IMPACT OF FLOODS 2010 ON HOUSEHOLD WELFARE IN NORTHERN SINDH DISTRICTS: ESTIMATION OF HOUSEHOLD CONSUMPTION OF SELECTED FOOD ITEMS

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ABSTRACT

The floods 2010 is being deemed as one among the biggest natural disasters in the human history given the magnitude of losses to human lives and the economic damages to the livelihoods of the people affected. This flood affected 22 million people directly and indirectly inundating 20% of the area of Pakistan. The effect of floods was deeper and colossal in the several districts of Sindh province. These districts include Kandhkot-Kashmore, Jacobabad, Shikarpur and Qamber-Shahdadkot, Dadu and Thatta. Present study has estimated welfare loss to the households of the flood affected districts of Kandhkot-Kashmore, Jacobabad, Shikarpur and Qamber-Shahdadkot as the worst affected districts in the province. Here fall in the household budget shares allocated to the selected food items has been taken as the proxy for the welfare loss. Marshallian household demand equations of the selected food items have been estimated using Ordinary Least Squares Method. Official sources of international and national organizations and institutions have been intensively exhausted for time series data from 2004 to 2013. The estimated welfare loss has been as high as the -22% in the budget share in 2010 in the selected districts. Further, the loss in budget shares has been reliable and valid as the previous literature suggests that there was a rise in the food prices by 17% approximately during the same time in the flood affected areas.

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Keywords: Floods, Household Welfare, Econometrics, Marshallian Demand Estimation

INTRODUCTION

Natural disasters and climatic changes leading to flash floods and temperature variations cause serious damages to the human and natural systems. The frequency of these disasters has been on rising trend during past decades (Diffenbaugh, Pal, Trapp, & Giorgi, 2005). These disasters can have heavy toll on the human systems particularly

in rural areas where households mostly rely on agriculture based resources. In 2010 the flash floods caused by the heavy monsoon rains inundated 20% of Pakistan's total area and brought it under water (Juren & Khan, 2010). The total losses due to the direct damage to infrastructure, (including private and public sector buildings and roads) and indirect damage due to the loss in the key sources of livelihood such as live-stock and standing crops and damage to the warehouses. The income loss to the households in flood affected areas was because of the direct damage to the standing crops and the livestock (Kirsch, 2011). Total population affected has been counted to 22 million across the area of 100,000 kilometers (NDMA, 2012). According to the reports (Kirsch, 2011) the most seriously flood affected component is the household economy. Whereas the greater impact of floods in Pakistan was visible in rural areas (69.5%) than in urban areas (33.3%). The households even 3 months after the floods 66% of the households in these areas were not having enough income to buy essential food items and medicines. The province of Sindh was severely affected with the damages of the flood. The summary of total estimated province or region wise damage is presented in the following table 1.

TABLE-1
TOTAL ESTIMATED DAMAGE DUE TO FLOOD 2010

Province/area	Damage Costs		Percentage	
	PKR Million	US $ Million		
AJK	7,303	86		0.85
Balochistan	52,676	620		6.16
FATA	6,271	74		0.73
Gilgit-Baltistan	4,165	49		0.49
KPK	99,625	1,172		11.66
Punjab	219,272	2,580		25.65
Sindh	372,341	4,380		43.56
Federal Cross Cutting Sectors	93,117	1095		10.89
Total	**854,770**	**10,056**		**100**

Source: Preliminary Damage and Need Assessment by Government of Pakistan in collaboration with Asian Development Bank and United nations on Flood 2010 (Juren & Khan, 2010).
PKR = Pakistani Rupee

According to table 1, the maximum losses due to the floods 2010 happened in the province of Sindh that is PKR 372341 m (US $4380 m) which is equal to 43.56% of the total flood damage cost in the country. On the other hand, the other three provinces suffered the remaining 56.5% losses with 25.65%, 11.66% and 6.16% respectively in Punjab, Khyber Pakhtunkhwa and Baluchistan. The damage of the flood varied between the sectors with major damages to the livestock and standing crops in agriculture sector and damaged houses in rural areas. Following table 2 presents the summary of flood losses by sectors and subsectors for the country.

TABLE-2
SUMMARY OF FLOOD 2010 ESTIMATED DAMAGE IN PAKISTAN BY SECTOR AND SUBSECTORS

	Sector	Total Damage		Percentage	
		PKR Millions	US $ Millions	Sectoral	Total
I	**Social Infrastructure**				
	Housing	135,014	1,588	81.48	15.80
	Health	4,223	50	2.55	0.49
	Education	26,465	311	15.97	3.10
	Sub Total	165,702	1,949	100	19.39
II	**Physical Infrastructure**				
	Irrigation and Flood Management	23,600	278	17.71	2.76
	Transport and Communication	112,911	1,328	65.6	13.21
	Water Supply and Sanitation	9,306	109	5.41	1.09
	Energy	26,300	309	15.28	3.08
	Sub Total	172,117	2,024	100	20.14
III	**Economic Sectors**				
	Agriculture, Livestock and Fisheries	428,804	5,045	84.08	50.17
	Private Sector & Industries	23,931	282	4.69	2.8
	Financial Sector	57,251	674	11.23	6.7
	Sub Total	509,986	6,001	100	59.66
IV	**Cross Cutting Sectors**				

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Governance	5,976	70	85.76	0.7
Environment	992	12	14.24	0.12
Sub Total	6,968	82	100	0.82
Grand Total	854773	10056		100

Source: Preliminary Damage and Need Assessment by Government of Pakistan in collaboration with Asian Development Bank and United nations on Flood 2010 (Juren & Khan, 2010).

Above table 2 presents the breakup of total flood 2010 damages into four major sectors namely, Social Infrastructure (Housing, Health and Education), second Physical Infrastructure (Irrigation and Flood Management, Transport and Communication, Water Supply and Sanitation and Energy), third, Economic Sectors (Agriculture, Livestock and Fisheries, Private Sector and Industries and Financial Sector) and fourth Cross Cutting Sectors (Governance and Environment). According to table 2, the maximum damage happened to the economic sectors (59.66%) that include Agriculture, Livestock and Fisheries (50.17%), Private Sector and Industries (2.8%) and Financial Sector (2.8%). Following chart 1 depicts the summary of the sectoral losses due to flood 2010.
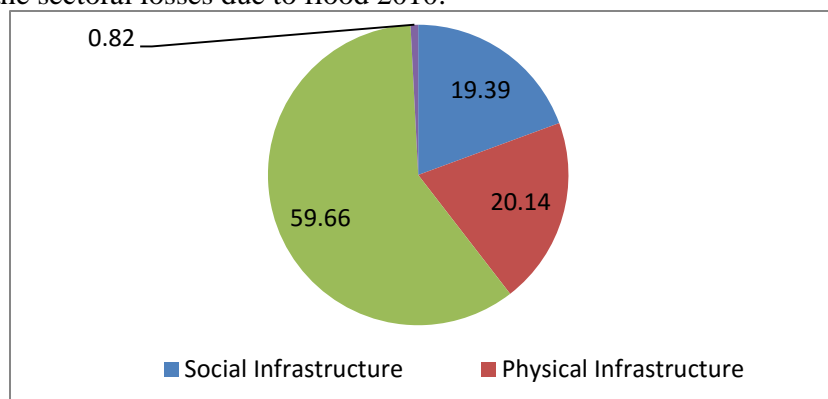
FIGURE-1
SUMMARY OF SECTOR WISE DAMAGE IN PERCENT DUE TO FLOOD 2010

Further detailed information on the districts of Sindh Province affected and their severity has been surveyed and the losses are estimated by OCHA (Office for the Coordination of Human Affairs) present a detailed picture of the province (UNOCHA, 2010).

According to the survey (UNOCHA, 2010), the worst affected districts in Sindh province by all respects are Jacobabad, Kashmore, Shikarpur and Qamber-Shahdadkot. The summary of the statistics on the damage/losses of area/crop area, cattle heads and the damaged houses in Sindh and the selected districts for study is presented in table 3 given below.

TABLE-3

FLOOD DAMAGES (2010) ON VILLAGES, CROP AREA, PERSONS AFFECTED AND HOUSES DAMAGED IN SELECTED DISTRICTS IN SINDH PROVINCE

		Kashmore	Shikarpur	Jacobabad	Qamber Shahdadkot	Total (Percent)	Sindh Total
Villages Affected	Number	1000 (13.74%)	1,359 (18.68%)	1,123 (15.43%)	550 (7.56%)	4,032 (55.41%)	7,277
Persons affected	Number	615,000 (8.8%)	778,000 (11.13%)	892,500 (12.77%)	980,500 (14.03%)	3,266,000 (46.73%)	6,988,491
Crop Area Affected	Acres	400,124 (16.31%)	110,189 (4.49%)	687,000 (28.0%)	497,380 (20.27%)	1,694,693 (69.07%)	2,453,503
Houses Damaged	Katcha (mud)	74,545 (8.84%)	94,303 (11.13%)	108,182 (12.77%)	118,848 (14.03%)	847,089 (46.73%)	847,089
	Pakka (cemented)	18,636 (8.93%)	23,576 (11.29%)	27,045 (12.95%)	29,712 (14.23%)	98,969 (47.41%)	208,772
	Total	93,190 (8.825%)	117,890 (11.16%)	135,239 (12.81%)	148,574 (14.07%)	494, 847 (46.77%)	1,055,961 (100%)
Cattle Heads	Number	17,500 (6.67%)	838 (0.32%)	615 (0.23%)	44,039 (16.80%)	62,992 (24.03%)	262,183

Source: MapAction UNOCHA (2010)

Table 3 presents summary of the flood damages from the surveyed data on the number of villages and persons affected, crop area damaged (in acres) and the number of Katcha (mud) and Pakka (cemented) houses damaged during flood. The statistics reveal that the four districts under study cover 55.41% of the total number of villages affected, 46.73% of the total persons affected, 69.07% of the crop area of the province and 46.77% of the total number of houses

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damaged in the province. Further, in case of the cattle heads the total impact is 24.03% in the selected districts, that is 24.03% of the total cattle heads died in the province happened in the selected four districts. This suggests that the scope of the study is sufficiently large for generalizability of the results over the whole province. The above paragraphs have been delineating the extent of the damage caused due to the floods 2010 to the social and physical infrastructure and the housing, agriculture and livestock as the key sources of the household livelihood in the province.

On the other hands, the region's commodity market was severely distorted in terms of supply-demand gaps and price distortions. To understand the market distortions, it is imperative to have an eye upon the economic resources of livelihood in the region. The districts selected for the study namely Kashmore, Jacobabad, Shikarpur and Kamber-Shahdadkot are dominantly agriculture based with majority of the occupations of the inhabitants agriculture and livestock affiliated. The damage to the houses (both Katcha or mud and Pakka or cemented), cattle heads perished and the loss of the standing crop in the fields led towards loss of livelihood and stable stream of the income flows to maintain the economic living. On the other side, the overall losses in agriculture and livestock created shortage of food and nonfood items causing price distortions. This ultimately affected the household budget shares spent on the household consumption. Present study has estimated budget shares of the households for selected items namely Wheat, Milk, Pulses (Moong), Chicken, Beef, Fish, Banana, Apple, Potato, Tomato, Onion, Other Vegetables, Sugar, Gram and Chilies. The total household budget share spent on the selected 15 household food items makes 55% of the total monthly income of the household. The estimated Marshallian Demand quantities of the selected items (in natural logs to avoid any trend related data discrepancies) are used to estimate the budget shares for last 10 years using actual prices and the quantities (in KGS) and the household monthly income. All data has been taken from the Household Income Expenditure Surveys (HIES) for various years. The tables on prices and quantities of the selected food items and household incomes are given in Appendix (Tables 4 and 5). Ordinary Least Squares Method of regression is used to estimate the demand equations (presented in Table 5 in Appendix).

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LITERATURE REVIEW

There are several studies who have estimated welfare losses in the rural areas because of floods and other natural disasters. Kousky (2012) has reviewed literature on the welfare effects of the natural disasters and cited work of (Rose, 2012) quoting that the welfare of the households may be estimated in two ways: ex post (as compensation required to avoid loss) or ex ante (evaluation of the uncertainty in monetary terms). Another study (Messner et al., 2007) has also provided guidelines for flood damage estimation meant for the practitioners of governments authorities as well as the nongovernmental organizations and the executing authorities dealing with ex-ante flood damage evaluation. In case of agriculture damages, classification of damages due to flood can be done in to three categories as (Dutta, Herath, & Musiake, 2003) has been suggesting. They are damages to the farm houses, farm infrastructure and farm product. In a developing country setting, the agriculture damage may shrink to the loss of livestock and standing crops that is the sole source of livelihood for the farmers. These farmers are mostly from the poor households and their ability to cope with the risks and uncertainties of natural disasters make them even more vulnerable. (Fafchamps, 2003) and (Dercon, 2005) have concluded in their research that the problem of flood damage exaggerates for the poor households who are not insured and governmental arrangements have not been sufficient in rural areas in developing countries.

Tenancy and the share cropping has been the deep-seated feature of agrarian society in the province. The social and economic vulnerability of the inhabitants of the province of Sindh is evident from the empirical studies (ADB, 2010) such as poverty rate in the rural part of the province in 2010 has been recorded as 53%. The fundamental trigger behind such enormous poverty rate in the rural parts of the province has been known as the concentrated land holding in the hands of few giant landlords (share of landholding of 25 acres or above is 88% that is highest in the country in contrast the same is 38.6% in Punjab and 21% in KPK and 81.4% in Baluchistan). Further, (Zaidi, 2005) has highlighted that fact that the share of Sindh districts in the bottom quartile has risen from 23.5% in 1970s to 35.2% in 1990s. Though the land reforms introduced in the country have not been very successful in effectively impacting the socioeconomic fiber of the whole country. Yet those reforms have

failed more miserably in Sindh reflected from the extreme divide between the land holding by farmers and the big land lords (feudal). Given the region characterizing extreme poverty in an agrarian society where the life as a whole relies upon cropping, harvesting and livestock, floods seem to be a horrific incident washing away all of the sources of livelihood from people around. The agriculture income in rural areas stems from cropping of wheat (40% of total area), rice (14%) and cotton (12%) in Pakistan (Dawn, 2008)[4]. Given the profile of selected districts, majority of the inhabitants of the region are involved in cropping of rice, wheat, sugarcane, cotton and livestock. Following table 4 presents the summary of production of selected agriculture items.

TABLE 3
AGRICULTURE OUTPUT OF IMPORTANT CROPS AND LIVESTOCK FOR SELECTED DISTRICTS

	Wheat	Cotton	Rice	Sugarcane	Cattle
	Tones				
Kashnore-Kandhkot	94.2	-	280.6	2.5	190872
Jacobabad	37.7	-	294.7	5.4	507240
Shikarpur	88.2	0.5	348.9	0.9	
Qamber-Shahdadkot	89.3	-	288.8	9.7	229617

Source: Global Research Insight for Development (Javed, 2014)

Moreover, flood damages have been classified in several studies as direct and indirect damages. The direct damages are defined as the losses which happen after the physical contact of flood water with humans, infrastructure, property or any other physical objects. Whereas the indirect damages are produced from the immediate impacts and occur – in space or time – outside the flood event (Merz, Kreibich, Schwarze, & Thieken, 2010). See for example (Parker, Green, & Thompson, 1987) and (Smith & Wards, 1998) for further classification of both impacts in tangible and intangible damages contingent on whether the losses can be monetarily assessed.

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[4] Since the figures are taken from Dawn, a well know newspaper of Pakistan, this may be treated as the best approximation.

However the interpretations of each type of losses differ vehemently (Jonkman, 2007). The assessment of loss of human life (the direct intangible loss) has been very tricky to be evaluated and involves complex models and systems of equations like (Duiser, 1989) or (Waarts, 1992)[5] using 1953 data on floods in Netherlands (also cited in Jonkman, 2007). Further these models have been incorporating the behavioural losses (for non-marketed values etc.) falling in the category of intangible damages of the natural disasters. Macroeconomic losses are assessed on the basis of the future valuation of the individuals in the context of their contribution in the economic production of the region/country. The idea here is not to estimate the intangible losses of flood rather the tangible losses in the form of loss in the welfare (fall in household budgeted share in consumption) effects of flood-prone households in a developing country setting.

METHODOLOGY AND ECONOMETRIC MODEL

A basic demand model in following general form has been applied to estimate the quantities demanded by the households in the selected districts.

$$Q_d = \alpha_0 - \alpha_1 P_{self} + \alpha_2 P_{subs} - \alpha_3 P_{comp} + \alpha_4 Y^d$$

Here Q_d is quantity demanded, P_{self} is the price of the good, P_{subs} is the price of substitute good and P_{comp} is the price of complementary good and Y^d is the disposable income of the household. The data on prices, quantities demanded and average household income have been taken from Household Income Expenditure Surveys of different years. Total of 15 household goods have been selected that represent the 55% approximately of the total monthly average household expenditure. Other goods like electricity, clothing or transportation goods are not included in the analysis due to their heterogeneity and less relevance in times of natural disasters flood in our case. The estimated demand equations are given in the following table 5.

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[5] The two papers are originally written in Dutch and translated using google translate for understanding purpose.

TABLE-5
ESTIMATED DEMAND EQUATIONS OF THE SELECTED FOOD ITEMS

	Food Item	
1	Wheat	$Q_d^{wheat} = 4.084 - 0.374P^{wheat} + 0.469P^{rice} + 0.027Y$
2	Milk	$Q_d^{milk} = 3.655 - 0.012P^{milk} + 1.05P^{butter} + 0.0000057Y$
3	Moong	$Q_d^{moong} = 0.826 - 0.61P^{moong} + 0.96P^{masoor} + 0.639P^{otherveg} + 0.052Y$
4	Chicken	$Q_d^{chicken} = 1.009 - 0.666P^{chicken} + 0.628P^{fish} + 0.023Y$
5	Beef	$Q_d^{beef} = 0.487 - 0.75P^{beef} + 0.788P^{chicken} + 0.054Y$
6	Fish	$Q_d^{fish} = 0.914 - 0.35P^{fish} + 0.23P^{chicken} + 0.48P^{beef} + 0.012Y$
7	Banana	$Q_d^{banana} = 0.605 - 1.385P^{banana} + 1.097P^{apple} + 0.036Y$
8	Apple	$Q_d^{apple} = 3.565 - 1.073P^{apple} + 1.231P^{banana} + 0.077Y$
9	Potato	$Q_d^{potato} = 0.482 - 0.304P^{potato} + 0.629P^{onion} + 0.638P^{otherveg} + 0.146Y$
10	Tomato	$Q_d^{tomato} = 0.395 - 0.532P^{tomato} + 0.745P^{potato} - 0.218P^{otherveg} - 0.456P^{onion} + 0.132Y$
11	Onion	$Q_d^{onion} = 1.983 - 0.044P^{onion} + 0.006P^{potato} + 0.094P^{otherveg} + 0.003Y$
12	Other vegetables	$Q_d^{otherveg} = 1.936 - 0.756P^{otherveg} + 0.367P^{onion} + 0.205P^{potato} + 0.0026Y$
13	Sugar	$Q_d^{sugar} = 2.409 - 0.275P^{sugar} - 0.789P^{tea} + 0.102Y$
14	Gram	$Q_d^{gram} = 1.807 - 0.777P^{gram} + 0.128P^{moong} + 0.525P^{masoor} + 0.068Y$
15	Chilies	$Q_d^{chilies} = 1.261 - 1.175P^{chilies} + 0.619P^{potato} + 0.877P^{motherveg} + 0.08Y$

DATA

All-time series data has been taken from Household Income and Expenditure Surveys of various years published and released by Pakistan Bureau of Statistics, and official source of data dissemination in the country. The surveys are expensive and time consuming therefore are conducted in intermittent years. SPSS has been used to replace the missing values through linear interpolation. This might be the implicit limitation of the study, though with replaced values have not affected much the regression results for the estimated demands. The budget shares have been estimated on the basis of estimated demanded quantities of households for selected food items. All data has been transformed into natural log values because this transformation of data assists in avoiding the non-normality of the data due to trending and stationarity.

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RESULTS

Decline in the budget share in consumption of selected food items by the households in the four selected districts is estimated and presented in the table 9 in appendix of Marshallian household demanded quantities. The percentage in the household estimated quantity demanded is presented in the following table 6.

TABLE-6
YEAR ON YEAR PERCENTAGE CHANGE IN THE ESTIMATED HOUSEHOLD
MONTHLY CONSUMPTION OF SELECTED GOODS

	1	2	3	4	5	6	7	8
	Wheat	Milk	Moong	Chicken	Beef	Fish	Banana	Apple
	Percentage Change (Year-on-year)							
2005	14.10	-21.80	56.13	-3.82	8.38	4.54	7.90	-4.06
2006	3.26	-14.41	-2.07	-2.85	3.96	5.64	3.75	-2.81
2007	-3.71	16.84	1.01	2.44	-4.89	-5.54	-4.34	1.24
2008	0.57	0.00	1.10	0.48	1.14	0.21	0.76	1.63
2009	1.92	5.90	40.98	0.61	-1.83	-5.24	-4.56	0.96
2010	1.81	-19.18	-29.89	-3.04	6.93	11.68	9.41	-2.39
2011	-2.74	16.84	2.97	3.32	-2.97	-5.19	-3.06	4.17
2012	-0.91	0.00	-1.75	-0.78	-1.82	-0.34	-1.22	-2.58
2013	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

	9	10	11	12	13	14	15
	Potato	Tomato	Onion	other vegetable	sugar	gram	Chilies
	Percentage Change (Year-on-year)						
2005	72.64	-33.22	-5.01	-10.34	0.55	12.07	10.91
2006	-10.49	-2.74	1.54	-7.92	49.40	-4.75	-14.35
2007	8.35	0.01	-1.58	8.01	-34.48	3.50	14.80
2008	3.11	2.81	0.06	0.55	2.17	1.44	1.69
2009	57.44	-22.08	-5.56	0.76	-37.92	5.90	26.85
2010	-41.63	27.82	7.58	-8.19	145.10	-8.94	-31.50
2011	14.36	5.01	-1.47	9.06	-31.96	6.13	18.25
2012	-4.84	-4.39	-0.10	-0.88	-3.41	-2.29	-2.68
2013	0.00	0.00	0.00	0.00	0.00	0.00	0.00

In case of all goods, the estimated household consumption has fallen by varying extents ranging between -2.39% fall in apple consumption to -31.5% fall in the consumption of chilies. The demand for sugar, behaving like an outlier increased

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unconventionally by 145.1% in year 2010. This may be attributed to the estimated rising trend in the consumption of tea (sugar is a complementary good hereby) in the rural areas in Sindh between different income groups. Ahmad, Sheikh, & Saeed (2015) have concluded that the estimate tea and other beverages estimated consumption shows a rising trend from low income groups to high income groups. If the statistical evidence conforms the tendency of more consumption of tea as income of a household falls, our estimated results are valid and conform the empirical evidence. This is so because the flood affected households in rural sector had been through natural disaster that washed away their sources of livelihood leading towards consumption of more tea so more sugar (due to complementarity effect) in 2010. Several goods have shown a normal trend in 2010 but decreasing trend in the preceding years. This is because of the intervention by various donor agencies, government organizations, philanthropists and nongovernmental organizations. The chart presenting the line graph of the same percentage year-on-year change in the consumption of food items is presented in the graph 1 given in appendix. The general declining trend in the consumption pattern of all selected goods confirm with the initial notion of the paper that along with other effects, consumption patterns of the households are affected badly after 2010 floods.

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TABLE-7
SUMMARY OF ESTIMATED MONTHLY BUDGET SHARES OF HOUSEHOLDS IN SELECTED DISTRICTS

	1	2	3	4	5	6	7	8
	Wheat	Milk	Moong	Chicken	Beef	Fish	Banana	Apple
2004	3.89	3.95	6.41	1.35	1.07	1.42	5.76	1.52
2005	4.52	4.25	8.15	1.36	1.04	1.48	6.71	1.54
2006	4.36	4.01	7.56	1.33	1.03	1.48	6.47	1.49
2007	4.67	4.39	8.49	1.37	1.05	1.49	6.97	1.55
2008	4.52	4.25	8.15	1.36	1.04	1.48	6.71	1.54
2009	5.56	5.04	11.88	1.42	1.05	1.52	8.12	1.64
2010	4.26	3.91	7.31	1.32	1.03	1.47	6.27	1.49
2011	4.31	4.05	7.65	1.35	1.04	1.46	6.33	1.54
2012	4.52	4.25	8.15	1.36	1.04	1.48	6.71	1.54
2013	4.52	4.25	8.15	1.36	1.04	1.48	6.71	1.54

	9	10	11	12	13	14	15		Year-on-Year Percentage Change
	Potato	Tomato	Onion	other vegetable	Sugar	gram	Chilies	Total	
2004	7.02	1.19	2.30	2.15	4.96	1.08	2.91	46.98	
2005	10.51	0.99	2.27	2.04	5.02	1.14	3.16	54.18	15.34
2006	10.12	0.98	2.25	1.92	5.80	1.12	2.94	52.87	-2.42
2007	10.90	0.98	2.31	2.07	5.14	1.14	3.22	55.72	5.39
2008	10.51	0.99	2.27	2.04	5.02	1.14	3.16	54.18	-2.76
2009	15.51	0.87	2.33	2.18	4.48	1.22	3.86	66.68	23.07
2010	9.83	0.99	2.22	1.91	5.67	1.12	2.90	51.70	-22.47
2011	9.94	1.01	2.21	2.00	4.83	1.14	3.07	51.93	0.45
2012	10.51	0.99	2.27	2.04	5.02	1.14	3.16	54.18	4.34
2013	10.51	0.99	2.27	2.04	5.02	1.14	3.16	54.18	0.00
Average								54.26	

By closely looking at the last column of table 7 given above, the budget share spent on the selected items by the rural households in the selected districts has declined significantly in the year 2010. Almost all of the goods observed decline in expenditure except on sugar (increased from 4.48 PKR in 2009 to 5.67 PKR in 2010). Last column with heading "Total" presents the total budget share of a rural household spent on the selected goods (food items) in a given year. On average the selected basket of goods covers 54.26% of the household budget which is a reasonable cover offered by the study.

The last column is presenting the year on year percentage change in the total household budget share allocated for the selected

food items. The estimated fall in the allocated budget share has shown a fall of 22.5% in the year 2010. This is quite significant fall in the household budget share due to the flood damages which reflects an immediate loss in the household welfare due to the flood damages in standing crops and livestock as a major source of rural livelihood. The study, however, does not quest for the estimated causes of fall in the budget shares. It may be because of the loss in the income or because of the rise in prices due to the shortage of supply of selected items. It has been estimated that the rise in wheat as a major staple food item in the district Sukkur (Closest district to Kashmore, Jacobabad and Shikarpur and a major trading hub of the region) due to the shortage of food items in 2010 is 17% (from PKR 240 to PKR 280 per 10 KG) (EMMA, 2010). Another study suggested that the rise in Consumer Price Index in September 2010 is recorded as high as 15.7% (Kronstadt, Sheikh, Pervaze, & Vaughn, 2010). Given the statistical evidence on the rise in inflation during year of 2010, it may be carefully predicted that the fall in the budget share on the selected food items may be partly attributed to the rise in consumer price index.

   Appendices: Prices, Quantities and Household Monthly Income of selected food items in PKR per KG.

TABLE-9

DOMESTIC MONTHLY HOUSEHOLD QUANTITIES OF THE SELECTED FOOD ITEMS IN KG/LITERS

	1	2	3	4	5	6	7	8	9	10
	Wheat	Milk	Moong	Chicken	Beef	Fish	Banana	Apple	Potato	Tomato
2004	50	36.57	0.82	2.53	2.36	2.33	38.36	2.76	7.05	3.01
2005	45.46	35.95	0.8	2.43	2.3	2.45	37.16	2.66	7.88	2.69
2006	43.01	36.6	0.73	2.31	2.1	2.57	34.65	2.41	7.04	2.22
2007	45.46	35.95	0.8	2.43	2.3	2.45	37.16	2.66	7.88	2.69
2008	45.46	35.95	0.8	2.43	2.3	2.45	37.16	2.66	7.88	2.69
2009	44.23	35.76	0.83	2.45	2.36	2.31	38.74	2.67	8.08	2.67
2010	44.58	34.86	0.83	2.43	2.38	2.58	36.87	2.78	9.33	2.86
2011	45.46	35.95	0.8	2.43	2.3	2.45	37.16	2.66	7.88	2.69
2012	45.46	35.95	0.8	2.43	2.3	2.45	37.16	2.66	7.88	2.69
2013	45.46	35.95	0.8	2.43	2.3	2.45	37.16	2.66	7.88	2.69

	11	12	13	14	15
	Onion	other vegetables	sugar	Gram	Chilies
2004	6.11	2.78	7.66	0.71	3.27
2005	5.99	2.42	9.09	0.74	2.62
2006	5.98	2.28	10.34	0.81	2.22
2007	5.99	2.42	9.09	0.74	2.62
2008	5.99	2.42	9.09	0.74	2.62
2009	5.94	2.44	9.19	0.74	2.45
2010	5.94	2.17	9.16	0.68	2.54
2011	5.99	2.42	9.09	0.74	2.62
2012	5.99	2.42	9.09	0.74	2.62
2013	5.99	2.42	9.09	0.74	2.62

TABLE-10
ESTIMATED DEMAND EQUATIONS OF THE SELECTED FOOD ITEMS (2004-2013)

		Unstandardized Coefficient		t(sign.)	R^2	F (Sign)
		B	Std. Error			
	Wheat Demand					
1	Constant	4.084	0.197	20.726 (0.00)	0.946	35.149 (0.000)
	Ln_P_Wheat	-0.374	0.075	-4.970 (0.003)		
	Ln_P_Rice	0.469	0.075	6.249 (0.001)		
	Ln_HH_M_Income	0.027	0.025	1.067(0.032)		
	Milk Demand					
2	Constant	3.655	1.381	26.537 (0.0)	0.317	15.08 (0.000)
	Ln_P_Milk	-0.012	0.022	-0.530 (0.0)		
	Ln_P_Butter	1.050	1.827	0.574(0.002)		
	Ln_HH_M_Income	0.0000057	0.001	0.334(0.001)		
	Moong demand					
3	Constant	0.826	0.440	1.874 (0.0)	0.76	17.2 (0.000)
	Ln_P_Moong	-0.610	0.432	-1.411(0.00)		
	Ln_P_Masoor	0.96	2.062	0.951(0.0)		
	Ln_P_Other veg.	0.639	2.135	0.721(0.0)		
	Ln_HH_M_Income	0.052	0.072	0.768(0.0)		
	Chicken demand					
4	Constant	1.009	0.221	4.563	0.724	8.247 (0.004)
	Ln_P_Chicken	-0.666	0.209	-5.432		
	Ln_P_Fish	0.628	0.193	5.188		
	Ln_HH_M_Income	0.023	0.031	0.740		
	Beef Demand					
5	Constant	0.487	0.569	0.855 (0.001)	0.82	9.35 (0.000)
	Ln_P_Chicken	0.788	0.521	0.701 (0.00)		
	Ln_P_Beef	-0.75	-0.469	-1.513 (0.001)		
	Ln_HH_M_Income	0.054	0.077	0.701 (0.00)		
	Fish Demand					
6	Constant	0.914	0.075		0.994	171.89(0.00)
	Ln_P_Fish	-0.35	0.21	12.179 (0.0)		
	Ln_P_Chicken	0.923	0.069	13.461 (0.0)		
	Ln_P_Beef	0.948	0.062	5.047(0.0)		
	Ln_HH_M_Income	0.012	0.010	1.178(0.0)		
	Banana Demand					
7	Constant	0.605	0.741	8.911 (0.0)	0.85	16.599 (0.00)
	Ln_P_Banana	-1.385	0.370	-3.739(0.0)		
	Ln_P_Apple	1.097	0.317	3.460(0.0)		
	Ln_HH_M_Income	0.036	0.04	0.890 (0.0)		
	Apple Demand					
8	Constant	3.565	1.687	2.113 (0.0)	0.29	80.14 (0.0)
	Ln_P_Banana	1.231	0.843	1.460 (0.00)		
	Ln_P_Apple	-1.073	0.721	-1.448(0.00)		
	Ln_HH_M_Income	0.077	0.092	0.845 (0.001)		

GRAPH-1
YEAR ON YEAR PERCENTAGE CHANGE IN THE HOUSEHOLD
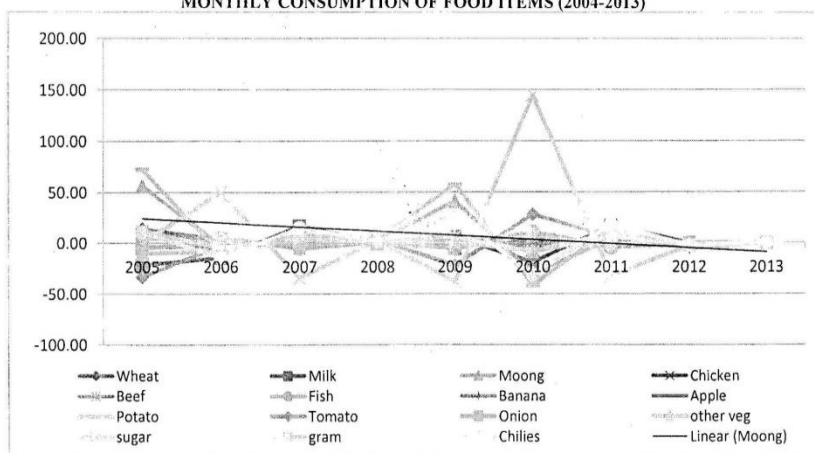MONTHLY CONSUMPTION OF FOOD ITEMS (2004-2013)

TABLE-12
SUMMARY OF YEAR ON YEAR PERCENTAGE CHANGE IN ESTIMATED
MONTHLY BUDGET SHARES OF HOUSEHOLDS IN SELECTED DISTRICTS

	Wheat	Milk	Moong	Chicken	Beef	Fish	Banana	Apple
2004								
2005	16.34	7.67	27.07	0.42	-2.70	4.58	16.58	1.18
2006	-3.52	-5.64	-7.24	-2.35	-1.74	0.19	-3.64	-3.30
2007	6.93	9.39	12.34	2.92	1.82	0.57	7.83	3.63
2008	-3.07	-3.11	-4.03	-0.50	-0.05	-0.76	-3.75	-0.21
2009	23.03	18.55	45.84	4.59	0.66	2.76	20.99	6.50
2010	-23.52	-22.37	-38.44	-6.98	-2.40	-3.12	-22.78	-9.33
2011	1.32	3.52	4.58	2.01	1.71	-0.72	0.95	3.23
2012	4.90	4.96	6.50	0.77	0.08	1.18	6.03	0.32
2013	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Potato	Tomato	Onion	other veg	sugar	gram	Chilies	Total
49.72	-16.67	-1.32	-5.09	1.24	5.21	8.64	
-3.64	-1.33	-0.54	-5.89	15.67	-1.55	-7.02	
7.65	-0.04	2.33	7.63	-11.39	1.77	9.56	
-3.59	1.38	-1.74	-1.27	-2.43	-0.19	-1.83	
47.56	-12.00	3.03	6.60	-10.76	6.90	21.98	
-36.59	13.43	-4.85	-12.55	26.65	-8.03	-24.84	
1.05	2.30	-0.70	5.19	-14.80	1.41	6.03	
5.76	-2.08	2.73	1.98	3.84	0.30	2.87	
0.00	0.00	0.00	0.00	0.00	0.00	0.00	

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CONCLUSION

There had been scant literature on the fall in household budget shares on food items in rural setting in developing countries due to natural disasters. Though, it is unanimously agreed upon on the basis of plenty of empirical evidence on direct and indirect impact of floods and other disasters on rural households in developing countries. Present study has predicted the fall in the household budget share in total expenditure that may be attributed to the shortage in the supply of food items in the flood affected areas during floods 2010. The estimated demand equations have been done using the time series data from Household Income and Expenditure Surveys or international databases of reliable institutions.

The year on year change in the budget shares spent on the individual goods have shown varying changes in the quantities and the budget shares, yet it is very much clear that the total fall in the budget shares spent on the selected food items in the year 2010 (flood year) has been 22.47% which is a significant fall in one year. Further, the result may be in synchronization with the rise in the food inflation calculated from the price of wheat from Sukkur district being the trade and commerce hub of the region that has been calculated as 17% approximately.

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