Households Losses in 2014 Floods and Coping Strategies

A Study of Chiniot, Punjab

By

AMEER HYDER

Department of Economics

Pakistan Institute of Development Economics

Islamabad

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Ameer Hyder

Supervisor

Dr. Nasir Iqbal

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DEDICATED

To

My Grandmothers
Jannat Sarfraz

And

Mondaan Abdullah.

Acknowledgement

In the name of Allah, the all Merciful, the special Merciful, who created the universe and knows whatever is in it, hidden or evident, Alhamdulillah, again all praises to Allah for bestowing me the intellectual ability, wisdom and strength to explore its secrets and completing this thesis.

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ABSTRACT

Pakistan is a developing country with excessive natural hazards. Flooding is the most devastating natural hazard in Pakistan. Pakistan has been witnessing the floods since its inception but the severity and occurrence of these floods have increased in recent years. Floods affect the households according to their vulnerability and capacity to deal with this issue. The study seeks to understand the coping mechanisms adopted by households and underlying factors which influenced the adaption of these mechanisms to recover from the floods of Sep, 2014. Furthermore, losses owing to these floods also have been analyzed. A case study in twelve villages of district Chiniot, Punjab, has been conducted to understand the coping mechanisms of flood sufferers. Households have mainly relied upon three type of strategies: borrowings from informal sector, assets disposal and government cash grants. Results of Logit and Tobit model show that shock and demographic factors are major determinants which influence adaption of these strategies. Only two type of losses have been reported by flood victims: loss of standing crops and damages to dwellings. Governmental flood warnings and cash grants have played a laudable role in mitigating the deleterious effects of floods. But findings show that distribution mechanism of government cash grants lacks transparency and merit.

Chapter 1

Introduction

1.1. The Background

Global warming is likely to intensify the rainfalls, storminess and distort the severity timing and predictability of weather patterns (Pryce and Chen, 2011). The link between climate change caused by human interferences with the world and environmental vulnerability has now been well established. Thus the human impact on the environment is creating a new kind of global casualty with potential impact on many different natural and social aspects (Naser, 2012). Moreover, population growth and economic development occurred simultaneously with increasingly unsustainable utilization of the earth's physical environment (Khan et al, 2009). Literature about environmental degradation centers around industrial revolution as a development that has introduced degradation of the environment and its associated dangers to humanity. So the degradation of environment, caused by industrial revolution, is being focused as threat to peace and security in the world. As time progressed, global warming is included on the list of developments that is causing concern which represented a common crisis to humanity (Torese Agena, 2008).

The full-range of man-made and natural disasters, floods in Pakistan and Sri Lanka, severe snow storms in Northern Europe, flooding and land-sliding in Brazil ,and tsunami in Japan have been witnessed over the last year (Wi and Kim, 2008). Climate change tends to increase the frequency and intensity of many of these disasters. It the potential to create a vicious cycle of poverty and vulnerability. Ultimately, natural disasters and climate change have a clear regressive effect on world development because they impact poorer nations far

more than rich ones and have a clear effect on the distribution of income, wealth, and costs worldwide (Ibarraran et al, 2007). Influenced by human activities and climate change, drought and flood are witnessing an ever-enlarging and ever-intensifying impact, and in this changing environment, water issues have become quite a serious problem. Especially in recent years, drought and flood have taken on a new trend of occurring more and more frequently, often simultaneously and with rapid succession, and the characteristics are increasingly becoming more apparent, posing new challenges to the safety of ecology, water supply, food, and economy (Yan at al., 2012).

Floods occur in many areas of the world. They are ranked first among other natural disasters in their adverse effects. Human activities are the main cause of a series of human-induced floods and they often aggravate the harmful impacts of floods of natural origin. Areas subjected to floods are equivalent to the total area of all the countries of Western Europe, whose population numbers about one billion (Istomina at al., 2004). The results of processing and analysis of data on river floods over the period of 2000–2014 indicate that the total of 4480 floods have been recorded in all the continents of the world over that period of time. The total damage caused by floods exceeds $135 billion. About 41% of these flood disasters have occurred in South Asia, which covers about 3.2% of the world land area and 10% of Asia, with over a population of over 1.46 billion accounting for 25% of the world population, it constitutes houses about 40% of the world's poor. The global distribution of flood disasters of 30 years shows Asia's extreme vulnerability to flood disasters (EM-DAT, 2015).

In South Asia, about 40% of the events are reported from India, followed by Bangladesh (17.2%), Pakistan (12.3%), Afghanistan (12.0%), Sri Lanka (10.2%), Nepal (7.2%), Bhutan (0.9%) and the Maldives (0.3%). During the past three decades (1976–2005), the reported number of natural disasters in South Asia are 943, out of which those caused by floods are

332, accounting for 35% of the natural disasters. This is showing that in South Asia, floods are a major hazard followed by windstorms, which include cyclones. Trend of floods occurrence is displaying upward picture: 3 events during 1976-79, 8 events in the period of 1980-89, 17 events in 1990-99 and 38 events have ensued in 2000-04. Over the period 1976–2005, on an average 2,154 people are killed annually due to floods in South Asia. A total of 491,074 deaths has been reported due to natural disasters in South Asia. Hydro meteorological disasters have resulted in 337,917 deaths (70%), out of which floods account for 64,658 numbers of deaths (20%). In these three decades, the total number of estimated people affected by floods in South Asia is close to 1 billion. The 1988 floods in Bangladesh have been reported to have affected more than half the population totaling to about 73 million people. The total economic loss reported for the 30-year period from 1976 to 2005 is about 32 billion dollars (Shrestha et al., 2006).

Pakistan is highly vulnerable to the adverse effects of climate change, particularly those resulting from rising temperatures, increased variability of monsoon, melting of Himalayan glaciers, and an increase in the frequency and intensity of extreme weather events and natural disasters (Malik at al., 2012). It is ranked 9th terms of flood-affected countries worldwide (Baqir at al., 2012). Environmental degradation has also given birth to natural calamities which are one of the main reasons for the less development of Pakistan. On other hand, Pakistan is also disadvantaged by its heavy dependence on a single river, the Indus, for surface water. The country is, therefore, highly vulnerable to the effects of basin degradation and water pollution (Mustafa at al., 2009). Since its inception it has faced 22 major floods, starting from 1950 to 2014.

The catastrophic flooding in Pakistan in 2010 lays bare the multiplicity of fault lines that beleaguer the country as perhaps no other single event in its history, with estimated flood damages of $9.7 billion. Not only the flooding threatens the life and livelihoods of well over

20 million citizens, it exposes once again the gravity and complexity of unsolved governance issues in this 60-year-old nation, issues that are inextricably linked to the overall stability of the region and of the world (White, 2010). A preliminary estimation have been that there may be zero real GDP growth and 25% inflation in the current fiscal year, compared to the IMF targets of 4.5% real GDP growth and 9.5% inflation. Pakistan's consumer price index (CPI) has increased by 15.7% in September 2010 (Government of Paksitan, 2010). Other estimates predict real GDP growth of about 2%-3% for the 2010-11 fiscal year, compared to 4.1% in the previous fiscal year. During four months, close to 2,000 fatalities have occurred and 20,000,000 inhabitants have displaced. Exceptional damage has been inflicted on crops and cropland and on agriculture support systems such as canals and levees; 4,500,000 mainly agricultural workers has lost their employment for 2010–2011 (Syvitski and Brakenridge, 2013). The floods have affected far more people (18.7 million) than other recent natural disasters in Pakistan such as the October 2005 Pakistan earthquake (3.5 million) with economic loss of $10.1 billion (6.5% of GDP) (Dorosh at al., 2010). More than 10,000 schools and 500 hospitals have been destroyed or damaged, as are about 1.6 million homes (World Bank, 2010). Pakistan loses a total of 3,072 lives and $16 billion to the floods in 2010, 2011 and 2012 (Pakistan Economic Survey, 2012).

Report reveals that torrential monsoon in 2014 rains has led to catastrophic flooding throughout parts of Pakistan and India, killing at least 648 people and damaging or destroying 375,000 homes (Aon Benfield, 2014). In Pakistan, government estimates cited economic losses in Punjab Province alone at PKR 200 billion, representing the fifth consecutive year that Pakistan has endured a billion-dollar flood event. Floods have affected standing paddy crops on 300,000 acres, cotton on 320,000 acres, sugarcane on 70,000 acres, fodders on 30,000 acres, vegetables on 25,000 acres and other crops on 100,000 acres of land. An estimated 15,000 cattle-heads have perished and 250 poultry farms have been destroyed.

Total damages into monetary terms, the flooding have caused an estimated Rs 240 billion loss to agriculture economy (NDMA report, 2014).

"Pakistan's Water Economy: Running Dry", Western Himalayan glaciers will retreat for next 50 years causing increase in Indus River flows. Then the glacier reservoirs will be empty, resulting in terrifying decrease of 30% to 40% in flow of Indus River over the century. Population growth is high so, increased number of people exposed to flood risks is high. Rise in temperature and rainfall has increased flood frequency (World Bank Report, 2010).

1.2. Motivation and Significance of Study

Floods are every-year phenomena in Pakistan with variation in severity level. The degree and height of flooding differ from year to year, so the damages and deleterious effects of the floods also vary both in time and places. Government takes actions in two ways, before floods it puts all efforts to mitigate the floods and after floods it attempts to manage the crisis. Ex-ante steps mainly include structural measures which could be effective in preventing normal floods but ineffective in case of extreme floods (Mutton and Haque, 2004). Ex-post steps consists of non-structural measures, for example, relief, supply of food, provision of shelter, rescue, and enhancing the coping abilities of individuals. These coping abilities are those fallback mechanisms when habitual means of meeting needs are distorted (Frankenberger, 1992). After suffering from severe shocks like floods, households take actions for revival and rehabilitation of normal life which are called coping mechanisms. These coping strategies are being highly focused in current studies of natural disasters. It is imperative to know how households in rural and flood-prone areas cope with such situations having no external support. Limited literature is available in the field of economics of natural disasters for Pakistan and, hence, to minimize the unfilled gap and to testify above said theories we chose a flood-prone district of Punjab, Chiniot, which has highly suffered from

flood of 2014. Apart from helping out the policy makers to assess the severity of floods, disclosure of strategies adopted by people for revival will also ease the government in targeting and enhancing these coping mechanism in its potential future plans. After the floods of 2014, Punjab government has distributed bulk of amount in cash grants, based on agricultural and dwellings losses, for the ex-post coping of victims. Study will also be beneficial in terms of analyzing the role of government cash grants.

1.3. Objectives and Hypothesis

The overall objective of the study, based on the flood in rural areas of Chiniot during 2014, is, "what coping strategies are adopted by households and how". It also focuses on the losses overborne by households and assesses the role of government cash grants for flood sufferers. Specifically, the objectives are;

i) Construction of flood exposure index to assess the severity of floods.

ii) Examination of losses of households owing to floods.

iii) Bring to light the coping strategies adopted by households after the floods for the revival and rehabilitation.

iv) To check out what are the underlying (shock and demographic) factors that influence the choice of coping strategies.

Based on the existing literature we hypothesize that major coping strategies after floods would be assets disposal, borrowings and government cash grants. And, significant determinants of these strategies would be shock and demographic factors.

1.4. Scheme of Study

Study comprises in six chapters. First chapter is introduction which includes the background, motivation and significance of study, and objectives and hypothesis. Situation analysis of flood in Pakistan and review of literature have been drawn in next two chapters, consecutively. Fourth chapter is all about data and methodology of the study. Chapter five

lays out estimated losses of households, self-reported coping strategies adopted by households and determinants of coping strategies. Last chapter summarizes the findings and recommends policy suggestions.

Chapter 2

Situation Analysis

Introduction

The present chapter deals with the situation analysis of floods in Pakistan. Section 2.1 presents history of floods in Pakistan. Section 2.2 deals with the national measures to tackle the issue which comprises on legal framework, institutions and management of floods in Pakistan. Last section concludes the whole story.

2.1. History of Floods in Pakistan

Pakistan has witnessed 22 major floods (Federal Flood Commission's Report, 2011) since its very birth. These floods have affected 599,459 square kilometers area, snatched 11,239 precious human lives and caused losses worth over Rs39 billion to the national economy. During last 69 years, floods have affected 180,234 villages. Here are empirical evidences of major floods;

Floods in 1960's: Floods of 1950 incur loss of 227 million dollars with taking 2910 lives. During 1955, heavy monsoon rainfall in Dalhousie, Sialkot, Bay of Bengal and Arabian Sea causes a highest recorded flood in the Ravi River. Same level of floods have also occurred in 1956, 1957 and 1959.

Floods in 1980's: After several low level hits of floods during 1970's, intense fall of monsoon rain in the month of August, 1973, leads to peak up the floods in Chenab River, perishing 472 lives. With the height of 6 meter, it inundates 3.6 million ha and devastates major crops. Total

estimated damages are $2.39 billion whereas households loses 70,000 livestock and 255,000 adobes. Pakistan also witnesses floods from 1974-1978 consecutively every year.

Floods in 1990's: In this decade Pakistan suffers from four floods in 1981, 1983, 1984 and 1988. Among these four floods, the last one has major impacts on the country. In this flood 508 people drown and direct estimated loss is near about 399 $ millions.

Floods in Last Decade of 20th Century: Again country gives way to four major floods in 1992, 1994, 1995 and 1998. But this time first flood of the decade imprints highly deleterious effects, covering more than 13,000 villages and taking 1008 precious lives.

Floods in 21st Century: up till now, Pakistan observes constant floods since 2007 onwards with main events in the years of 2010 and 2014. Floods of 2010 are largest in the history of Pakistan with the estimated cost more than 10 $ billions. Uninterrupted occurrence of these floods in last eight years is setting off alarming situation. The summary of all major floods is underlying in the table.

Table 2.1 History of Floods Losses in Pakistan

YEAR	DIRECT LOSSES ($ millions)	LOST LIVES	AFFECTED VILLAGES	FLOODED AREA (km2)
1950	227	2,910	10,000	17,920
1955	176	679	6,945	20,480
1956	148	160	11,609	74,406
1957	140	83	4,498	16,003
1959	109	88	3,902	10,424
1973	2,388	474	9,719	41,472
1975	318	126	8,628	34,931
1976	1,621	425	18,390	81,920
1977	157	848	2,185	4,657
1978	1,036	393	9,199	30,597

YEAR	DIRECT LOSSES ($ millions)	LOST LIVES	AFFECTED VILLAGES	FLOODED AREA (km2)
1981	139	82	2,071	4,191
1983	63	39	643	1,882
1984	35	42	251	1,093
1988	399	508	100	6,144
1992	1,400	1,008	13,208	38,758
1994	392	431	1,622	5,568
1995	175	591	6,852	16,686
1998	na	47	161	na
2001	na	201	na	na
2003	na	230	na	na
2010	10,056	1,600	na	38,600
2011	66	516	38,700	9,098

km2 = square kilometer; na = not available. Source: Government of Pakistan

2.2. National Measures to Tackle the Floods

As a floods prone country and high vulnerability, government has mapped out several measures, from building spurs to passing laws. All these measures are discussed one by one.

2.2.1. Policies and Legal Framework

Currently Pakistan does not have any official national water policy but it recognizes the draft of water policy which aims at construction of flood-protection facilities, maintenance of current infrastructure, efficient usage of non-structural measures and formation of flood response plans. Apart from water policy Pakistan also does not have a comprehensive law of flood management. One of the major reason is that Constitution of Pakistan confers water related responsibilities to Provinces. Federal government takes measures by its institutions like WAPDA and the Indus River System Authority. To carry out these, there are legislations like WAPDA Act (1958), the Environmental Protection Act (1997) and the Indus River System Authority Act (1992). But existing water and land-use laws address some flood-related issues while there is dire need of full-fledged framework to tackle this phenomena.

2.2.2. Institutional Landscape

There are twelve institution which are responsible for managing the floods. These institutions can be divide into two categories according to their assigned roles: Hazard or risk managing institutions and crisis handling institutions. Former one deals with structural and non-structural measures while latter one takes position on rescuing, aiding and rehabilitation. Federal Flood Commission (FFC) is a major player in handling the flood mitigating measures. It has been established in 1977 and since then, it has put its efforts in collecting better data on weather, creating awareness and adaptability capacity among the population. Flood protection schemes are prepared by both federal and provincial authorities. Following are flood management institutions in Pakistan:

Table 2.2 Flood Management Institutions in Pakistan

Organization	Responsibility	Level
1) Pakistan Commissioner for Indus Waters	Coordinates with India on floods in the trans-boundary rivers	National
2) Water and Power Development Authority(WAPDA), Ministry of Water and Power	Operates and manages the Mangla and Tarbela reservoirs and manages hydrometeorological data	National
3) Federal Flood Commission (FFC), Ministry of Water and Power	Prepares and coordinates implementation of national flood protection plans, and conducts oversight of flood forecasting, warning, and management	National
4) Pakistan Meteorological Department (PMD)	Forecasts rainfall and flood, and issues warnings	National
5) Flood Forecasting Division, PMD	Conducts model simulations, forecasts flood, and issues warnings	National
6) Emergency Relief Cell, Cabinet Division	Coordinates relief operations at the national level	National
7) National Disaster Management Authority (NDMA)	Conducts oversight and coordination of disaster management, including rescue and relief operations, at the national level	National
8) Provincial irrigation departments	Constructs, manages, operates, and maintains barrages and flood protection works, and implements protective measures	Provincial

Organization	Responsibility	Level
9) Provincial disaster management authorities	Coordinates with other provincial departments, including for rescue and relief operations	Provincial
10) District administrations	Conducts relief and rescue operations at the district level	Provincial
Pakistan Army	Assists the civil authorities in real-time flood fighting and rescue and relief operations	National
11) Other relief organizations	Manages post-flood relief operations at the provincial level	National
	Source: Government of Pakistan.	

Since its inception, FFC has also developed following three National Flood Projection Plans (NFPP):

Table 2.3 National Flood Protection Plans

Description	Main Activities	Total Cost (Rs billion)
NFPP-I (1977–1987)	A total of 311 flood-protection schemes are completed, mainly river-training works.	1.6
NFPP-II (1988–1998)	A total of 438 flood-protection and river-training schemes are completed. Procured and installed a 10-cm weather radar and a meteor burst telecommunication system (69 high-frequency radio sets), and has also carried out prefeasibility studies, as well as floodplain mapping of some areas.	8.6
NFPP-III (1998–2008)	A total of 463 flood-protection schemes are completed. Has procured and installed 24 high frequency radio sets, 20 remote stations, and a 10-cm weather radar. Has upgraded existing 10-cm weather radar in Lahore, and early warning system is developed.	7.6
Draft NFPP-IV	The NFPP-IV is being prepared. The proposal tentatively includes finishing the work left over from earlier plans; improving the operation of major reservoirs; updating the flood operation manual; determining the extent of the floodplain; and improving flood forecasting, flash flood monitoring, and capacity building.	≥ 30.0

cm = centimeter; NFPP = national flood protection plan, Source: Government of Pakistan.

2.2.3. Flood Management

From earliest floods to recent ones of 2014, Pakistan had suffered more than $20.0 billion. Apart from these costs it has also paid high costs, more than $1.2 billion, to mitigate and manage the floods. Major part of these spending includes borrowing from international agencies. These borrowings has been spent on improving and making effective quick emergency response mechanisms as well as fostering the structural and non-structural measures.

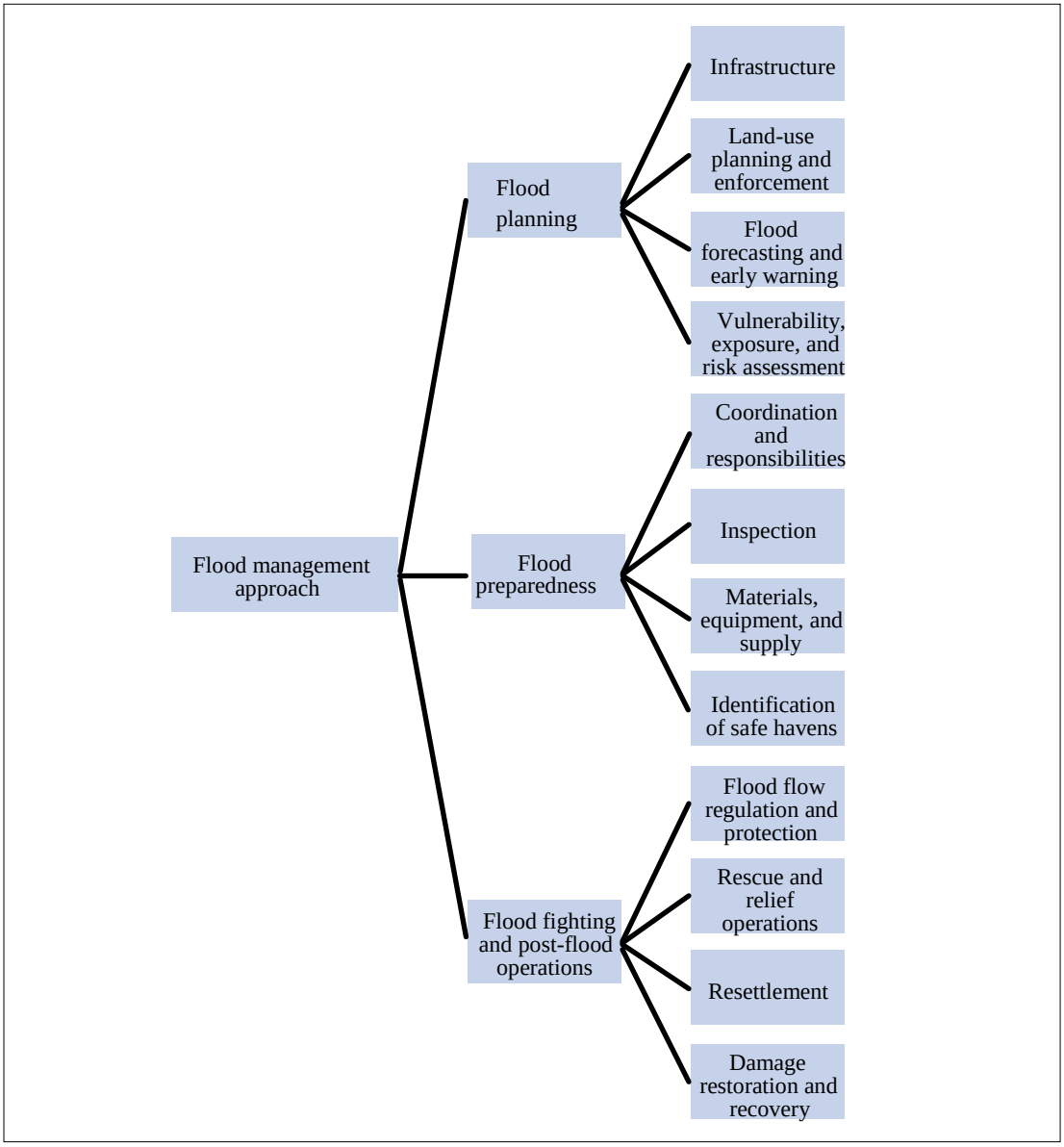
Table 2.4 Costs of Flood Management

Projects	**Funding Source**	**Amount** ($ millions)
1986 Flood Protection Sector Project	ADB	124.0
	Government	24.4
	Beneficiaries	3.9
1988 Flood Protection Sector Project	World Bank	44.0
	ADB	39.0
1992 Flood Protection Sector Project	World Bank	139.0
	ADB	78.0
	Provinces	41.6
1998 Flood Protection Sector Project	ADB	100.0
2010 Flood Emergency Reconstruction	ADB	649.0
Total		1,242.9

Source: Asian Development Bank report, 2012

Report of Asian Development Bank on Indus Basin floods summarizes the flood management system in Pakistan in following diagram:

Figure 2.1 The Flood Management System in Pakistan



Source: Asian Development Bank Report, 2012

2.2.3.1. Emergency Response Initiatives

Before the upcoming monsoon, every year all government departments take part in preparing for efficient emergency response. They also prepare and plan to the situations of different areas. Their vigilance and readiness includes the flood forecasting system, strengthening the critical

levees, identification of safe places and arrangement of relief supplies. In flood forecasting, Pakistan Meteorological Department plays very important role and warns as early as possible. All the rescue forces like 1122 and police are deployed and trained for utilizing them in emergency.

2.2.3.3. Structural and Non-structural Flood Mitigating Measures

Historically, Pakistan primarily relies upon structural measures or ex-ante preventive measures to reduce the effects of floods. Structural measures include building of flood-protection levees, and forming spurs. Since 1960, Pakistan has constructed 6,800 flood-protection levees and 1,410 spurs.

Table 2.5 Levees and Spurs on Major Rivers

Province	**Levees** (km)	**Spurs** (no's)
Punjab	3,332	496
Sindh	2,422	46
Khyber Pakhtunkhwa	352	186
Balochistan	697	682
Total	6,803	1,410

km = kilometer, Source: Federal Flood Commission. 2011.

Non-structural measures include floods relief, rescue and post-flood-related operations. In these operations governmental crisis-handling agencies participates. Post-flood renovation starts just after the floods.

2.3. Conclusion

From the above discussion, it can be concluded that Pakistan is still missing the concrete legal plan to address the issue. Integrated Water Resource Management and Integrated Flood Management are still up in the air. Constitutional changes are still awaiting because under constitution it is subject matter of provinces to oversee the flood management. Failure of national plans is evident and it has been acknowledged in Water Policy draft.

Structural measures can only be effective up to certain limit for which these structures are designed and their failure is manifested by floods of 2010. Extreme level occurrence of floods is also proving the ineffectiveness of structural measures and usefulness of non-structural measures is worth. But no strategies have been developed to improve the flood fighting abilities of the individuals and communities. Proper flood mapping is still being disregarded. Water storage capacity of Pakistan is only 12 % of annual availability which is one of the lowest in the world. After the construction of Tarbela Dam in 1974, construction of new dams is encumbered by inter-provincial disputes. Concluding, Pakistan needs to reconsider its traditional approach with transforming this “burden” into “water asset” and this approach should be replaced with a risk-based pro-active approach to achieve sustainable flood management.

Chapter 3

Review of Literature

Introduction

This chapter compiles the literature review of the study under four sections. First section deals with theoretical literature and is divided into two sub-sections: sub-section 3.2.1 covers literature on coping strategies while sub-section 3.2.2 wraps up literature on determinants of coping strategies. Section 3.3 portrays empirical evidence of this natural phenomena whereas section 3.4 reviews literature available for Pakistan. Last section concludes the chapter.

3.1. Theoretical Literature

There is considerable theoretical literature that suggests different types of strategies for coping with natural disasters for survival. It also advocates that adoptions of these strategies depends upon socioeconomic factors. So, theoretical justification of coping strategies is being discussed in next two sub-sections.

3.1.1. Coping Strategies

Jane Corbett (1988) expounds that with the experience large number of households may mean the failure of established strategies and devise new ones. Distress migration towards relief camps seems to be last measure of people after the failure of all other available strategies. Study identifies coping strategies adopted by African people during severe droughts: insurance mechanisms (rationing of current food consumption), gradual disposal of productive assets (inter-households transfers, disposal of assets, and sale of possessions) and distress migrations. All the strategies have not been adopted simultaneously but in sequential pattern and this pattern starts from collecting food and ends at migration.

Frankenberger's (1992) work explicates that households employ several coping strategies when they suffer from a shock like floods. Coping strategies are those fallback mechanisms when habitual means of meeting needs do not work. The first households attempt to minimize risks and manage losses to ensure some minimal level of sustenance whereas second strategy employed by households is disposal of assets. This study explains that firstly liquid assets are disposed and then productive assets. Marketing of the productive assets makes difficult for the household to return to a pre-crisis state. Finally, the household or individual is forced to migration.

A framework has been given by Schwarzer and Schwarzer (1996) which describes four types of coping behavior in a crisis: reactive, anticipatory, preventive, and proactive, and precautionary, defined as follow:

a) Reactive coping - is as an effort to deal with the crisis that has already taken place, coping efforts aim to either compensate for loss or alleviate harm.

b) Anticipatory coping - is as an effort to deal with an imminent threat.

c) Preventive coping - is an effort to build up general resistance resources that result in less strain in the future (minimizing the severity of the impact of potential distress) and an overall reduced risk of the crisis.

d) Proactive coping - is an effort to build up general resources that facilitate promotion toward challenging goals/future.

Uitto (1998) elaborates vulnerability and exposedness as characteristics of an individual or group that influence their capacity to anticipate, resist, cope with and recuperate from natural shocks. Thus, extent and occurrence of such natural events depend on three variables: (1) vulnerability or propensity to suffer loss (2) exposure of human lives, buildings and other entities at risk (3) hazard of floods, earthquakes etc. Scale of vulnerability or exposedness relies upon wealth, ethnicity, education, gender, and socioeconomic status.

Rashid's (2000) findings reveal the coping strategies of urban poor of Bangladesh. Study finds many of the women urinating inside their homes or directly into the floodwaters, dearth of clean water, high food prices, deteriorated law and order situation, increased domestic violence, water-prone illnesses, relying on mere social support, inability to pay back loans, and homelessness.

Emmanuel Skoufias (2003) demonstrate that there are huge economics costs of ex-ante (mitigating) strategies and ex-post (coping) strategies adopted by households and governments. Government adopts different types of ex-post strategies like cash transfers, wage subsidies, microfinance, and social funds to target different beneficiaries. While households adopts different types of ex-post strategies like Mexican households decrease their fertility in response to the tequila crisis, rural households in Bangladesh borrow more soon after the 1998 floods, Ugandan households resort to fostering orphan children of relatives dying from AIDS, while South African households rely on local support networks. Floods affect household welfare through the destruction of human and physical capital stock. To handle these disasters, poorer households are less equipped to deal with external shocks and they can only use informal insurance as their coping strategy which ultimately leads them to unescapable poverty trap. Such crisis also force households to decrease their investments on human capital like education of children. If economic and natural shocks come together than all coping strategies flop worst.

Through examination by Ninno et al. (2003) clarifies how floods have affected the wellbeing of households in Bangladesh by increase in unemployment levels, decrease in income levels, shortfall of food availability, and deterioration of health. Households have confronted the shock by reducing expenditures, selling assets and borrowing. Their results shows inadequacy of government policies and exemplary role of private sector to adjust with

this shock. The governments of developing nations face the challenge of scarce resources which further reduces its ability to effectively deal with deleterious effects of disasters.

Dasgupta (2007) proposes early flood warning systems as a best strategy to mitigate the effects of floods. Study further emphasizes upon pre-flood exodus, household flood insurance and financial support for the poor as coping mechanism for river floods.

Khandker (2007) points out that in every society, households choose strategies, coping mechanisms, to mitigate the adverse effects of shocks that affect the probability of being poor or vulnerable. Some households have a better ability to cope with shocks than others, depending on local conditions and physical endowments.

Hansson et al. (2008) conclude that smaller the economy and larger the event, the more significant impact is, which depresses the already weak economy further. Study suggests two major components for the formation and implementation of ex-post strategies: structural defense (systems of water flows like rivers, dams), non-structural measures (warning systems and education, borrowing, insurance, cross border prospective, international aid, and multiple stakeholders).

Kreibich et al (2009) emphasize on the role of risk awareness that if the people are less experienced with such natural hazards and have less awareness about the severity of event than the results will be disastrous. Flood management authorities at local level like municipal authorities have not been in position to address the issues during floods in Germany, so these authorities should be fully equipped to address such issues.

Ghorpade (2012) describes three types of coping strategies:

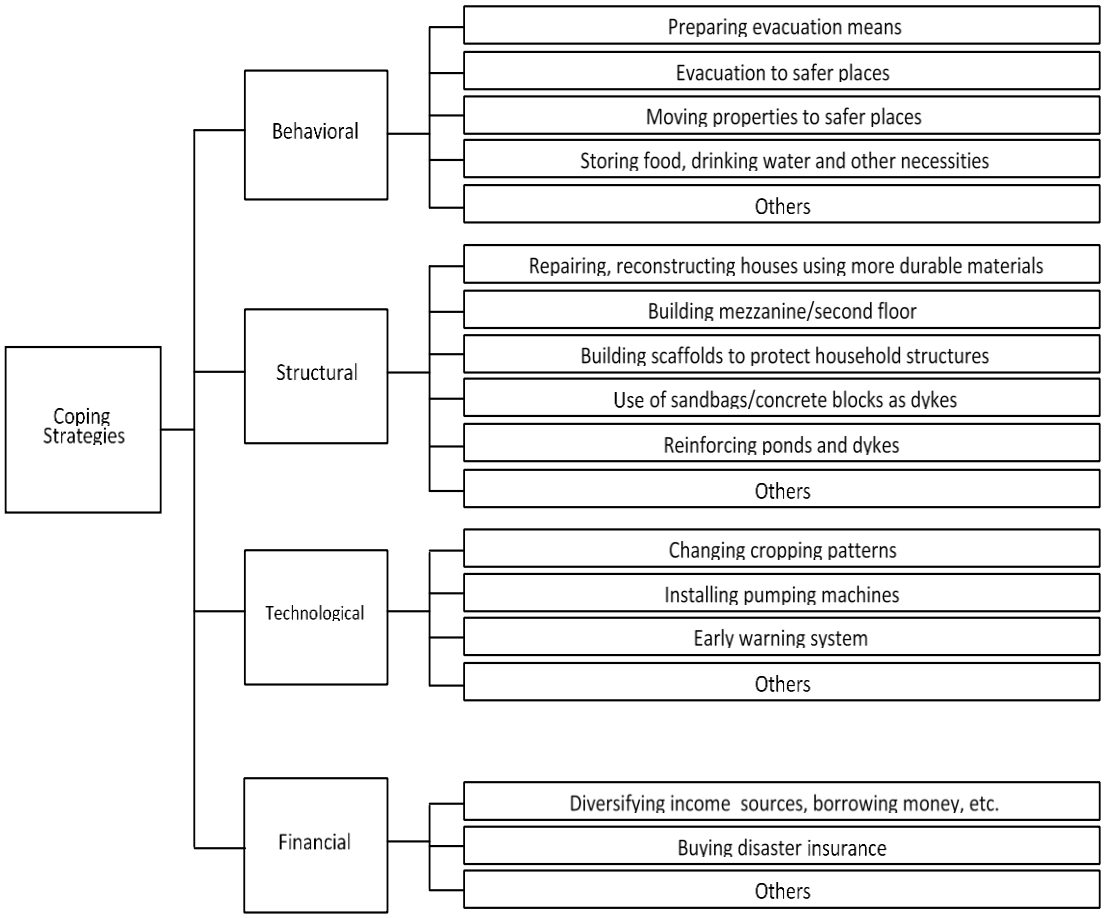
1) Risk reducing strategies – to achieve income smoothing or secured sources.

2) Self-insurance –include assets disposal to deal with climatic shocks.

3) Risk sharing strategies –include mechanisms that share risks within a group.

Sultana and Rayhan (2012) highlights that major proportion of households are found to borrow money from informal sources. A censored Tobit model analysis shows that households start coping with borrowing money and gradually move to cope via assets disposal and savings after the floods.

Israel and Briones (2014) recapitulates the coping strategies adopted by households in Asian countries:



3.1.2. Determinants of Coping Strategies

Jane Corbett (1988) summarizes that always same type strategies are not adopted during these events and all households are not equally vulnerable to food crisis during this event, rich seldom starve. Study finds income level of households an important determinant for

adoption of particular strategy. The poor and the rich households do not have the same options, for example poor find it more difficult to obtain credit, have fewer assets to liquidate, and are constrained by high dependency ratios. Effectiveness of these strategies is further affected by presence or absence of relief programs.

Canon (1994) argues that nature provides us many opportunities of production and hazards like floods, earthquakes. Study demonstrates that there are particular characteristics of different groups of people (derived from social and economic processes) which mean some avoid disasters while other do not. And vulnerability of people is classified by regarding class, gender, race, age, education and income.

Morrow (1999) suggests to develop mapping of vulnerable community for disaster management by considering woman-headed households, concentration of elders and children, poor community, ethnic minorities and households' size. This will help out rescue agencies and government in effective resistance to natural hazards.

Cutter et al. (2003) develop vulnerability index combining the biophysical and social vulnerability. Study considers wealth, gender, race, rural or urban, employment loss, property, occupation and family structure as important contributors for resilience to environmental and natural hazards.

Grothmann and Reusswig (2004) answer the question that why some households adopt precautionary measures to mitigate floods while others do not. Study finds that perceptual factors like experience of previous floods, fear and reliance upon public flood protection, are better than the socio-economic factors in coping with flood. There are three main determinants of floods vulnerability and damages: flood exposure, sensitivity, and adaption. Flood exposure level is measured by velocity, frequency, water level, and duration.

Brouwer et al. (2007) submit that poorer segments of society live closer to the river, and face a higher risk of flooding and are thus more vulnerable. Inundation levels are also higher for poorer households. So, higher exposure levels are associated with higher inequality and less access to land. Inequality also results in higher flood damage, confirming the hypothesis found in the literature that an unequal income distribution contributes to socioeconomic vulnerability. The poor suffer more in relative terms, but not in absolute term. So, there is clearly a need of more government involvement to either provide further flood protection or flood relief directly. Moreover, policies for income equality can also be effective.

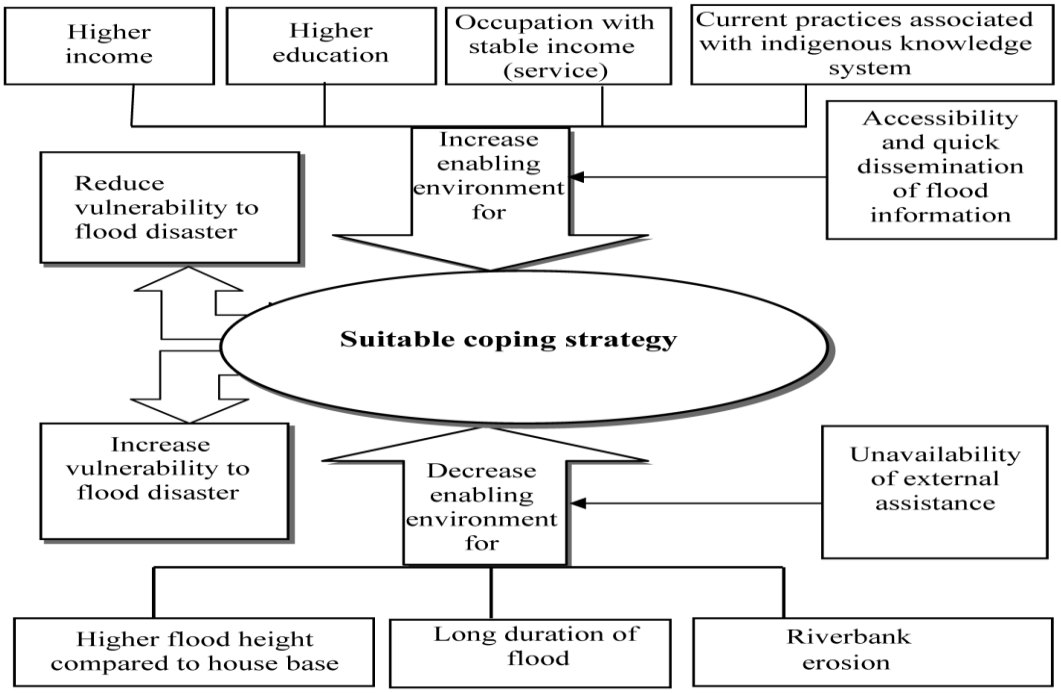
Paul et al. (2009) recommend that people continuously battle against flood vulnerability in accordance with their level of exposure and abilities, with varied strategies employed at different geophysical locations. The paper reports that households' ability to cope varies depending on people's socioeconomic conditions, such as education, income and occupation. Although floods in Bangladesh generate socioeconomic misery and people's indigenous coping strategies have helped them to reduce significantly their vulnerability.

3.2. Empirical Evidence

Ninno et al. (2002) develop a flood exposure index to show the actual severity of floods faced by different households. This is new kind of work as in past traditional indicators like causalities and damages have been used to indicate the severity of floods. On the basis of this index, study divide the households in three categories according to their level of exposure to the flood: not exposed, moderate, severe and very severe. Study find self-reported coping strategies which are borrowings, loans, changing eating habits, and selling of assists. It also check relationship between coping strategies and flood exposure index, by Logit model, which is highly significant in the case of borrowing and most widely used coping measure.

Rashid et al. (2006) discover empirically that households start borrowing when they realize that a flood shock is taking place. Gradually, they start divestment strategy or spending money from savings and selling assets with the extended period of flood.

Study by Paul et al. (2009) find out coping strategies like raising the homestead, using water-purifying tablets, changing eating behavior and determinants of these coping strategies are education, income level, occupation, external assistance. Study proposes a coping strategy mechanism:



Sultana and Rayhan (2012) find coping strategies borrowings, use of saving, changing habits and taking aid. Study illustrates determinants of these coping strategies with high significance level are shock factors (level of flood water, duration of flood) and demographic factors (income level, family size etc.).

3.3. Literature on Pakistan

Hasson (2009) briefly speaks of the major concerns for Pakistan due to extreme climatic events and melting of glaciers under global warming conditions are:

1) Deglaciation in Karakoram Mountains has increased.

2) Frequency and intensity of floods is due to reduction of natural reservoirs and variations in precipitation input.

3) Owing to change in intensity and frequency of precipitation events, inter-annual pattern of flows in the Indus Basin Rivers may change considerably.

4) Inadequate & non-regulated escapage of flows below Kotri and sea level rise may cause further sea water intrusion in the delta of Indus and other coastal areas of Pakistan.

5) Increased floods resulting from glacial lakes' outbursts in Western Himalayas are foreseen.

6) Increased sedimentation due to high intensity rains and loss of reservoirs capacity.

Analysis of past 50 years floods data for Pakistan taken shows that the number of events per decade has increased during the last two decades, during 1950-59 six events occurred but during 2000-06 twenty-two events occurs, which incidentally is the period during which the average global temperatures have been the highest since the mid eighteenth century.

Damage assessment by Kronstadt et al. (2010) of 2010 floods sums up 3.3 million hectares countrywide of standing crops, including rice, maize, cotton, sugarcane, fruit orchards and vegetables, have been damaged or lost completely due to flooding, with about 1.3 million hectares affected in the four hardest hit provinces. This represents about 14% of the total cropped area in 2008. Agriculture is one of the primary mainstays of Pakistan's economy. It accounts for approximately 23% of GDP, employs about 43% of the labor force and provides about 60% of the country's export earnings. Arable crops, livestock, and fishing and forestry represent 65%, 31%, and 4% of Pakistan's agricultural GDP, respectively. Approximately 80% of people in the flood-affected areas depend on agriculture for their livelihood. The affected populations have suffered severe crop, livestock, and grain stock losses, though assessments of medium and longer term impacts on the agricultural sector in Pakistan are still ongoing. The floods have affected the most densely populated livestock

areas in Pakistan. The national livestock population is estimated at 217 million animals in 2006, including cattle, buffalo, sheep, goats, donkeys, and poultry. Estimates show that over 1.2 million livestock and 6 million poultry have perished.

Dorosh et al. (2010) highlight the issues of Pakistan in dealing with floods of 2010. These issue include channeling of funds, lack of coordination between the federal and provincial authorities, difficulties of flood damage restoration projects, political inconsistency, capacity and delivery issues, lack of early warning systems, mainstreaming concerns for women and children. Study suggests lessons, learnt from South Asian disasters, which are: market and trade policies; institutional framework and sources of financing; livelihood support programs and welfare transfers; and rehabilitation of agriculture and infrastructure.

Ahmad et al. (2011) write that natural disasters often result in great losses, both in terms of materials and people's lives. Vulnerability to natural disasters combined with socio-economic vulnerability of the people pose a great challenge to the government machinery. The actual disaster results in substantial damage to the population in terms of loss of life and property. This direct result can be termed the 'first disaster'. Another wave of damage triggered by a chain of cause-and-effect events relating to the first disaster results is indirect damage to people remote from the original disaster. For example, the people cannot repay their loans, resulting in losses to money lenders. Such events can also result in higher incidences of problems relating to health (heart attacks, strokes), emotional responses (suicides) and crime (homicides). This is called the 'second disaster' and can be in greater magnitude than the 'first disaster'. As a result of their unique geo-climatic conditions, four provinces, Azad Jammu and Kashmir and Gilgit Baltistan are vulnerable to geo-climatic disasters. Over 40% of the land area is vulnerable to earthquakes, 6% to cyclone, 60% to floods, and 25% of the Barani land or rain fed is vulnerable to drought. The health problems

of the flood-affected areas consists in the prevention and/or the treatment of the diseases: cholera, malaria, bowel diseases like dysentery and diarrhea, and pneumonia and other respiratory diseases. There has been also a phenomenal increase in the incidence of psychiatric disorders in the flood affected population. The common problems include: acute stress disorder, post-traumatic stress disorder, anxiety disorders, depression, alcohol and drug abuse.

Malik et al. (2012) declare that Pakistan is highly vulnerable to the adverse effects of climate change, particularly those resulting from rising temperatures, increased variability of monsoon, melting of Himalayan glaciers, an increase in the frequency, intensity of extreme weather events and natural disasters. Low-intensity Punjab (mostly consisting of South Punjab) is the most vulnerable region. The region is prone to floods as well as rise in temperature. The region has a high degree of sensitivity and low adaptive capacity.

Baqir et al. (2012) find epidemiology of seven diseases in the aftermath of floods of 2010 in Khyber Pukhtunkhwa. These diseases include diarrhea, skin and eye infections, malaria, leptospirosis, hepatitis, respiratory infections.

Assessments by Looney (2012) show that floods of 2010 have destroyed the economy of Pakistan by imprinting short-run and long-run impacts. Short-run impacts are on agriculture, manufacturing, refugees, unemployment, fiscal deficit stress and long-rum impacts are on inflation, increased poverty and supply constraints. Using these conventions the total damage (direct, 64.6% and indirect, 35.4%) have been brought on by the floods amounts to $10.056 billion. About half of the damage has occurred in the agricultural sector (50.2%) with housing (15.8%), transport and communications (13.2%) also have heavily impacted. With the end of the 2010–2011 fiscal year (1 July 2010 through 30 June 2011), a clearer picture of the floods impact has emerged. For the economy as a whole, the floods appear to have reduced GDP growth by about 2 percentage points. Overall the agriculture sector has recorded modest

growth of 1.2% in 2010–2011 against the target of 3.8%.The destruction of major crops, particularly rice and cotton, have led to a negative growth of 4% in major crops. Specifically rice production decline to 4.8 million tons is the lowest level of production since 1994–1995. The price of wheat has been more than doubled from 425 to 950 rupees (4.9 to 11 dollars) for 40 kilograms. The procurement prices for different types of rice have been more than doubled and cotton prices have been increased by over 40%. Growth in large scale manufacturing declines to 1.0% in 2010–2011 from 4.9% in the previous year. In this setting the disruptive effects of the floods, no doubt, have contributed more to inflation that would normally have been the case. Inflation rises to 15.7% in September 2010 from 12.3% in July 2010. Unfortunately the people most severely affected have been predominantly small farmers and unskilled laborers. They belong to the most vulnerable portion of Pakistan and almost all live below or just around the national poverty line. Development Program's preliminary estimates, the floods pushed a further 4% of Pakistan's population below the calorie-based poverty line, mostly in rural areas. According to the World Bank, about 2% of households control more than 45% of the total land area. Large farmers have also monopolized subsidies in water and agriculture – with the system in place contributing heavily to rural poverty.

Kurosaki et al. (2012) opine that to cope with disaster and emergency situations, self-coping through borrowing is an important strategy throughout the world. With regard to borrowing and lending, institutional sources are rarely used in this area; only two instances of institutional-source borrowing have been reported during the second survey in Khyber Pukhtunkhwa, and they have social and business purposes. In case of Khyber Pukhtunkhwa, Pakistan, Institutional-source borrowing has been avoided by respondents in the sample villages, because of the interest charged on these loans—a practice prohibited by Islamic law and which is contrary to the people's social norms. Other factors responsible for this response could be the lengthy and difficult procedures involved, a lack of collateral, and the illiteracy

of some of the affected households. Informal credit sources are often used in the study area. Borrowing from friends and relatives is common, and this indicates strong social connections among the people. We have further found that after one year, overall recovery has been improved, but that there remains substantial variation across households regarding the extent of recovery. The initially rich households have tended to recover more quickly than other households at the time of the second survey, but the speed of recovery has significantly declined during the previous year.

Shahzad (2014) hypothesizes and proves that disasters have a significant negative effects on the GDP of Pakistan. Moreover, Pakistan is considered as a disaster-prone nation due to its geographical location. Pakistan has always been likely to be affected because of floods, monsoon rains. Study finds that an occurrence of disaster will affect GDP negative and will result in its decrease by US$ 2.38×10^{6}.

3.4. Conclusion

Hence, it can be summarized that coping strategies can vary along with different regions and adoption of these strategies is contingent to socioeconomic factors. These coping strategies are adopted in some sequential path and level of vulnerability of the households is determined by the pre-conditions of that household like income level, education, and physical endowments.

Chapter 4

Methodology and Data Construction

Introduction

The present chapter deals with the methodology and data construction used in the study. Section 4.1 presents the modelling framework. Section 4.2 deals with data collection procedure, from development of questionnaire to digitalization of data, whereas section 4.3 consists the construction and definition of flood exposure index. Villages exposedness under index has been discussed in section 4.4 and diagnostic test applied for data are discussed in last section.

4.1. Modelling Framework

There are multiple coping strategies that are simultaneously choosed by the flooded households. All coping mechanisms are not utilized by each of the flooded households, so if the dependent variable is dichotomous or categorical, four models: Linear Probability Model (LPM), probit, logit, and tobit are proposed for data analysis. LMP is criticized for estimating constant marginal effects, ignoring heteroscedasticity and is used to avoid the issue of linearity.

4.1.1 Models for Estimation of Determinants of Coping Strategies

Following two models are used for estimation of determinants of coping strategies.

4.1.1.1. Logit Model

The logit model is appropriate for non-truncated dichotomous dependent variable in regression analysis. Ninno et al. (2002) have regressed logit model for determinants of households coping strategies. It can be expressed as,

$$Y_i^* = x_i^{!}\beta + \varepsilon_i \qquad (1)$$

where $Y_i = 1$ if $Y_i^* > 0$ and otherwise $Y_i = 0$.

The random variable Y_i is transformed from the original dependent variable Y_i^*, x_i denotes exogenous variable and ε_i is error term.

4.1.1.2 Tobit Model

As our responses from the households are not restricted only for one coping strategy, so the dependent variable is truncated. The regression models suitable for this type of truncated sample, where there are significant zero values in the dependent variable, is known as the censored regression model or tobit model (Greene 2003, p. 764), proposed by Tobit (1958). Sultana et al. (2012) also use tobit model to find the determinants of coping strategies in Bangladesh. The general formulation is given in terms of an index function:

$$Y_i^* = x_i^! \beta + \varepsilon_i \qquad (2)$$

where $Y_i = 0$ if $Y_i^* \leq 0$ and $Y_i = Y_i^*$ if $Y_i^* > 0$

The random variable Y_i is transformed from the original dependent variable Y_i^*, x_i denotes exogenous variable and ε_i is error term. As heteroscedasticity emerges a serious problem in this model so we estimates tobit with robust standard error for each of the coping strategies and find that the significance levels of the independent variables are not changed for the estimated models with normal standard errors.

4.2. Data

To fulfill the objectives of study, micro-level data from twelve villages of district Chiniot, is used. Collection of data starts from developing questionnaire (see appendix) to digitalization the data.

4.2.1. Questionnaire

The questionnaire for survey has five sections: first section is about education information of all households, second contains employment and income while third section deals with assets and damages. Fourth and fifth sections inquire about coping mechanism and details of floods, respectively.

4.2.2. Sampling Framework and Sample Size

All the villages are supposed to suffer from floods and are chosen according to the criterion which is their distance from the river Chenab: first three villages (Monian da pump, Shah-dat ka thatha, Kacha) are on the bank of the river, next three (Mingini, Road e ki, Tahli) villages lie between 1-2 km away from the river, succeeding three villages (Ahmed Wala, Bahga, Kalri) are situated 2-3 km ahead and subsequent last three villages (Kunan wali, Purana bagha, Sahaban wali) are distanced more than 3 km's. From each village, twenty households have been selected via simple random sampling, making final sample size of 229 households. According to Government sources, total victims in district are 35,000 households and with this population size optimum sample size is 166 households (confidence level (%): 99 and margin of error (%): 10).

4.2.3. Data Collection Procedure

Survey is conducted just after the two months of floods, in December, 2014. We have visited the affected areas and questionnaires are filled after face-to-face interviews to get highest response

rates and to seek appropriate information. Firstly, pilot survey of thirty households have been conducted and after checking reliability of data we have visited the field again.

4.2.4. Digitalization of Data

Data have been digitalized in the software package spss 16. Data from this package can easily be used in other statistical softwares, stata 12 and excel 2013. Digitalization of data have taken first two and half weeks of January, 2015.

4.3. Construction of Flood Exposure Index (FEI)

Severity of floods in Punjab at local levels is measured by height of flood water and duration of flood. Now, these indicators of severity of floods very across the flooded area due to embankments and height of lands, indicating the variation of exposure of flood in villages. In order to assess the direct exposure of households we use the flood exposure index developed by Ninno et al., (2002). This index is based on information of five measures given by households: depth of water in the homestead, depth of water in the home, ground table water rise, number of days water stayed in home and number of days stayed out of home. All five variables have been ranged (0-5 or 0-6) and these metrics are summoned to form a combined index ranging from 0-100. Variable, ground table water rise, has been given low weightage by ranging only 1-2 because of provision of unreliable information by respondents. Further it is also poor indicator of flood level. Other four variables have been allotted equal range. Lastly, based on combined index, we have created a category variable in which households are categorized as: (1) not exposed to floods, (2) moderately exposed to floods, (3) severely exposed to floods, and (4) very severely exposed to floods.

Table 4.1 Construction of Flood Exposure Index

Variable	Original Variable		Constructed Category Variable	
	Range	Unit of Measure	Range	Categories
Depth of water in the homestead	0-15	Feet	0-6	0 to 5 : number of feet 6: 6 or above feet
Depth of water in the home	0-10	Feet	0-5	0 to 4 : number of feet 5: 5 or above feet
Ground table water rise	0-25	Feet	0-2	1: 1 to 12 feet 2: 13 to 25 feet
Number of days water stayed in home	0-30	Days	0-6	1: 1 to 5 days 2: 6 to 10 days 3: 11 to 15 days 4: 16 to 20 days 5: 21 to 25 days 6: 26 to 30 days
Number of days stayed out of home	0-60	Days	0-6	0: None 1: > 0 ≤ 1 week 2: > 1 ≤ 2 weeks 3: > 2 weeks ≤ 3 weeks 4: > 3 weeks ≤ 4 weeks 5: > 4 weeks ≤ 5 weeks 6: > 5 weeks 0r above
Index Range			0 to 25 or (0*100)/25 to (25*100)/25 or **0 to 100**	
Flood Exposed Categories			**0** **1 to 50** **51 to 75** **76 to 100**	**Not Exposed** **Moderate** **Severe** **Very Severe**

4.4. Villages Exposedness under FEI

The majority of household have been severely exposed to the floods of 2014 in Chiniot, Punjab and level of exposure to the floods varies among the households even of same villages (conform with results of Sultana et al. 2012). The resulting frequency distribution of household-level flood exposure by village is reported in Table 3.2. Results show variations across households within villages in the severity of flood exposure. All together about 75 percent of households are exposed severely, 13 percent of households are exposed very severely while only 12 percent households are exposed moderately to the floods.

Table 4.2 Villages Exposedness

Village	Flood Exposure		
	Moderate (% of HH's)	**Severe (% of HH's)**	**Very Severe (% of HH's)**
Ahmed wala	5	95	___
Bagha	11	89	___
Kacha	10	65	25
Kalri	10	75	15
Kunan wali	15	70	15
Mingini	___	100	___
Monian da pump	___	65	35
Purana bagha	53	47	___
Road-e-ki	10	85	5
Sahaban wali	25	75	___
Shah-hadat ka thatha	___	47	53
Tahli	___	100	___
Grand Total	**12**	**75**	**13**

Two villages from the sample are fully exposed to severe level of floods: *Mingini* and *Tahli.* More than 75 percent of households of five villages are also severely exposed: *Sahaban wali, Road-e-ki, Bagha, Kalri* and *Ahmed wala.* In *Shah-hadat ka thatha, Monian da pump* and *Kacha,* 53 percent, 35 percent and 25 percent of households are very severely exposed to the

floods. Whereas 53 percent, 25 percent and 15 percent households of *Purana bagha, Sahaban wali* and *Kunan wali*, respectively, are moderately exposed to the floods.

The villages, *Monian da pump, Shah-dat ka thatha*, and *Kacha*, are on the bank of the river, hence households of these villages are severely and very severely exposed to the floods. *Kunan wali, Purana bagha* and *Sahaban wali* are distanced more than 3 km's from the river, so households of these villages are also moderately exposed to the floods. The more village is away from the river, the more chance to be exposed moderately or less.

4.5. Diagnostic Tests

After conducting pilot survey of thirty households, Cronbach's Alpha test of reliability has been utilized. This test provides satisfactory results. To check out heteroscedasticity, Breusch–Pagan test has been used. Results confirm the homoscedasticity and hence, these is no issue of heteroscedasticity.

Chapter 5

Households Losses and Coping Strategies

Introduction

The present chapter deals with the losses of households in the consequence of floods and coping strategies adopted by households. Section 5.1 presents agricultural and dwellings losses while coping strategies are shown in section 5.2. Last section comprises on determinants of coping strategies.

5.1. Losses

Extreme level of floods deluge large areas and cause damages to crops and property (Paul 1997; Few 2003). Two types of losses are reported by respondents: agricultural and dwellings (falling of rooms) losses. Floods forecasting information is an important mechanism to mitigate floods effects and results of chapter 7 show that 72 percent households get this information more than week before the arrival of floods via government announcements. Governmental success is also visible by the fact that floods cast damage only to immoveable goods of households, crops and dwellings.

5.1.1. Agricultural Losses

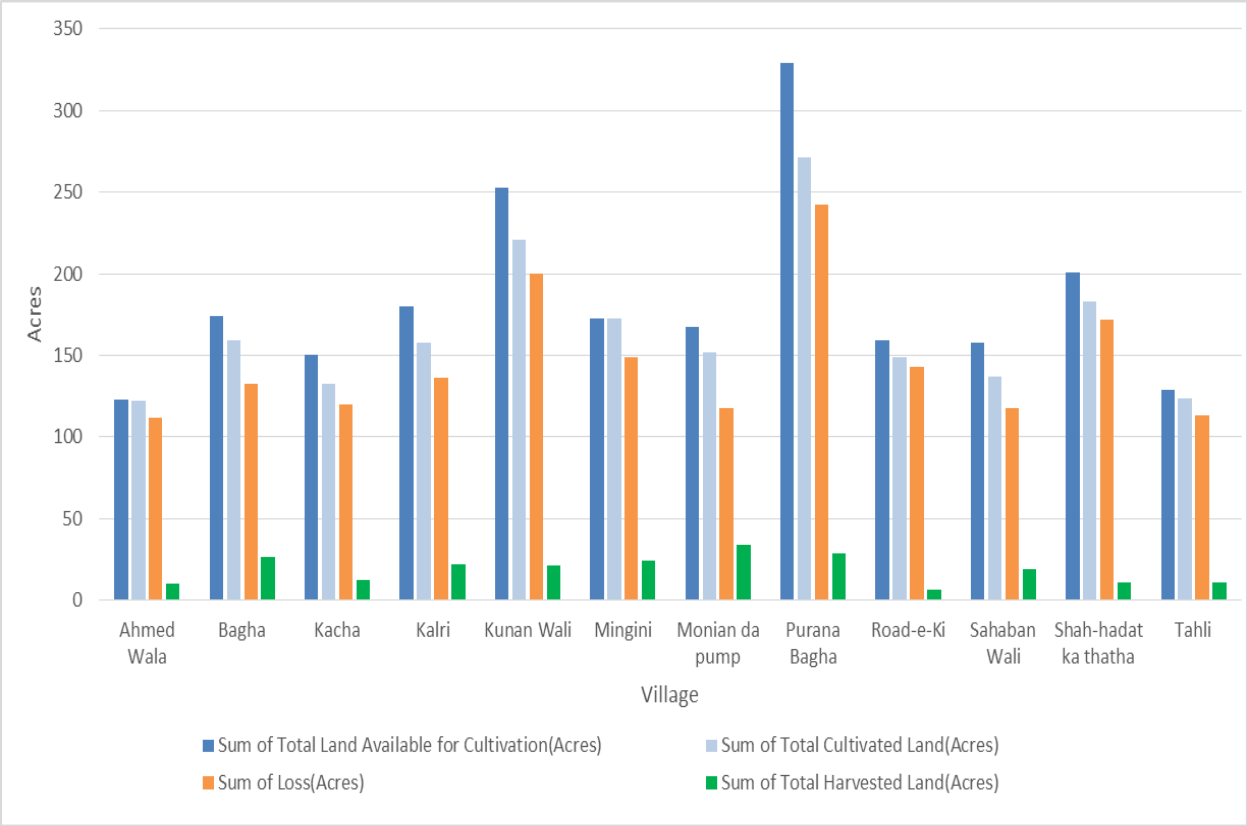
Near about 89 percent area of crops has been lost by floods with the estimated value of 59,968 thousand rupees. Five villages, *Ahmed wala, Kacha, Road-e-ki, Shah-hadat ka thatha,* and *Tahli* have lost more than 90 percent of crops while six villages, *Bagha, Kalri, Kunan wali, Sahaban wali, Purana bagha,* and *Mingini* have lost 80-90 percent crops. There is only one village, *Monian da pump,* having loss of crops less than 80 percent.

Table 5.1 Aggregate Agricultural Losses Note: Percentage is given in parenthesis.

Village Name	Flood Exposure	Total Cultivated Land (acres)	Total Harvested Land (acres)	Loss (acres)	Loss in Value (Rs Thousand)
Ahmed Wala		**122**	**10 (8)**	**112 (92)**	**4042**
	Moderate	25		10 (10)	908
	Severe	97	10 (10)	87 (90)	3134
Bagha		**159**	**26.5 (17)**	**132.5 (83)**	**4711**
	Moderate	67	12.5 (19)	54.5 (81)	1970
	Severe	92	14 (15)	78 (85)	2741
Kacha		**132.2**	**12 (9)**	**120.2 (91)**	**3838**
	Moderate	10		10 (100)	230
	Severe	104.2	9 (9)	95.2 (91)	3138
	Very Severe	18	3 (17)	15 (83)	470
Kalri		**158**	**22 (14)**	**136 (86)**	**4491**
	Moderate	19	3 (16)	16 (84)	627
	Severe	139	19 (14)	120 (86)	3864
Kunan Wali		**221**	**21 (10)**	**200 (90)**	**6961**
	Moderate	31		31 (100)	904
	Severe	190	21 (11)	169 (89)	6057
Mingini		**172.5**	**24 (14)**	**148.5 (86)**	**5139**
	Moderate	43.5	7 (16)	36.5 (84)	1371
	Severe	129	17 (13)	112 (87)	3768
Monian da pump		**151.5**	**34 (22)**	**117.5 (78)**	**4316**
	Severe	88.5	23 (26)	65.5 (74)	2358
	Very Severe	63	11 (17)	52 (83)	1958
Purana Bagha		**271**	**29 (11)**	**242 (89)**	**8145**
	Moderate	221	26 (12)	195 (88)	6434
	Severe	50	3 (6)	47 (94)	1711
Road-e-Ki		**149.2**	**6.2 (4)**	**143 (96)**	**4060**
	Moderate	17		17 (100)	476
	Severe	132.2	6.2 (5)	126 (95)	3584
Sahaban Wali		**137**	**19 (14)**	**118 (86)**	**3757**
	Moderate	94	14 (15)	80 (85)	2576
	Severe	43	5 (12)	38 (88)	1181
Shah-hadat ka thatha		**183**	**11 (6)**	**172 (94)**	**6012**
	Severe	163	11 (7)	152 (93)	5374
	Very Severe	20		20 (100)	638
Tahli		**124**	**11 (9)**	**113 (91)**	**4496**
	Severe	124	11 (9)	113 (91)	4496
	Grand Total	**1980.4**	**225.7 (11)**	**1754.7 (89)**	**59968**

Out of 1980 acres, only a small share of 226 acres (11 percent), is harvested somehow or used as a fodder for the animals. This small represents the crop to sugarcane which has height more than 10 feet, strong coating and is also a water thirsty crop. All these elements have helped in saving this crop. The villages which cultivated high portion of sugarcane, can be easily identified by green

Figure 5.1 Aggregate Agricultural Losses



bars in the figure 5.1. So, it can be induced that *Monian da pump*, *Purana bagha* and *Bagha* have sowed high portion of sugarcane and ultimately, this remains safe from the disastrous clutches of floods.

Four types of crops have been cultivated in these villages: fodder (888 acres), rice (625 acres), sugarcane (226 acres) and cotton (99 acres). Percent wise fodder, rice, sugarcane and cotton are

Table 5.2 Crop-wise Losses

	Acres									
Village	**Total Land Available for Cultivation**	**Total Cultivated Land**	**Sugar cane**	**Fodder**	**Rice**	**Cotton**	**Other Corps**	**Total Harvested Crops**	**Loss**	**Loss in Value** (Rs Thousand)
Ahmed Wala	123	122	10	59	53	__	__	10	112	4042
Bagha	174	159	26.5	43	44	14	32	26.5	133	4711
Kacha	150	132	12	77	36	7	__	12	121	3838
Kalri	180	158	22	82	44	9	1	22	136	4491
Kunan Wali	253	221	21	101	79	7	13	21	200	6961
Mingini	173	173	24	81	51	14	3	24	149	5139
Monian da pump	168	152	34	60	57	2	__	34	118	4316
Purana Bagha	286	279	29	80	64	28	85	22	257	8581
Road-e-Ki	159	149	6	107	30	6	__	6	143	4060
Sahaban Wali	137	133	19	60	36	3	17	19	118	3757
Shah-hadat ka thatha	201	183	11	96	73	3	__	11	172	6012
Tahli	129	124	11	43	59	7	4	11	113	4496
Grand Total	**2121**	**1995**	**226**	**888**	**625**	**99**	**155**	**219**	**1770**	**60404**

44, 31, 11 and 4, respectively, whereas 10 percent entails with other type of crops (includes all crops other than the major four crops).

5.1.2. Dwelling's Losses

Other reported loss is of dwellings, falling or damaging of rooms. Dwellings are categorized according to their make-up of cement and raw bricks. 42 percent households have cemented homes while other 58 percent have homes made up of raw bricks. Dwelling formed of raw bricks are more vulnerable to floods because of their less resistant capacity to confront with high level of water. So, only 30 percent cemented rooms have fallen while 70 percent of rooms with raw bricks

Table 5.3 Losses of Dwellings

		Rooms (%)			Loss of Rooms (%)		
Flood Exposure	**Villages**	**Cemented**	**Raw Bricks**	**Total Number of Rooms**	**Cemented**	**Raw Bricks**	**Total Affected Number of Rooms**
Very Severe		**22**	**78**	**98**	**25**	**75**	**67**
	Kacha	13	88	16	20	80	10
	Kalri	0	100	7	0	100	4
	Kunan Wali	100	0	16	100	0	15
	Monian da pump	0	100	31	0	100	18
	Road-e-Ki	100	0	4	___	___	___
	Shah-hadat ka thatha	0	100	24	0	100	20
Severe		**42**	**58**	**534**	**31**	**69**	**116**
	Ahmed Wala	17	83	59	___	___	___
	Bagha	60	40	43	___	___	___
	Kacha	8	92	38	0	100	21
	Kalri	20	80	46	38	63	24
	Kunan Wali	86	14	43	86	14	22
	Mingini	70	30	67	___	___	___
	Monian da pump	0	100	45	0	100	13
	Purana Bagha	53	47	36	___	___	___
	Road-e-Ki	52	48	56	46	54	13
	Sahaban Wali	85	15	41	___	___	___
	Shah-hadat ka thatha	10	90	29	0	100	17
	Tahli	26	74	31	33	67	6

Flood Exposure	Villages	Rooms (%)		Total Number of Rooms	Loss of Rooms (%)		Total Affected Number of Rooms
		Cemented	Raw Bricks		Cemented	Raw Bricks	
Moderate		**60**	**40**	**88**	**42**	**58**	**12**
	Ahmed Wala	100	0	4	100	0	2
	Bagha	100	0	12	___	___	___
	Kacha	0	100	7	0	100	2
	Kalri	0	100	11	0	100	4
	Kunan Wali	77	23	13	100	0	3
	Purana Bagha	74	26	23	___	___	___
	Road-e-Ki	0	100	6	0	100	1
	Sahaban Wali	83	17	12	___	___	___
	Grand Total	**42**	**58**	**720**	**30**	**70**	**195**

have yielded to floods. Poor people in villages normally have houses of raw bricks which further increases their vulnerability as compared to rich people having cemented adobes. The villages which are very severely exposed to the floods have 75 percent damaged rooms of raw bricks while severely exposed villages have 69 percent. The moderately exposed villages have lost 58 percent rooms made of raw bricks. Finally, 27 percent rooms have affected to the deleterious effects of floods.

5.2. Coping Strategies Adopted by Households

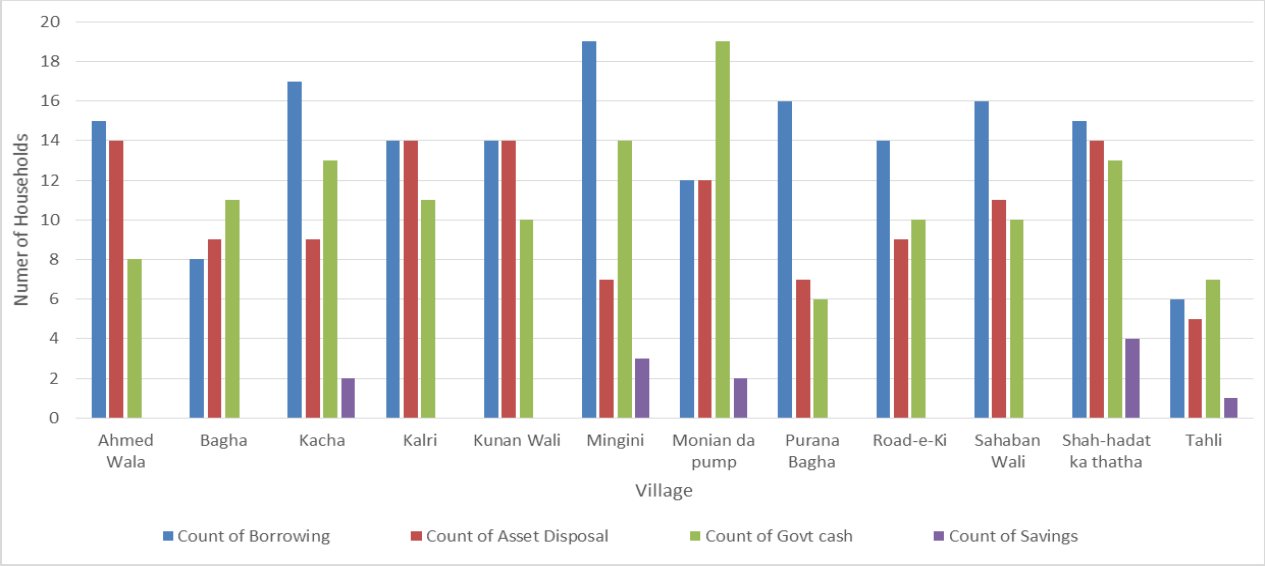
Four different types of mechanism are taken by flood sufferers: borrowing, asset disposal, savings and government cash grants. Rashid et al. (2006) have also found same patterns of coping mechanisms for households in Bangladesh. These measures are analogous to our hypothesis. Some of households also adopt more than one strategies.

Table 5.4 Coping Strategies Adopted by Households

	Number of Households				
Village	**Borrowing**	**Asset Disposal**	**Savings**	**Government Cash Grant**	**Total Households**
Ahmed Wala	15	14	___	8	20
Bagha	8	9	___	11	20
Kacha	17	9	2	13	20
Kalri	14	14	___	11	20
Kunan Wali	14	14	___	10	20
Mingini	19	7	3	14	20
Monian da pump	12	12	2	19	20
Purana Bagha	16	7	___	6	20
Road-e-Ki	14	9	___	10	20
Sahaban Wali	16	11	___	10	20
Shah-hadat ka thatha	15	14	4	13	19
Tahli	6	5	1	7	10
Grand Total	**166**	**125**	**12**	**132**	**229**

Majority of households, 38 percent, rely on borrowing for the revival the floods while 30 percent people used government cash grants. 29 percent households have disposed their assets and only 3 percent have contented by using their savings.

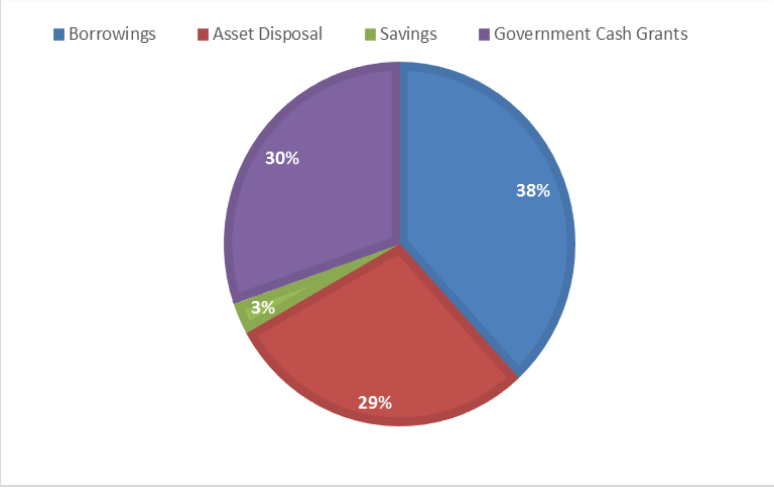
Figure 5.2 Coping Strategies Adopted by Households



166 households have gone for borrowings, 132 households depends upon government cash grants, 125 households dispose their assets and only 12 households sustains by using their savings. Almost every village has highest frequency of borrowing. After borrowing, some villages prefer to rely on government cash grants while others like to go for assets disposal. Minimal role of savings is noticeable because majority of respondents have been poor and others laugh out when they are inquired about their savings. Other reason is that villages, which are on the bank of the river, have been suffering from these epidemic floods since 2007. Floods leave poverty as its aftermath effects, making poor a destitute. Government cash grants have played a commendable role as ex-post coping strategy for the flood victims.

This measure has been also pivotal in rescuing people from disposing their assets and loaning, which can further depart victims vulnerable to poverty-trap.

Figure 5.3 Distribution of Strategies



5.2.1. Assets Disposals

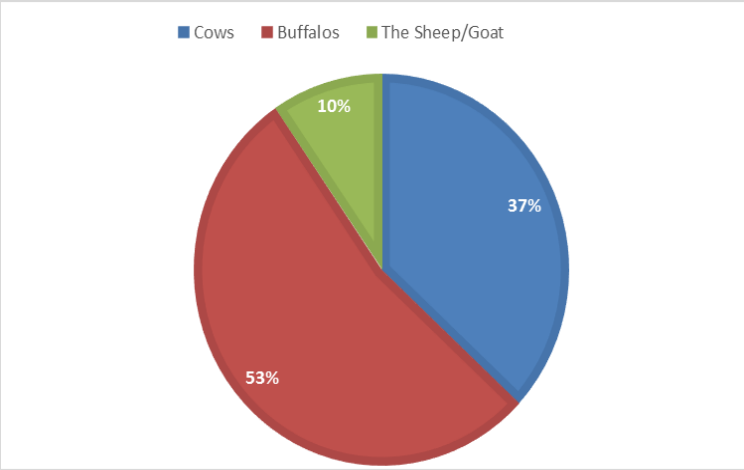
Third most widely used coping mechanism, after borrowing and government cash grants, is asset disposal. 96 percent households have stated their occupation agriculture. Having no savings and losing all cash crops like rice and cotton, people have been left behind with only asset, livestock.

Table 5.5 Components of Assets Disposal

		Number of Households		
Village	**Total Number of Households**	**Cows**	**Buffalos**	**Sheep/Goat**
Ahmed Wala	14	3	11	___
Bagha	9	5	6	1
Kacha	9	2	8	1
Kalri	14	6	11	2
Kunan Wali	14	8	8	2
Mingini	7	7	1	___
Monian da pump	12	8	9	2
Purana Bagha	7	2	6	1
Road-e-Ki	9	4	4	2
Sahaban Wali	11	4	8	2
Shah-hadat ka thatha	14	6	9	1
Tahli	5	3	3	1
Grand Total	**125**	**58**	**84**	**15**

Three types of livestock have been marketed: buffalos, cows and the sheep/goat. 84 households have sold buffalos and 58 households have disposed cows. Only 15 households are informed to sell the sheep/goat. Out of 125, 32 households have sold more than one type of animal. If we ignore this this double counting than 53 percent households have sold buffalos, 37 percent households have disposed cows and 10 percent households have marketed the sheep/goat.

Figure 5.4 Components of Assets Disposal



5.2.2. Borrowings

Borrowing is the most common strategy adopted by the flooded households. Borrowings are gotten from four type of sources: friends/relatives/neighbours, private banks, government banks and middle man. Highest frequency of households have borrowed from friends/relatives/neighbours and then from middle man. Both of these sources are interest free, complying with religion, and easily approachable. Majority of households are illiterate and avoid cumbersome procedures to take loans from banks. On other hand banks are highly risk averse and do not provide loans of agricultural lands which are prone to flood.

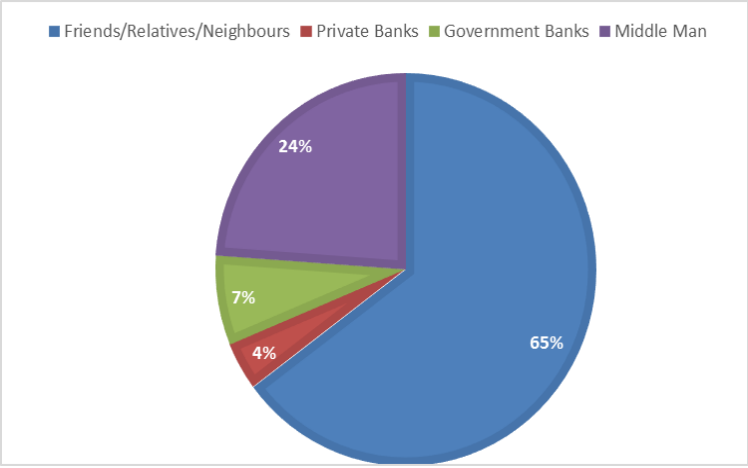
114 households borrow from friends/relatives/neighbours while 42 households get money from middle man, which expresses the role of strong informal economy as well as failure of banks to fulfill the gap. Only 20 households loan from government and private banks. Loaning of private banks is more risk averse than government banks, hence only 7 households have successfully borrowed from private banks while 13 households get loans from public banks.

Table 5.6 Components of Borrowings

Village	Total Number of Households	Number of Households			
		Friends/Relatives/Neighbours	Private Banks	Government Banks	Middle Man
Ahmed Wala	15	12	1	___	2
Bagha	8	8	___	___	1
Kacha	17	13	___	___	5
Kalri	14	6	___	4	5
Kunan Wali	14	6	2	2	6
Mingini	19	15	___	___	4
Monian da pump	12	7	___	4	2
Purana Bagha	16	15	___	___	1
Road-e-Ki	14	12	___	___	2
Sahaban Wali	16	12	3	1	___
Shah-hadat ka thatha	15	5	1	2	11
Tahli	6	3	___	___	3
Grand Total	**166**	**114**	**7**	**13**	**42**

65 percent households get borrowing from friends/relatives/neighbours while other 35 percent utilize other three sources of borrowings.

Figure 5.5 Components of Borrowings



5.2.3. Flood Forecasting Information

Timely flood information accomplishes effective results as it does in case of Chiniot. In this regard, land record and revenue department of the district have played a crucial role and they have been given charges decimate flood information. Moreover they have been also answerable for making

	Source of flood-forecasting information	
Village	**Government Announcement (%)**	**News (%)**
Ahmed Wala	75	25
Bagha	90	10
Kacha	80	20
Kalri	65	35
Kunan Wali	45	55
Mingini	70	30
Monian da pump	65	35
Purana Bagha	90	10
Road-e-Ki	50	50
Sahaban Wali	80	20
Shah-hadat ka thatha	95	5
Tahli	50	50
Grand Total	**72**	**28**

sure displacement of households near the bank of river. This strategy of government have worked well and as a result no loss of moveable goods, like animals, has been reported. 72 percent of households get flood information from government sources: announcements and visits of public servants. Only 28 percent have acquired flood information from non-governmental sources.

5.2.4. Government Cash Grants

Paul and Routray (2010) argue that provision of access to income-generating sources for the most vulnerable households can both help to reduce poverty as well as increase their coping capacity against floods. Government is second most widely used coping mechanism by households of sample villages. These cash grants are distributed by considering agricultural losses and dwellings

Table 5.8 Government Cash Grants

Village	Flood Exposure								
	Moderate			Severe			Very Severe		
	Total HH's	HH's Received GCG	HH's No GCG	Total HH's	HH's Received GCG	HH's No GCG	Total HH's	HH's Received GCG	HH's No GCG
Ahmed Wala	1 [316]	___	1 [316]	19 [3726]	8 [1020] (690)	11 [2706]	___	___	___
Bagha	3 [385]	2 [128] (130)	1 [257]	17 [4326]	9 [2384] (180)	8 [1942]	___	___	___
Kacha	2 [230]	1 [60] (20)	1 [170]	13 [2526]	9 [1394] (580)	4 [1132]	5 [1082]	3 [672] (300)	2 [410]
Kalri	2 [492]	1 [210] (25)	1 [282]	15 [3327]	10 [2509] (435)	15 [818]	3 [672]	___	3 [672]
Kunan Wali	3 [923]	1 [338] (20)	2 [585]	14 [4628]	8 [2910] (437)	6 [1718]	3 [1410]	1 [150] (40)	2 [1260]
Mingini	___	___	___	20 [5139]	14 [3653] (651)	6 [1486]	___	___	___
Monian da pump	___	___	___	13 [2102]	12 [1934] (765)	1 [168]	7 [2214]	7 [2214] (515)	___
Purana Bagha	10 [3152]	3 [701] (130)	7 [2451]	10 [4993]	3 [1545] (120)	7 [3448]	___	___	___
Road-e-Ki	2 [476]	___	2 [476]	17 [3524]	10 [2432] (650)	7 [1092]	1 [60]	___	1 [60]
Sahaban Wali	5 [1295]	2 [458] (55)	3 [837]	15 [2462]	8 [1072] (410)	7 [1390]	___	___	___
Shah-hadat ka thatha	___	___	___	9 [3510]	5 [2190] (370)	4 [1320]	10 [2502]	8 [1884] (460)	2 [618]
Tahli	___	___	___	10 [4496]	7 [3686] (555)	3 [810]	___	___	___
Grand Total	**28**	**10**	**18**	**172**	**103**	**69**	**29**	**19**	**10**

HH's=households, RCG= government cash grants, [agricultural loss in rupees thousand], (government cash grants in rupees thousand)

damages. 132 households have received these cash grants. From moderately exposed households, only 33 percent households get these grants while 60 percent sevely exposed households have obtained these grants. 66 percent very severely exposed households have received grants. But households which have not received these grants are also severely exposed to the floods as well as also have substantial agricultural losses for the qualification of these grants, for example, in *Ahmed wala* and *Kalri* more than half of severely exposed households with sizeable agricultural have not received grants. The fact remains evident that households highly have relied upon these grants but distribution mechanism of these grants is still questionable.

6.3. Determinants of Coping Strategies

Firstly, in both logit and tobit model determinants of all coping strategies have been sorted. Here coping strategies, borrowing, saving, asset disposal and government cash grants are taken as dependent variable while shock factors (depth of water in homestead, number of days water stayed at home, number of days spent out of home, agricultural loss) and demographic factors (household size, household head age, education of household head, gender of household head, occupation of household head) have been taken as independent variables. Constructions of these variables is consisted with the studies of Ninno et al. (2002) and Sultana et al. (2012).

Then, relationship between these coping mechanisms and flood exposure has been checked by both models.

6.3.1 Results of Logit Model

All shock factors are highly significant determinants of households coping strategies while for government cash grants demographic factors like gender of household head and education level of households head have significant role. These results are analogous with the previous studies of Ninno et al. (2002) and Sultana et al. (2012). In the case of saving two factors number of days

water stayed at home and education of household head are significant. In case of number of days water stayed at home there is 1.15 more likelihood that households will consume its savings. Usage of savings depends on households income, if household have high income level it will have more saving to spent in the time of crisis as compared to poor households. In this survey only twelve households from sample have some savings to use, so results for saving are not fully justifiable as there is a negative relationship between number of days spent out of home and savings.

For government cash grants household head age, education of household head, gender of household head, number of days spent out of home, depth of water in homestead and agricultural loss are coming up with high level of significance. All these variables have positive relationship with government cash grants. Only household size have negative relationship with government cash grants.

All variables have positive relationship with borrowing and asset disposal except household head age, education of household head, and gender of household head (male=1). Agricultural loss is very significant at level 1 % for both of strategies. If household head is male, educated and aged there are high chances to get government cash grants which is visible from table 5.10. Hence, households head have received government cash grants and avoided from borrowing and asset disposal.

Chapter 6

Summery and Recommendations

6.1. Summary

Following are the key findings of the study;

1. The study have manifested that majority of household have been severely exposed to the floods of 2014 in Chiniot, Punjab. The level of exposure to the floods varies among the households even of same villages.

2. 72 percent households have received flood warnings by governmental sources. Households have been unable to save only immoveable possessions, crops and rooms. All types of crops have been drenched by flood water and only the sugarcane have resisted effectively. Other type of loss households suffer in the form of falling and damaging of rooms. Most of households' adobes are made of raw bricks which have been more vulnerable to floods than cemented houses and hence, such households have suffered more in these losses.

3. Households have relied upon major three type of coping strategies after the floods: borrowing, assets disposal and government cash grants.

4. All shock factors are significant determinants of households coping strategies while for government cash grants demographic factors like gender of household head and education level of households head have significant role.

5. Government cash grants and early flood warnings have played a laudable role in mitigating and coping the aftermaths of floods but the distribution mechanism of these grants reveals lacks of transparency and meritocracy.

6.2. Recommendations

Although government has achieved its objective by timely provision of cash grants to households but still there is a vast room of improvement. Following recommendations could be useful to address this issue:

1. Transparent distribution mechanism and target-based approach will increase the effectiveness of these grants. Main focus of grants should be poor households: households with female heads and small farmers because of their high level of vulnerability.

2. Provision of easy loaning by banks and initiatives for the formulation of crop insurance in floods prone areas can also be crucial in mitigating the effects of floods.

During floods of 2014 in Punjab, prices of fodder have risen but on other hand prices of livestock have decreased in the market because of households asset disposal strategy, excessive supply of livestock. Skin diseases and fever-like health hazards have been reported by majority of households of the sample. Floods also exacerbate the poverty levels in these areas. Future research in these areas will be constructive in understanding the multidimensional and complex flood-related risks.

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Appendix

QUESTIONNAIRE

Losses in Floods and Household Coping Strategies

General Information

District Name	Chiniot	Tehsil Name	Bhawana
Household number		Village / Circle	
Name of the Respondent		Phone / Cell No.	
Age of Family Head		Household Size	
Gender of Family Head	1=Male 2=Female		
Address of the Household			

Department of Economics
Pakistan Institute of Development Economics, Islamabad

Table 6.9 Determinants of Saving and Government Cash Grants, Logit Model

	Saving			Government cash grants		
Variable	**MFX**	**Odds Ratio**	**z**	**MFX**	**Odds Ratio**	**z**
Depth of water in homestead	0.0104	0.8714 (0.1291)	-0.93	0.0327	1.146 (0.1016)*	1.54
Number of days water stayed at home	0.0107	1.1524 (0.0904)**	1.81	0.0041	0.983 (0.0708)	-0.24
Number of days spent out of home	-0.0029	0.9627 (0.0323)	-1.13	0.0107	1.0457 (0.0183)***	2.55
Agricultural loss	-0.0001	0.9984 (0.0024)	-0.65	0.0450	1.0002 (0.0006)**	0.26
Household size	0.0077	1.1073 (0.1505)	0.75	-0.0115	0.9532 (0.0612)	-0.75
Household head age	-0.0008	0.9894 (0.0326)	-0.32	0.0072	1.0303 (0.0119)***	2.6
Education of household head	0.0145	1.2126 (0.1205)**	1.94	0.0183	1.0793 (0.0436)**	1.89
Gender of household head(male =1)	___	___	___	0.5566	24.0616 (26.6228)***	2.87
Occupation of household head(agriculture =1)	___	___	___	___	___	___
Village dummy 1 (Monian da pump = 1)	-0.0422	0.5303 (0.6003)	-0.56	0.2858	4.4872 (6.3707)	1.06
Village dummy 2 (Shah-hadat ka thatha = 1)	0.2214	6.7018 (9.6886)	1.32	-0.0181	0.9278 (0.9869)	-0.07
Village dummy 3 (Kacha = 1)	0.0128	1.1774 (1.3745)	0.14	0.0857	1.4495 (1.5022)	0.36
Village dummy 4 (Kunan Wali = 1)	___	___	___	-0.1118	0.6348 (0.6738)	-0.43
Village dummy 5 (Bagha = 1)	___	___	___	0.0656	1.3245 (1.4313)	0.26
Village dummy 6 (Purana Bagha = 1)	___	___	___	-0.1477	0.5494 (0.6015)	-0.55
Village dummy 7 (Sahaban Wali = 1)	___	___	___	-0.0052	0.9784 (1.086)	-0.02
Village dummy 8 (Road-e-Ki = 1)	___	___	___	-0.1278	0.5953 (0.6493)	-0.48
Village dummy 9 (Kalri = 1)	___	___	___	-0.0618	0.7764 (0.8732)	-0.23
Village dummy 10 (Mingini = 1)	___	___	___	0.1505	1.973 (2.119)	0.63
Village dummy 11 (Ahmed wala = 1)	___	___	___	-0.1305	0.5888 (0.6282)	-0.5
Constant	___	0.2234 (0.5522)	-0.61	___	0.0026 (0.0055)***	-2.82
Log pseudo likelihood		-22.71			-128	
Number of observations		71			224	
Prob > chi2		0.0375			0.0013	
Pseudo R2		0.213			0.1648	

(robust standard errors), *** significance at 1 %, ** significance at 5 %, * significance at 10 %.

Table 6.10 Determinants of Borrowing and Asset Disposal, Logit Model

	Borrowing			Asset Disposal		
Variable	**MFX**	**Odds Ratio**	**z**	**MFX**	**Odds Ratio**	**z**
Depth of water in homestead	0.0037	0.9788	-0.27	0.0596	1.2735	3.05
		(0.0784)			(0.1009)***	
Number of days water stayed at home	0.0011	0.9934	-0.12	0.0223	0.9135	-1.6
		(0.0536)			(0.0515)*	
Number of days spent out of home	0.0029	1.0172	1.18	0.0045	1.0183	1.22
		(0.0147)			(0.0152)	
Agricultural loss	0.0005	1.0027	2.23	0.0006	1.0023	3.2
		(0.0012)***			(0.0007)***	
Household size	0.0187	1.1147	1.68	0.0105	1.0435	0.74
		(0.0719)*			(0.0603)	
Household head age	-0.0045	0.9741	-2	-0.0038	0.9847	-1.29
		(0.0128)***			(0.0118)	
Education of household head	-0.0126	0.9294	-1.68	-0.0038	0.9848	-0.38
		(0.0406)*			(0.04)	
Gender of household head (male=1)	- 0.0693	0.6682	-1.35	-0.0699	0.753	-1
		(0.2002)			(0.2129)	
Occupation of household head (agriculture=1)	0.287	3.6654	0.42	0.1047	1.5228	0.24
		(11.2832)			(2.6884)	
Village dummy 1 (Monian da pump = 1)	-0.1474	0.4775	-0.77	-0.021	0.9188	-0.08
		(0.4561)			(0.9695)	
Village dummy 2 (Shah-hadat ka thatha = 1)	0.019	1.1189	0.11	-0.0382	0.8573	-0.15
		(1.1402)			(0.9097)	
Village dummy 3 (Kacha = 1)	0.1056	2.0893	0.72	-0.1067	0.6514	-0.44
		(2.1376)			(0.6317)	
Village dummy 4 (Kunan Wali = 1)	-0.0458	0.7772	-0.25	0.1905	2.3102	0.82
		(0.7826)			(2.3506)	
Village dummy 5 (Bagha = 1)	-0.2429	0.3168	-1.18	0.0760	1.3703	0.32
		(0.3077)			(1.3346)	
Village dummy 6 (Purana Bagha = 1)	0.0934	1.8869	0.57	-0.0974	0.6762	-0.39
		(2.0948)			(0.6762)	
Village dummy 7 (Sahaban Wali = 1)	0.1149	2.2679	0.78	0.2135	2.5964	0.95
		(2.3878)			(2.6133)	
Village dummy 8 (Road-e-Ki = 1)	0.0358	1.2455	0.22	0.0887	1.4466	0.37
		(1.2295)			(1.4482)	
Village dummy 9 (Kalri = 1)	-0.0019	0.9888	-0.01	0.2417	3.0218	1.1
		(0.9288)			(3.0267)	
Village dummy 10 (Mingini = 1)	0.2317	11.9793	1.83	-0.1177	0.6229	-0.48
		(16.2932)**			(0.6185)	
Village dummy 11 (Ahmed wala = 1)	0.0589	1.4552	0.38	0.2674	3.502	1.27
		(1.4323)			(3.4574)	
Constant	___	0.7911	-0.07	___	0.114	-0.92
		(2.7747)			(0.269)	
Log pseudo likelihood		-113.21			-133.5	
Number of observations		227			227	
Prob > chi2		0.0178			0.0051	
Pseudo R2		0.143			0.1449	

(robust standard errors), *** significance at 1 %, ** significance at 5 %, * significance at 10 %.

Table 6.11 Borrowing, Asset Disposal and Flood Exposure, Logit Model

	Borrowing			Asset Disposal		
Variable	**MFX**	**Odds Ratio**	**z**	**MFX**	**Odds Ratio**	**z**
Flood exposure	0.0270	1.0189 (0.0151)**	1.26	0.0110	1.0457 (0.0143)***	3.27
Constant		0.8727 (0.7916)	-0.15		0.0808 (0.0679)***	-2.99
Log pseudo likelihood		-131.24689			-150.38494	
Number of observations		227			227	
Prob > chi2		0.2067			0.0007	
Pseudo R2		0.0065			0.0371	
(robust standard errors), *** significance at 1 %, ** significance at 5 %, * significance at 10 %.						

Table 6.12 Saving, Government Cash Grants and Flood Exposure, Logit Model

	Saving			Government cash grants		
Variable	**MFX**	**Odds Ratio**	**z**	**MFX**	**Odds Ratio**	**z**
Flood exposure	0.0003	1.008 (0.0325)	0.25	0.0104	1.0437 (0.0138)***	3.22
Constant		0.0282 (0.057)**	-1.77		0.0999 (0.0806)***	-2.86
Log pseudo likelihood		-40.9651			-149.6697	
Number of observations		227			227	
Prob > chi2		0.8039			0.0013	
Pseudo R2		0.0009			0.034	
(robust standard errors), *** significance at 1 %, ** significance at 5 %, * significance at 10 %.						

Lastly relationship between coping mechanisms and flood exposure is significant as well as positive. Only for saving this relationship is positive for insignificant. These results are consistent with the study of Ninno at al. (2002).

6.3.2. Results of Tobit Model

Results of tobit model are consistent with the results of logit model like all shock factors are positively related with coping strategies and agricultural losses are highly significant. Results of tobit model are also coherent with the findings of Sultana et al. (2012).

Table 6.13 Determinants of Borrowing, Asset Disposal and Government Cash Grants, Tobit Model

Variable	Coefficient of Asset Disposal	Coefficient of Borrowing	Coefficient of Government Grants
Depth of water in homestead	9508(6342)	3655(3571)	4601(2328)**
Number of days water stayed at home	5232(2722)**	2445(2680)	908(1289)
Number of days spent out of home	1444(871)*	383(559)	795(457)*
Agricultural loss	155(38)***	316(129)***	61(29)***
Household size	-58(3447)	5554(2935)**	-2291(1810)
Household head age	-1333(652)**	-447(474)	708(344)**
Education of household head	-858(2253)	941(1889)	1468(1064)
Gender of household head (male = 1)	-32594(51188)	-22444(13286)*	10816(8249)
Occupation of household head (agriculture = 1)	16677(107835)	79112(120228)	32996(15893)***
Village dummy 1 (Monian da pump = 1)	56221(50387)	-124604(90202)	8500(31271)
Village dummy 2 (Shah-hadat ka thatha = 1)	15403(37864)	-121750(95043)	-24226(30666)
Village dummy 3 (Kacha = 1)	22939(47310)	-79412(78776)	309(30069)
Village dummy 4 (Kunan Wali = 1)	80040(47980)*	-119842(97106)	-30959(30664)
Village dummy 5 (Bagha = 1)	54067(49483)	-148890(91032)*	-21511(28329)
Village dummy 6 (Purana Bagha = 1)	-961(52711)	-126475(101956)	-51482(32599)*
Village dummy 7 (Sahaban Wali = 1)	84952(52526)*	-14664(79874)	-10750(29903)
Village dummy 8 (Road-e-Ki = 1)	60431(54629)	-84831(79977)	-14693(30647)
Village dummy 9 (Kalri = 1)	91452(42442)***	-97716(80930)	-22848(29458)
Village dummy 10 (Mingini = 1)	25951(51203)	-71485(80866)	-5098(28838)
Village dummy 11 (Ahmed wala = 1)	103288(46436)***	-54896(85184)	-8975(32828)
Constant	-49965.24(161518.2)	-83261(144395)	-44863(47103)
Uncensored observation	125	166	130
Log pseudo likelihood	-1694.7259	-2213.6503	-1681.6936
Pseudo R2	0.0132	0.0206	0.0146
Prob > F	0.0005	0.4625	0

(robust standard errors), *** significance at 1 %, ** significance at 5 %, * significance at 10 %.

Flood exposure is also highly significant as well as have positive relationship with asset disposal, government cash grants and borrowings.

Table 6.14 Saving, Government Cash Grants and Flood Exposure, Tobit Model

Variable	Coefficient of Asset Disposal	Coefficient of Borrowing	Coefficient of Government Grants
Flood exposure	2767(-820)***	961(634)*	1714(396)***
Constant	-156547(-52958)***	-26083(39113)	-93981(25423)***
Uncensored observation	125	166	130
Log pseudo likelihood	-1711.7843	-2259.695	-1699.6508
Pseudo R2	0.0033	0.0002	0.004
Prob > F	0.0009	0.1317	0

(robust standard errors), *** significance at 1 %, ** significance at 5 %, * significance at 10 %.

1. Education Information

ID Code	Q1	Q2	Q3		Q4	Q5	Q6	
	Names of household members. Do not list guests, visitors. - Include if a member working abroad or working within country.	Sex 1=Male 2=Female	Age **Report Years only if age 5 year and older. Years and months if less than 5 year**		Relationship to head of household **(see codes below)**	**Education (age 5 and above)** Literacy (age 5 and above) Can (member) read or write in any language 1=Yes 2=No	Has (member) ever gone to school? 1=Never attended school **(» Go to next person)** 2=Attended school in past 3=Currently in school	Highest comp **(see codes be**
	Name	Code	Years	Months	Code	Code	Code	
01								
02								
03								
04								
05								
06								
07								
08								
09								
10								
11								
12								
13								
14								
15								

Codes for Q4

01=Head 02=Spouse 03=Son/Daughter 04=Mother/Father 05=Sister/Brother 06=Nephew/Niece 07=Grand Child 08= Uncle/ante 09=Mother/Father-in-law 10=Son/daughter-in-law 11=Sister/brother-in-law 12=Grandfather/mother
14=Servant15=Not related

Codes for Q7

00= < Class 1 01=Class 1 02=Class 2 03=Class 3 04=Class 4
05=Class 5 06=Class 6 07=Class 7 08=Class 8 09=Class 9
10=Class 10 11=Class 11 12=Class 12 13=Class 13 14=BA/BSc
15=Class 15 16=Post graduate MA, M.Sc, Med 17=Polytechnic Diploma
18=Degree in Engineering 19=Degree in Medicine 20=Degree in Agriculture
21=Degree in Law 22=M.Phil, Ph.D 23=Others (specify)

2. Employment and Income

Employment and Income (to be asked age 5 and above)

ID Code	Q1 What is the sector of "_"' current wage job/occupation ? Code	Q2 What is the type of jobs that he performs? Code	Q3 What is type of employer "_" works for ? Govt. 1 Govt. Project 2 Non-Govt. Project 3 Private 4	Q4 How much money in cash, did ..…, earn during the last year?
	Code	**Code**	**Code**	**Rs**
01				
02				
03				
04				
05				
06				
07				
08				
09				
10				
11				
12				
13				
14				
15				

Codes for Question 1 - Job Sectors

Food Processing (Manufacturing .....
Manufacturing of Textile Products .....
Manufacturing of Wooden Products, Furniture .....
Manufacturing of Paper Products, Printing, Publishing .....
Other Manufacturing of Industry .....
Agriculture.....
Livestock .....
Fisheries.....
Forestry.....
Wholesale Trade .....
Retail Trade .....
Other Business.....
Hotel/ Restaurants.....
Electricity/gas/water .....
Transportation.....
Communication.....
Army/Police.....
Science/ Education.....
Arts and Culture.....
Health care .....
Sport/ tourism/ retirement....
Finance and credit.....
Management and administration .....
Other non material activities.....
Others.....
Agricultural Work .....
Agricultural work (Off Farm)
Fish culture/ Fishing .....
Look after live stocks.....
Look after Poultry (Duck, Chicken, Pigeons).....
Cultivation and other works on fruits.....
Agricultural labour on other agricultural activities (Off Farm) .....
Other agricultural activities (excluding 11-15) .....
Non Farm Activities
C.1 Industrial Enterprise
Processing of crops.....
Tailoring .....
Sewing .....
Pottery.....
Blacksmith .....
Goldsmith .....
Repairing of manufactured products .....
Other Manufacturing.....
C.2 Trade
Petty Trading (Small retail shop) .....
Medium Trading (Retail and insignificant wholesale).....
Wholesale Trading/ Aratdari.....
C.3 Transport
Rickshaw/van Pulling .....
Car/bus/truck Driver .....
Helper .....
Other Transport worker.....
C.4 Construction Work
Mason.....
Helper.....
Other construction worker.....
Earthen work.....
C.5 Services
Service (Employee).....
Pensioner.....
Service worker in NGO.....
Servant in house .....
Household work .....
Other non material activities ..

Sources of Household Income

Sector	Agriculture	Livestock and poultry raising	Job	Pension and other benefits	Selling the "kind" received	Rental income	Other sources	**Total**
Current Income (in Rs)								

3. Housing and Assets

Q1. What is your present occupancy status?

□ [1] Owner occupied (not self hired) □ [2] Owner occupied (self hired) □ [3] On rent

□

[4] Subsidized rent [5] Rent free □ [6] Other (specify)

Q2. How many rooms does your household occupy? ---------- in numbers

Q3. Walls of this building are made of which material?

[1] Burned bricks/blocks [2] Raw bricks/mud [3] wood/bamboo

[4] Stone [5] Others

Q4. What is main source of drinking water for this household?

[1] Piped Water [2] Hand pump [3] Motorized Pumping/tube well

[4] Open well [5] Closed well [6] canal/river/stream

[7] others

Q5. What type of toilet is used by your household?

[1] Flush connected to public sewerage [2] Flush connected to pit [3] Flush connected to open drain

[4] Dry raised latrine [5] No toilet in the household

Q6. Does your household have?

Item	Yes	No	Item	Yes	No	Item	Yes	No
Electricity			Iron electric			Motorcycle		
Gas			Fan electric			Tractor		
Telephone/ Mobile			Television			Car		
Water supply			Refrigerator			Washing Machine		
Computer/laptop			Air cooler			Cooking range		
Sewing machine			Air conditioner			Stove/Burner		

Q7. Does your household have LAND? [1] Yes [2] No If Yes, please indicate number of Acres [……..] No of Acres

Q8. Does your household have Livestock? [1] Yes [2] No If Yes, please indicate number of animals

1. Chicken [……..] 2. Goat [……..] 3. Sheep [……..] 4. Cow [……..] 5. Buffalos [……..]

6. Value of Lovestock [……..]

4. Asset Damages

1. Description of asset	2. Asset code	3. Quantity/ Nos	4. Who owns (Member ID)	5. Estimated current value: Price paid if bought less than 1 year ago .....1 Current value if older than 1 year .....2 If sale is not possible, ask about costs & time to replace the asset 3	
				Current estimated value	Estimate of loss due to flood – (Rs)

Codes for Q2.

Own housing 1 Other housing 2 Land (for Hh) 3 Plough 4 Power tiller 5 Share of irrigation/boat/pumps 6 Threshing machine 7 Other ag. equip. 8 Motor cycle 9 Rickshaw/Van 10 Bicycle 11 Push cart 12 Sewing machine 13 Hand tubewell 14 Hand saw 15 Radio 16 Wall clock 17 Television 18 Jewelry (gold/ silver) 19 Other val. Assets 20

5. Flood

5.1. House damages

Description				2014 Flood
Did you have water in your house, Ft. (if no = 0)				
For how many days (if no = 0)				
Tyes of Damages				
Bolter(boundary support of house to prevent from floods) damages (yes/no)	Falling of rooms (yes/no)	Falling of walls (yes/no)	Floor damages (yes/no)	Others (plz mention details) (yes/no)
Repairing Cost of Damages				
Bolter(boundary support of house to prevent from floods) damages (Rs)	Falling of rooms (Rs)	Falling of walls (Rs)	Floor damages (Rs)	Others (plz mention details like house paiting etc) (Rs)

Total repairing cost if any damage due to flood (no cost= 0)				
For how many days you were out of your home (if no = 0)				

5.2.Flood Exposure Index Information

Q1	Q2	Q3	Q4	Q5	Q6
Depth of water in the homestead	Depth of water in the home	Number of days of water in the home	Did ground water table rise after the flood	How much home is away from river	No of days not going to job/work
Feet	Feet	Days	Feet	Meters	Days

6. Diseases History and Health Expenditures (All Family members)

ID Code	Name (s) of the family member(s) Copy form the roster	Q2 Was (name) sick during Floods? 1=Yes 2=No	Q3 Disease Type (more than one disease is possible) (See codes below)			Q4 Duration of sickness (days)			Q5 Last disease only: Whether visited any health practitioner (e.g. doctor, hakeem, homeopathic) 1, yes 2, no **(»Q7)**	Q6 Last disease only: Type of health practioner visited 1= private doctor/private hospital/clinic 2= Govt. hospital/ dispensary 3= BHU/Rural health centre 4= Hakeem/ Homeopathic 5= Others (Maulvi/Siana/Pir)	Q7 Expenditures
			1	**2**	**3**	**1**	**2**	**3**	**Code**	**Code**	**Rs**
01											
02											
03											
04											
05											
06											
07											
08											
09											
10											
11											
12											
13											
14											
15											

Codes for Q3 01=cough, 02=Flu, 03=Fever, 04=Burn, 05=Accident, 06=Measles, 07=Pneumonia, 08=Diarrhea, 09= Malaria, 10=Typhoid, 11= Diabetes, 12=Heart Diseased, 13=Aids, 14=T.B 15=Cancer, 16=Asthma, 17=Hepatitis 18=BP, 19=Gastro, 20=Kidney disease 21=Drug intake 22=Depression 23=Skin disease 24=Injured 25=Handi capped 26=Other (Specify) _____

7. Land and Crop Information

Total Land for Cultivation	Crops area cultivated at the time of arrival of Flood					Total Land which was cultivated before at the time of arrival of flood
	Sugarcane	Cotton	Rice	Fodder	Others	
Acres	Acres	Acres	Acres	Acres	Acres	Acres

Crops area which was saved after Floods				
Sugarcane	Cotton	Rice	Fodder	Others
Acres	Acres	Acres	Acres	Acres

Crop Name	Harvested (In mounds)	Loss (In mounds)	Loss (In Rs)
Sugarcane			
Cotton			
Rice			
Fodder			
Others			

8. Livestock Information

1. Type of animal	2. Code	3. Quantity Owned Before Flood	4. Quantity Owned After Flood	5. No of Lost/Sold	Loss in Rs
CHICKEN	101				
COWS	102				
BAFFOLOWS	103				
SHEEP	104				
GOAT	105				
OTHERS	106				

9. Price Information

Item	**Price/Kg(** before floods**)**	**Price/Kg(** during floods**)**	For how many days this hype remained!
Wheat			
Rice			
Sugar			
Fodder			

10. Assets Disposal

Description of asset	Asset code	Sold Quantity	How much received (Rs.)	Purpose of Selling
Wheat	301			
Rice	302			
Wheat	303			
Fodder	304			
CHICKEN	101			
COWS	102			
BUFFALOWS	103			
SHEEP	104			
GOAT	105			
OTHERS like jewelry, savings etc	106			

11. Borrowings

Did you borrow during or after the floods? (yes/no) …….

Source	Code	Y for yes	N for no	Purpose of borrowing See codes below	Total Borrowings (Rs)
Friends/Relatives	01				
Neighbours	02				
Pvt Banks	03				
Govt Banks	04				
Pally Dar	05				
Others(please mention)	06				

For house damages=01 For recultivation=02 To return borrowings or debt=03 Health=04 Education=05 Food=06 Others=07

12. Government Subsidies

Did you get govt subsidy during or after the floods? (yes/no) …….

How much subsidy received from government (Rs)	Utilized for See codes below

For house damages=01 For recultivation=02 To return borrowings or debt=03 Health=04 Education=05 Food=06 Others=07

13. Eating Habits

Availability of food during flood days (yes or no)	No's of meals eaten during flood days	No's of meals skipped during flood days	Incidence of meal skipping (%)

14. Others

How many days before the flood you get the information about the arrival of flood? (Days)	What were the sources of information? (see code below)

Friends/Neighbours/Relatives=01, Television=02, Radio=03 Newspaper=04 Govt Announcement=05 Internet=06 Others(Please mention)=07 …….