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DO DEMAND SIDE POLICIES IMPROVE THE FOOD SECURITY OF LANDLESS RURAL HOUSEHOLDS? INVESTIGATING PAKISTAN'S ACHIEVEMENTS IN THE PUNJAB

M. K. Bashir, S. Schilizzi[*] and S. Mohammad[**]

Institute of Agricultural and Resource Economics, Faculty of Social Sciences, University of Agriculture, Faisalabad, Pakistan
[*]Institute of Agriculture and School of Agricultural and Resource Economics, Faculty of Science, University of Western Australia; [**]Layyah, Government College University, Faisalabad
Corresponding Author Email: khalid450@uaf.edu.pk

ABSTRACT

The study aims to assess the impact of two short term demand-side policies on the food security of landless rural households. A conceptual model is designed to work out the policy impact pathways using a partial equilibrium technique. Primary data from 576 landless rural households was analyzed using a two-stage (fold) regression model. The first stage of the analysis shows that food subsidies significantly improve food intake along with monthly income, livestock assets (large animals) and household heads' education The second stage shows that monthly income increases due to the minimum wage rate, joint family system, livestock assets (large animals), and education level of intermediate and graduation.

Keywords: Demand-side policies; impact assessment; rural food security; landless households; Punjab; Pakistan

INTRODUCTION

Today, food insecurity is a worldwide concern as the number of undernourished people soars to 842 million, about 12% of the world's population. Undernourishment is most severe in developing countries. This is especially true of Africa and Asia where more than 92percent of the world's undernourished people live, i.e. 226.4 and 552 million, respectively. In South Asia only, 294.7 million people are undernourished, which comprises 35 percent of the total undernourishment of the world (FAO, 2013). Governments in these countries are trying hard to deal with this problem. Their investments in food security policies have been increasing through several development programs, but their contribution to reducing food insecurity appears so far to have been negligible (Babatunde *et al*., 2007; Fayeye and Ola, 2007; and Oriola, 2009).

Pakistan gained food 'self sufficiency' in 1980s (Gera, 2004) and continuously retained this status (Bashir *et al*., 2007; and Bashir *et al*., 2012). Its economy is mostly agrarian and the share of agriculture is 21.4 percent of GDP. The agriculture sector employs about 45 percent of the total labour force and provides shelter to 65 percent of the total population (GOP, 2013). Pakistan is one of the leading producers of many important agricultural commodities in the world1 (FAO, 2011). Despite its importance and contribution, the proportion of the undernourished population in the country is high, namely 17.2 percent (FAO, 2013).

The Punjab is a home to the largest population of the country, accommodating 54.34 percent of the total population. Its agriculture sector contributes the most towards the country's agricultural GDP (57 percent). It has more than 3.8 million farms out of 6.6 million in Pakistan (GOP, 2013). However, more than 70 percent of the households in the province are landless. They earn most of their income from non-agricultural sources and are mostly engaged in informal activities. Usually, they earn their livelihood from paid employment and self employment (Anwar *et al*., 2004). Such households are the most vulnerable ones to food insecurity (Yasin, 2000).

In Pakistan, like other developing countries, the governments have considered short term policies to deal with food insecurity. Two demand-side policies have in particular been implemented by the government: a food subsidy and a minimum wage rate. Despite being in operation for a long time, the high number of currently undernourished population calls into question the real contribution of these policies. This study aims to assess the impact of these policies on effective household food security, especially regarding the landless rural households. To achieve this aim, the specific research questions are: What is the role of selected policies in

[1]World rank **2nd:** buffalo milk and meat; **3rd:** apricots and chickpeas;**4th:** onions, cotton lint, goat milk and meat; **5th:** sugarcane, dates, chillies and peppers; **6th:** mangoes, guava, okra and pulses; **10th:** wheat, and spinach; **11th:** rice, oranges and pistachios (FAO,2011)

improving the food security of landless rural households? Are these policies implemented effectively?

MATERIALS AND METHODS

Conceptual model: The main focus of the current study pertains to the analysis of short term policies from the perspective of landless rural households. It is assumed that all others (urban households, small and large scale farmers, etc.) remain unaffected and the impacts of all other policies on the food security of landless rural households are minimal and can be considered constant. To such a particular focus, a partial equilibrium framework is the best choice because: data on other sectors of the economy and non-target household categories is usually insufficiently specific (Rausser and Irwin, 1989); the need of disaggregated data (Sadoulet and de Janvry, 1995; and Ragona and Mazzocchi, 2008) for more detailed predictions of short term food security policies; and the empirical simplicity of its framework that allows the analysis of the direct effects of short term policies on food security (Rausser and Irwin, 1989)

For this study, the selected demand-side policies are food subsidy and minimum wage rate. Food subsidy aims to improve the access to food by providing food items at lower prices at Utility Stores Corporation's (USC) wide network of outlets throughout the country2. On the other hand, Government has fixed the minimum wage at Rs. 7000 per month for the industrial sector. The aim of this policy is to increase household access to food by ensuring them a minimum monthly income. It is implemented by the labor department. Households whose heads or any members are working or has worked in the industrial areas are the beneficiaries of this policy because it is only applicable to industrial sector.

Figure 1 presents the simplest scenario of policy-food security relationship. The short term policies are meant to improve household food security ('A' in Figure 1). In reality, this relationship is indirect because of the complexities of food security phenomenon. There are several socio-economic factors that are responsible for any improvement or deterioration in household food security ('1' in Figure 1). The policies help improve these factors that in turn improve household food security ('B' in Figure 1), but this relationship is also an indirect one because the policy instruments are dependent on some institutes to be implemented. From the literature we know that there are certain socio-economic factors that are responsible for a change in household food security. Figure 2 explains the model presented in Figure 1 in terms of socio-economic factors and possible impact pathways.

Household calorie intake is considered as a proxy for food security. The socio-economic factors listed in the dotted frame are the product of literature review. The impact pathways are drawn from the above information on policy goals. Food subsidy is supposed to improve the calorie intake directly while the minimum wage rate improves household income which in turn improves calorie intake.

In connection to the pathways suggested above, the decision making process of households can be explored using a household model. Bashir *et al*. (2012) explained the household behaviour for rural household food security (relationship 1 of Figure 1) which is extended to explore the impact of policies. In terms of governments' specific objectives, the effectiveness of policies depends on their effects on households' private incentives (Rao, 1989). It has been noted that food subsidies improve households' food intakes (Edirisinghe, 1987; Bouis and Hunt, 1999; Ahmed *et al*., 2001; Barrett 2002; and Jones and Frongillo, 2006). Likewise, the minimum wages increase the minimum possible income of the households to ease out their access to food (Maxwell, 1995 and Maxwell, 1996; and FEWS NET, 2011). Similarly, both input and output subsidies improve farm productivity (Barkley, 1992; Hoque, 1993; Ghani, 1998; Khan, 2002; McCloud and Kumbhakar, 2008; and Mhango and Dick, 2010) thereby increasing household incomes which improve their food intakes.

For a possible policy impact, the income, Y_Z (9_Z) and consumption, X_Z (10_Z) equations of Bashir *et al.*, (2012) can be re-written as:

$$Y_Z^s = wL \quad (1)$$

$$X_Z^s = D(P_M, P_{NM}) \quad (2)$$

Where:

^{s} = possible impact of policies
w = Wage rate
L = Total available labour
P_M = Prices of food commodities purchased from market
P_{NM} = Prices of non-food commodities purchased from market

Similarly, the food security, FS_Z equation (11_Z^s) given in Bashir *et al.* (2012) can also be re-written for a possible improvement due to the selected policies as:

$$FS_Z^s = F(X_Z^s(.), Y_Z^s(.)) \quad (3)$$

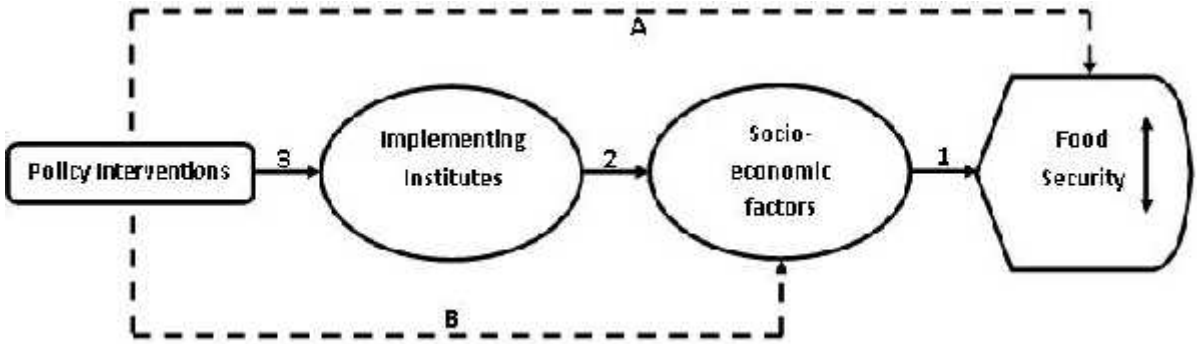
Data collection and empirical model: The study uses primary data to assess the impact of selected policies on food security at rural household level. For this purpose, the Punjab province was selected because: it is the most populous province of the country, more than 55 percent of the total population lives here (GOP, 1998); it has the largest agricultural share in country's agricultural GDP i.e. 57 percent (GOP, 2013); and it is the home to 74 percent landless households. The selection of the study

[2] see for reference www.usc.com.pk

area, however, does not imply that the problem of food insecurity does not exist in other provinces and / or the policies are working fine there.

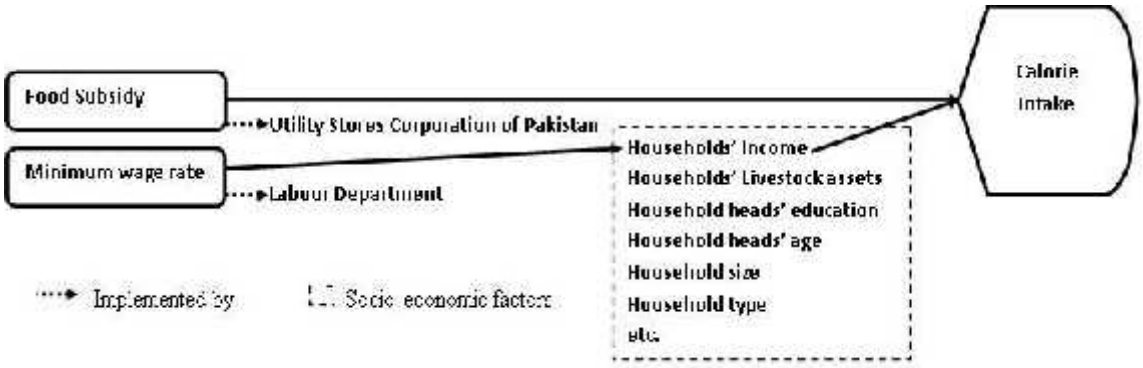
- The province has 36 districts that can be grouped into three regions on the basis of geographical homogeneities as:
- North Punjab comprises of the districts situated at 350 to 900 meters above sea level and situated towards north of the province;
- Central Punjab contains districts having mostly plains; and

South Punjab covers the districts situated in south of the province having mixed characteristics of desert and plains.



Source: Author's design

Figure 1. Policies and rural household food security



Source: Author's design

Figure 2: Policy impact pathways

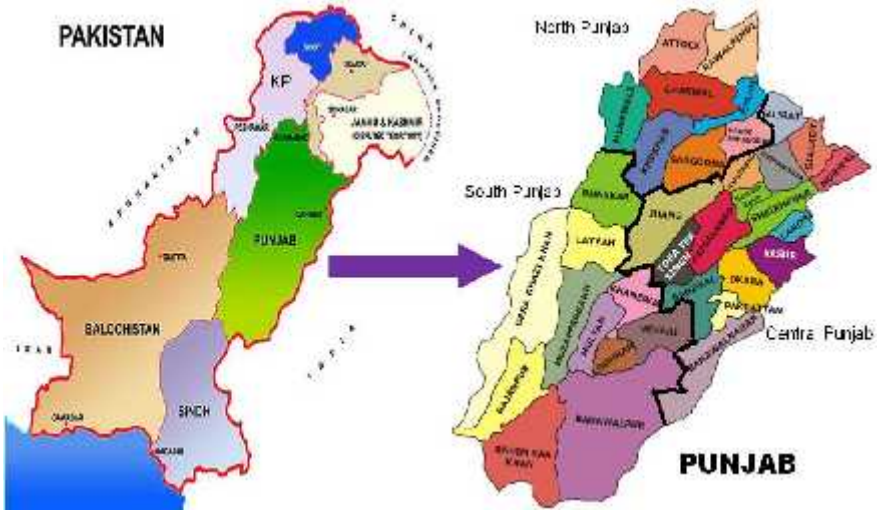


Figure 3: Selection of study area and strata formation

Figure 3 shows the division of study area into 3 sub-regions that these regions were heterogeneous in terms of district numbers. There were 8, 17 and 11 districts in North, Central and South Punjab regions, respectively. One third of the districts were considered a reasonable representative sample. A proportionate sample was drawn from each region. As a result three districts each from South and North Punjab and six districts from Central Punjab were selected according to homogeneity of different attributes (population, number of villages, irrigated and non irrigated land, and per capita and per acre wheat production. One percent of the villages (6) were randomly selected from each district. From each village 8 landless households were selected randomly that made total sample size of 576 households.

The information on various aspects of food security and policy impacts was collected by a comprehensively designed interview schedule under three main categories: general and demographic information of the household; the consumption of different food items on weekly basis; and the income, expenditures and policies impact.

Calorie calculation: Calorie intake is considered as a proxy for food security. The calorie consumption method is criticized on various grounds including: there is a lack of consensus among researchers over threshold levels (Jensen and Miller, 2010); it ignores impact of nutrient adequacy (Wolfe *et al*., 2000); it does not account for the vulnerability; and the substitution effects due to an increase in income people may choose a tastier food having more calories than the simple routine diet are often ignored (Jensen and Miller, 2010).

The selection of calorie consumption method is justified on the following grounds:

- to avoid the problems due to lack of consensus among researchers over threshold levels, calorie intake is used as dependent variable instead of food security status;
- it is expected that using food intake as a dependent variable instead of food security status will take care of the substitution effect. The main assumption behind is the non-linear relationship between income and calorie intake; and
- the selected household category belongs to the lowest income group, for them food intake is more important than a tastier food and they are the ones who are the most vulnerable ones to become food insecure (Yasin, 2000).

For calculating per capita calorie consumption of each household, the '7 days recall' method was used to collect the information about the food items consumed in last seven days prior to the interview. The information was processed using the calorie guide for Pakistan provided by Allama Iqbal Open University (AIOU, 2001). The calculated calories were adjusted for age and gender differences within the households using the adult equivalent units as suggested by NSSO (1995).

Empirical model: The impact pathways identified in Figure 2 suggest a two-stage (fold) regression model as a suitable analytical technique to solve the problem (see for example Peyrot, 1996; Khasnobis and Hazarika, 2006 and Bashir *et al*., 2010a). The first-stage regression model assesses the impacts of food subsidy and households' monthly income along with other socio-economic factors on calorie intake: the consumption (X_Z) part of equation (3). The equation with explanatory variables can be written as:

$$\ln Cal_i = \beta_0 + \beta_1 fSub_i + \ln \beta_2 mI_i + \beta_3 hS_i + \beta_4 hhA_i + \beta_5 hD_i + \beta_6 LS_{Li} + \beta_7 EP_i + \beta_8 EM_i + \beta_9 EI_i + \beta_{10} EG_i + £_i \quad (4)$$

Where:

$\ln Cal_i$ = natural log of calorie intake of the i[th] household

$fSub_i$ = food subsidy received by the i[th] household (dummy '0' did not receive and '1' received)

$\ln mI_i$ = natural log of monthly income of the i[th] household

hS_i = household size of the i[th] household

hhA_i = age of the i[th] household's head

hD_i = decision making regarding food consumption (dummy '0' female, '1' male

LS_{Li} = ownership of livestock assets by the i[th] household (large animals i.e. buffalos and cows)

EP_i = education level of primary (5 years of schooling i.e. grade 5) of the i[th]household head (dummy, '0' otherwise. '1' primary)

EM_i = education level of middle (8 years of schooling i.e. grade 8) of the i[th] household head (dummy, '0' otherwise. '1' middle)

EI_i = education level of up to intermediate (10-12 years of schooling i.e. grade 10 and 12) of the i[th] household head (dummy, '0' otherwise. '1' up to intermediate)

EG_i = education level of graduation and above of the i[th] household head (dummy, '0' otherwise. '1' graduation and above)

$_{0–10}$ = coefficients of regression

$£_i$ = error term

$$mI_i = {}_0 + {}_1 mwr + {}_2 hhA_i + {}_3 TE_i + {}_4 Ft_i + {}_5 LS_{(L)i} + {}_6 LS_{(S)i} + {}_7 EP_i + {}_8 EM_i + {}_9 EI_i + {}_{10} EG_i + £_{2i} \quad (5)$$

Where:

mI_i = monthly income of the i[th] household

mwr_i = minimum wage rate (dummy, '0' worked in the industrial sector and did not get minimum wage, '1' worked in the industrial sector and got minimum wage)

hhA_i = age of the i[th] household's head

TE_i = total earning members in the i[th] household

Ft_i = family structure of the i[th] household (dummy, '0' joint (combined household i.e. more than one household under a common household head), '1' nuclear (single household)

$LS_{(L)i}$ = ownership of large livestock assets (buffalos and cows) by the i[th] household

$LS_{(S)i}$ = ownership of small livestock assets (goats and sheep) by the i[th] household

EP_i = education level of primary (5 years of schooling i.e. grade 5) of the i[th]household head (dummy, '0' otherwise. '1' primary)

EM_i = education level of middle (8 years of schooling i.e. grade 8) of the i[th] household head (dummy, '0' otherwise. '1' middle)

EI_i = education level of up to intermediate (10-12 years of schooling i.e. grade 10 and 12) of the i[th] household head (dummy, '0' otherwise. '1' up to intermediate)

EG_i = education level of graduation and above of the i[th] household head (dummy, '0' otherwise. '1' graduation and above)

$_{0–10}$ = coefficients of regression

$£_{2i}$ = error term

There are three common variables in both the models i.e. household head's age, livestock assets (large animals) and household heads' educational status. In the first-stage model, household heads' age is expected to decrease the calorie intake because increasing age weakens the decision making power that may hinder the overall food intake of the household. Livestock assets (large animals) are expected to increase the calorie intake (the provision of dairy products to the members of a household). Similarly, with higher education levels, the household head can help improve household food security by increasing the knowledge about the nutritional facts of various food items, and food safety.

The second-stage regression solves the income (Y_Z) part of equation (3) to assess the impact of minimum wage rate and other socio-economic factors on households' monthly income. The equation with explanatory variables can be written as:

In the second-stage model, age of household head is expected to reduce the income because older persons are physically weak and are unable to do laborious jobs in the fields. Livestock assets are expected to increase the household income by selling the surplus products of both large and small animals (dairy products from large animals and meat from small animals). It is expected that the educational level of household heads help them to get higher wages.

Both the models fulfil the validity of exclusion restriction. Inferentially, it is not possible to test the validity of exclusion restriction (van den Berg, 2007). However, the test for hetroscidasticity can be used to check the validity (Klein and Vella, 2009). To test the hetroscidasticity we checked cross-correlations between both error terms and dependent variables. The results suggested that there is no hetroscidasticity. In addition, we applied robust regression to avoid any meagre chance of hetroscidasticity. Furthermore, different functional forms were tested for the models of both stages and the functional forms given in equations 4 and 5 were selected on the basis of number of statistically significant exogenous variables, F and t statistics, and a-priori expectations.

RESULTS AND DISCUSSION

The descriptive statistics of the continuous variables are presented in Table 1,which shows that the calorie intake of the sampled households ranged between 690 Kilo Calories per Adult Equivalent (KAD) to 4980 KAD, with a mean intake of 3006 KAD. Household monthly income was as low as Rs. 3000 per month and as high as Rs. 48,792 per month, with an average of Rs. 13,210. The average age of the household head was 45

years with a minimum of 23 years and a maximum of 75 years. Family size, in the study area, was as low as 2 members and as high as 18 members, while average family size was 6 members per household. The minimum earners in a household were recorded as one. On the other hand, there were up to 5 earning members in some households. There were a maximum of 15 large and 10 small animals in a household.

Table 1: Descriptive statistics

Continuous variables	Min	Max	Mean	Std. Dev
Calorie intake (Cal_i)	590	4980	3006	879
Monthly income (MI_i)	3000	48792	13210	6424
Household heads' age ($HHHA_i$)	23	75	45	10
Family size ($fSize_i$)	2	18	6	2
Total earning members ($Tear_i$)	1	5	1	1
livestock large animals ($LSA_{(L)i}$)	0	15	1	2
livestock small animal ($LSA_{(S)i}$)	0	10	1	1

Data source: Field survey

A profile of attributes of household characteristics is presented in Table 2. According to the results, about 36 percent of the respondents had only primary education (5 years of schooling, i.e. grade 5) followed by 15 percent having up to intermediate level of education (10-12 years of schooling). The majority of the respondents (59 percent) reported that they were able to obtain the food subsidy from the outlets of the Utility Stores Corporation. Similarly, about 70 percent of the respondents reported that they worked in the industrial sector and 94 percent of them said that they received the government's announced minimum wage. Males were responsible for food-related decisions in about 74 percent of households. The majority of households belonged to the nuclear family type, i.e. 72 percent.

Determinants of calorie intake (First-stage model): The results of the first-stage regression model are presented in Table 3. It was found that out of ten variables, seven are statistically significant, including food subsidy, monthly income, household head's age, household size, livestock assets (large animals) and educational levels of intermediate and graduation and above. Only the results of the statistically significant variables are explained below:

Food subsidy ($fSub_i$): As expected, the coefficient of food subsidy indicates a positive relationship with calorie intake. The value of the coefficient of elasticity for this variable is calculated as 0.144, which tells us that an increase of one percent in the food subsidy will increase calorie intake by 0.144 percent.

Table 2:A profile of attributes of households

Household distribution by household heads' education levels

Education levels	Illiterate	Primary	Middle	Intermediate	Graduation
Number of households	171 (29.69%)	210 (36.46%)	65 (11.28%)	86 (14.93%)	44 (7.64%)
Household distribution by getting food subsidy					
		Got food subsidy		Did not get food subsidy	
Number of households		341 (59.2%)		235 (40.8%)	
Household distribution by off-farm work					
		Yes		No	
Number of households		506 (87.8%)		70 (12.2%)	
Household distribution by getting minimum wage					
		Got		Did not get	
Number of households		472 (93.28%)		34 (6.72%)	
Household distribution by decision making					
		females		Males	
Number of households		149 (25.9%)		427 (74.1%)	
Household distribution by family structure					
		Nuclear		Joint	
Number of households		413 (71.7%)		163 (28.3%)	

It is the first study in Pakistan to directly investigate the impact of food subsidy given by the government through Utility Stores Corporation. Various impact assessment efforts have been made for other countries; for example, Capps and Kramer (1985) found a positive impact of the food stamp scheme in the USA using a different methodology. Similar results were found by Miller and Coble (2006) and Gundersen and Zaliak (2003) for the same program in the USA, but using different methodologies (seemingly unrelated regression

and variance decomposition, respectively). For India, Chellaraj *et al*. (1992) found a positive impact of food subsidies using a seemingly unrelated regression model.

Monthly income (mI_i): Monthly income has a positive impact on food intake. The elasticity value calculated for the coefficient tells us that an increase of one percent in monthly income will increase calorie intake by 0.063 percent. The impact of monthly income is 2.5 times less than the food subsidy. This is because the income is spent not only for food but for other necessities including health, education, clothing, shelter, etc. while the food subsidy provides cheaper food.

Earlier, Lorenzana and Sanjur (1999) found for Venezuela that an increase of one percent in income reduced food insecurity by 0.292 percent. Similarly, for Pakistan, it was found that women's earning of cash income positively impacts children's nutrition, i.e. one percent increase in cash income improved nutrition by the weight-for-height and weight-for-age by 0.68 and 0.46 percent, respectively (Khasnobis and Hazarika, 2006). For Vietnam, an increase in income by one percent was found to increase calorie intake by 0.38 percent (Ngwenya, 2007). In Nepal, Gyawali *et al*., (2008) found that an increase in income by one percent increased food security by 0.1 percent. The impact of monthly income is relatively small in our study which may be due to the availability of subsidized food.

Household heads' age (hhA_i): Household heads' age has a negative relationship with food intake. The elasticity value of its coefficient suggests that an increase of one percent in household head's age will reduce per capita food intake by 0.23percent.A similar relationship was found by Bashir *et al*. (2010b) for Faisalabad district of the Punjab, Pakistan, Titus and Adetokubo (2007) for Nigeria and Onianwa and Wheelock (2006) for the USA.

Household Size (hS_i): Household size also has a negative impact on food intake. An increase of one percent in household size will reduce food intake by 0.34 percent. Similar relationship was found by Bashir *et al*. (2010b) for Faisalabad district of the Punjab, Pakistan; Sindhu *et al*. (2008) for India; and Amaza *et al*. (2006) for Nigeria using binary regression technique.

Livestock assets (large animals) (LS_{Li}): The ownership of large livestock (buffalo and cows) has a positive impact on food intake. These animals provide direct dairy products to the households. An increase of one percent in the ownership of these assets increases per capita food intake by 0.009 percent. The results conform to the earlier studies of Bashir *et al*. (2010b) for Pakistan and Haile *et al*. (2005) for Ethiopia, who found similar impact of livestock assets on household food security status. Ali and Khan (2013), applied Poisson Regression Model and found that the incident of rural food insecurity in Pakistan was 19-41 percent low in households who own livestock. Bashir *et al*., (2013) found a similar relationship between food insecurity and livestock ownership in rural areas of the Punjab, Pakistan. They found that most of the food insecure households (up to 65%) did not own any livestock.

Education Levels (EI_i): Similarly, the education level of the household head has a positive relationship with food intake. It helps the household head to be able to provide his household a balanced diet. The value of the coefficient of elasticity suggests that per capita food intake of the households whose heads have up to intermediate level of education, increases by 0.13 percent. A positive relationship between education levels and food security was found by Bashir *et al*.(2010b) for Pakistan, Ojogho (2010) for Nigeria and Kaiser *et al*. (2003) for the USA using binary regression models.

Table 3: Results of first-stage regression model

Variables	β	Robust S.E.	t-value	Elasticities (δ)3
Get food subsidy ($fSub_i$)	0.242 **	0.025	9.61	0.144
Monthly income (mI_i)	0.063 *	0.028	2.21	0.063
Household heads' age (hhA_i)	-0.005**	0.001	-4.27	-0.225
Family Size (hS_i)	-0.054 **	0.006	-8.88	-0.342
Decision making (hD_i)	-0.0314	0.026	-1.22	-0.023
Livestock assets large animals (LS_{Li})	0.012*	0.005	2.68	0.009
Education level primary (EP_i)	0.040	0.028	1.43	0.015
Education level middle (EM_i)	-0.018	0.035	-0.51	-0.002
Education level intermediate (EI_i)	0.090 **	0.034	2.65	0.013
Education level graduation (EG_i)	0.079	0.043	1.82	0.006
(Constant)	7.791 **	0.267	28.9	N/A

Data source: Field survey 2010-2011

$R^2 = 0.45$ | $F = 44.58^{**}$ | ** significant at < 1 %; * significant at < 5 %| S.E. = standard errors

Determinants of income (Second-stage model): The results of the second-stage regression model are presented in Table 4. It was found that out of ten variables, six are statistically significant at less than 1 and 5 percent significance levels. The significant variables include the minimum wage rate, household heads' age, family structure, livestock assets (large animals) and educational of intermediate and graduation levels. The results are explained below:

[3]For log-log variables, $\delta = \beta_{i\,|}$
For log-linear variables, $\delta = \beta_i$(mean of independent variable)

Minimum wage rate (mwr$_i$): As expected, the minimum wage has a positive relationship with monthly household income. Every time a household receives the minimum wage, its monthly income increases by Rs. 2646.63. In terms of elasticity values, an increase of one percent chances of getting the minimum wage rate, monthly income of landless rural households increases by 0.163 percent. It is the first study to assess the impact of minimum wage rate on landless rural households' monthly income.

Household heads' age (hhA$_i$): Household heads' age has a negative impact on monthly household income. The coefficient value suggests that an increase of 1 year in age will decrease the monthly income of a household by about Rs. 65.60. In terms of elasticity, an increase of one percent in household head's age will decrease household's monthly income by 0.224 percent.

Family structure (FSt$_i$): Living in a joint family has a positive impact on monthly income because of pooling the resources. Living together in a joint family increases monthly income by Rs. 4,925. To the best of our knowledge, this is the first study to ascertain this relationship.

Livestock Assets (large animals) (LS$_{Li}$): The ownership of large livestock animals is positively related to households' monthly income. The livestock act as a buffer against bad times and the surplus helps improve income. An increase of ownership of one animal increases monthly income by Rs 1170. The elasticity coefficient for this variable says that an increase of one percent in the ownership of large livestock increases households' monthly income by 0.06 percent. Earlier, for Kenya using a lin-log relationship, it was found that one percent increase in the number of sheep increases per capita income by 0.04percent (Onyeiwu and Liu, 2011).

Education of intermediate and graduation levels (EI$_i$and EG$_i$): The education level of the household head has a positive relationship with monthly income. A household head with 10-12 years of schooling and above ensures an increase in monthly income of Rs. 1780 (0.02 percent) and 5518 (0.032 percent), respectively. Earlier for Jhelum district, Bashir *et al*. (2010) found that an increase of one schooling year increased household income by Rs. 384. Similarly, Aikaeli (2010) found that with an increase of one schooling year in the education of household head, income increased by 0.326 percent. Ibekwe *et al*. (2010) found that household income in Nigeria increased by 0.819 percent with an increase of one schooling year of the household heads' education level.

Table 4: Results of second-stage regression model

Variables	β	Robust S.E.	t-value	δ4
Minimum wage rate (MWR_i)	2646.63**	548.35	4.83	0.163
Household heads' age ($HHHA_i$)	-65.60**	20.82	-3.15	-0.224
Total earning members ($Tear_i$)	-210.30	358.260	-0.60	-0.021
Family structure (FSt_i)	4924.55**	531.35	9.27	0.105
Livestock large animals ($LSA_{(L)i}$)	1169.68 **	390.62	2.99	0.064
Livestock small animal ($LSA_{(S)i}$)	-197.19	487.14	-0.40	-0.008
Education primary ($Edu_{(P)i}$)	-244.50	480.31	-0.51	-0.007
Education middle ($Edu_{(M)i}$)	-228.56	688.03	-0.33	-0.002
Education intermediate ($Edu_{(I)i}$)	1779.50*	697.52	2.55	0.020
Education graduation ($Edu_{(G)i}$)	5517.76**	1346.30	4.1	0.032
(Constant)	11587.36**	1091.15	10.62	N/A

Data source: Field survey 2010-2011
$R^2 = 0.333$ | $F = 22.17^{**}$
**significant at < 1 %; * significant at < 5 %| S.E. = standard errors

Conclusion: This study is the first to assess the impact of demand side policies on the food security of Pakistan. It aimed in particular to assess the impact of two demand-side short term policies (food subsidy and minimum wage rate) on the food security of landless rural households. The analysis was carried out in two stages. The first-stage analysis investigated the direct relationship between the food subsidy (and various other predictor variables)and food intake, while the second-stage analysed the relationship between household income and minimum wage rate, as well as several other predictor variables. Results indicate that food subsidy, monthly income, livestock assets (large animals) and household heads' education of intermediate and graduation levels and above improve food intake while household heads' age and household size deteriorate food intake. Monthly income was improved by the minimum wage rate, the joint family system, livestock assets (large animals) and household heads' education of intermediate and graduation levels and above. Household heads' age was found to decrease households' monthly income.

The limitation of the study lies in the lack of information on the proportions of food purchased from utility stores and from other markets; and the income earned from minimum wage rate and from other earnings.

[4]For lin-lin variables, $\delta = \beta_i$(mean of independent variable/mean of dependent variable)

Despite this limitation, the findings are both timely and important because a record numbers of individuals and families are experiencing food insecurity in Pakistan (26 percent; FAO 2010). Food insecurity is a reality for many households living in rural areas, especially the landless. Our results provide the first hard evidence on the positive impact of these government policies. This suggests the need for more rigorous research efforts at the household level than have so far been produced.

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