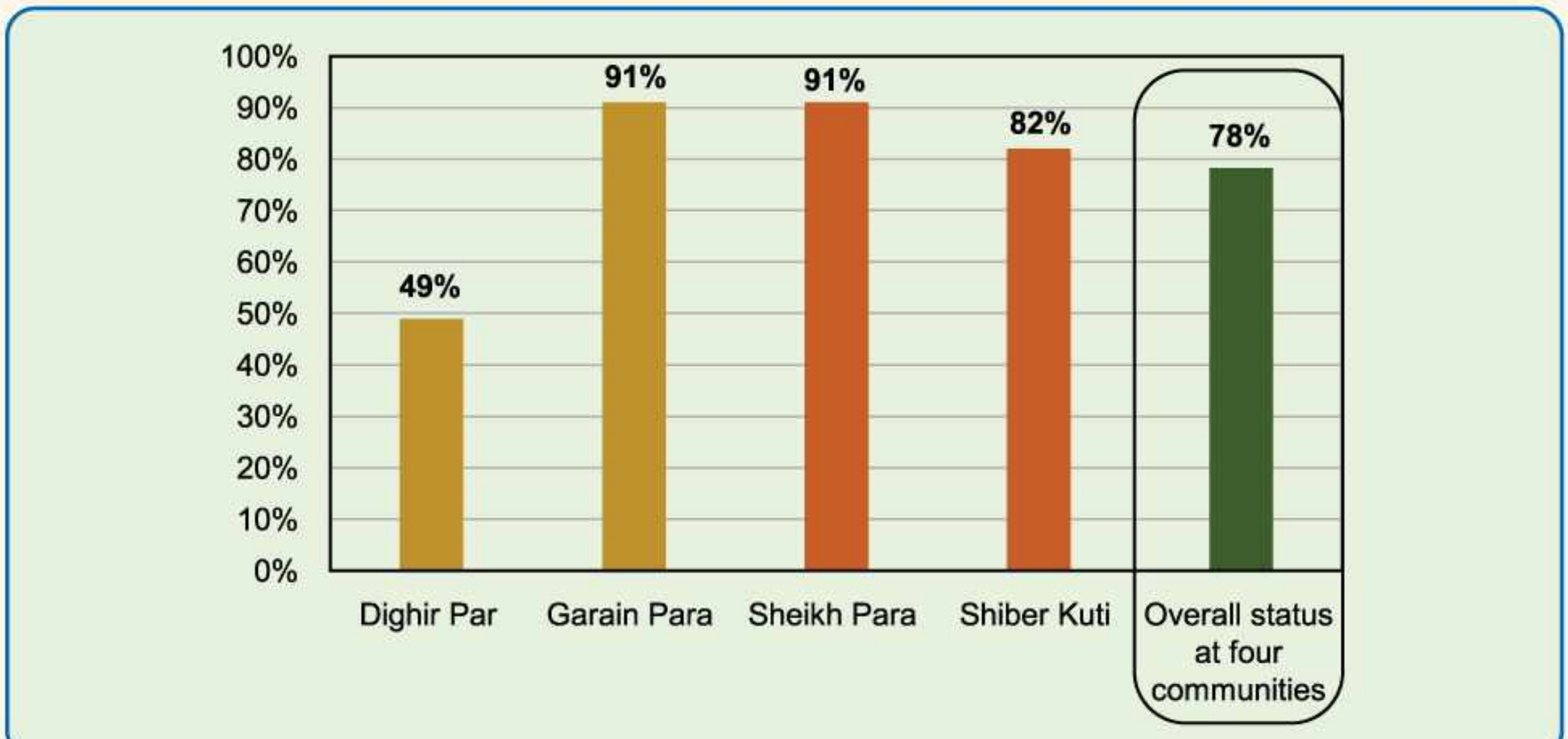


Figure 1 shows that about 78% of the households of the four communities were affected by flood in 2019. The study revealed that the four communities were affected by flood for three times in 2019. In July 2019, the communities were heavily affected by flood for two times and at the first week of September the communities were also affected by the flood which had impacts on the community people's life and livelihoods. Around 91% of the households of the Garain Para community of Nilphamari and Sheikh Para community of Lalmonirhat community were affected by flood water. On the other hand, about 82% households of the Shiber Kuti community of Lalmonirhat were also affected. Comparing with the three communities, the Dighir Par community of Nilphamari was less affected. Around 49% of the households of this community were affected by flood. But the households located at this community have more distance between each to other. That's why, the intensity of the flood was not the same as like as at the other three communities.

Table 1: Period of household's affecting during flood in 2019

Name of district	Name of communities	Duration of affected time/period			
		1 to 3 days	4 to 5 days	6 to 7 days	8 to 10 days
Nilphamari	Dighir Par	91%	9%	N/A	N/A
	Garain Para	34%	50%	6%	10%
Lalmonirhat	Sheikh Para	9%	16%	59%	16%
	Shiber Kuti	18%	32%	50%	N/A

Table 1 shows that the households of the four communities under IFRP were inundated from 1 to 10 days during the flood of July (two times) and September (first week) in 2019. The flood water remained at the affected households 5 days at all communities. About 10% of the households of Garain Para of Nilphamari and 16% of the households of Sheikh Para of Lalmonirhat were affected by flood water respectively from 8 to 10 days.

1.2 Literature Review

Before conducting the study; different national and international documents, policy papers, books and articles and peer-viewed documents on flood vulnerability, flood early warning system, community resilience, climate change etc were viewed. The literature review was helpful to conduct the study easier and convenient.

In Bangladesh, floods originate from precipitation in the whole of the GBM basin, about 7% of that lies within Bangladesh. In an average year, about 25% of the areas of Bangladesh inundated during flood. During severe floods, over 60% of the country is inundated, which had been occurring every 4 to 5 years. These floods have devastating effects. River-bank erosion results in the loss of thousands of hectares of agricultural lands and affects the population for years after years. Flood causes destruction of country's physical and social infrastructure, transport network, assets, crop production, loss of lives etc. Flood not only deteriorates the social lives of people but also the economy. It causes considerable damages to standing crops, livestock, poultry, houses, transportation and communication systems, educational and institutional buildings and other social facilities. Flood also deteriorates the normal functions of life affecting homesteads, agricultural land, daily activities, water supply, sanitation conditions and economic structure. All previous big floods in Bangladesh have caused enormous damages to properties and considerable loss of life (Climate Change Profile: Bangladesh, Ministry of Foreign Affairs, April 2018).

South Asia accounts for more than 21% of the world population and is one of the most densely populated regions on the earth. The region faces frequent and intense natural disasters each year. In recent years, the countries in the region have endured a series of catastrophic disasters, including devastating floods, compounding their pains of poverty and poor performance in various sectors of human development (Memon, 2012). Loss and damage from flood account for 4.75 percent of national GDP of Bangladesh respectively (Luo et al., 2015).

In Bangladesh, households and community response to extreme recurring events like flood is a factor of the extent of their vulnerability, the intensity of the hazard, and their level of capacity. If people are informed ahead in time of the flood, there are more actions they can take to prepare and

reduce their risks and vulnerability. Flood early warning depends on the capacities of relevant national, local and community institutions to understand, interpretation, dissemination and respond to floods. Interruption in one single stage would fail the overall early warning system (Fakhruddin, SHM and Ballio, F 2014).

The Teesta river originates in the Teesta Khangste glacier in the high-altitude area of Sikkim in India, it flows through the northern parts of West Bengal, and then enters Bangladesh where it flows through the northern Rangpur division before meeting the Brahmaputra. The situational analysis identified climate-related hazards such as floods, droughts, unpredictable snowfall, hailstorms, strong winds, cold and heat waves, extreme precipitation events, and landslides, as well as the non-climatic hazard of earthquakes, as major factors in the vulnerability of the people in the region. The seasonal and annual flow of Teesta river can be affected by the melting of glaciers at higher altitudes, which can affect water availability in the nearby downstream during the dry season. Rainfall was found to be crucial in the Teesta downstream area, as the river and its tributaries are mostly rain fed. Climatic variability across the basin has several implications for people's lives and livelihoods (HI-AWARE, 2017).

Living in a low-lying and densely populated country on the front line of climate change, Bangladeshis are taking a lead in adapting to rising temperatures and campaigning to limit climate change. Bangladeshis will keep their heads above water, but at huge costs. However, it also indicates that this response comes with huge costs. Floodplain inhabitants use a wide range of tried-and-tested strategies to cope with the conditions during and after the flooding. However, repeated exposure to flooding events often means impoverishment Roy, Manoj; Hanlon, Joseph and Hulme, David (2016).

Early warning communication systems are made of two main components: communication infrastructure hardware that must be reliable and robust, especially during the natural disasters; and appropriate and effective interactions among the main actors of the early warning process such as the scientific community, stakeholders, decision makers, the public, and the media (EWCII, 2003). Many communication tools are currently available for warning dissemination such as short message service (SMS), e-mail, radio, TV, and web service. Information and Communication technology (ICT) is a key element in early warning. ICT plays an important role in disaster communication and dissemination of information to organizations in charge of responding to warnings and to the public during and after a disaster. Redundancy of communication systems is essential for disaster management, while emergency power supplies and back-up systems are critical in order to avoid the collapse of communication systems after disasters occur. In addition, in order to ensure reliable and effective operation of the communication systems during and after disaster occurrence, and to avoid network congestion, frequencies and channels must be reserved and dedicated to disaster relief operations. Dissemination of warnings often follows a cascade process, which starts at international or national level and then moves outwards or downwards in the scale, reaching regional and community levels early warnings may activate other early warnings at different authoritative levels, flowing down in responsibility roles, but all are equally necessary for effective early warning (Twigg J., 2003).

Early warning systems are an important component of disaster risk management strategies. Flood early warning system assess the flood risk and it's the main purpose is to issue warnings when a flood is to forecast about flood occurring. Early warning systems for floods comprise four inter-related elements. This multifunctional system improves community preparedness for extreme

weather events such as floods, in terms of both warning and increasing understanding of risks and appropriate flood responses. This minimizes safety and infrastructure threats. As part of the warning, the system provides a prediction of the scale, timing, location and likely damages of the impending flood. The system uses data from sensors to measure water levels at strategic points in local water basins (rivers, lakes) or flood defences (dikes, dams, embankments) to forecast a potential flood event. The current increase in the number and degree of extreme weather events such as floods make this technology important for climate change adaptation (Climate Technology Centre and Network, 2013).

To ensure good communication and understanding the risk alerts through early warning systems, inclusion of education and knowledge on disaster risk reduction is essential. Educating the young can help raise awareness among vulnerable groups located in high risk areas, as well as highlighting expected changes in risk location and frequency. This heightened awareness provides opportunities for risk preparedness and allows for community level adaption in the context of climate change (Kellman and Glantz, 2014).

1.3 Objectives of the Study

The main objective of the study was to examine the effectiveness of developed flood early warning under IFRP to reduce the economic loss during flood in 2019 at the four communities. The specific objectives of the study were:

- To assess the effectiveness and results of the FEWS to reduce the impacts on assets and income of the community people
- To measure the capacity of CDRT and CDMC volunteers in disseminating the early warning messages and assisting communities to respond to flood
- To accumulate practices and key learning of the community people, Red Crescent volunteers and other stakeholders to ensure the flood early warning system as exemplary and replicable in the other flood-prone areas to reduce flood loss and achieve community resilience.

1.4 Scope of the Study

The study was conducted after a period when the community people just experienced the impacts of flood and recovered from the flood situation. Around 78% of the households of the four communities were inundated by the flood in 2019. The daily livelihoods of the community people were hampered, and people were restricted during the flood. The CDMC and CDRT volunteers of the four communities played a great role in making the community people aware and take safe shelter when the flood water was increasing. The Red Crescent volunteers were able to reduce community people's loss by using the technique of FEWS under IFRP. The developed FEWS enhanced the capacity of the volunteers to help community people and work for community people them before, during and after flood. The community people had experienced less effect with the flood in 2019 compared to the flood of 2017. Beside this, the community people had increased resilience capacity to respond to flood and come back to normal life after the flood. As they gained knowledge and received messages on climate change, adaptation, flood, disaster risk reduction, shelter, WASH and health issues through different types of meetings, activities, workshops, and IEC materials (calendar, billboard, poster, brochure, leaflet, books etc). So, the community people also learnt how to take preparation for flood and do necessary work to respond for this in order to reduce the loss. In this regard, the developed FEWS added a great significance to the people of the four

communities. Additionally, the IFRP team and the community volunteers worked to reduce the loss of flood in 2019. As a result, there was a big scope to assess the benefits of the FEWS how it worked to reduce economic loss of the community people comparing to previous floods. The learning from the study will be helpful to motivate different stake holders to introduce FEWS in community resilience and climate change programme. Besides, the FEWS can be replicated in the other parts of the areas of Bangladesh following the results from IFRP.

RESEARCH METHODOLOGY

2.1 Study Area and Reviewing Secondary Data Sources

The study was conducted at four communities of Nilphamari and Lalmonirhat namely:

- Dighir Par community of Nilphamari
- Garain Para community of Nilphamari
- Sheikh Para community of Lalmonirhat
- Shiber Kuti community of Lalmonirhat.

The Dighir Par community is located at Tepa Kharibari Union of Dimla Upazila which 56 kilometres far from Nilphamari District Sadar. The community is located at the edge of Teesta river. Telir bazar, Gayabari Union and an embankment is situated at the north, south and east part of the community respectively. The Garain Para community of Khalisha Chapani Union is 2 kilometres far from Dighir Par community, Nilphamari.

On the other hand, the Sheikh Para community is located at Khuniagachh Union which is 12 kilometers far to south from Lalmonirhat District Sadar. The community is located at the edge of Teesta river. The community people are experienced with flood and river erosion since 1970. For tackling river erosion, an embankment of stone was made at the south part of the community at the edge of Teesta river. And, the Shiber Kuti community is located at east-south part of Kulaghat Union which is 13 kilometers far from Lalmonirhat District Sadar. The community is located at the middle position of two-rivers namely Dharla and Ratnay. The Dharla river flows at the east part and the Ratnay river flows at south-west part of the community.

Both quantitative and qualitative research methods were used. The study was collaboratively conducted by BDRCS and IFRC team with the support of two Units. For this, secondary data and IFRP documents were reviewed. The secondary data sources included different national and international documents, research and policy papers, peer-viewed documents on flood vulnerability, early warning system and its effectiveness, community resilience, adaptation, livelihoods etc. The IFRP documents included proposal and VCA report, contingency plan, baseline study report, activity monitoring database, event and situation report of flood in 2019 etc. As the part of review, data and replicable system on early system and its successful application was also be reviewed from local and international perspectives.

The Garain Para community of Nilphamari is vulnerable to flood as water of Teesta river usually enters at the community. A man was using a boat for transportation within the community (Photo: IFRC)

The people of Dighir Par, Nilphamari have been living with the flood vulnerability as Teesta river is very close to their houses and flood affects them almost every year (Photo: IFRC)

The Sheikh Para community, Lalmonirhat is located at the bank of Teesta river and inundated by flood every year. The community people face two or three times flood every year which hampers their livelihoods (Photo: IFRC)

Scenario of Ratnay river, Shiber Kuti community, Lalmonirhat. The community is located between Dharla and Ratnay rivers. Every year, the Ratnay river overflows during monsoon and creates flood. Sometimes, the community people also face small-scale river erosion (Photo: IFRC)

2.2 Data Collection Team

The data collection team was led by BDRCS and IFRC representatives who guided and trained the enumerators and monitored and managed the entire process of household's survey. A total 4 enumerators (2 enumerators from each Unit) subsequently collected quantitative data from household level. Two separate orientations (for 1 day) were provided to the enumerators at two stages in Nilphamari and Lalmonirhat. Orientation was given on the data collection procedure and proper understanding on questionnaire and issues of the FEWS and flood resilience from DRR context. As a result, all enumerators were able to understand the survey perspective uniformly. Details of the developed flood early warning mechanism under IFRP and its necessity and impacts on the community people, interview technique by using KoBo Toolbox, rapport building with community people, ideas of community properties and assets were also explained during orientation session. Firstly, the enumerators were properly oriented on the data collection and secondly, they provided their feedbacks after getting the orientation. Finally, they went at community level for household data collection and completed successfully. Data were collected from four communities from last week of September to first week of October 2019.

A volunteer of Nilphamari BDRCS Unit was collecting data from a woman of Dighir Par community (Photo: IFRC)

Volunteers of Lalmonirhat BDRCS Unit collected household data from Sheikh Para and Shiber Kuti community (Photo: IFRC)

A CDRT volunteer of Shiber Kuti community, Lalmonirhat was working during the data collection of the study (Photo: IFRC)

Camille Chatenier and Daniel Ramskov Erichsen were working at IFRC Bangladesh as Intern-Resilience for three months. They were pursuing master's degree from Department of Disaster Risk Management and Climate Change Adaptation, Lund University, Sweden. They came in Bangladesh to learn about disaster risk reduction and flood resilience through RCRC movement. They were part of study team and went to community for conducting the study contributed a lot (Photo: IFRC)

2.3 Quantitative Data Collection

2.3.1 Household and CDRT Survey

Two surveys were conducted for the study. For this, two sets of questionnaires were developed for getting the responses from household's respondents and community volunteers. A field test was completed before finalizing the both questionnaires. The gaps and needs of the questionnaires were identified by the field test and feedbacks were incorporated into the questionnaires accordingly. One survey was conducted at the selected households with a structured questionnaire. Beside this, a survey was conducted on the CDRT volunteers to assess their enhanced capacity achieved through the programme that they had applied before and during flood period to reduce loss of community people. Both surveys were completed by using KoBo Toolbox on random sampling basis.

A field test was completed at two communities before finalizing the tools (questionnaires and cehcklists) of the study (Photo: IFRC)

Table 2: Sample and selection for the household and CDRT survey

Targeted Stakeholders	Total Households and CDRT Volunteers under IFRP	Confidence Level (%)	Margin of Error (%)	Final Sample Size	Community Wise Equal Distribution			
					Nilphamari		Lalmonirhat	
					Dighir Par	Garain Para	Sheikh Para	Shiber Kuti
Survey at households	1,675	95	7	176	44	44	44	44
Survey on CDRT volunteers	100	95	7	67	17	17	17	16
			Total	**243**	**61**	**61**	**61**	**60**

Table 2 shows that a total 176 household's respondents were interviewed based on 95% confidence level with 7% margin of error. Data were collected from 44 households from each of the community by equal distribution. The structured questionnaire for household survey was comprised to reveal how the community people were able to reduce loss during the flood in 2019 through being benefitted by the developed flood early warning system under IFRP. The prepared questionnaire for household survey covered issues like application of the community people's knowledge of FEWS before and during the flood, measurements taken by the community people when they were informed that the flood water was entering their community, effectiveness of FEWS to reduce the loss of flood in 2019 compared to the flood in 2017, and economic aspects and the response of the community people during and post flood period.

Beside this, a total 67 CDRT volunteers were interviewed following 95% confidence level with 7% margin of error. Another structured questionnaire was developed for the CDRT survey. The questionnaire included different aspects like the increased capacity of the CDRT volunteers to disseminate the early warning messages and roles of CDRT volunteers to inform and help community people before and during flood for reducing the damages of flood considering the vulnerability of the communities.

2.4 Qualitative Data Collection

Some significant qualitative data were collected from four communities and Upazila and District level so that the effectiveness of the FEWS to flood in 2019 can be assessed comparing to the previous flood situation.

Table 3: Plan of FGDs, In-depth Interviews and KIIs

Sl no.	Targeted Stakeholders (at field level)	FGD/ Key Indepth Interview/ Key Informant Interview	Numbers	Remarks
01	Experienced community people by the flood in 2019	FGD	4	1 FGD at per community

02	CDMC volunteers	FGD	4	1 FGD at per community
03	Affected household representatives (male and female) by flood in 2019	Key In-depth Interviews	8	2 In-depth Interviews at per community
04	Representatives of Upazila Water Development Board	Key In-depth Interviews	4	1 KII with representative of Dimla (Nilphamari) BWDB, 1 KII with Kaunia (Rangpur) BWDB and 2 KIIs with Lalmonirhat Sadar BWDB
05	District Relief and Rehabilitation Officer	Key Informant Interview	1	1 KII with DRRO, Lalmonirhat
		Total	**21**	

Table 3 shows that a total 8 FGDs and 5 Key In-depth Interviews were conducted. Flood experienced community people including targeted household representatives; CDMC volunteers; Representatives of Upazila Water Development Board of Nilphamari, Lalmonirhat and Rangpur; and District Relief and Rehabilitation Officer of Lalmonirhat provided information and shared their experiences regarding flood and DRR issues. Beside this, three schools were visited (1 in Nilphamari and 2 in Lalmonirhat) to assess the school students' knowledge on flood resilience and early warning system.

FGD with flood-affected household representatives at Dighir Par community in Nilphamari (Photo: IFRC)

FGD with Sheikh Para CDMC volunteers in Lalmonirhat (Photo: BDRCS)

FGD with the CDMC memebrs at Garain Para community in Nilphamari (Photo: IFRC)

FGD with the female memebers at Shiber Kuti community in Lalmonirhat (Photo: IFRC)

2.5 Ensuring Data Quality

The data manager conducted spot checking during the survey time and reviewed the collected data every day. Feedbacks and directions were provided to enumerators as and when needed to maintain the data quality. The data manager revisited the interviewed households to do cross-checking of the data collected by the enumerators. The accuracy of the data was assessed at KoBo as well as before analysing.

2.6 Data Processing, Analysis and Report Preparation

Household data were imported from KoBo toolbox into excel version. Then MS Excel and SPSS were used for analysing the data. Data were displayed through tables and graphs based on nature, necessity and suitability of information. Collected data from field were also compared with study objectives and interpreted descriptively. By analysing the primary and secondary data, the report was prepared to share with KOICA, MoFA (RoK) and dissemination to other stakeholders.

2.7 Ethical Issues

Ethical issues were maintained while doing the fieldwork and duration of the study. All the targeted respondents, community people and other stakeholders were informed about the objectives of the study. The culture and perception of the community people and other respondents were prioritized from principles and values of RCRC movement. The respondents were informed that the findings of the study will be used to reduce the loss of flood and cope with disaster situations in future.

2.8 Limitations of the Study

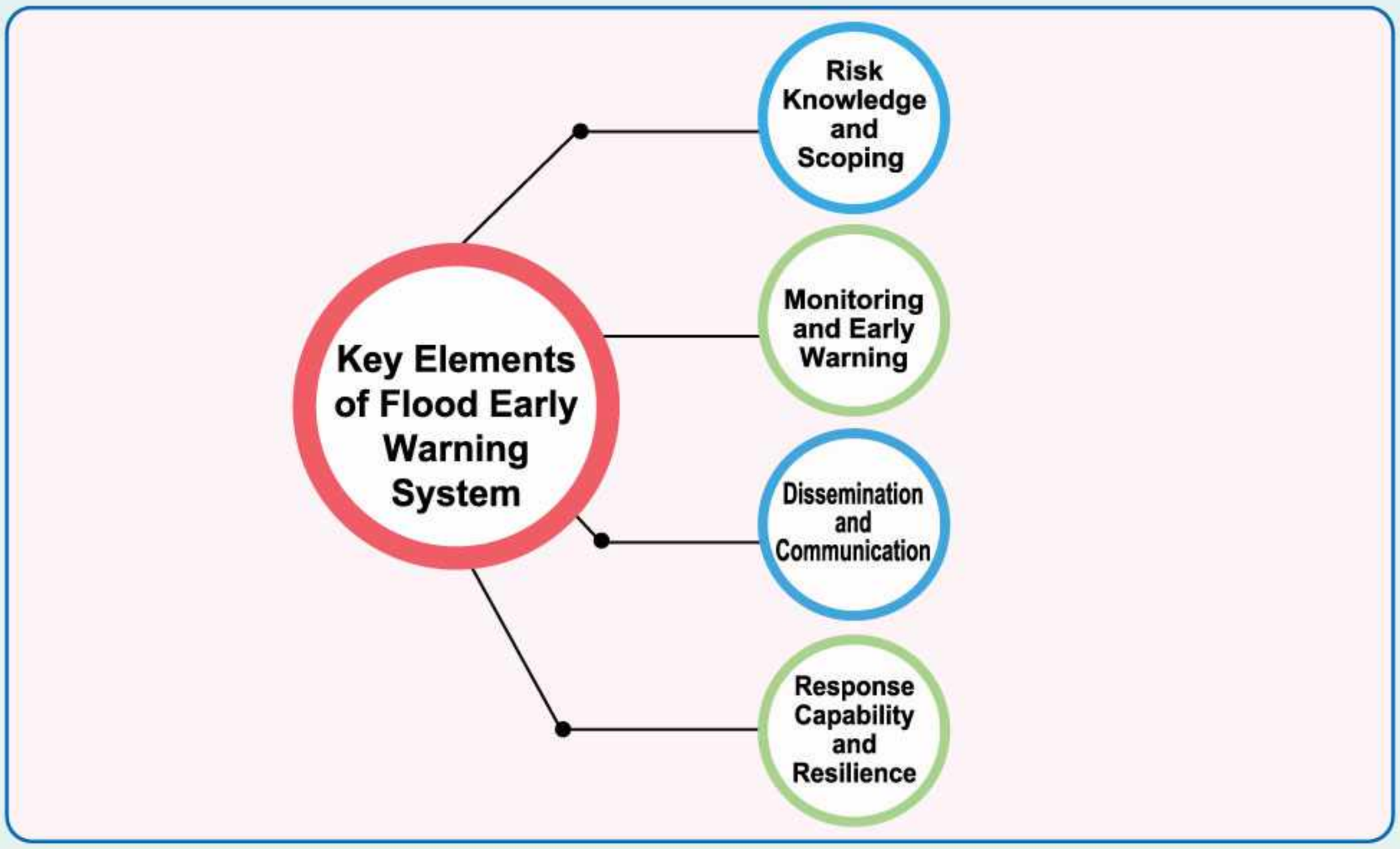
The confidence level of quantitative data collection at household level of the study was determined as 7%. This was also followed for the CDRT volunteer's survey. It would be better if the confidence level was 5% and the sample would be more (313). Beside this, it would be better if one dependent community against each of the community or district under IFRP was surveyed, then effectiveness of FEWS developed under IFRP would be more visible and highly comparable.

FLOOD EARLY WARNING SYSTEM UNDER IFRP

3.1 Flood Early Warning System and its Key Elements

Early Warning System (EWS) evolved about 3 decades ago. The needs for EWS started to arise in 1970s and 1980s when the prolonged droughts and famines in Sahel of West Africa and in the Horn of Africa occurred. Since its early development, EWS stared to be used for other hazards (technological, hydrological, and meteorological for societal risk and vulnerability reduction and towards sustainable development (ESIG-ALERT, 2004). In January 2005, the United Nations convened the Second World Conference on Disaster Reduction in Kobe, Hyogo, Japan. During the conference, an agreement called the "Hyogo Framework for Action 2005-2015: Building the Resilience of Nations and Communities to Disasters" (HFA) was negotiated and adopted by 168 countries. The paradigm for disaster risk management was broadened from simply post-disaster response to a more comprehensive approach that also included prevention and preparedness measures. HFA also stressed the need for, "identifying, assessing and monitoring disaster risks and enhancing early warning systems." Following the agreement, efforts were underway to incorporate early warning systems as an integral component of any nation's disaster risk management strategy, enabling governments and communities to take appropriate measures towards building community resilience to natural disasters. "The set of capacities needed to generate and disseminate timely and meaningful warning information to enable individuals, communities and organizations threatened by a hazard to prepare and to act appropriately and in sufficient time to reduce the possibility of harm or loss" (UNDDR, 2009). Now, EWS is increasingly recognized at the highest political level as a critical tool for the saving of lives and livelihoods and there are increasingly more investments by national and local governments, international development agencies and bilateral donors to support such systems.

Figure 2: Key elements of Flood Early Warning System



Source: United Nations Office for Disaster Risk Reduction (UNDDR), 2006.

Figure 2 reveals that a flood early warning system mainly consists of four elements namely: risk knowledge and scoping, monitoring and early warning, dissemination and communication, and response capability and resilience. The risk knowledge and scoping include hazard, elements of risk and vulnerability and systematically collecting data and undertaking risk assessments and scoping. The monitoring and warning focus on rainfall, river level, warning decision etc. and install early warning instrument and flood monitoring by upstream communities. On the other hand, the dissemination and communication keep importance on dissemination and communication and household warning and information by upstream and provide early warnings to downstream communities. And finally, response capacity and resilience suggest ensuring evacuation centres, search and rescue, relief goods and enhance community response capabilities and build resilience.

3.2 Benefits of Flood Early Warning System

Flood Early Warning System (FEWS) is a system by which flood induced hazards can be minimized and prevented. Currently, different humanitarian and development organizations are working on flood forecasting and early warning at local, national, continental and global scale. In a flood early warning system, the most important input is real time hydro-meteorological observations provided by weather radar satellites and automatic hydro-meteorological station network (Billa et al.,2006; Budhakooncharoen, 2004). This real time data can be used in various ways to evaluate flood risks and issues of flood warning and for taking necessary preparation as well. Apart from real time data, probabilistic weather forecasts (Numerical Weather Prediction-NWP) are also playing an important role in providing input for hydrological models to generate warnings scenarios (Burger et al.2009). Besides having forecasts of the most important input (precipitation), a model needs to be selected that characterizes and simulates the catchment responses for flood early warning (Thielen et al., 2010). The development of flood forecasting and warning systems is an essential element in regional and national flood preparedness strategies and is a high priority in many countries. FEWS is being considered as an alternative for dealing with flood problems, partly because these systems are less expensive compared to structural schemes. Despite the high priority accorded to flood warnings in flood risk management by governments, there is a lack of good data on the benefits and costs of these systems (Wallingford 2006).

The benefits of flood early warning system can be calculated by assessing the possible savings of the quantity of flood damage to private and public assets resulting from action taken in response to the warning. This flood reduction benefit BEWS can be expressed as: the benefits of flood early warning systems come from the savings in flood damages. Floods are random events that cause damages and hence flood damages are also random or probabilistic events. The probability of any specific amount of flood damage depends on the probability of the flood event necessary to cause those damages. Determining flood damages combines a risk assessment in terms of the probability of future flood events to be averted, and a vulnerability assessment in terms of the damage that would be caused by those floods and, therefore, the economic savings to be gained by their reduction (UNEP 2012).

3.3 Developed Flood Early Warning System under IFRP

Flood Early Warning System (FEWS) was developed at four communities under IFRP. For developing the system, two-day trainings were arranged where 25 CDRT and 5 CDMC volunteers attended at each community. The participants were orientated at the trainings about flood risk and being efficient for taking necessary initiatives so that they can effectively contribute during the flood

period. The training was conducted by the NHQ Officials of BDRCS and IFRC. The participants had known about the flood risk considering the context of their own community following the Contingency Plan developed under the programme. They also received understanding on how to take necessary steps to minimize the flood loss and damages to the community people and their livelihoods and properties if flood occurs at their community. In this regard, the Officials from Dimla and Lalmonirhat Water Development Board (WBD) were invited at the training. The WDB Officials shared their experiences and provided commitment to be a part of making the system effective for the communities. After the conduction of the trainings, the APO and volunteers were made connected to the WDB to get timely information. The WDB Officials of the two Upazilas were regularly sending messages to the APOs of IFRP based on the flood risk situation to share the water level of the Teesta and Dharla river. Then two flood markers were established at suitable places (on the bank of the river) of the communities along with explanatory signboards so that the CDRT and CDMC volunteers can make the community people aware if there is any potential sign of flood. The flood marker was prepared with the red, green and yellow colour to show the intensity of water to enter at the communities during the flood period. If the volunteers, realize that the flood water can cross the level of danger then they will alert the community people to shift their properties and other valuable things and take necessary steps as well. The volunteers will make the community people aware by using hand mike, going to households and disseminating message at crowded places. There were a total of 100 CDRT volunteers (25 at each community) and 68 CDMC volunteers (17 at each community) under the programme. CDRT volunteers worked at community by disseminating flood early warning messages, providing response, search and rescue, and First Aid support during normal and disaster period. They did voluntary works like participating in drills, different awareness raising activities including trainings, workshops, meetings on DRR, climate change and other developmental issues, and promote the learnings from the activities at the community. They coordinated with CDMC during emergency response period for preparedness activities at their communities. They also collected related information and shared with programme team and CDMC for proper implementation and monitoring of programme. Every month, CDRT used to arrange a meeting to discuss their progress, challenges and capacity. They usually formulated the plan of their next meeting and sent the discussion points of the meeting to IFRP team. They worked by coordinating with Water Development Board (WDB) at Upazila level for early warning message dissemination.

Established flood marker with explanatory signboard, Dighir Par community, Nilphamari (Photo: IFRC)

Flood marker with explanatory signboard was established at Sheikh Para community, Lalmonirhat (Photo: IFRC)

Flood marker with explanatory signboard beside the Dharla river, Shiber Kuti community, Lalmonirhat (Photo: IFRC)

Flood marker with explanatory signboard, at Shiber Kuti community beside the Ratnay river, Lalmonirhat (Photo: BDRCS)

3.4 CDRT volunteers and their roles to respond to flood

Figure 3: Educational qualification of CDRT volunteers

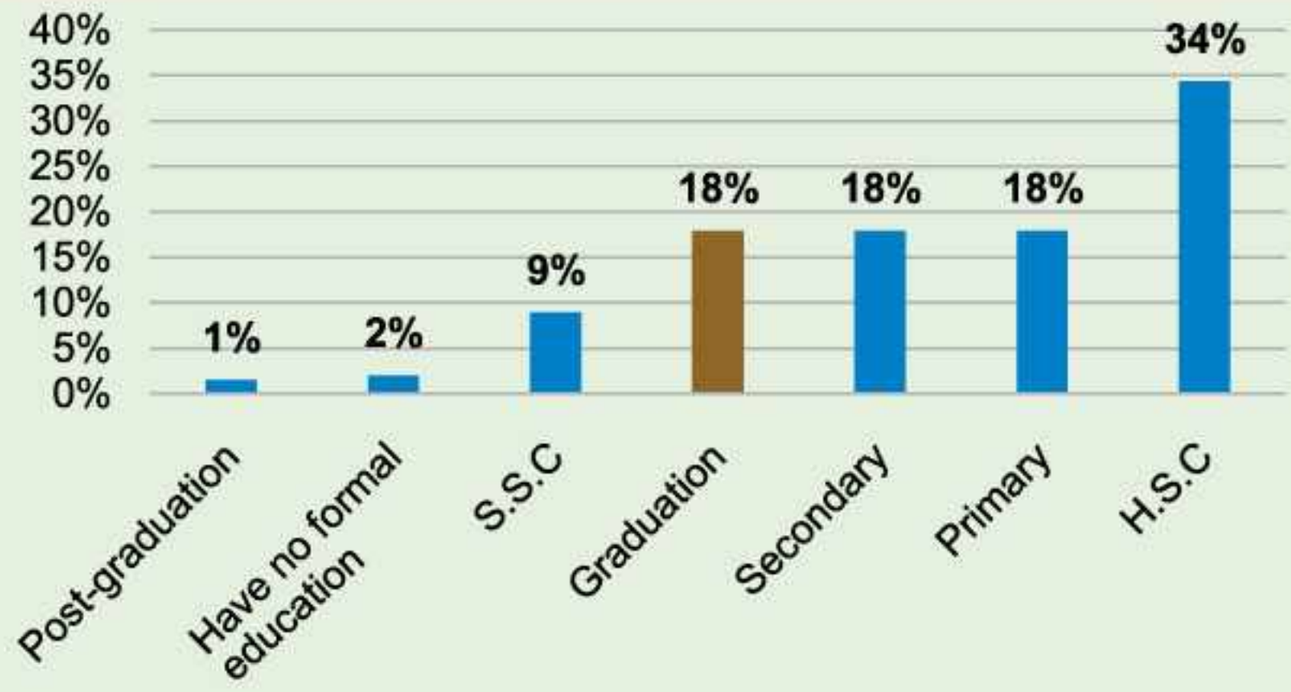


Figure 3 shows that 34% and 18% of the CDRT volunteers had H.S.C and graduation, secondary and primary education respectively. So, most of the CDRT volunteers had formal education. The CDRT volunteers have been playing voluntary roles for the respective community under the programme. So, it was tried to include educated and conscious CDRT volunteers while forming the groups.

Figure 4: Trainings provided to the CDRT volunteers from the inception of IFRP

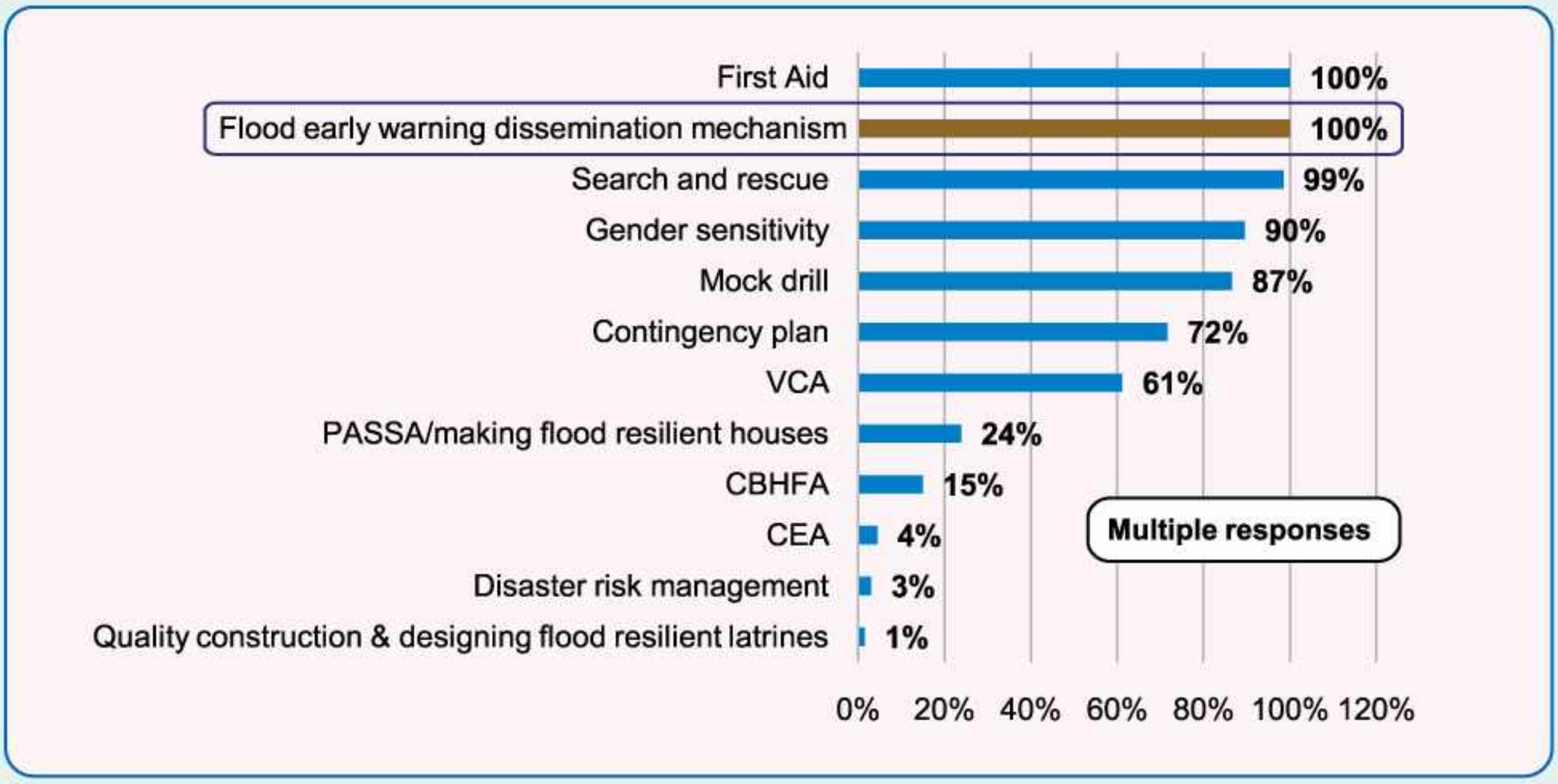


Figure 4 shows that the CDRT volunteers got different types of trainings from the inception of the programme that made them capable to work for the community people during flood and other disasters. The CDRT volunteers received trainings like First Aid, search and rescue, gender sensitivity, mock drill, contingency plan, VCA and PASSA/making flood resilient houses. All the CDRT volunteers got trainings on flood early warning dissemination mechanism that helped them to be efficient on taking measures for the community people before and during flood. Beside this, some of the CDRT volunteers got trainings on community engagement and accountability, disaster risk management and quality construction and designing flood resilience latrines. From the beginning of the programme, it was tried to enhance the capacity of the CDRT volunteers so that they can play significant role for the community people during flood and disasters.

Figure 5: CDRT volunteer's initiatives when the flood water reached at yellow level of flood marker

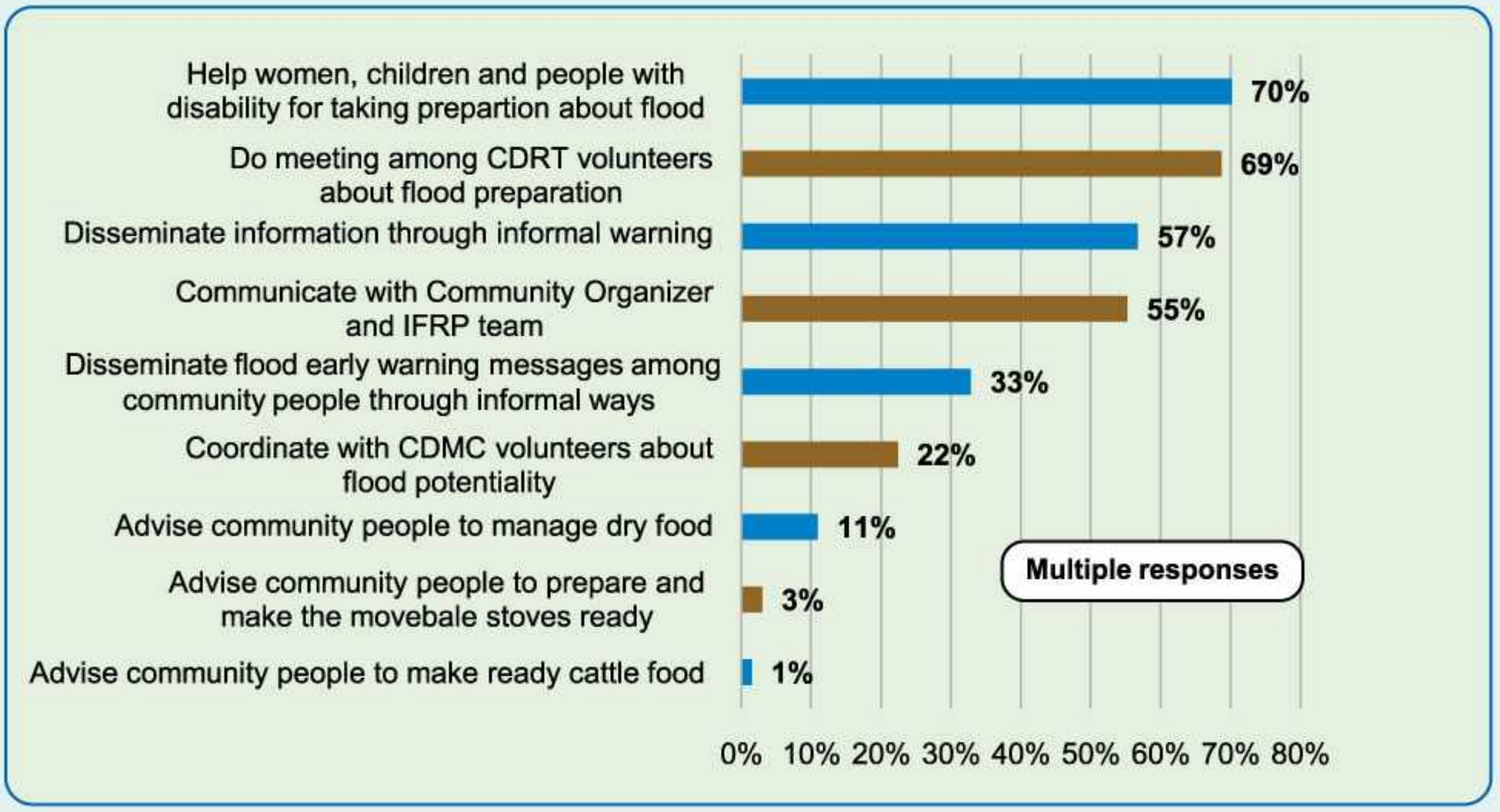


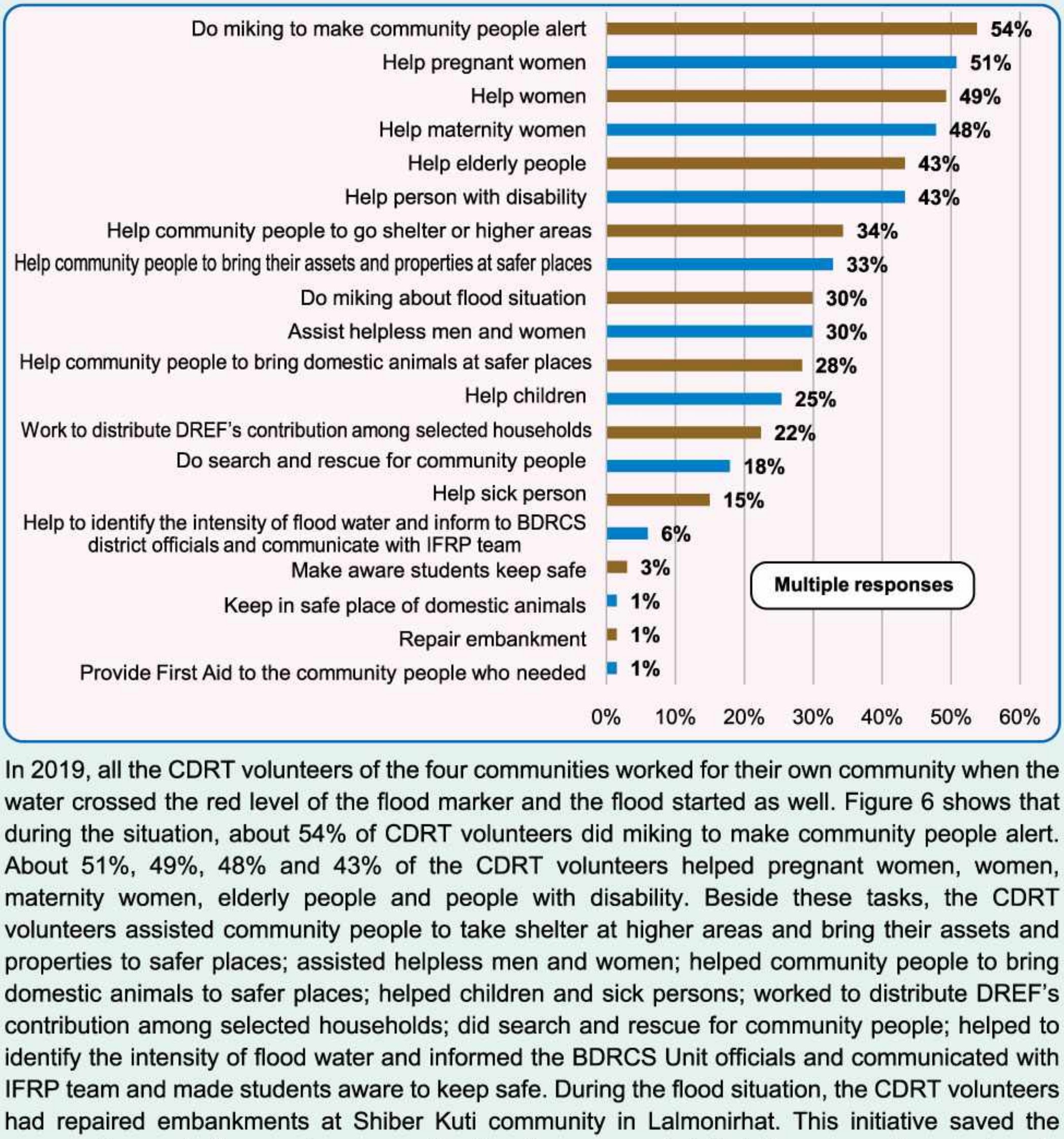
Figure 5 demonstrates that the CDRT volunteer's initiatives when the flood water reached at yellow level of flood marker. About 70% of the CDRT volunteers helped women, children and people with disability for taking preparation about flood. About 69%, 57% and 55% of the CDRT volunteers arranged meeting among them for taking preparation for flood, disseminated information through informal warning and communicated with Community Organizer and IFRP team. Beside this, about 33% and 22% of the CDRT volunteers disseminated early warning messages among the community people and coordinated with CDMC volunteers about flood potentiality. The overall initiatives of the volunteers helped the community people to be aware and prepared about the flood and take actions accordingly.

"My community is a flood-prone community of Lalmonirhat District. Almost every year, flood occurs at our community. Earlier, there was no such volunteer team like CDRT at our community. After the inception of the IFRP, the CDRT team has been playing a very important role to sensitize and motivate the community people about the flood risks and tasks that should be done before and during flood. This community was heavily affected by flood in 2017 and 2019. But, the preparation of the community was more than the previous time's flood. Here, the CDRT played a great role in making the community people aware that flood was coming. The CDRT volunteers took different initiatives when the flood water reached the yellow level of the flood marker. Firstly, they arranged a meeting and planned what should be done for the community to reduce their loss. They did all the necessary work within their capacity for the

Md Abdul Matin (44), flood affected household head (household no.55) Sheikh Para community, Lalmonirhat (Photo: IFRC)

community people when they realized that the flood was happening. For their initiatives, we realized that we had chance to take necessary preparation and take safe shelter. So, before the flood water entered at our community the people took plans from their respective position" ------ Md Abdul Matin (44).

Figure 6: Roles of CDRT volunteers when flood water reached at red level of flood marker and community people were affected



In 2019, all the CDRT volunteers of the four communities worked for their own community when the water crossed the red level of the flood marker and the flood started as well. Figure 6 shows that during the situation, about 54% of CDRT volunteers did miking to make community people alert. About 51%, 49%, 48% and 43% of the CDRT volunteers helped pregnant women, women, maternity women, elderly people and people with disability. Beside these tasks, the CDRT volunteers assisted community people to take shelter at higher areas and bring their assets and properties to safer places; assisted helpless men and women; helped community people to bring domestic animals to safer places; helped children and sick persons; worked to distribute DREF's contribution among selected households; did search and rescue for community people; helped to identify the intensity of flood water and informed the BDRCS Unit officials and communicated with IFRP team and made students aware to keep safe. During the flood situation, the CDRT volunteers had repaired embankments at Shiber Kuti community in Lalmonirhat. This initiative saved the community people from a dangerous situation. It was revealed that the community was heavily affected as the embankment was broken by heavy flood in 2017. But during flood in 2019, the scenario was opposite. The CDRT and CMDC volunteers worked together to involve the community

people and did a great work for the community people in this regard. At the four communities, the CDRT volunteers provided First Aid to the community people as per needs. Under the programme, Community Disaster Response Emergency Fund (C-DREF) was formed at the four communities. The community people have been regularly contributing to this fund so that the money can be used during the flood period as per the decision of community people and CDMC. During the flood in 2019, a portion of C-DREF was used at Shiber Kuti community, Lalmonirhat.

Figure 7: Comparative roles of CDRT volunteers during flood in 2019 and 2017

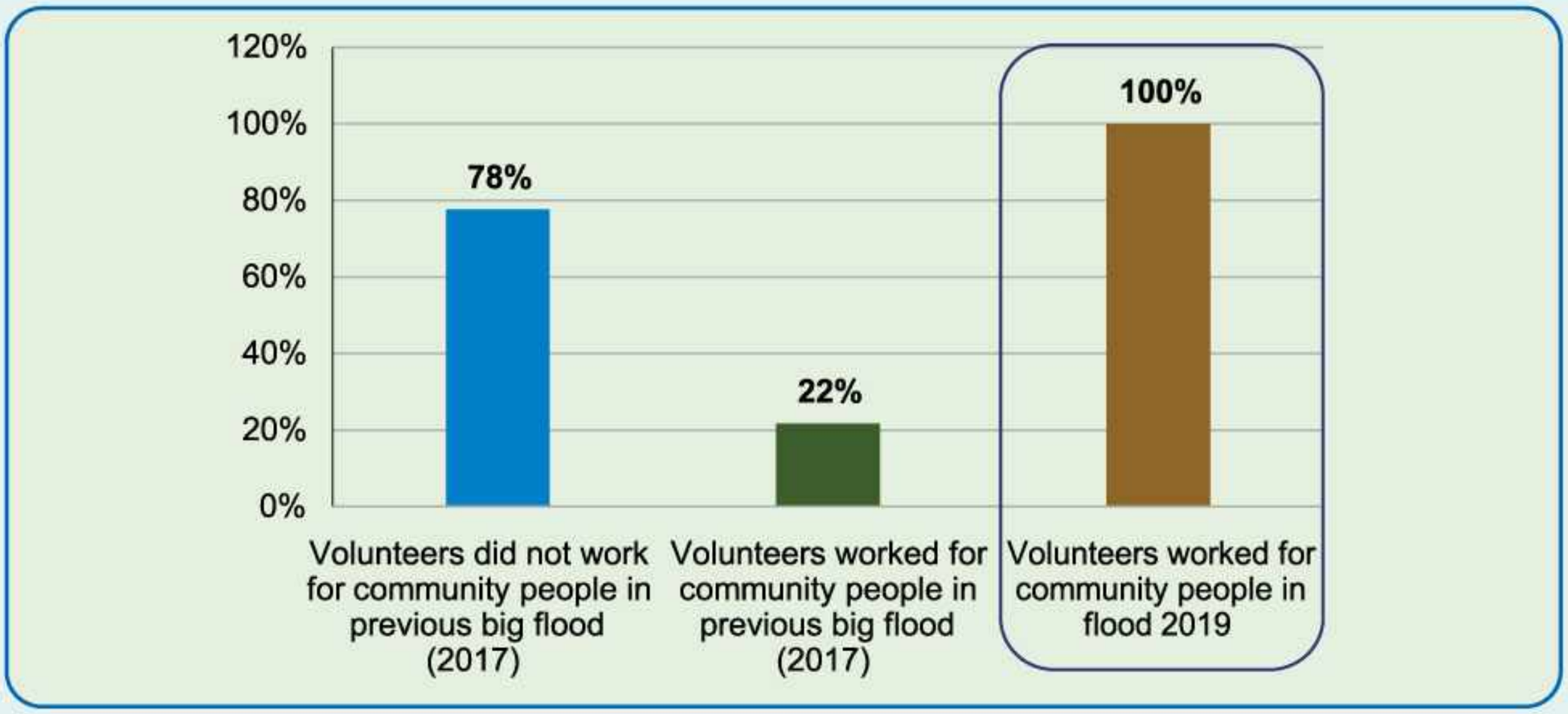


Figure 7 shows that about 78% of the volunteers of the CDRT did not work in the previous big flood for affected community households and people. That time, they were not aware about how to respond to flood and make the community people safe and rescued. But in flood in 2019, all the volunteers worked for the community people before and during flood. Earlier, no other programme was implemented by any organizations at their community that included the FEWS and made the community volunteers involved in working for flood response.

Table 4: Reasons for that the CDRT volunteers were able to work and contribute during flood

Reasons	Respondent's response (%)	
Capacity of CDRT volunteers was enhanced through different types of trainings and orientations	75%	**Multiple responses**
Installed flood marker helped the CDRT volunteers to identify flood situation	69%	
CDRT volunteers were guided about their roles and responsibilities to contribute for community people during flood period by IFRP team	54%	
Orientation on flood early warning system was very helpful	49%	
Proper guidance was provided by IFRP team and BDRCS Unit	31%	
Community people were more aware about flood risk and preparedness in 2019	30%	

Reasons	Respondent's response (%)
CDRT had enough equipment to respond flood	24%
Both community people and volunteers had access to information and networking	18%
Connection and engagement among community people increased	10%
CDRT volunteers were aware about need of vulnerability of community people	10%

Table 4 shows the reasons for that the CDRT volunteers were able to work for the community people before, during and after the flood in 2019. During flood in 2019, the CDRT volunteers contributed for the community people through their endeavours. For this, IFRP played a vital role as the motivating factor to make them engaged and eager to work for the flood situation. About 75% of the CDRT volunteers mentioned that their capacity was enhanced through different types of trainings and orientations whereas about 69% informed that the installed flood marker at their community helped them to identify flood situation. About 54% and 49% of the CDRT volunteers mentioned that they were guided about their roles and responsibilities by the COs and APOs and oriented on flood early warning system. This helped them to work for the community people. Beside these, proper guidance was provided by IFRP team and BDRCS which made the CDRT volunteers more aware about flood risk and preparedness. Under the programme, CDRT volunteers got enough search and rescue kits, First Aid Boxes to respond flood. The CDRT volunteers also mentioned that both community people and volunteers had access to information. The networking, connection and engagement among community people increased. The CDRT volunteers were aware about needs of the vulnerable community people. By thus, they responded to community people during the flood.

FINDINGS OF THE STUDY

4.1 Demographic profile of community people

Figure 8: Gender of respondents

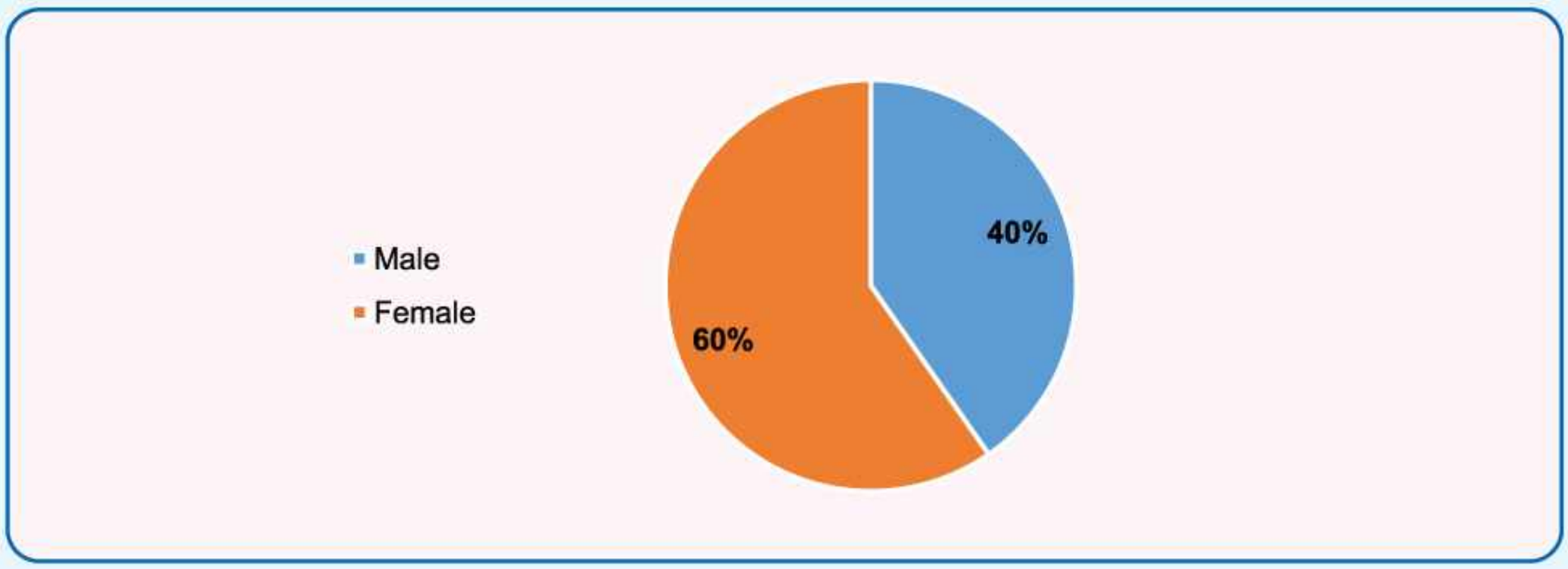


Figure 8 shows that about 60% of the surveyed people at the four communities were female and the remaining 40% were male. The household survey was conducted at daytime and in this period most of the males at community level usually go outside of the household for income generating activities. That's why the male respondents were less than the female respondents.

Figure 9: Religion of respondents

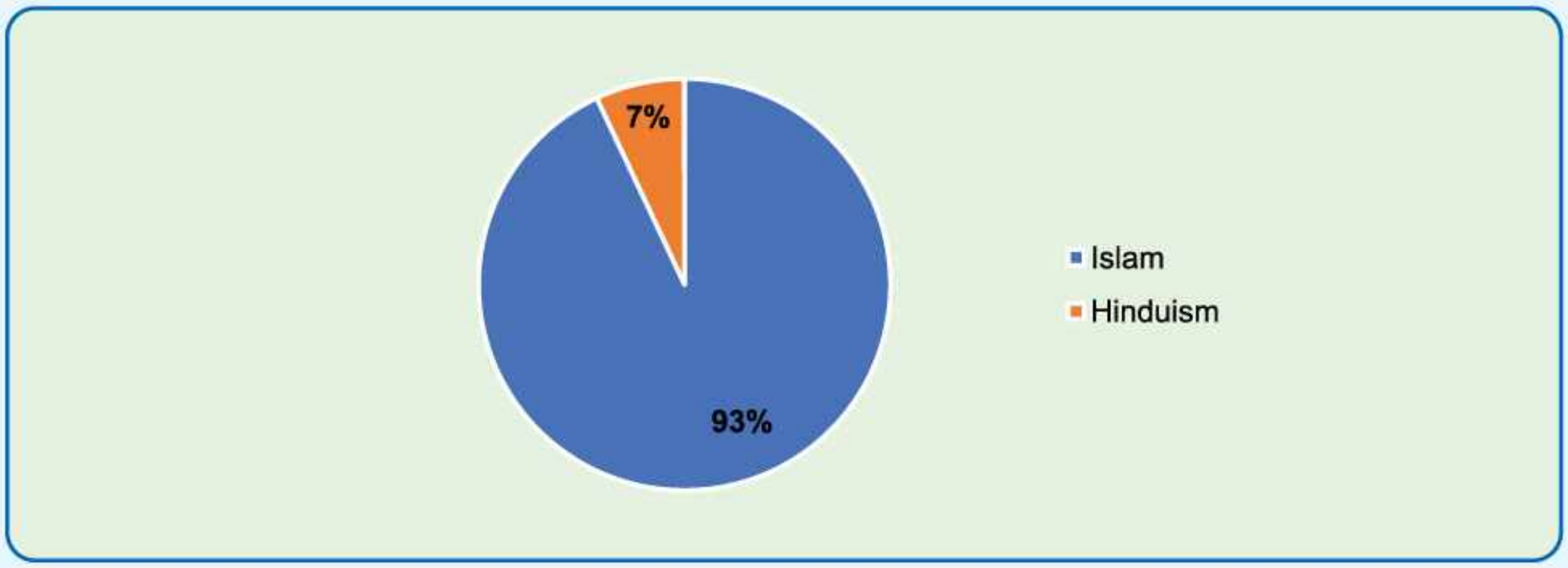


Figure 9 shows that 93% of the respondents were Muslim and 7% were the followers of Hindu religion. No respondent from other religion was found in the study. The community people had social and religious harmony and have been living together for many years.

Figure 10: Educational qualification of respondents

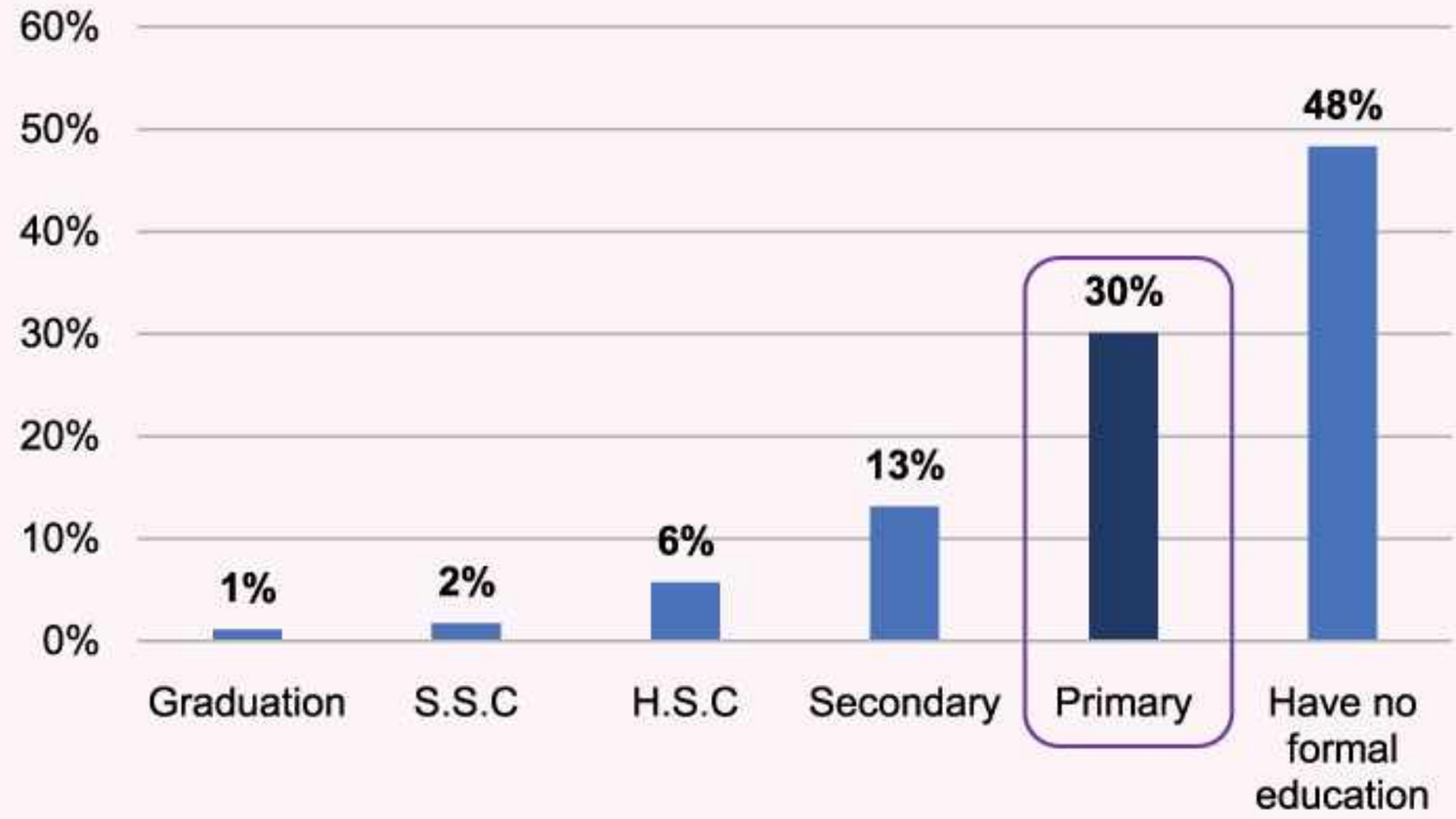
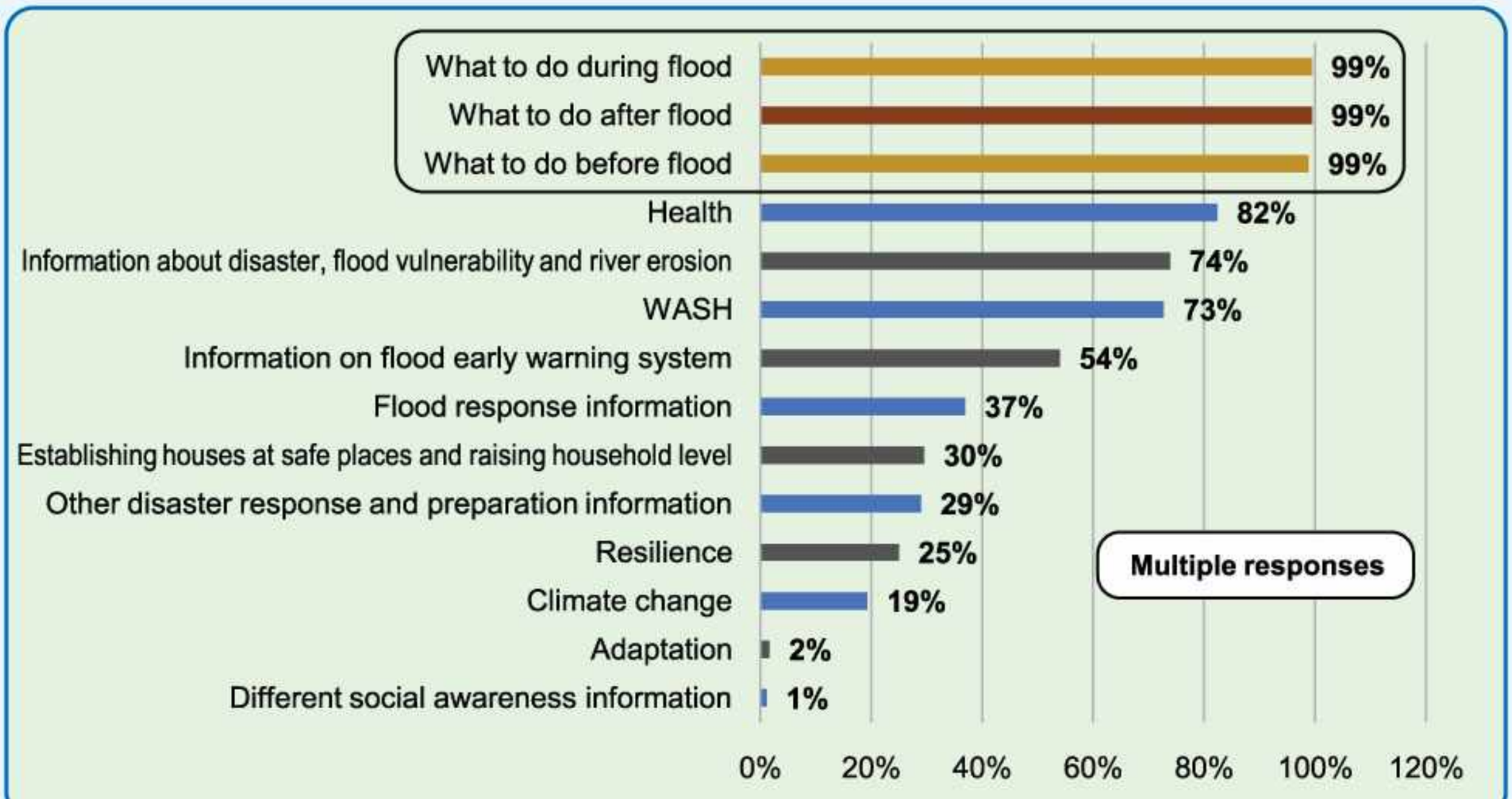


Figure 10 shows that about 48% of the respondents had no formal education. On the other hand, about 30% and 13% of the respondents provided information that they had primary and secondary education respectively. But, a few numbers of respondents were found with having S.S.C, H.S.C, graduation and post-graduation. Beside this, the overall community education was limited within primary level in most of the cases.

Figure 11: Community people's learnings from courtyard meetings about flood resilience



It was found that all the respondents attended at courtyard meetings and received information on flood, other disasters and resilience during the last one year. Under the programme, each of the community was divided into eight micro-groups. Courtyard discussions (micro-group sessions) with

the 8 micro-groups (one session per month with one micro-group at each community) are being organized so that the community people have increased access to knowledge on disaster risk reduction and flood resilience. The COs and APOs have been conducting the courtyard sessions by using a flipchart developed under the programme. Figure 11 shows that about 99% of the respondents learnt about what to do before, during and after flood. About 82%, 74%, 73% and 54% of the respondents received information on health; disaster, flood vulnerability and river erosion; flood early warning system and WASH respectively. Along with this information, the respondents mentioned that they had received information on flood response, construction of safe shelter, other disaster response and preparation. The respondents were also oriented about climate change, adaptation and resilience at the courtyard meeting. The respondents also got different social awareness programmes from the courtyard sessions.

"During last year, the community people learnt a lot of things from the courtyard sessions and meetings on taking preparation for flood, disaster risk reduction, resilience, adaptation, climate change, health, safe water and sanitation etc. I am a member of micro-group no. 8 of Shiber Kuti community and now I know how to take preparation before flood, what measures should be under taken during flood and how to come back in normal life after the flood situation. We, the community people had learnt from the yard sessions during last year. We also discuss the learning from the sessions at household level. Thus, our household members are also now conscious about flood vulnerability. I will say, the arranged sessions under Integrated Flood Resilience Programme had greater impacts to make the community people sensible about flood risk reduction and other social awareness issues. Now, I know about the intensity and danger level of flood water as I learnt about the flood early warning system. I have practical knowledge in this regard" --- Mst. Hasina Begum (40).

Mst Hasina Begum (40), community woman, (household no 93), Shiber Kuti community, Lalmonirhat (Photo: IFRC)

Figure 12: Respondents knowledge on developed flood marker and early warning

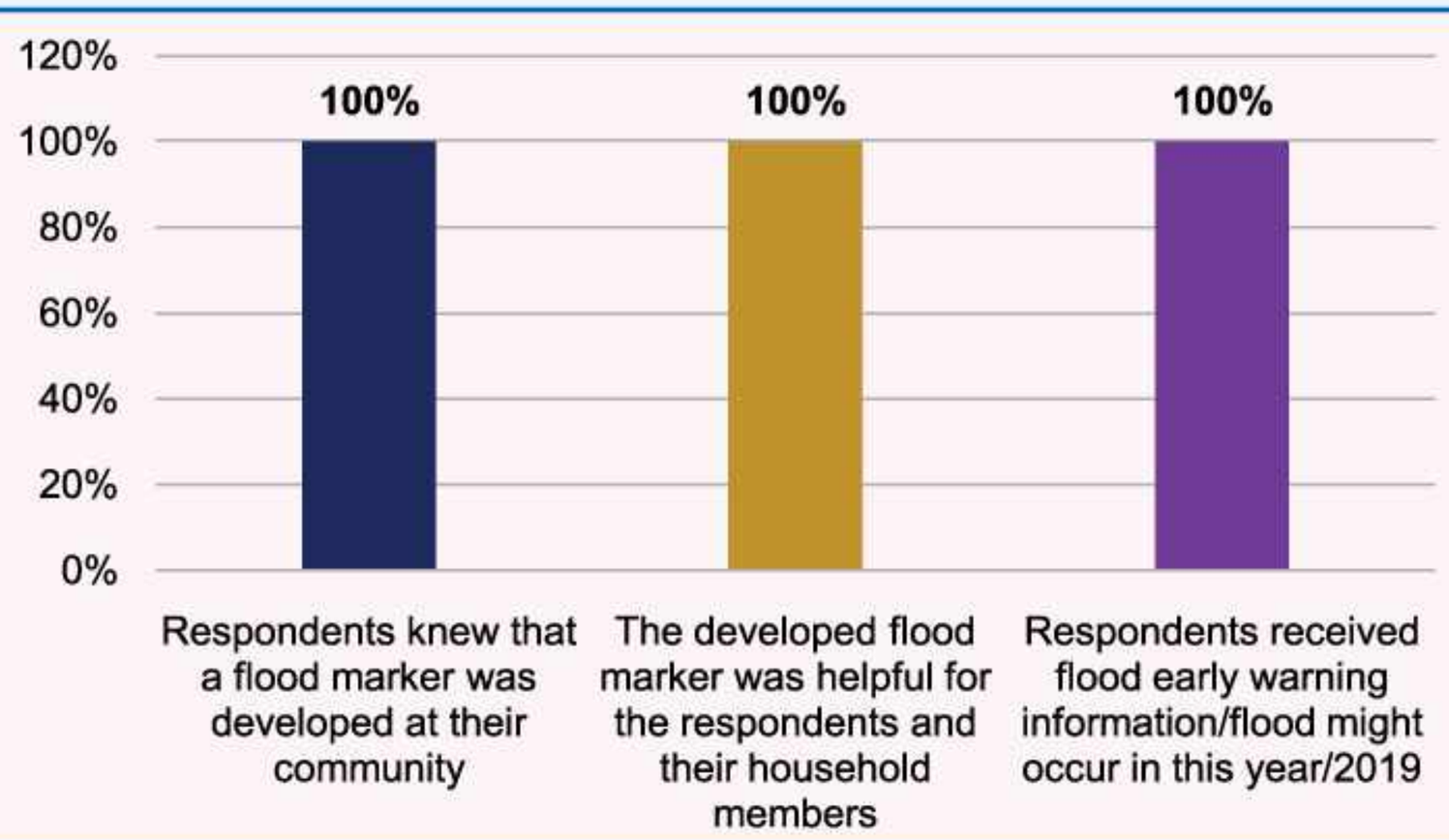


Figure 12 shows that all respondents were conscious about the flood marker that was established at their community by BDRCS under IFRP. They mentioned that they had seen this type of flood marker for the first time in their life. The developed flood marker was helpful for the respondents and their household members. In 2019, all the respondents received flood early warning information and information that flood might occur.

Figure 13: Ways for respondents to get information that flood might occur

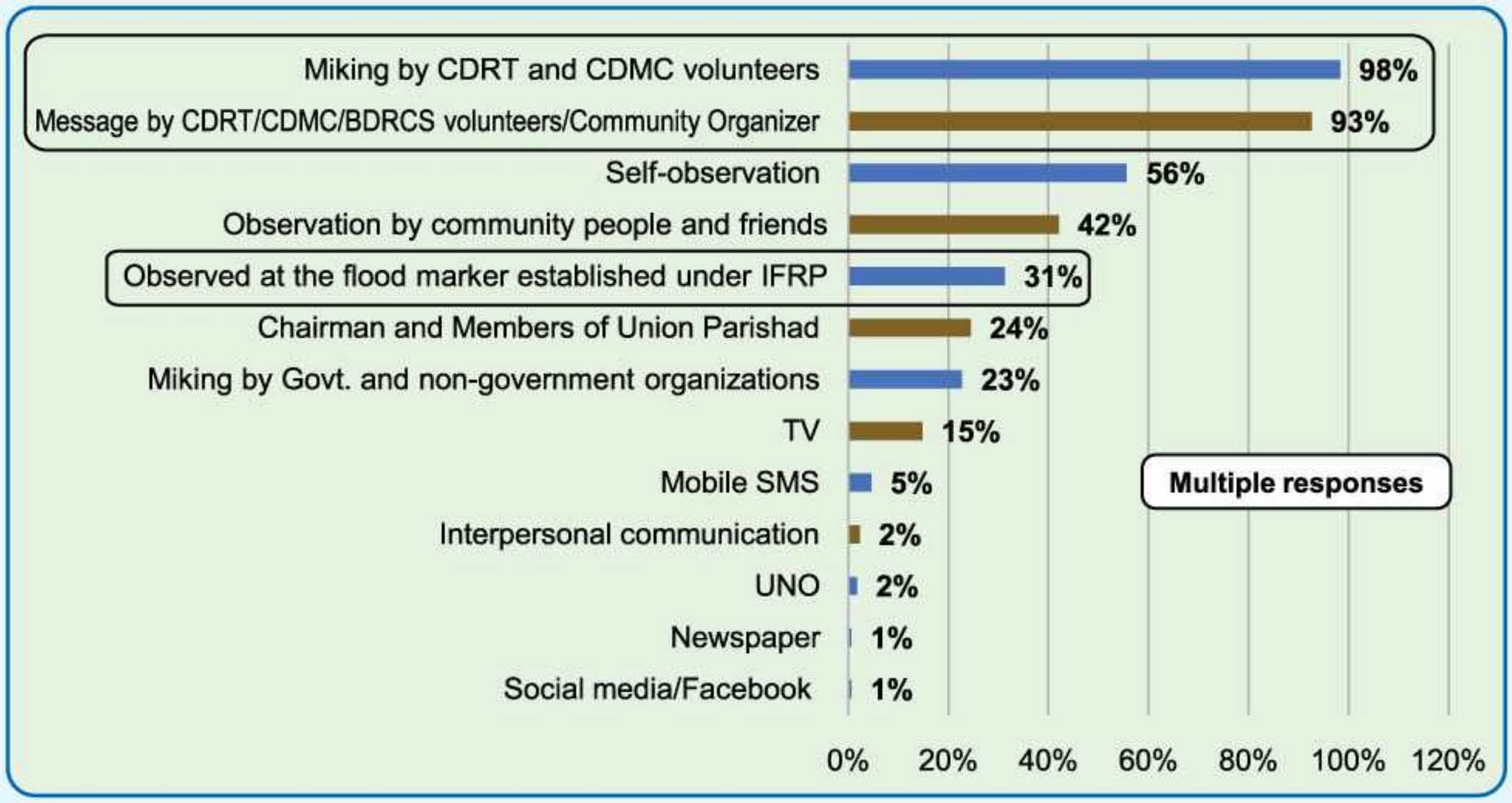


Figure 13 shows that about 98% and 93% of the respondents received flood early warning messages in 2019 through miking by CDRT and CDMC volunteers and message by CDRT, CDMC, BDRCS volunteers and COs. About 56% of the respondents noticed the probability of flood by self-observation. Here it is significant that about 31% of the respondents observed the flood probability by seeing at the flood marker installed under IFRP. The respondents also received flood early information through observation by community people and friends, from Chairman and Members of UP, miking by Government and non-government organizations, TV and mobile SMS. Beside this, some of the respondents got the flood early warning message from interpersonal communication, UNO, newspaper and social media/Facebook.

4.2 Community preparation after getting the flood warning message

Figure 14: Measures undertaken by community people after getting early warning information and knowing the probability of flood

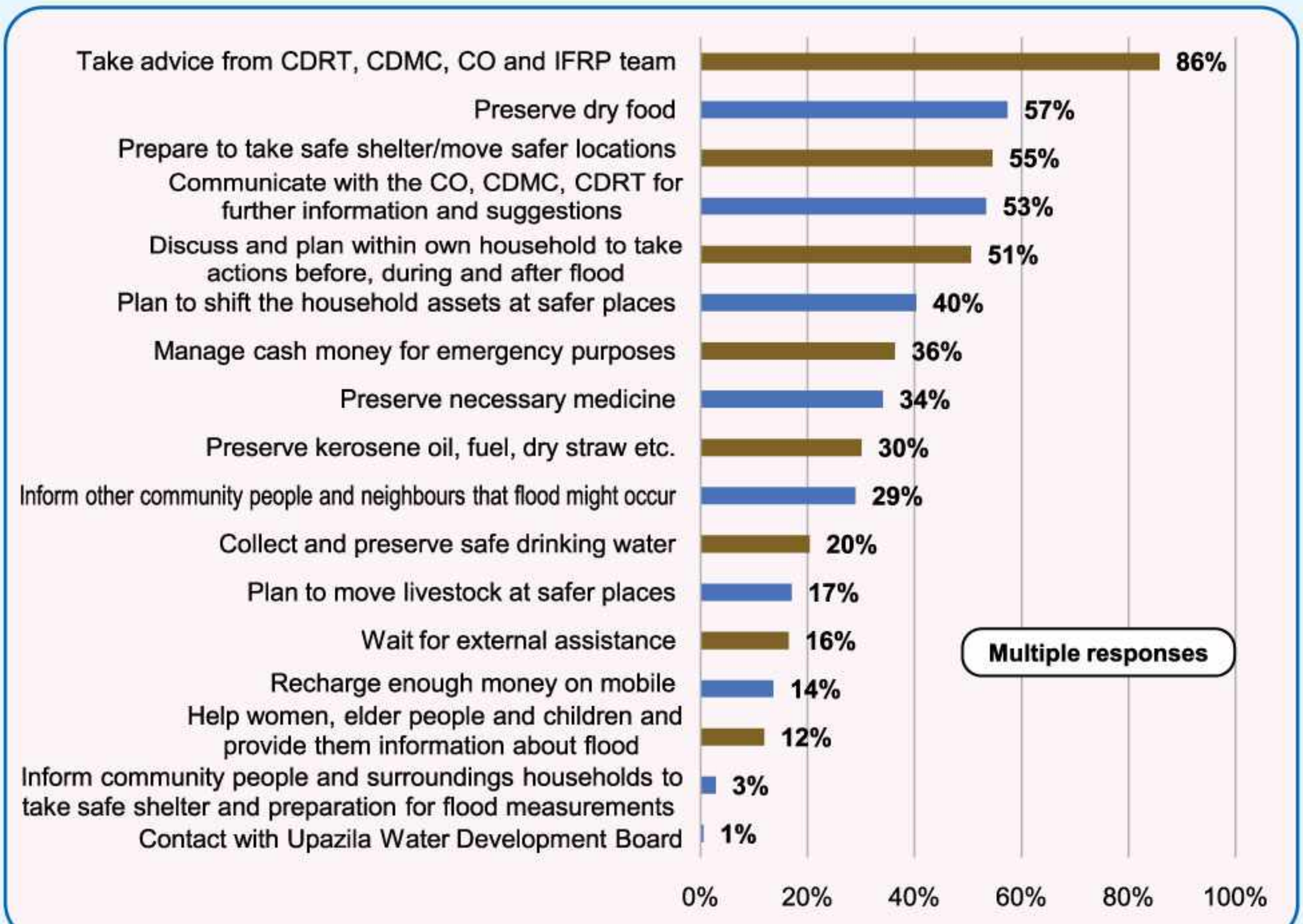


Figure 14 shows that the respondents and their household members took a lot of initiatives after getting the flood early warning information. About 86% of the respondents and their household members took advice from CDRT, CDMC, CO and IFRP team on what to do during the situation. About 57%, 55%, 53% and 51% of the respondents and their household members preserved dry food; took preparation for safe shelter or moved to safer locations; communicated with the CO, CDMC, CDRT for further information and suggested, discussed and planned within their own households to take actions before, during and after flood respectively. They also planned to shift the household assets to safer places, managed cash money for emergency purposes, collected and preserved necessary medicine, safe drinking water and kerosene oil, fuel, dry straw etc. as their part of taking preparation for flood. Beside this, the respondents and their household members informed other community people and neighbours that flood might occur; planned to move livestock to safer places; recharged enough money on mobile; helped women, elder people and children and provided them information about flood and informed community people and surroundings households to take safe shelter and preparation for flood measurements.

"In the last few years, we faced two big floods. One was in 2017 and another was in 2019. Both floods had harmful effects on the lives and livelihoods of our community people. But in 2019, we were able to reduce the loss of flood as we had shifted our necessary assets and properties to safer places after getting the information that flood might occur. Beside this, the affected people of the households were alert and took safe shelter. This happened because of the endeavour of CDRT and CDMC volunteers as well as the IFRP team, BDRCS Lalmonirhat. They informed the community people and disseminated a lot of messages at the whole community by doing miking and going to households. But in 2017, nobody alarmed us about the intensity of flood, and we could not assess what to do before and during flood and we didn't take enough initiatives. In 2-19, the CDRT volunteers worked hard to make the community people aware to take right decision before and during flood. They worked voluntarily and visited the household at day and night to help to shift the properties of use. They also worked to repair the embankment with the support of community people so that the water can not enter into our community".

Md Jalal Hossen (47), flood affected community people (household no. 101) at Shiber Kuti community in Lalmonirhat (Photo: IFRC)

Figure 15: Taking help from CDRT and CMDC volunteers by the community people

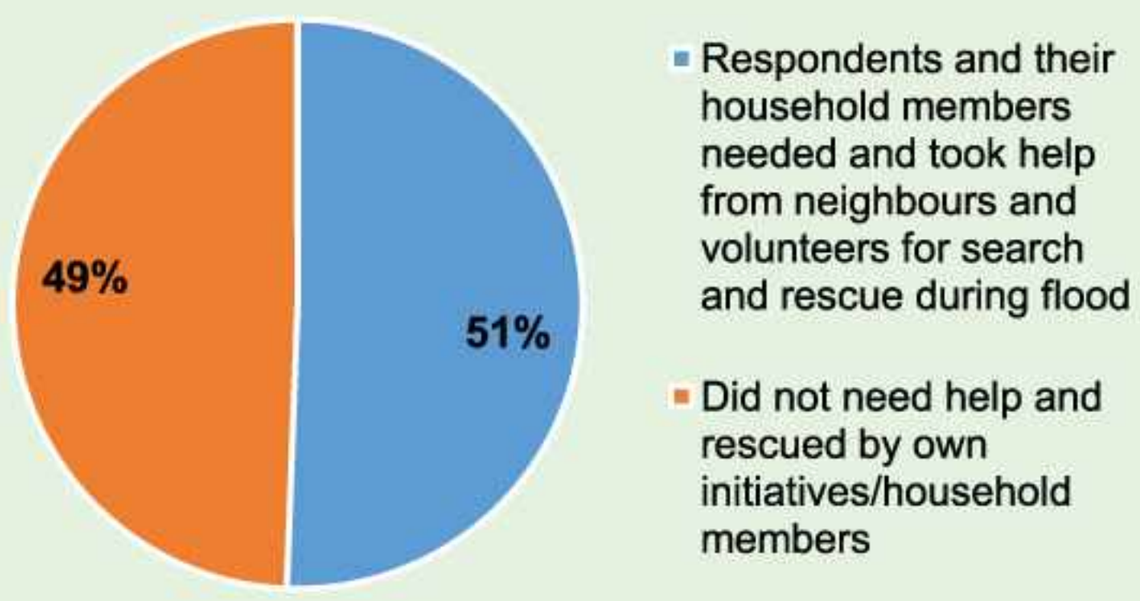


Figure 15 shows that about 51% of respondents and their household members needed and took help from neighbours and CDRT and CDMC volunteers for search and rescue and other purposes during flood. In this regard, the CDRT and CDMC volunteers helped the community people to shift different types of properties, cattle, necessary assets from their household to safer places. It was found that in previous floods, the community people used to take help from the neighbours and community people but during flood in 2019, the community people got extra support from the CDRT and CDMC volunteers that helped them to take more preparation.

Figure 16: Types of supports that CDRT and CMDC volunteers provided to community people before and during flood

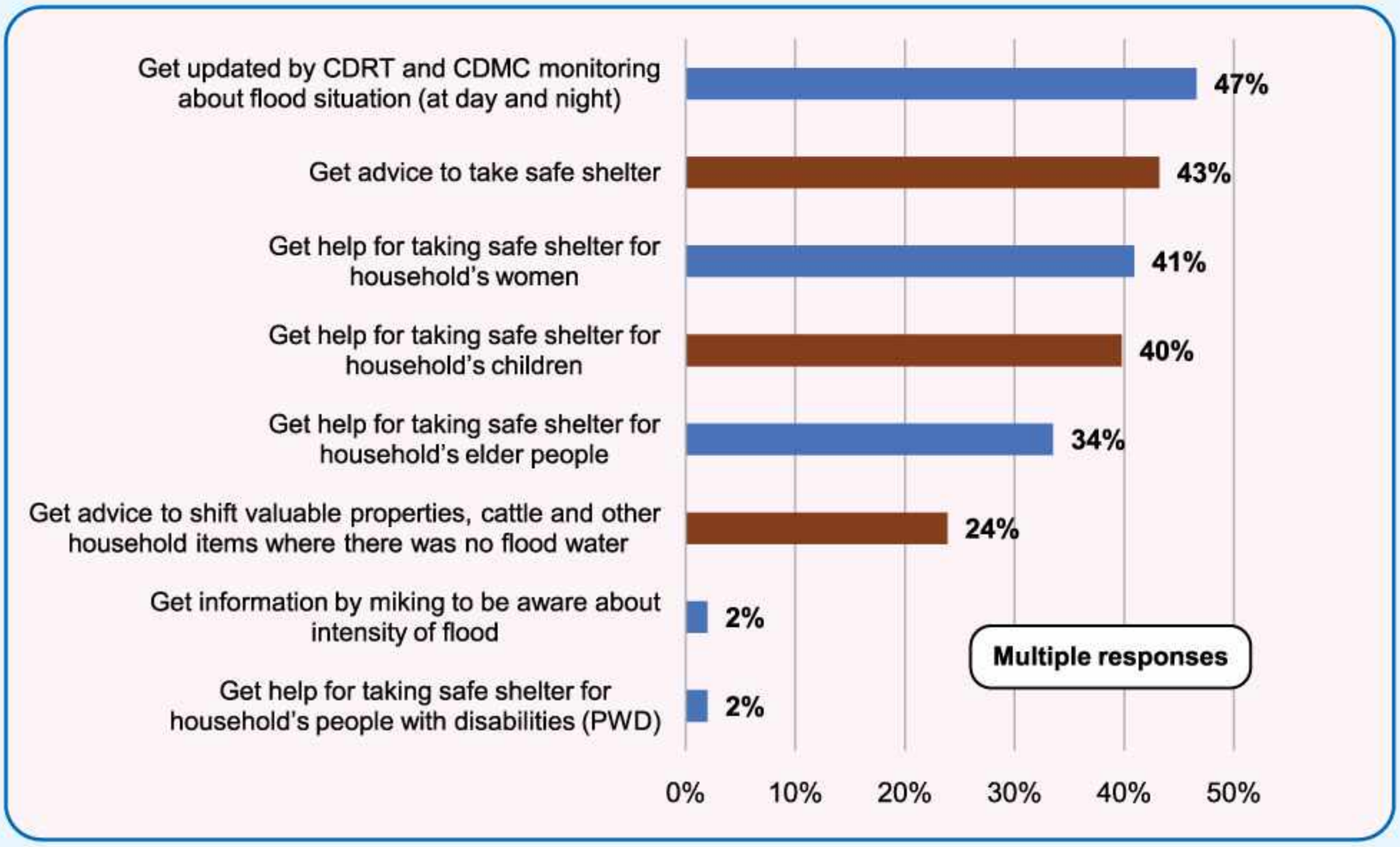


Figure 16 describes that during the flood period the respondents and their household members received different types of support from the CDRT and CDMC volunteers. About 47% of the respondents got updated information on flood situation by CDRT and CDMC volunteers. About 43% and 41%, 40% and 34% of the respondents got help to take safe shelter for the household's women and received help to take safe shelter for household's women, children and elderly people. Besides, a significant portion of the respondents and their household members got advice to shift valuable properties, cattle and other household items where there was no flood water. A few got information by miking to be aware about intensity of flood and received help to take safe shelter for the household's people with disabilities.

4.3 Impacts of flood in 2019 and economic loss reduction by flood early warning system

Table 5: Impacts of flood in 2019 on the life and livelihoods of the community people

Impacts of flood in 2019	Respondent's response (%)	
Hamper daily working opportunity/income	81%	Multiple responses
Earn but at a limited extent	63%	
Crops were damaged	61%	
Keep harmful impacts on tube-wells and latrines	57%	
Living house was damaged	57%	
Reduce daily working opportunity/income	56%	
Cooking problem/preparing foods	53%	
Face health complexity	45%	
Face skin diseases	36%	
Seedling was destroyed	34%	
Trees and vegetables were damaged	33%	
Face safe drinking water and hygiene management problem	31%	
Spread diseases	30%	
Store house was damaged	28%	
Cattle house was damaged	23%	
Inundate tube-wells and latrines	22%	
Problems in domestic cattle management	17%	
Livestock death (hen, duck etc.)	10%	
Face social insecurity	7%	
Household members become sick/injured/shocked	3%	

Table 5 shows the impacts of the flood in 2019. About 81% of the household's daily income was hampered due to flood, about 63% of the households were bound to earn at a limited extent and about 56% of the household's income was reduced. About 61% of household's crops were damaged whereas about 57% of household's tube-wells and latrines were harmfully affected and living houses were damaged respectively. Beside these impacts; cooking problems/preparing foods, health complexity, livestock death (hen, duck etc.), skin diseases, destroy of seedling, damaging trees and vegetables, safe drinking water and hygiene management problem, damaging store and cattle houses, inundating tube-wells and latrines and problems in domestic cattle management were seen due to flood. Some of the respondents mentioned that they and their household's members felt insecurity for various reasons during the flood.

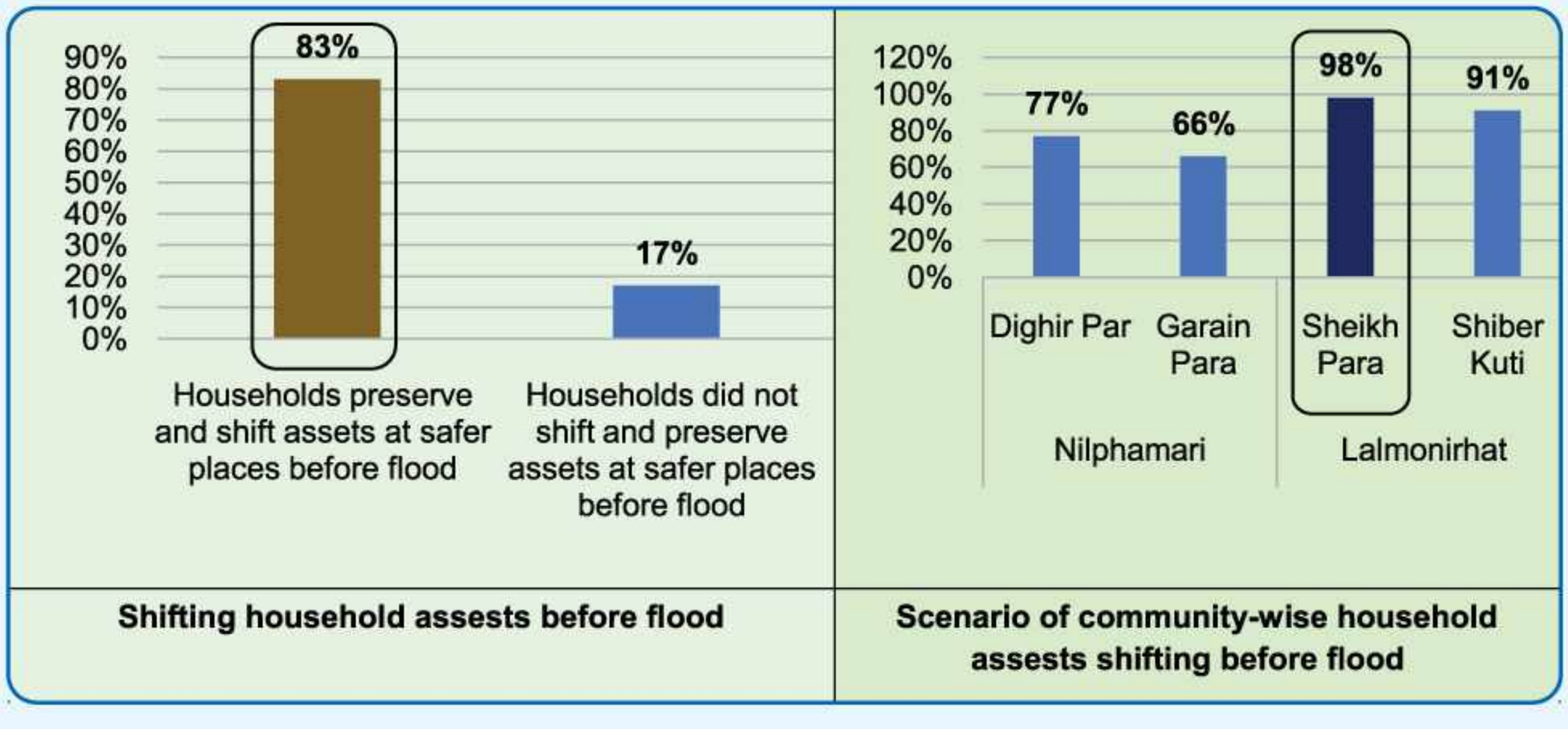
"My household is located at a place where the flood water comes easily but there are so less points that water will release very quickly. My community (Dighir Par in Nilphamari) is very vulnerable and water gets stuck for a long time as the area is low (almost parallel to the river level). So, almost every year like other households and community people, my household members face the flood situation.

In 2019, my household was affected by flood for three times (two times in July and one time in the first week of September). Every time, my household members were surrounded by water for an average of seven days. During this period, we faced a lot of problems. We had to use a boat for moving from one place to another, and cooking foods was very tough during the period. Another big problem was ensuring hygienic sanitation during the flood. Because, when the flood water entered our community, the latrines got flooded. In 2019, we were frequently aware about flood's intensity by the CDRT and CDMC volunteers and looking at the flood marker established by BDRCS.

Abed Ali (23), representative of vulnerable household, (household no 306) Dighir Par Community, Nilphamari (Photo: IFRC)

That's why, my preparation to face flood was better than the other period. But there were some communities around our areas where the people did not know about this type of system like FEWS and they did not get benefits like us that we got during the flood time. For reducing the impacts of flood this type of system needs to be popularized more and long-term initiatives should be taken to reduce the loss of flood" ----Abed Ali (23).

Figure 17: Outcome of FEWS and significant endeavours of CDRT and CDMC volunteers to reduce flood loss



All respondents mentioned that the FEWS, and the endeavours of CDRT and CDMC volunteers had significant impacts to reduce the loss of flood in 2019. In this regard, the community people knew about the intensity of flood as they were frequently informed by the CDMC and CDRT volunteers. Because of this, they were able to shift and save their household assets to safer places where there was no flood. Figure 17 describes that about 83% of the respondents and their household members shifted their valuable assets to safer places which significantly helped them to reduce loss of flood. The community people of Sheikh Para, Lalmonirhat had persevered and shifted most of their valuable assets (about 98%) before the flood. In this regard, the CDRT and CDMC volunteers of

four communities played vital role to motivate the community people to preserve and shift their household assets and properties.

"Our household is located at the closest position of Teesta river at Dighir Par community, Nilphamari. So, when flood water enters the community, our household is firstly affected. Every year, our household members face the impacts of flood. Flood used to create an unbelievable situation for us, and we spent sleepless nights. During flood in 2017, we could not shift our valuable assets because we were not informed at the right time and did not know about the intensity of the flood. So, we had faced loss during floods in earlier times. In 2019, Red Crescent volunteers at our community provided early warning messages and made us aware through miking and door to door visits. This helped us to know that flood was coming, and my household members became ready to take steps like taking shelter at roads and shifting properties to a suitable place. In this regard, we took help from the CDRT volunteers who helped me to shift rice, cloths, utensils, cattle and dry foods at the road of our community. We had to stay at the road for four nights and flood hampered our daily life. But we were able to save our domestic assets" ----Mst. Anzuara Begum (50).

Mst. Anzuara Begum (50), vulnerable woman, (household no: 301) Dighir Par community, Nilphamari (Photo: IFRC)

Figure 18: Types of assets that were preserved and shifted before flood by the households

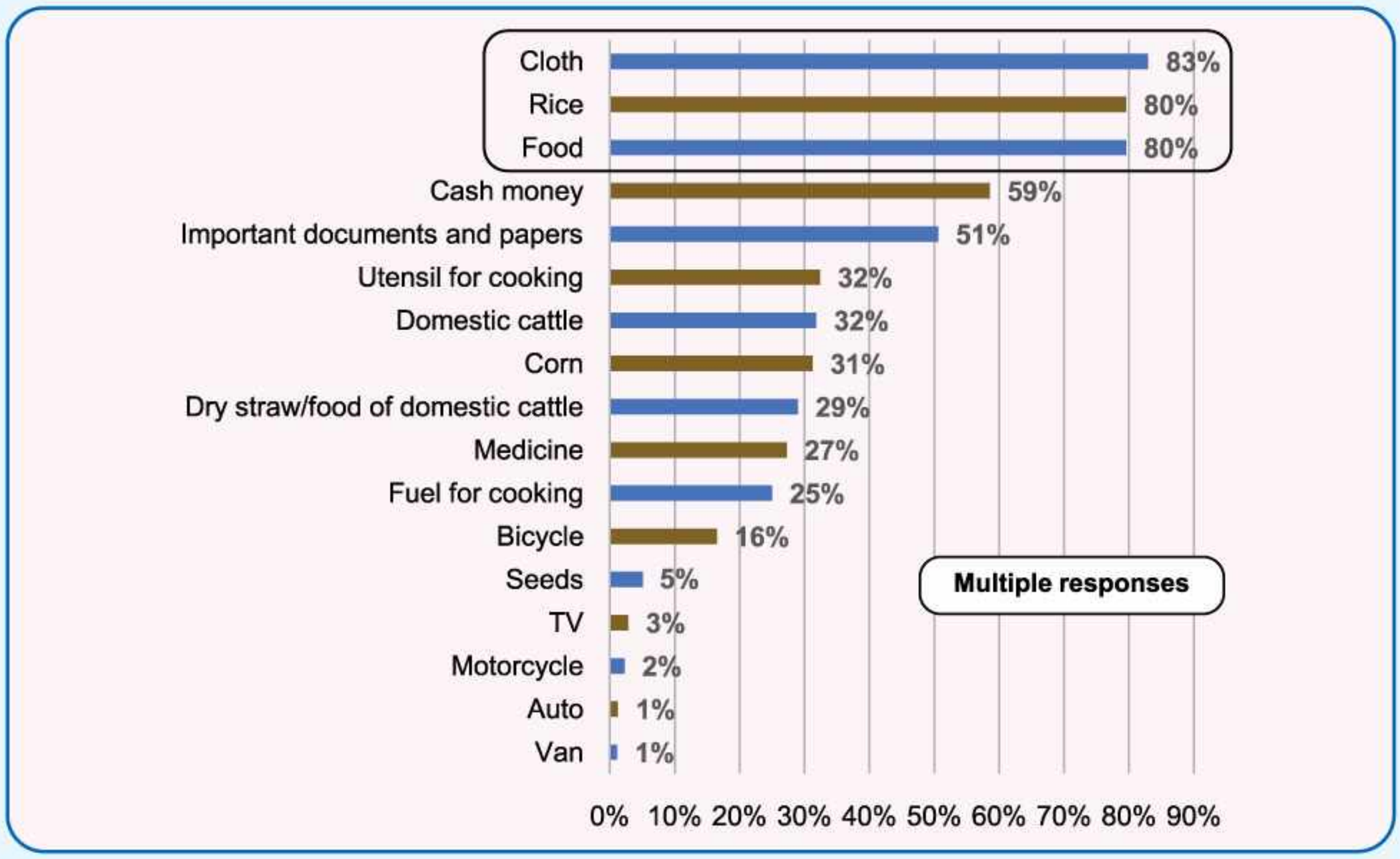


Figure 18 shows that about 83% and 80% of the households preserved and shifted cloth, and rice and food before the flood. About 59% of the households preserved and shifted cash money whereas 51% of the households did the same work for important documents and papers. About 32% of the households preserved and shifted utensil for cooking and domestic cattle to safer places before the flood. The community people also shifted corn, dry straw/food of domestic cattle, medicine, fuel for cooking, bicycle, seeds, TV, motorcycle, auto and van before the flood to safer places within own houses and/or other places where the flood water did not reach.

Table 6: Community-wise economic loss by flood in 2017

Name of District	Name of communities	Economic loss of the households during the flood of 2017 (BDT)										
		1 to 10,000	10,001 to 20,000	20,001 to 30,000	30,001 to 40,000	40,001 to 50,000	50,001 to 60,000	60,001 to 70,000	70,001 to 80,000	80,001 to 100,000	Up to 100,001	Average loss (BDT)
Nilphamari	Dighir Par	34%	9%	11%	7%	14%	7%	4%	5%	4%	5%	37,209
	Garain Para	9%	32%	27%	2%	13%	5%	2%	4%	2%	4%	40,045
Lalmonirhat	Sheikh Para	5%	3%	32%	18%	27%	6%	2%	2%	6%	N/A	42,772
	Shiber Kuti	1%	10%	27%	16%	25%	2%	11%	2%	3%	2%	46,795
Average at four communities												**41,705**

Table 6 shows the economic loss of flood in 2017 at four communities. The intensity of flood in 2017 was equal to the flood of 2019. Both floods were regarded as mega-flood. The average household's economic loss at the four communities was BDT 41,705 in flood of 2017. The loss of the community people was assessed through considering the level of damage on the assets and properties, hampering the income of households, damages of the houses, effects on domestic animals, health impacts, crop and agricultural loss and post impacts of flood to come at normal life.

Table 7: Community-wise economic loss by flood in 2019

Name of District	Name of communities	Economic loss of the households during the flood of 2019 (BDT)					
		1 to 5,000	5,001 to 10,000	10,001 to 15,000	15,001 to 20,000	More than 20,001	Average loss (BDT)
Nilphamari	Dighir Par	57%	24%	4%	5%	10%	6,150
	Garain Para	73%	16%	2%	2%	7%	9,568
Lalmonirhat	Sheikh Para	8%	9%	20%	34%	29%	24,204
	Shiber Kuti	12%	27%	11%	29%	21%	17,386
Average at four communities							**14,327**

Table 7 shows that the average economic loss of the flood in 2019 was reduced to BDT 14,327. The average loss by flood in 2017 was BDT 41,705 at four communities. The study identified that the economic loss of the communities for flood in 2019 was comparatively less than the previous flood (2017). This was possible as the developed flood early warning system under the programme functioned well and CDRT, CDMC and IFRP team worked relentlessly for the community people to save their assets and properties. Through the programme, the community people had been aware, and the flood early warning system was also effective.

"The intensity of flood has increased in the last few years in this area. Teesta river overflows during the monsoon. Every year, flood causes serious damage to the crops and infrastructures at our community and nearby villages. While the flood interrupts the daily life, it also damages the valuable assets that we have. My house is usually affected at least two or three times during the flood season every year. During the last big flood in 2017, I had a loss of almost BDT 10,000 as I could not shift my valuable assets to a safer place. The flood early-warning system, developed by BDRCS under its Integrated Flood Resilience Programme (IFRP), made life a safer for me and people living at the community. We were also oriented and made aware about the flood marker and early warning system through orientation and micro-group sessions. When the flood was about to hit in 2019, CDRT volunteers advised me, my household members and other community people to be prepared and leave the house for safe shelters. Before leaving the house, I covered all my valuable assets in an iron hutch and kept it in a higher place (maacha). I came back to my house only after when the flood water receded a few days later and all my valuable goods were safe and not damaged" --- Md Mojidul Islam (44).

Md Mojidul Islam (44), representative of frequent flood-affected household (household no. 121) Sheikh Para community, Lalmonirhat (Photo: IFRC)

Figure 19: Comparison of economic loss between flood in 2017 and 2019 at four communities

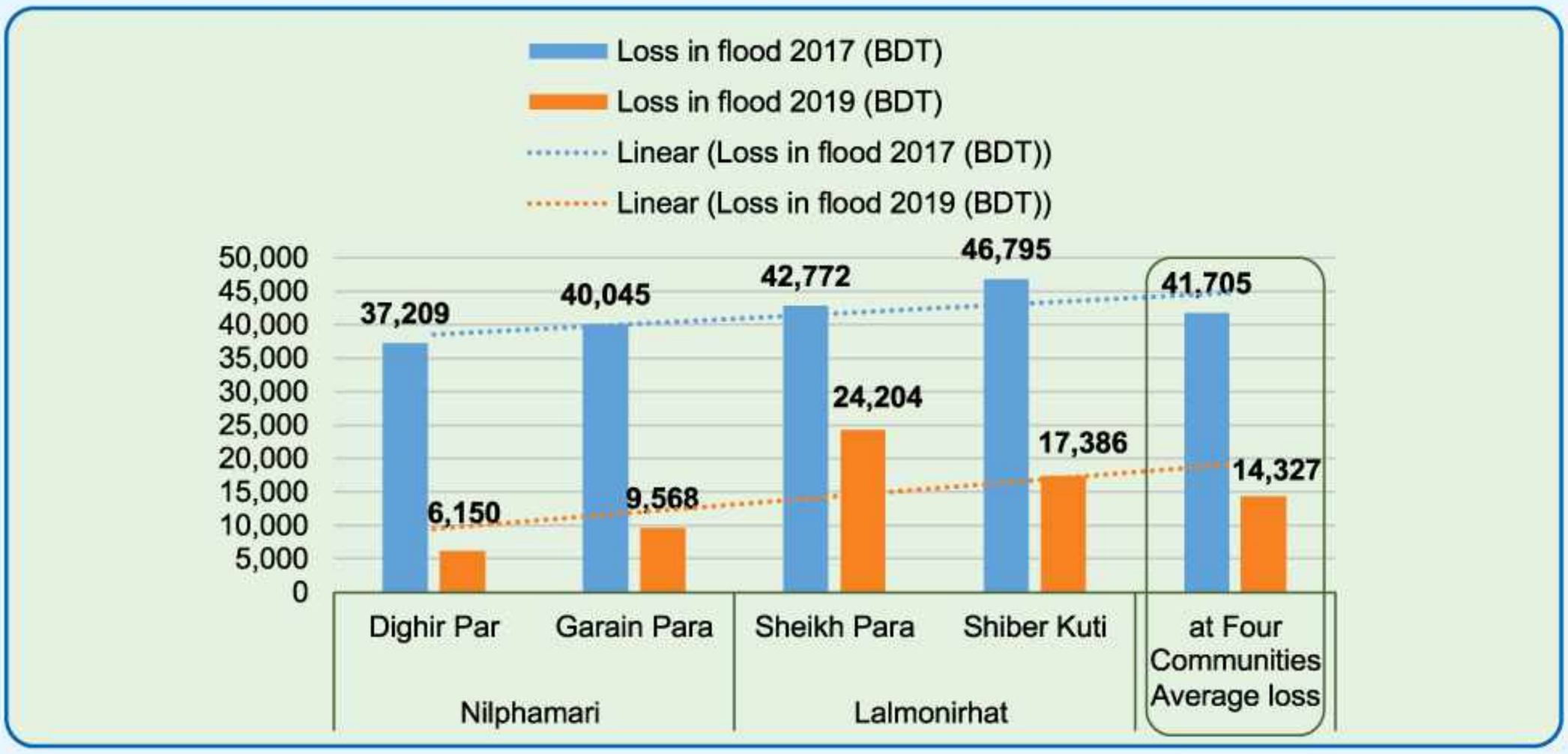


Figure 19 shows the comparison of loss of flood in 2017 and 2019 at four communities. In 2017, the average loss at the four communities was BDT 41,705 which was reduced to BDT 14,327 in 2019. The scenario of reducing economic loss was the same at all four communities. The economic loss of Dighir Par and Garain Para community of Nilphamari reduced to BDT 6,150 and 9,568 from BDT 37,209 and 40,045 respectively.

On the other hand, the consequence of economic loss at the two communities of Lalmonirhat was also similar. Here the community's loss due to flood also reduced in 2019 compared to the flood in 2017. The loss of Sheikh Para community reduced to BDT 24,204 from BDT 42,772 and loss of Shiber Kuti came down to BDT 17,386 from BDT 46,795. The FEWS and endeavours of volunteers and IFRP team had played a significant role for reducing the loss of flood.

Figure 20: Average economic loss reduction at four communities in 2019 comparing to the flood in 2017

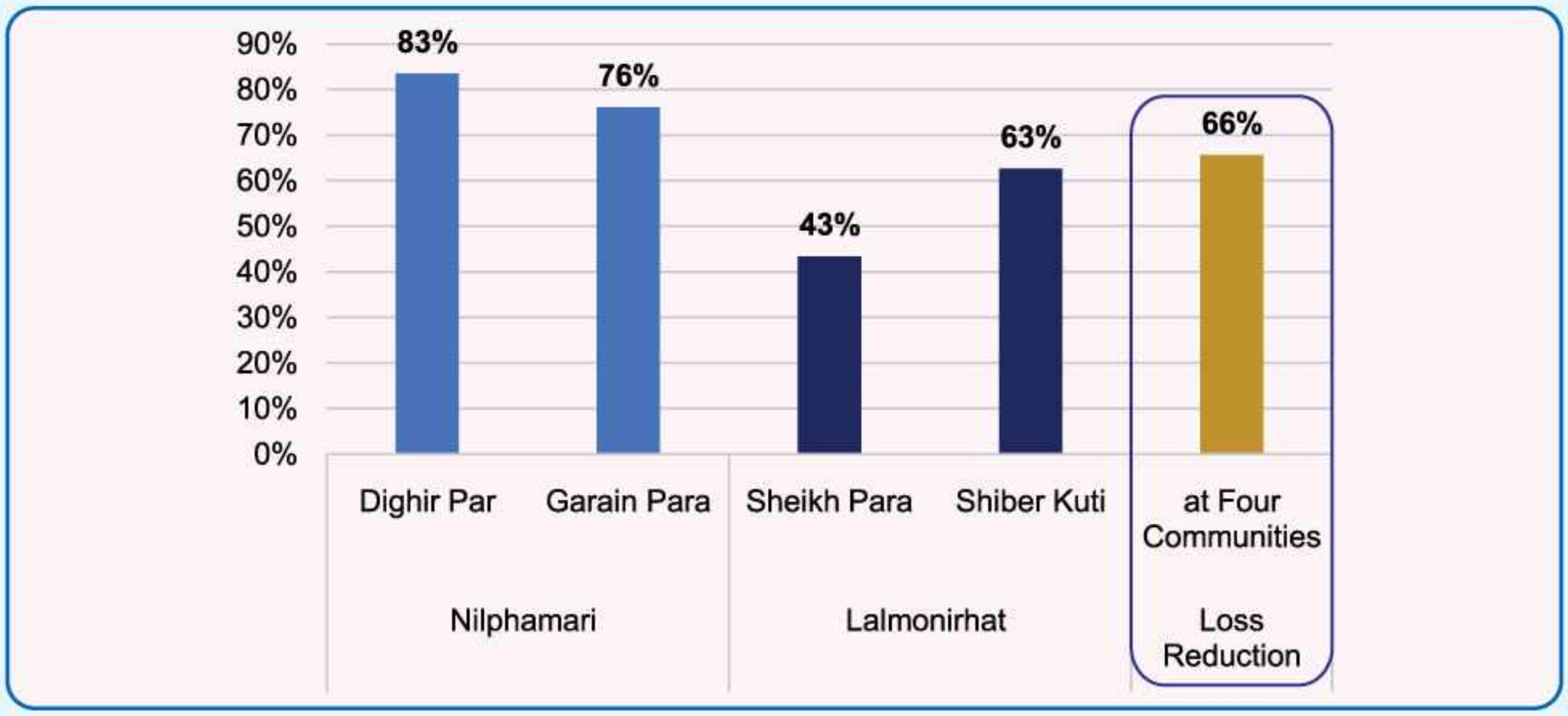


Figure 20 shows that about 66% of the economic loss reduced at four communities as a result of introducing the FEWS under IFRP. The Dighir Par and Garain Para community people of Nilphamari faced 83% less loss in 2019 than the flood in 2017. On the other hand, the Sheikh Para and Shiber Kuti community people of Lalmonirhat had about 43% and 63% less loss respectively comparing to the flood in 2017.

Figure 21: Households needed time to recover after flood in 2019

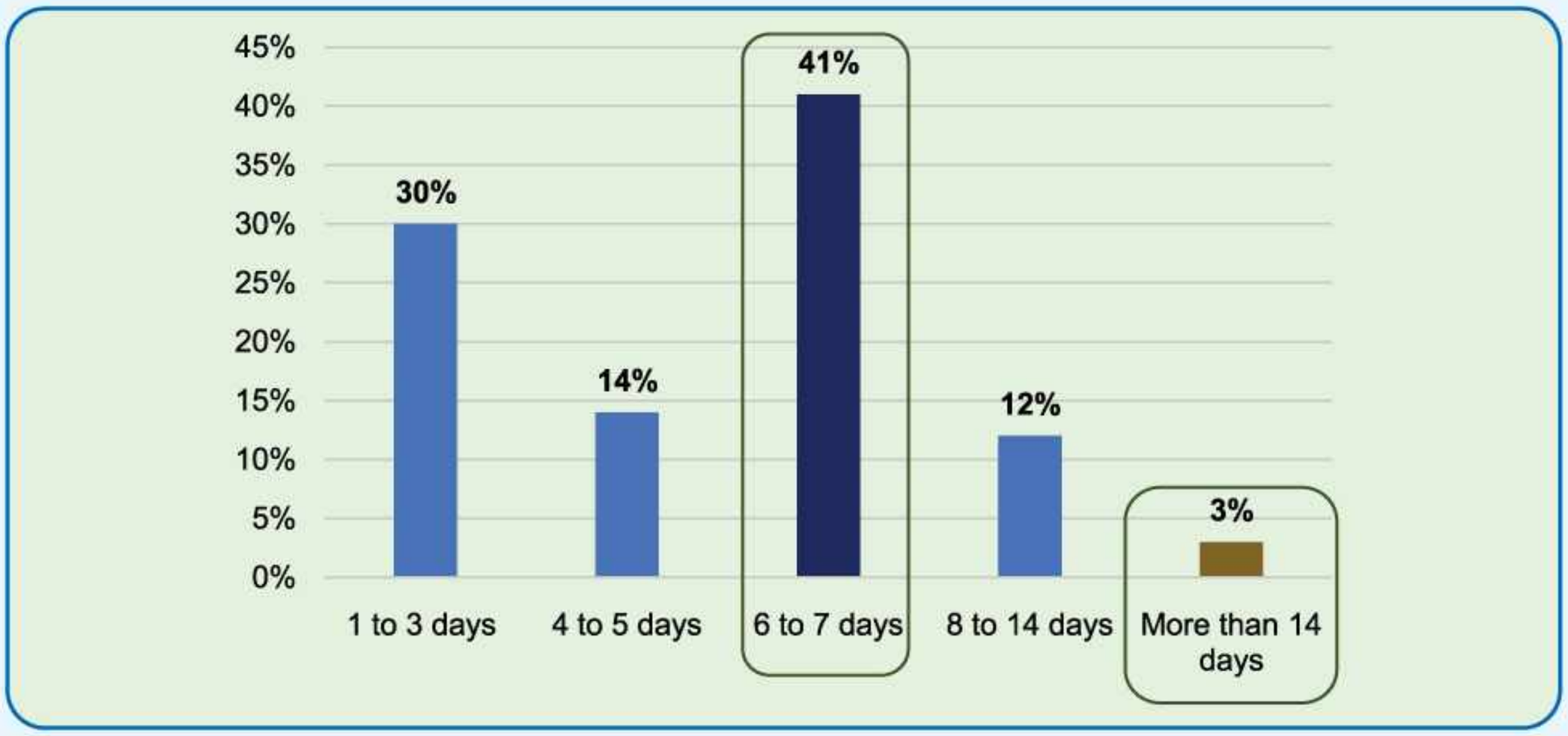


Figure 21 shows that about 41% of households needed 6 to 7 days to recover from the flood in2019. Only 30% of the households came back to their normal life and income generating activities within 1 to 3 days. Beside this, a significant portion of the households needed 4 to 5 days and 8 to 14 days to recover from the flood situation. It was found that about 3% of the households needed more than two weeks to minimize the impacts of flood. This indicates that there are some vulnerable households at the four communities which's position are in such place where the households need extra time to come back at normal life if they are affected by flood.

Table 8: Community-wise scenario of recovering from the flood in 2019

Name of District	Name of communities	Duration to recover from the flood situation				
		1 to 3 days	4 to 5 days	6 to 7 days	8 to 14 days	More than 14 days
Nilphamari	Dighir Par	79%	18%	3%	N/A	N/A
	Garain Para	36%	25%	32%	7%	N/A
Lalmonirhat	Sheikh Para	N/A	2%	61%	23%	14%
	Shiber Kuti	2%	12%	68%	18%	N/A

Table 8 shows that the community people of Dighir Par of Nilphamari were able to come back to their normal life in 7 days after the flood in 2019, whereas some of the people from the Garain Para community of Nilphamari needed 8 to 14 days to recover from the flood.

But, the scenario of Sheikh Para of Lalmonirhat was different. The community was located at such a position where the flood water stayed for a longer duration. The households of this community needed most time to recover from the flood situation. About 14% of the people of this community needed more than two weeks and 61% of the people needed 6 to 7 days to come back to normal from the flood situation. On the other hand, about 68% of the households of Shiber Kuti community needed 6 to 7 days to recover from the flood situation.

4.4 Reputation and challenges of community volunteers

Figure 22: Enhanced reputation of community volunteers and continuing the same work during next flood

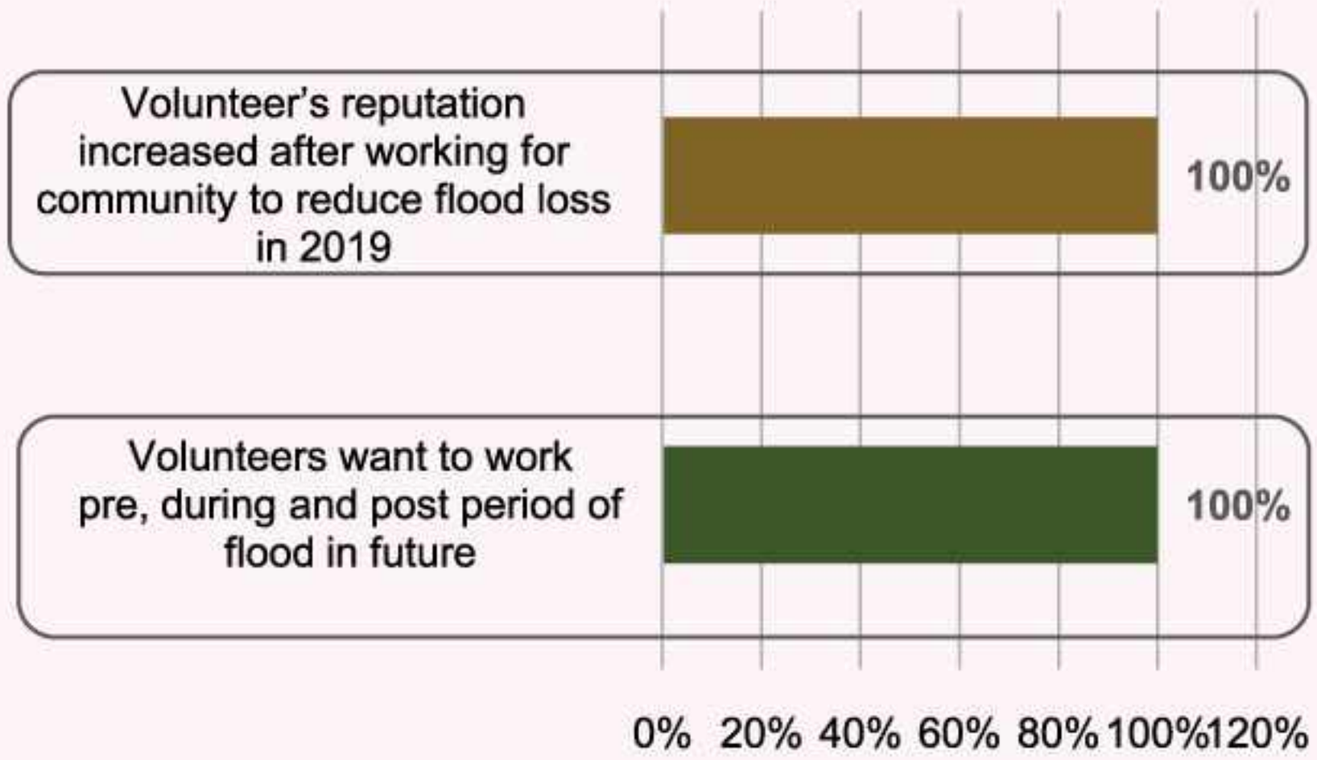


Figure 22 shows that all CDRT volunteers mentioned that their reputation at society increased as they greatly helped the community people during the flood in 2019. Now, the people of the communities treat them as dedicated volunteers who have expertise to work for reducing the loss of flood. The community people now think that the CDRT volunteers had achieved the skill to work during flood by the different trainings, orientations and other programmes arranged by BDRCS. This type of recognition also motivated the CDRT volunteers of the four communities. All CDRT volunteers informed that they want to do the same work for the community people if flood happens in future. The CDRT volunteers will continue their endeavours in pre, during and post periods of flood to make the community people alert and reduce the level of loss.

Table 9: Challenges that volunteers faced during flood while working for community people

Challenges faced by the community volunteers	Response (%)	
Had to use or take or borrow others boat for short period	55%	**Multiple responses**
Had no own boat for CDRT volunteers to rescue community people	40%	
Lack of shelter centers to shift flood affected people and their assets	22%	
Community people's apathy to take safe shelter	10%	
Much speed/amount of flood water	7%	
Hard physical communication during flood period	7%	
Inclement weather/too much rain during the flood period	3%	
Inadequate search and rescue equipment	3%	

Table 9 shows that the community volunteers (CDRT and CDMC) faced some challenges while working for the community people during the flood in 2019. About 55% of the volunteers had to use

or take or borrow boat from others during flood period. This was a major challenge for them. It would be very helpful for them if they had own boat for using, then they could do more search and rescue activities. For this, about 40% of the community volunteers mentioned that they should have own boat to work smoothly for the community people during the flood period. About 22% of the volunteers mentioned that some of the community people had apathy to take safe shelter or leave their houses before the flood period. Beside these, the community volunteers faced difficult communication during flood, inclement weather/too much rain during the flood period and inadequate search and rescue equipment.

4.5 Community resilience in flood-prone areas of Bangladesh

Figure 23: Resilience at the targeted communities

Source: IFRC Framework for Community Resilience, 2014.

Flood early warning system is an integrated system of tools and plans managed by and for communities, providing real-time flood early warning messages to reduce flood risks. FEWS is based on people-centred, timely, simple and low-cost technology. It disseminates information to the vulnerable communities downstream through a network of communities and government bodies. A properly designed and implemented system can save lives and reduce property loss by increasing the lead time to prepare and respond to flood on ground level (UNDRR, 2012). The early warning system developed under IFRP was activated through the community networking. The community people were directly involved with the system. An effective networking was created with the government bodies specially with the representatives of Upazila/District water development board. APOs collected consistent information from the representatives of water development board from the beginning of period. FEWS was intervened under IFRP to enhance the community people's capacity to cope with the flood situation and withstand with the vulnerability as well as to come back in normal life after flood. The FEWS was an intervention where the four-community people, CDMC, CDRT and UDRT volunteers and government bodies were involved to respond to flood. Through establishing the system, the effective communication was kept by the BDRCS with the community people representatives and the WDB. As a result, a good partnership was established among BDRCS, community people and WDB. The information was disseminated among the community people. Through the dissemination of the messages, the people of the surroundings of the community were also benefitted.

Opinion Story: One

"The participation of the community people is necessary to achieve community resilience"

"Every day, I contact with the two flood forecasting centres, one is Gajaldoba (105 Kilometres far from Dimla) and another is Domohani (65 Kilometres far from Dimla in West Bengal of India. These two flood forecasting centres are located at the upstream of India and if I get information that water is increasing at Indian side, then I start to make the people alert in our areas. If the flood water of Gajaldoba increases, then the areas in Dimla Upazila will be inundated after 12 hours. I have a radio to contact with the representative of India for flood forecasting. I just pass the information to others. The Government officials like Upazila Nirbahi Officer (UNO) and DRRO of Deputy Commissioner (DC) Office contact me about flood information. When the UNO gets message that there is potentiality of flood occurring, then he/she takes measures and visits vulnerable spots of the Districts and aware people on the flood situation. Beside this, different types of non-government organization's representatives also contact me. They work from their own angle and take preparation for facing the flood. The BDRCS representatives like ULO and APO had contacted with me and keep connection about flood information in 2019. When the flood early warning system was developed under the programme of BDRCS, then I had attended at the community orientation. The participation of the community people is necessary in such types of activities. Because, we work at Upazila level but there are many vulnerable and hard-to-reach communities in both side of Teesta river. These communities have different types of limitations like proper knowledge on flood and right time response. Every year, there remains a risk of flood in Teesta basin and only WDB can not ensure the information of flood response for all the communities. That's why, different organizations including Government and non-government should initiate programme like IFRP. If this continuation is ensured, then the community people will be benefitted" ---Md Nurul Islam (47).

Md Nurul Islam (47), Guess Reader, Bangladesh Water Development Board (BWDB), Dimla Upazila, Nilphamari (Photo: IFRC)

Opinion Story: Two

"Only mitigation initiatives are not enough for reducing the flood risk and for this resilience and adaptation is mandatory"

If flood resilience programmes like IFRP are undertaken more, then the loss at community level will be reduced. There are many vulnerable communities around both side of Teesta and Dharla river in Bangladesh. So, if there is a community-based flood risk reduction programme implemented, then the respective community people will be aware about the ways to get safe from flood risks. The loss will be reduced at these communities, where the flood early warning system exists. For professional work, we frequently go to the field and take preparation before the flood. There are many areas in the Chars, where people always fight with the flood intensity and disasters. These people should be reached through different types of awareness raising and initiatives. Because only, the mitigation initiatives like hardware installments (establishing dams, polder, bridge) cannot reduce the flood risk. The people living in hard-to-reach areas need special focus in this regard. Only mitigation initiatives are not enough for reducing the flood risk in the countries like Bangladesh because here within small areas many people reside. For this, both community-based disaster risk reduction and mitigation programme should be undertaken" ---- Ratan Sarkar (40).

Ratan Sarkar (40), Deputy Assistant Engineer, Bangladesh Water Development Board (BWDB), Lalmonirhat (Photo: IFRC)

Opinion Story: Three

"Knowledge and innovations should be shared and disseminated, and advocacy is essential to reduce disaster risk"

"Reducing the risk of flood is a collaborative initiative where the efforts of community people, Government representatives and non-government organizations are essential. During the flood in 2019, the Lalmonirhat District Administration took necessary measures to respond to the flood for the flood-affected Unions and villages of the District. I worked with the different stakeholders and some organizations considering the risk of disaster and climate change. The National Disaster Preparedness Day (NDPD) for Disaster Risk Reduction and International Day for Disaster Risk Reduction (IDDRR) is observed on at District level with the participation of departments and organizations. As BDRCS has been implementing a programme on flood resilience which is significant for the four-communities. The flood early warning system has significance to reduce the ratio of loss as the system makes the community people aware. The Government authority can take proper initiatives for any types of response. In this regard, BDRCS should do some advocacy initiatives on the issues that they are working on. The different activities, knowledge and innovation of BDRCS should be shared and disseminated among the different stakeholders. The learning and experiences from the flood early warning system developed at the programme areas of BDRCS can be replicated in other flood affected areas of Bangladesh to reduce the damages" ---Md Ali Haider (55).

Md Ali Haider (55), District Relief and Rehabilitation Officer (DRRO), Lalmonirhat (Photo: IFRC)

4.6 Recommendations and Conclusion

The study accumulated some recommendations which will be helpful for the BDRCS, community volunteers and the community people to retain the benefits of flood early warning system in future. Besides, the recommendations will be useful for minimizing the gaps if the FEWS is established at the other areas in Bangladesh by BDRCS to achieve community resilience. The recommendations accumulated from the study are following:

- The full application of the developed flood response system under IFRP should be applied during the next flood. The teams formed under the Contingency Plan should be activated before and during flood. The contents and directions developed under Contingency Plan should be frequently discussed among the CDMC, CDRT and other volunteers of each community by COs and APOs
- A printed copy of the Contingency Plan should be distributed among all the CDMC and CDRT volunteers individually so that they have full capture over it and can-do better response following its guidance. Discussion on the developed Contingency Plan should be continued at the micro-group meetings by COs and APOs
- If there is any potentiality of flood during the crucial time of monsoon season in 2020, the APO should stay beside at a suitable place of the communities in order to make coordination among COs, CDRT, CDMC and other volunteers as well as with the Unit for better response to flood. This will be also important to take decision on utilizing the Community Disaster Relief Emergency Fund (C-DREF) for the respective flood affected community people
- C-DREF is a unique initiative for responding to flood. As such, C-DREF should be developed at any other communities while implementing community resilience programme so that community people can get support immediately during flood period
- A boat should be ensured for every community in next year (2020) as the part of providing critical logistic support (safety and rescue equipment's) under the programme in order to make quick response to flood during the critical situation. The CDRT and CDMC volunteers will use the boat to respond to flood for the community people. Beside this, the provision of providing at least one boat should be ensured for the respective community if any flood resilience programme is implemented in future
- The UDRT volunteers should be more involved in flood response along with the CDRT and CDMC volunteers at the communities of IFRP. For this, enough training for UDRT volunteers should be ensured along with the CDRT volunteers while establishing the FEWS in future
- Both CDRT and CDMC volunteers should get the search and rescue equipment (like umbrella, raincoat etc.) equally so that they can respond together during flood.
- Better coordination and more advocacy network should be developed with the DRRO, District level for focusing on the good work and initiatives undertaken by BDRCS. More coordination should be established with the DRRO by BDRCS through observing different disaster related days and organizing programmes and sharing the lessons of IFRP
- The effective communication and collaboration that was built with the representatives of District and Upazila Water Development Board through the IFRP should be continued in the future

- The established flood marker and explanatory signboard at the four communities under IFRP should be kept functional and maintained even after the end of programme. For this, the community people and CDMC and CDRT volunteers should be motivated to retain the learning of the programme
- It should be ensured that the community people leave their houses willingly and take safe shelter before and during the flood period if the situation worsens. For this, more emphasizes should be given to sensitize the community people through the courtyard discussion meetings and school sessions.

Flood vulnerable communities around the world are now being benefitted by taking services from FEWS. The tool is contributing to enhance community resilience among the different communities around the world. The advantages of a flood early warning system are to make the community people engaged to take preparation by their own capacity and respond to the flood situation and create a network among government organizations, service providers and other stakeholders. The Integrated Flood Resilience Programme has the goal to make the community people resilient so that they can respond before and during flood and can come back to their normal life by very short time. The FEWS developed under the programme had been effective and reduced the community's economic loss by flood in 2019 comparing to by flood in 2017. Countries like Bangladesh have inadequate flood early warning system at community level considering the flood vulnerability. The geo-graphical location and recent frequent intensity of floods resulted from natural and anthropogenic climate change will be longer in coming future. So, the community people need a strong community-based mechanism which can ensure their preparation and quick respond to flood. So, mechanism like FEWS should be developed at other communities, and the community people should be engaged through the effective networking with Government and non-government bodies which will help to achieve community resilience. The effectiveness of flood early warning system should be popularized both at locally and globally considering the geo-physical and cultural context to achieve community resilience.

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ANNEX

- **Annex 1: Questionnaire for Household Survey**
- **Annex 2: Questionnaire for CDRT Survey**

Questionnaire for Household Survey

1. Can the survey be conducted?
   - Yes
2. Name of interviewer? ----------
3. Name of supervisor? ----------
4. Date of interview: ----------
5. Time of interview: ----------
6. Name of district: (Choose one response)
   - Nilphamari
   - Lalmonirhat
7. Name of community? (Choose one response)
   - Garain Para
   - Dighir Par
   - Sheikh Para
   - Shiber Kuti
8. Household number? ----------(the number to be placed from the household list)
9. Name of respondent? ----------
10. Age of respondent? ----------
11. Gender of respondent? (Observation)- (Choose one response)
    - Male
    - Female
12. Religion of respondent? (Choose one response)
    - Islam
    - Hinduism
    - Buddhism
    - Christianity
    - Others (please specify)
13. Educational qualification of respondent? (Choose one response)
    - Primary
    - Secondary
    - S.S.C
    - H.S.C
    - Graduation
    - Post-graduation
    - Above post-graduation
    - Have no formal education
14. Mobile number of the respondent? (Choose one response)
    - Mobile no----------
    - N/A

15. Have you attended at any courtyard meeting and received any information on flood and other disaster in last one year? (Choose one response)
    - Yes
    - No
16. If yes, what kinds of information you received from the courtyard meeting? (Choose multiple responses)
    - Information about disaster, flood vulnerability and river erosion
    - Information on flood early warning system
    - What to do before flood
    - What to do during flood
    - What to do after flood
    - Flood response information
    - Other disaster response/preparation information
    - Climate change
    - Resilience
    - Adaptation
    - Health
    - WASH
    - Safe shelter/establishing houses at safe places and raising household level
    - Different social awareness information
    - Others (please specify)
17. How long was your household affected/inundated with flood water in this year/2019? (Choose one response)
    - 1 to 3 days
    - 4 to 5 days
    - 6 to 7 days
    - More than 7 days
    - Others (please specify)
18. Do you know that a flood marker was developed/installed under IFRP at your community? (Choose one response)
    - Yes
    - No
    - Do not know
19. If yes, was the developed/installed flood marker under IFRP helpful for you/your household members to assess the possibility of flood and take actions after seeing its level of water? (Choose one response)
    - Yes
    - No
    - Do not know

20. Did you receive flood early warning information/flood may occur in this year/2019? (Choose one response)
    - Yes
    - No
21. How did you get the flood early warning information/flood may occur in this year/2019? (Choose multiple responses)
    - Self-observation
    - Observation by community people and friends
    - Interpersonal communication
    - Message by CDRT/CDMC/BDRCS volunteers/Community Organizer
    - Was informed at yard discussion meeting that flood might occur
    - Observed at the flood marker established at the community under IFRP
    - Miking by CDRT and CDMC volunteers of BDRCS
    - Miking by GOs and other non-government organizations
    - TV
    - Social media/Facebook
    - Newspaper
    - Chairman and Members of Union Parishad
    - UNO
    - Representatives of Upazila Parishad
    - Mobile SMS
    - Others (please specify)
22. What did you do after getting the flood early warning information/knowing the probability of flood? (Choose multiple responses)
    - Take advice from CDMC, CO and IFRP team
    - Inform other community people and neighbors that flood might occur
    - Discuss and plan within own household to take actions before, during and after flood
    - Prepare to take safe shelter/move safer locations
    - Plan to shift the household assets at safer places
    - Manage cash money for emergency purposes
    - Inform community people and surroundings households to take safe shelter and preparation for flood measurements
    - Plan to move livestock at safer places
    - Preserve dry food
    - Preserve necessary medicine
    - Preserve kerosene oil, fuel, dry straw etc.
    - Collect and preserve safe drinking water
    - Communicate with the CO, CDMC, CDRT for further information and suggestions
    - Contact with Upazila Water Development Board
    - Help women, elder people and children and provide them information about flood
    - Keep enough money in mobile

- Wait for external assistance
- Others (please specify)
- Did nothing

23. Did you need help from neighbors and volunteers regarding search and rescue during the flood situation of this year/2019? (Choose one response)
    - Yes
    - No/rescued by own initiatives/household members
24. If yes; did you take help, assistance or information from CDRT and CDMC volunteers to evacuate your households' properties and people at safer places before and/or during the flood? (Choose one response)
    - Yes
    - No
25. If yes, what types of assistances did you get from CDRT and CDMC volunteers to evacuate your households' properties and people at safer places before and/or during the flood? (Choose multiple responses)
    - Get advice to shift valuable properties, cattle and other household items where there was no flood water
    - Get advice to take safe shelter
    - Get help for taking safe shelter for household's children
    - Get help for taking safe shelter for household's women
    - Get help for taking safe shelter for household's elder people
    - Get help for taking safe shelter for household's people with disability
    - Get information by miking to be aware about intensity of flood
    - Get updated by CDRT and CDMC monitoring about flood situation (at day and night)
    - Others (please specify)
26. What were the impacts of flood in this year/2019 on your household? (Choose multiple responses)
    - Crop was damaged
    - Seedling was destroyed
    - Dry straw/food of domestic cattle was destroyed
    - Trees and vegetables were damaged
    - Hamper daily working opportunity/income
    - Reduce daily working opportunity/income
    - Earn but at a limited extent
    - Loss of human lives
    - Cooking problem/preparing foods
    - Household members become injured/shocked
    - Livestock death (hen, chicken, duck etc.)
    - Livestock death (cow, goat, buffalo etc.)
    - Problems in domestic cattle management
    - Health complexity
    - Spread diseases

- Skin diseases
- Safe drinking water and hygiene management problem
- Inundate tube-wells and latrines
- Social insecurity
- Others (please specify)

27. Was your household affected by flood in 2017? (Choose one response)
    - Yes
    - No
28. If yes, how much economic loss had your household faced in flood 2017? ----------(BDT)
29. How much economic loss had your household faced in this year/flood in 2019?-------(BDT)
30. Do you think, the FEWS and CDRT and CDMC volunteers'endeavors had significant impacts to reduce the loss of flood to your assets and lives? (Choose one response)
    - Yes
    - No
    - Do not know
31. In this year/flood in 2019, did you/your household members shift any type of assets at safer places from your household before/during the flood? (Choose one response)
    - Yes
    - No
32. If yes, which of the following household assets did you/your household members shift to the safer places before/during the flood? (Choose multiple responses)
    - Cash money
    - Important documents and papers
    - Food
    - Domestic cattle
    - Dry straw/food of domestic cattle
    - Furniture
    - Cloth
    - Rice
    - Corn
    - Utensil for cooking
    - TV
    - Medicine
    - Seeds
    - Fuel for cooking
    - Bicycle
    - Motorcycle
    - Rickshaw
    - Auto
    - Van
    - Products/materials of shops (if any)
    - Other valuable things (please specify)

33. How much times did your household need to recover after flood situation and come back in normal life? (Choose multiple responses)
    - 1 to 3 days
    - 4 to 5 days
    - 6 to 7 days
    - 8 to 14 days
    - More than 14 days
34. According to you, which of the following measures are helpful for reducing the loss of flood at your community and to cope with flood in future? (Choose multiple responses)
    - Strengthen housing structure
    - Strengthen and popularize flood early warning system
    - Increase volunteer's activity at community level
    - Long-term mitigation like building embankment, dredging river
    - Have community-based boat
    - Install high-raised tube-wells
    - Install hygienic latrines
    - Raise household platform
    - Raise the community roads
    - Increase number of community volunteers
    - Enhance communication and connectiveness among community people
    - Increase number of shelter center
    - Others (please specify)
35. Do you think that the other/surroundings communities were aware about flood and disaster preparedness and become benefited through the IFRP? (Choose one response)
    - Yes
    - No
36. Would you please allow me to take a photo of you? ----------

Questionnaire for Community Disaster Response Team (CDRT) Survey

1. Can the survey be conducted?
   - Yes
2. Name of Interviewer? ----------
3. Name of Supervisor? ----------
4. Date of Interview? ----------
5. Time of Interview? ----------
6. Name of district? (Choose one response)
   - Nilphamari
   - Lalmonirhat
7. Name of community? (Choose one response)
   - Garain Para
   - Dighir Par
   - Sheikh Para
   - Shiber Kuti
8. Name of respondent/CDRT volunteers? ----------
9. Age of respondent? ----------
10. Gender of respondent? (Observation)- (Choose one response)
    - Male
    - Female
11. Religion of respondent? (Choose one response)
    - Islam
    - Hinduism
    - Buddhism
    - Christianity
    - Others (please specify)
12. Educational qualification of respondent? (Choose one response)
    - Primary
    - Secondary
    - S.S.C
    - H.S.C
    - Graduation
    - Post-graduation
    - Above post-graduation
    - Have no formal education
13. Mobile no. of respondent? (Choose one response)
    - Mobile no----------
    - N/A

14. What kinds of relevant trainings regarding response to flood and other disasters you received through the IFRP? (Choose multiple responses)
    - Flood early warning dissemination mechanism
    - Search and rescue
    - First Aid
    - Climate change
    - Adaptation
    - Resilience
    - Disaster risk management
    - Disaster response
    - Disaster preparedness
    - Mock drill
    - PASSA/making flood resilient houses
    - Gender sensitivity
    - Others (please specify)
15. Do you think that the trainings were useful for disseminating early warning and further response before and during flood? (Choose one response)
    - Yes
    - No
16. Have you ever measured the level of water by looking at the flood marker? (Choose one response)
    - Yes
    - No
17. If yes, what is the meaning of green level of water of flood marker? (Choose multiple responses)
    - Normal time
    - There is no risk of flood to houses, community people, cattle and properties
    - It is good level of water for agricultural works and others
    - Others (please specify)
18. Did you do anything when the water reached at the yellow level of the marker? (Choose one response)
    - Yes
    - No
19. If yes, what did you do when the flood water reached at the yellow level of flood marker? (Choose multiple responses)
    - Do meeting among CDRT volunteersabout flood preparation
    - Communicate with Community Organizer and IFRP team
    - Coordinate with CDMC volunteers about flood potentiality
    - Disseminate flood early warning messages among community people through informal ways
    - Disseminate information through informal warning
    - Make/keep ready search and rescue equipment for flood response

- Help women, children and people with disability
- Others (please specify)

20. Did you work for your community people/households when the flood water reached at red level of flood marker and the community was affected with flood in this year/2019? (Choose one response)
    - Yes
    - No
21. If yes, what did you do when the flood water reached to red level of the marker and community people were affected by flood in this year/2019? (Choose multiple responses)
    - Do miking to make community people alert
    - Do search and rescue for community people
    - Help community people to go shelter or higher areas
    - Help community people to bring their assets and properties at safer places
    - Help community people to bring domestic animals at safer places
    - Do miking about flood situation
    - Assist helpless men and women
    - Help women
    - Help pregnant women
    - Help maternity women
    - Help children
    - Help elderly people
    - Help person with disability
    - Help sick person
    - Provide First Aid to the community people who needed
    - Help to identify the intensity of flood water and inform to BDRCS district officials and communicate with IFRP team
    - Work to distribute DREF's contribution among selected households
    - Others (please specify)
22. Do you think the other/surroundings community people were also aware about the flood by your activity (Choose one response)?
    - Yes
    - No
    - Do not know
23. Did you work for the community people in previous year's flood/2017? (Choose one response)
    - Yes/worked as general member of community
    - No
24. If yes, which time did you work for the community people during flood situation? (Choose one response)
    - In this year/2019
    - In previous flood/2017
    - Equal for both times

25. Was the flood early warning system useful for you/CDRT volunteers to take overall preparation to help the community people? (Choose one response)
    - Yes
    - No
26. Do you think that as CDRT volunteeryou were able to work and contribute for the flood affected people of your community by the flood in 2019 than the flood of previous year? (Choose one response)
    - Yes
    - No
27. If yes, what were the reasons? (Multiple responses)
    - Capacity of CDRT volunteerswas enhanced though different types of trainings
    - CDRT volunteers had a guideline, by this they knew about their roles and responsibilities to contribute for community people in flood
    - CDRT volunteers had enough equipment to respond flood
    - Community people was more aware about flood risk and preparedness
    - Both community people and volunteers had access to information and networking
    - Orientation on flood early warning system was very helpful
    - Flood marker helped to identify flood situation
    - Connections and engagements among community people was increased
    - Proper guidance was provided by IFRP team and BDRCS Unit
    - CDRT volunteers were aware about need of vulnerability of community people
    - Others (please specify)
28. Did you face any challenge while working during the flood situation? (Choose one response)
    - Yes
    - No
29. If yes, what were the challenges? (Choose multiple responses)
    - Had no own boat for CDRT volunteers to rescue community people
    - Had to use or take others boat for short period
    - Inadequate search and rescue equipment
    - Hard physical communication during flood period
    - Community people's apathy to take safe shelter
    - Much speed/amount of flood water
    - Inclement weather/too much rain during the flood period
    - Lack of shelter centers to shift flood affected people and their assets
    - Less volunteers/team volunteers
    - Others (please specify)
30. Do you think that your reputation was increased because of working before, during and after flood for the community people? (Choose one response)
    - Yes
    - No

31. Do you want to continue the same work that you did for your community people if flood happens in next year or future? (Choose one response)
    - Yes
    - No
32. Would you please allow me to take a photo of you? ----------

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