Households Losses in 2014 Floods and Coping Strategies: A Study of Chiniot, Punjab

Ameer Hyder
Mphil Economics

Supervised by Dr. Nasir Iqbal

Department of Economics
Pakistan Institute of Development Economics (PIDE)

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Motivation of Study

Motivation

- Global Warming is likely to intensify the rainfalls, storminess and distort the severity timing and predictability of weather patterns.
- As a result 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.
- The global distribution of flood disasters of 30 years shows Asia’s extreme vulnerability to flood disasters.
- 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.

Motivation

- 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.
  - Therefore, highly vulnerable to the effects of basin degradation and water pollution.
  - Since its inception; faced 22 major floods, starting from 1950 to 2014.

Motivation

- Report reveals that torrential monsoon in 2010 rains has led to catastrophic flooding throughout parts of Pakistan;
  - killing at least 648 people
  - damaging or destroying 375,000 homes.
  - Economic losses in Punjab Province alone at PKR 200 billion
  - 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.
  - 15,000 cattle-heads have perished and 250 poultry farms have been destroyed.
  - Total damages in monetary terms, are Rs 240 billion

Literature Gap and Significance

- Given this background it is important analyze the coping strategies adopted by the household to mitigate the flood damages/losses.
- Literature suggests that coping strategies vary along with different regions and adoption of these strategies is contingent to socioeconomic factors.
- The literature revolves around these strategies: borrowings, assets disposals, local aids and migration, but there are some missing elements in the literature like government involvement in ameliorating the households' coping abilities, components of borrowings and assets disposals.
- On other side households depend upon borrowings and asset disposals but still the questions are unanswered for the case of Pakistan; what are the borrowing sources of the households and what type of assets are disposed.

Literature Gap and Significance

- The study will focuses on all the aforementioned points. We will also construct flood exposure index, which is not available so far, for this district which can become the basis of this type of index for national level to assess the severity of floods and damages in different areas of the country and government will be able to focus on these areas accordingly. This index will also be helpful tool for the government to design the targeted policy framework for mitigation of floods in these areas.
- The focus of this study is limited to one district “Chiniot” of Punjab, Pakistan.
- Essence of district Chiniot is its high agriculture yield, closeness to the bank of the river Chenab, proneness to floods and facing this issue several times, and severity of floods in this area.

Objectives of the Study

The specific objectives of the study are as follows:

- Construction of flood exposure index to assess the severity of floods
- Examination of losses of households owing to floods.
- Bring to light the coping strategies adopted by households after the floods for the revival and rehabilitation.
- To check out what are the underlying factors that influence the choice of coping strategies.

Review of Literature on Coping Strategies

Literature on Coping Strategies

- Jane Corbett (1988) finds distress migration towards relief camps as last measure of people after the failure of all other available strategies.
- Frankenberger's (1992) summarizes that firstly liquid assets are disposed and then productive assets. Finally, the household or individual is forced to migration.
- Rashid's (2000) findings reveal the coping strategies of urban poor of Bangladesh: social support, inability to pay back loans, and homelessness.
- Ninno et al. (2003) clarifies that households during the floods of 2002 have confronted the shock by reducing expenditures, selling assets and borrowing.
- Hansson et al. (2008) suggests major components for the formation and implementation of ex-post strategies: education, borrowing, insurance.
- Rayhan (2012) highlights that households borrow money and gradually move to assets disposal and savings after the floods.

Literature on Determinants of Coping Strategies

- Jane Corbett (1988) summarizes that income level of households an important determinant for adoption of particular strategy.
- Canon (1994) argues that coping mechanisms of people are dependent upon class, gender, race, age, education and income.
- Morrow (1999) suggests the followings determinants of coping strategies: woman-headed households, concentration of elders and children, poor community, ethnic minorities and households' size.
- Cutter et al. (2003) considers wealth, gender, race, rural or urban, employment loss, property, occupation and family structure as important determinants of coping mechanisms.
- Paul et al. (2009) reports that households' ability to cope varies depending on people's socioeconomic conditions, such as education, income and occupation.

Methodology and Data Construction

Sample Selection

- Primary data is collected by conducting a sample survey and using the questionnaire method.
- Survey is conducted just after the two months of floods, in December, 2014 and questionnaires are filled in response of face-to-face interviews to get highest response rates and to seek appropriate information.
- 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.

Models for Estimation of Determinants of Coping Strategies

- **Logit Model**
- **Tobit Model**

- **Dependent Variables: Coping Strategies** (borrowing, saving, asset disposal, government cash grants)
- **Independent Variables: Shock Factors** (depth of water in homestead, number of days water stayed at home, number of days spent out of home, agricultural loss) ; **Demographic Factors** (household size, household head age, education of household head, gender of household head, occupation of household head) and **Flood Exposure Index**

Construction of Flood Exposure Index

- Severity of floods in Punjab at local levels is measured by height of flood water and duration of flood.
- 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.
- 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.

Construction of Flood Exposure Index

	Original Variable		Constructed Category Variable	
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 34 35 to 67 68 to 100	**Not Exposed** **Moderate** **Severe** **Very Severe**

Villages Exposedness

	Flood Exposure		
Village	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**

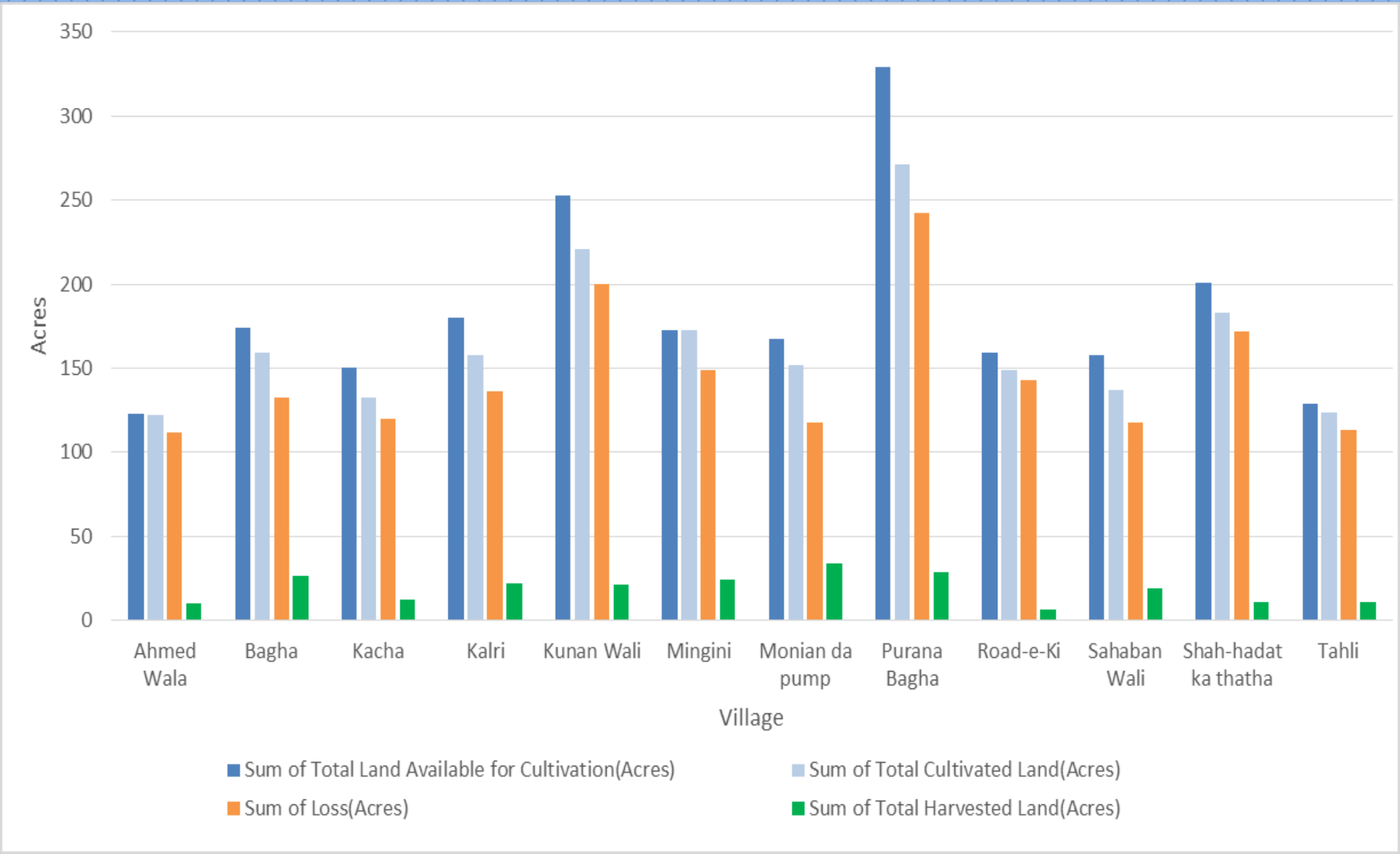
Results:

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**

Aggregate Agricultural Losses



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**

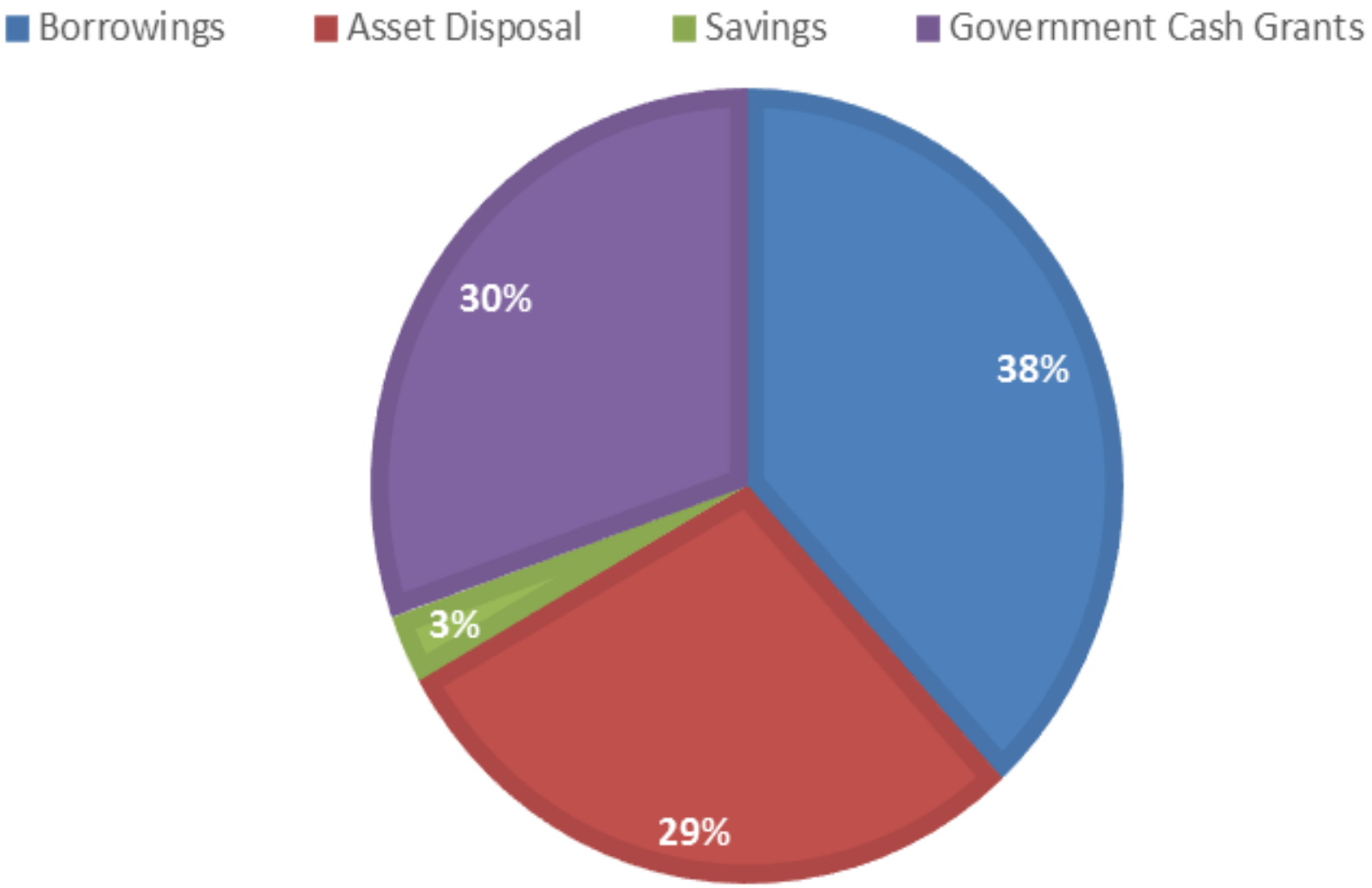
Losses of Dwellings

		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
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**

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**

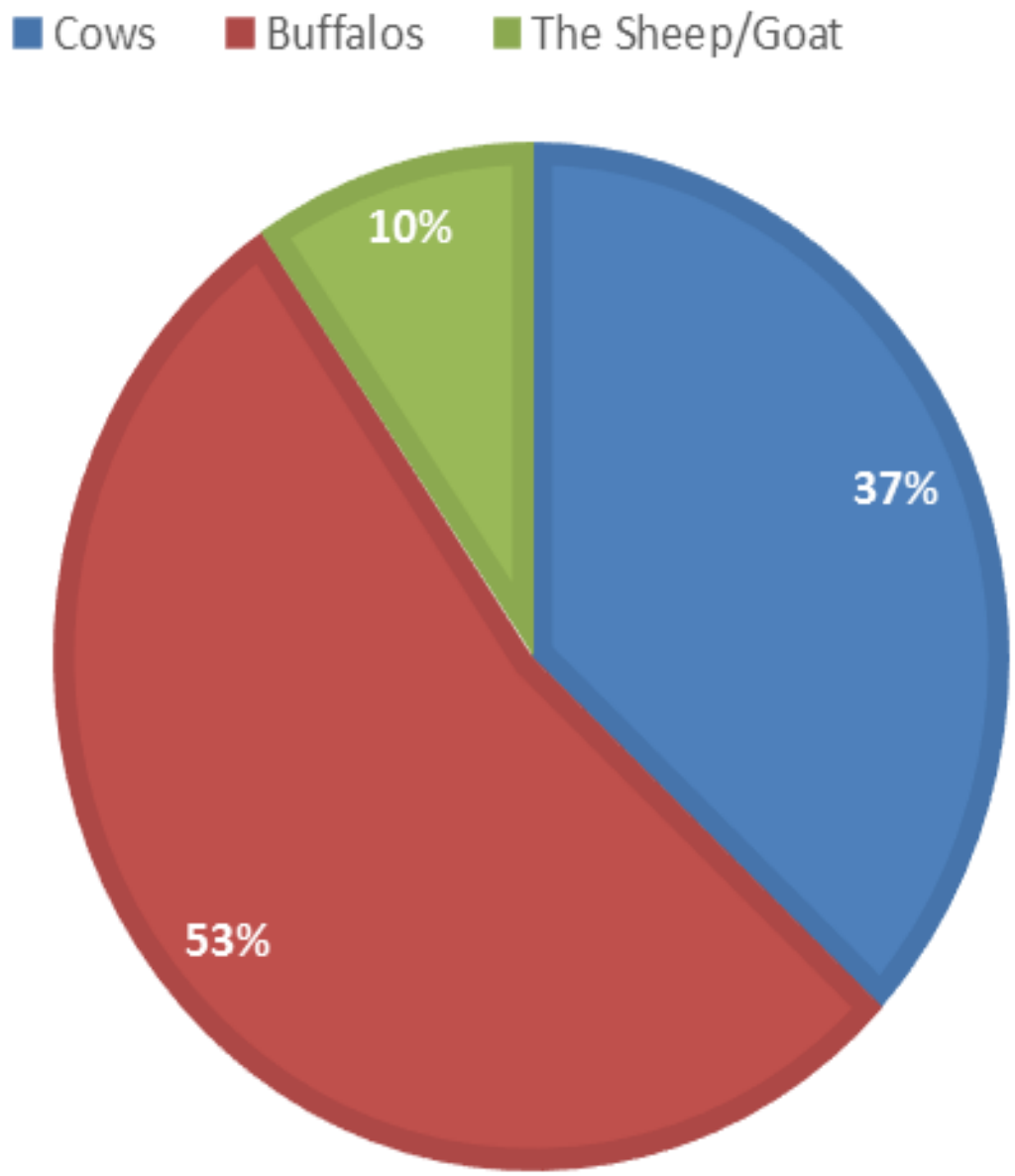
Coping Strategies Adopted by Households



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**

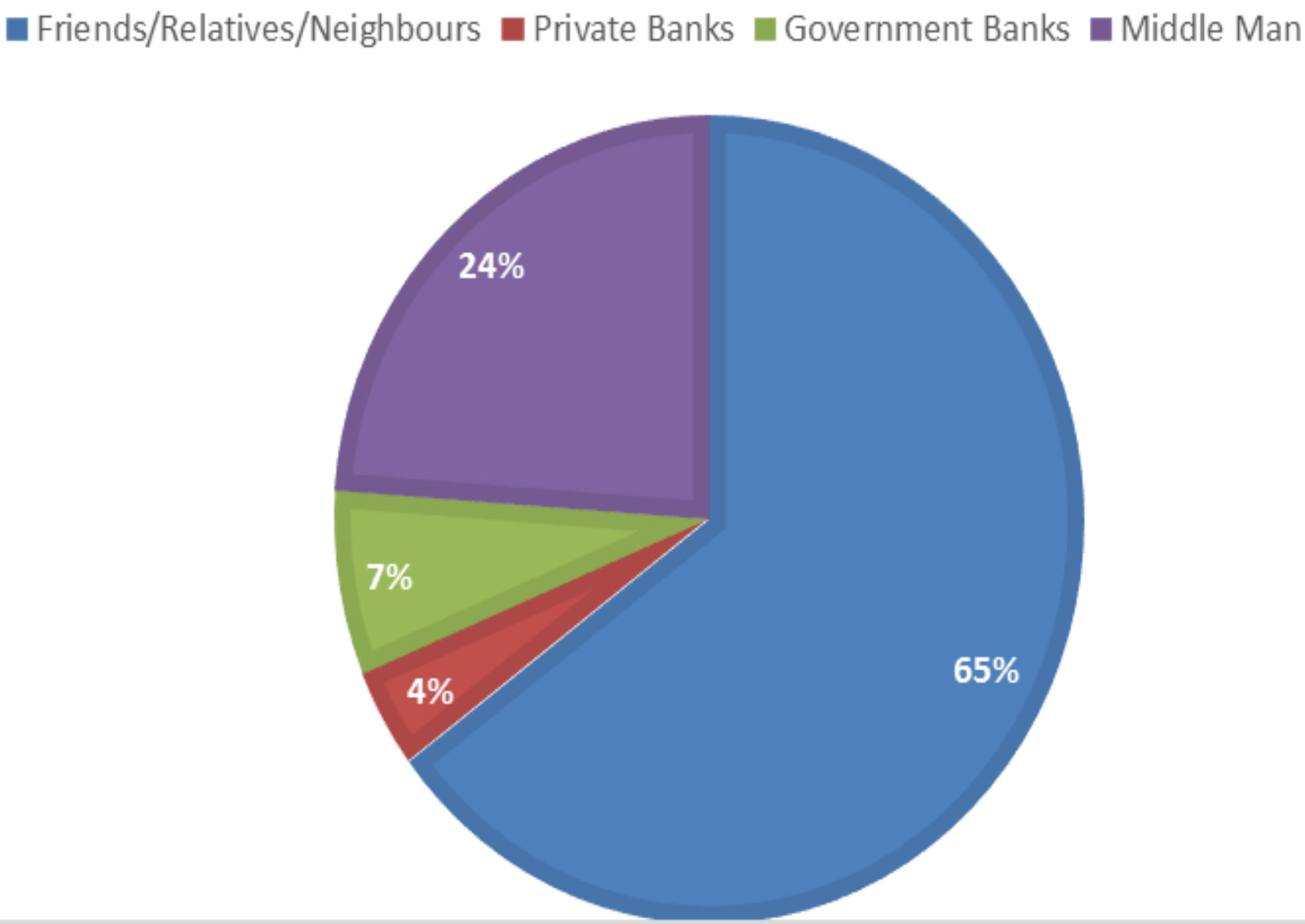
Components of Assets Disposal



Components of Borrowings

		Number of Households			
Village	Total 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**

Components of Borrowings



Flood-forecasting Information

	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**

Government Cash Grants

	Flood Exposure								
	Moderate			Severe			Very Severe		
Village	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)

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	

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

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 %.**

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 %.**

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

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 %.**

Summary and Recommendations

Summary

- The study have manifested that majority of household have been severely exposed to the floods and level of exposure varies among the households even of same villages.
- Households have been unable to save only immoveable possessions, standing crops and rooms. Households' made of raw bricks have suffered more in these losses than cemented houses.
- Households have relied upon major three type of coping strategies after the floods: borrowings, assets disposal and government cash grants.
- All shock factors are significant determinants of households coping strategies while for government cash grants demographic factors have significant role.
- 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 role of overwhelming political economy.

Recommendations

- Transparent distribution mechanism and target-based approach will increase the effectiveness of government flood-relief grants.
- 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.

THANK YOU!

Households Losses in 2014 Floods and Coping Strategies
A Study of Chiniot, Punjab

Dr. Nasir Iqbal
Pakistan Institute of Development Economics, Islamabad

and

Ameer Hyder
Pakistan Institute of Development Economics, Islamabad

Pakistan Institute of Development Economics
Islamabad
2015

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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.

1. Introduction

1.1. Motivation of the Study

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 has 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 (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). 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). "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. Significance and Objectives

Literature suggests that coping strategies vary along with different regions and adoption of these strategies is contingent to socioeconomic factors like households' head income level, education, and physical endowments. The literature revolves around these strategies: borrowings, assets disposals, local aids and migration, but there are some missing elements in the literature like government involvement in ameliorating the households' coping abilities, components of

borrowings and assets disposals. Massive government involvement is inevitable during such emergent shocks and can be examined 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. 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. After suffering from severe shocks like floods, households take actions for revival and rehabilitation of normal life which are called coping mechanisms. What really missing is that do households really rely on government grants and aids as they rely on other type of coping strategies like borrowings and asset disposals. On other side households depend upon borrowings and asset disposals but still the questions are unanswered; what are the borrowing sources of the households and what type of assets are disposed. It is imperative to focus on these angles and, hence, apart from testifying the theories available in literature we have developed the case study to answer the aforementioned questions which will be the contribution of this study in the existing literature. We have chosen one of the most vulnerable and flood-prone district of Pakistan, Chiniot, which has highly suffered from flood of 2014. If the study finds the high reliance of households on the government financing then it will be gateway to further research in this area like what necessary measure are required to assure that every household gets equal chance to get these financing and how this financing can be make more targeted. We will also construct flood exposure index, which is not available so far, for this district which can become the basis of this type of index for national level to assess the severity of floods and damages in different areas of the country and government will be able to focus on these areas accordingly. This index will also be helpful tool for the government to design the targeted policy framework for mitigation of floods in these areas.

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". 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 savings. And, significant determinants of these strategies would be shock and demographic factors.

Study comprises in five chapters. First chapter is introduction which includes the background, motivation and significance of study, and objectives and hypothesis. Review of literature have been drawn in next chapter and third chapter is all about data and methodology of the study. Chapter fourth 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.

2. Review of Literature

This chapter compiles the literature review of the study under four sections.

2.1. 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.

2.1.1. 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:

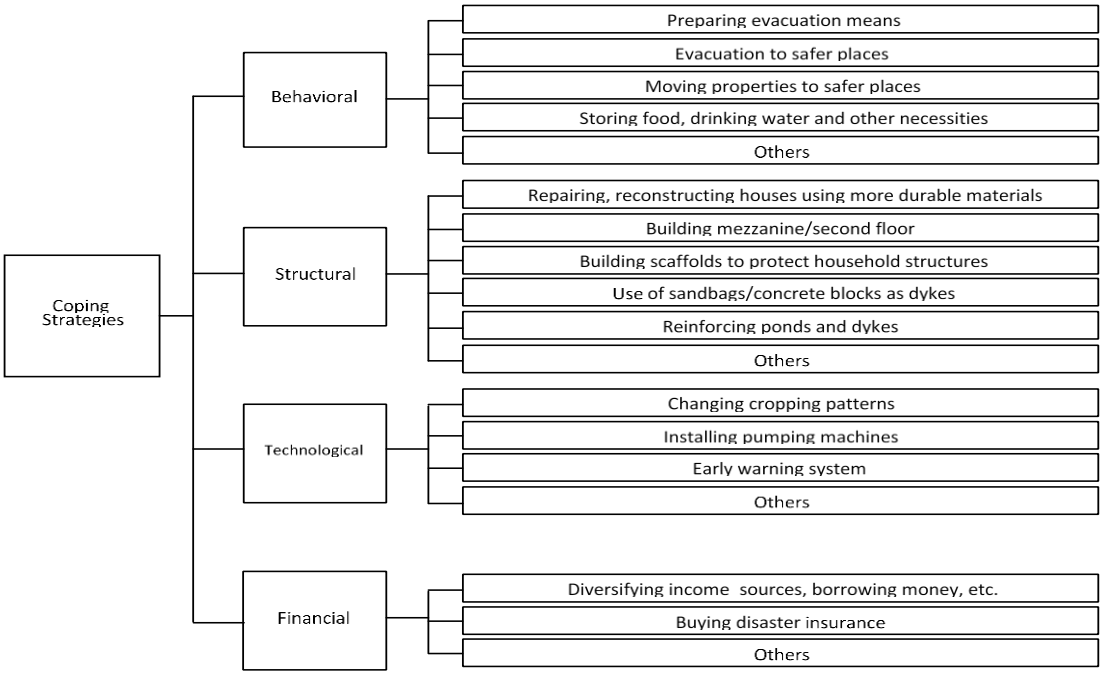
1) Risk reducing strategies – to achieve income smoothing or secured sources.

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:



2.1.2. 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.

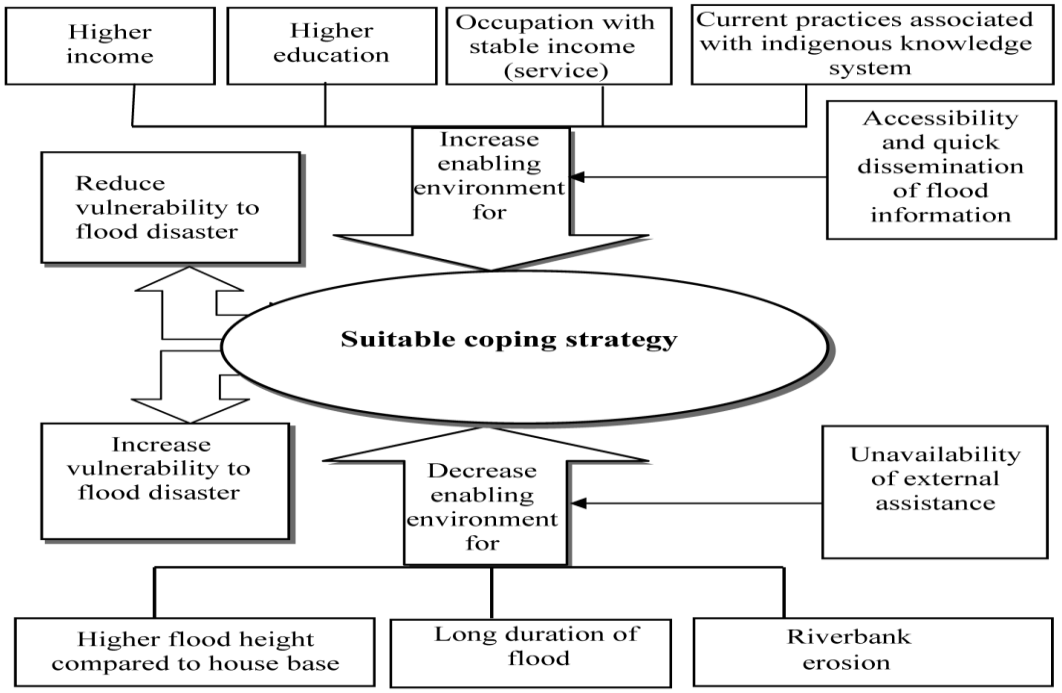
2.2. Empirical Evidence

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.).

2.3. 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. Methodology and Data Construction

The present chapter deals with the methodology and data construction used in the study.

3.1. Modelling Framework

There are multiple coping strategies that are simultaneously chosen 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.

3.1.1 Models for Estimation of Determinants of Coping Strategies

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

3.1.1.1. 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.

3.1.1.2 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.

3.2. 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.

3.2.1. 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.

3.2.2. 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).

3.2.3. 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.

3.2.4. 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.

3.3. 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 3.1 Construction of Flood Exposure Index

	Original Variable		Constructed Category Variable	
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. 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 3.2 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.

3.5. 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.

4. Households Losses and Coping Strategies

The present chapter deals with the losses of households in the consequence of floods and coping strategies adopted by households.

4.1. 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.

4.1.1. 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.

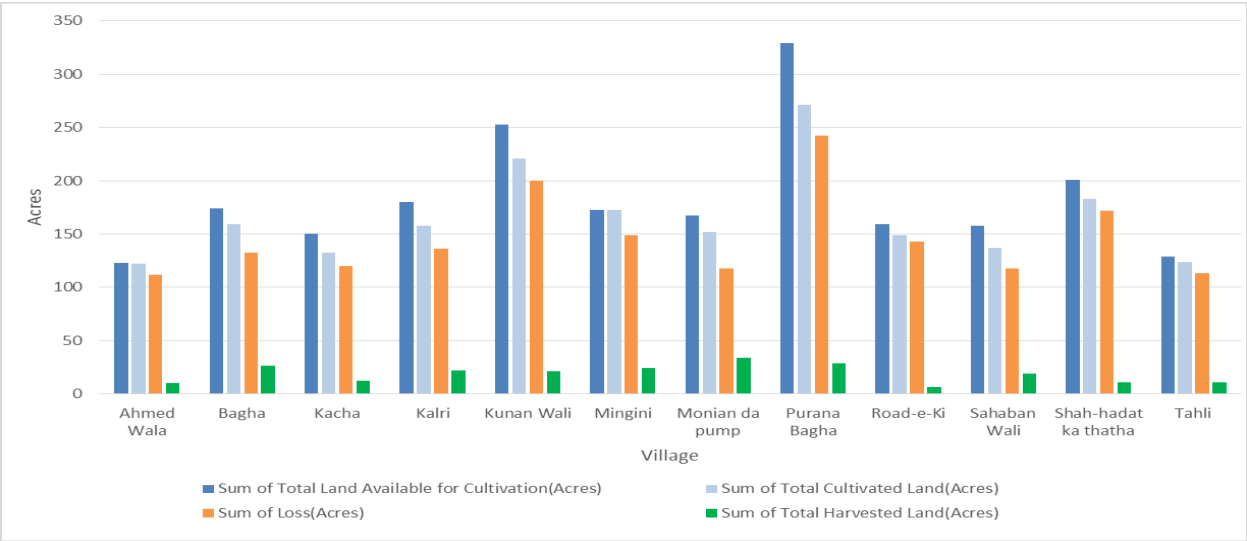
Table 4.1 Aggregate Agricultural Losses Note: Percentage is given in parenthesis.

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**

Village Name	Flood Exposure	Total Cultivated Land (acres)	Total Harvested Land (acres)	Loss (acres)	Loss in Value (Rs Thousand)
	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 4.1 Aggregate Agricultural Losses



bars in the figure 4.1. 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 44, 31, 11 and 4, respectively, whereas 10 percent entails with other type of crops (includes all crops other than the major four crops).

Table 5.2 Crop-wise Losses

	Acres									
Village	**Total Land Available for Cultivation**	**Total Cultivated Land**	**Sugarcane**	**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**

4.1.2. 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 4.3 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
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

Flood Exposure	Villages	Rooms (%)		Total Number of Rooms	Loss of Rooms (%)		Total Affected Number of Rooms
		Cemented	Raw Bricks		Cemented	Raw Bricks	
Moderate							
	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.

4.2. 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.

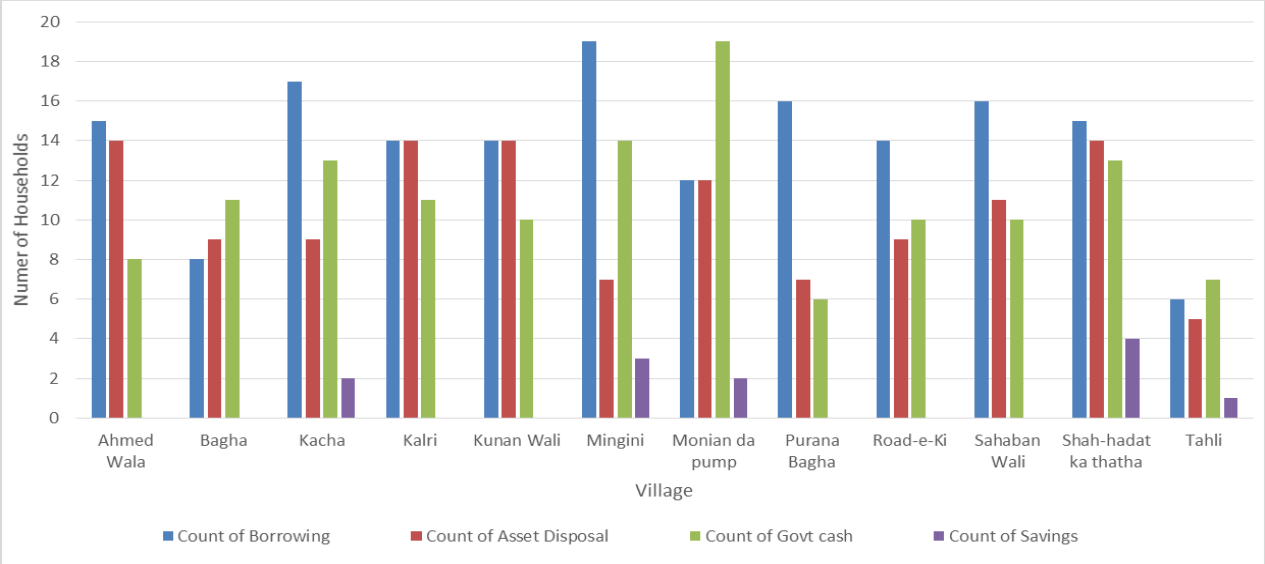
Table 4.4 Coping Strategies Adopted by Households

Village	Number of Households				Total Households
	Borrowing	Asset Disposal	Savings	Government Cash Grant	
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

Village	Number of Households				Total Households
	Borrowing	Asset Disposal	Savings	Government Cash Grant	
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 4.2 Coping Strategies Adopted by Households



One hundred and sixty-six 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.

4.2.1. 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 4.5 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.

4.2.2. 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.

One hundred and fourteen households borrow from friends/relatives/neighbours while 42 households get money from intermediaries, 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.

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

Table 4.6 Components of Borrowings

Village	Total Number of Households	Number of Households			
		Friends/Relatives/Neighbours	Private Banks	Government Banks	Intermediaries
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**

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

Village	Source of flood-forecasting information	
	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. Seventy-two 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]

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
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.

4.3. 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 also been checked by both models.

4.3.1 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 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 4.10. Hence, households

head have received government cash grants and avoided from borrowing and asset disposal.

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 but 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 %.

5. Summery and Recommendations

5.1. 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. Seventy-two 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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