The Rationale of Public Policies to Cope the Daunting Challenging of Food Security: A Case Study of Punjab (Pakistan)

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Abstract

Food security is a menace and sinister to socio-economic development however it has close connection to public policies in order to transform a mild state of nausea into pander the food requirements of the people. A great deal of existing studies focuses on partially analyzing food security dimension with respect to particularly food availability and connections to household food security. Public policies have unceasing enticement on food security that has been remained limited priority of the policy makers. This study has examined the impacts of closely related public policies especially on all dimension of food security in a Pakistan's selected area. Primary data has collected from 140 respondents of the six union councils of the area in Punjab Pakistan. In Logit Regression, results illustrate that public policies regarding water irrigation, improved seed and fertilizers policy, price support and health policies have significant and positive impacts on the food security of the targeted area while climate change has significantly been adverse impact particularly on food availability of the area from 2015 to 2017. Food inflation colligation with inflation have negative impacts on food security that shows people's purchasing power has been impaired in one hand while average yield has been decreased due to configuration of input and output prices distortion. There summarized the results which shows government interventions concentrate more on food availability while other dimensions of food security are neglected in priority benchmark in the implementation and regulative authorities. Findings of this study propose that public policies need coordination and priority-based realization both from the government administrations and public sides.

Keywords: Food Security, Public Policies, Climate Change, Pakistan

Introduction

Food security is the heliocentric and a burning challenge throughout the world particularly in developing countries. Like anywhere else in the world, Pakistan is confronting the serious problem of food insecurity in multidimensional perspectives. Pakistan is the 6th largest country in the World. Moreover, there is expected that population of Pakistan will be 221 million in 2012 (Planning Commission, 2007) and 351 million in 2050 (FAO and PARC, 2014). Food security is delineated as people receive and preserve sufficient food to cope with the nutritional requirements for sanguine and acrobatic life. It was stated that food security subsists when majority of the people have sufficient food, secured in nutritional requisites along with economic and physical access for the fulfillment of dietary needs to have active and robust life (World Food Summit, 1996). Historically the initiative to focus Food Security was undertaken in the Universal Declaration of Human Right (1948). There was given recognition that right to food is the fundamental component of standard of living and accredited that this right was the essential cause of World Food Crisis of 1972-74 (Ahmad and Farooq, 2010). It was declared in the World Food Summit (1996) that Food Security exists when all people, at all times, have physical and economic access to sufficient safe and nutritious food to meet their dietary needs and food preferences for a healthy and active life". Moreover, H. E. Romano Prodi 'the Chairman of the World Food Summit' (1996) stated that

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"The Rome Declaration strikes us alleviate the half of the numbers of people who are chronically undernourished by 2015 on the Earth planet…. If each of us gives his or her best I believe that we can accomplish this target and even surpass the target we have set for ourselves". However, World Population is expected to increase between 8.3 million and 10.9 million by 2050 while United Nation Population division projected the range between 3.2 million to 24.8 million by 2150. The food demand is estimated to increase 50 percent in 2030 and 70 percent in 2050. Moreover, there is 30 percent world food has been producing in which 1.3 million tons is wasted or lost every year (UNDESA, 2014). It is estimated that there are 925 million people in the world who are victim of hunger (which is 34 percent higher than now) while 1.4 billion people are living on less than US $ 1.25 a day (IFAD, 2014). The whole scenario is reflecting the serious challenge of food insecurity and hunger throughout the World.

Railcar of Food Security in Pakistan

The articles of the Constitution of Pakistan (38d, 9, 4) acknowledged fundamental rights as rights to life and stated that State shall provide basic necessities of life, such as food, clothing, housing, education and medial relief, for all citizens, irrespective of sex, caste, creed or race, as are permanently or temporarily unable to earn their livelihood on account of infirmity, sickness or unemployment. Food security is multi-factorial and spontaneous phenomenon although it also has external stimulus. There has been involved various factors which directly and indirectly spread over to the issue of food security like agriculture, micro and macro-economic policies, socio-political setup, education and health structures, climatic phenomenon to ecologic encumbers, ethnic and sectarian rifts, economic terrorism, national and international conjugal. National Nutrition Survey (2011) revealed that 41.9 percent households are food secure and 28.4 percent is food insecure except hunger. Moreover, moderate hungers are 19.8 percent while 8.9 percent are severe food insecure due to hunger. The rural households (60.6 percent) are more food insecure than urban (52.4 percent). However, there has been provincial inter and intra food security disparities. FATA has the most food deficit population (67.7 percent) followed by Baluchistan 61.2 percent, and Khyber Pakhtunkhwa 56.2 percent (SDPI, 2009).

Moreover, food security conditions have been remained unsatisfactory in 61 percent districts of Pakistan**.** The issue of Hunger and food security is interwoven. Hunger is mostly referred to the distress connected with insufficient food. The Food and Agriculture Organization of the United Nations (GHI, 2014) defines that food deprivation (undernourishment) is related to consumption for 1800 kilocalories a day that is the minimum requirement for people to enjoy a salubrious and progressive life. However, Undernutrition is beyond the pale of calories. It does signify deficiencies in any or among all of the areas related to energy, protein, or essential minerals and nutrients. Undernutrition is the result of inadequate intake of food, poor utilization of nutrients due to illnesses or a combination effect of these factors. Moreover, malnutrition refers more broadly to both undernutrition and over nutrition that is the problems of unbalanced diets, such as consuming too many calories in relation to requirements with or without low intake of micronutrient-rich foods.

Constituent Ingredients of Food Security

Food security is incorporated with the constituents of availability, approachability, exercising, and sustainability. Food availability covers the "supply side". Moreover, food availability means domestic production, import potential, food aid, food stock and food storage capacity. Food accessibility means economic and physical access that is purchasing power, income of the population, market and transport infrastructure (National Food and Nutrition Security Policy, 2012). Both availability and access parts of food security are

inseparably inter-linked (Pinstrup and Andersen, 2009). Food utilization is the utilization of food through adequate diet, clean water, sanitation and health care to reach a state of nutritional well-being where all physiological needs are met. This brings out the importance of non-food inputs in food security (World Food Summit, 1996). Moreover, food stability is mainly concerned with food safety, hygiene and good practices applied in food chain, meeting needs of energy (quality diet and diversity) of micro and macro nutrients (National Food and Nutrition Security Policy, 2012). For an active and healthy life, the human body has to effectively utilize the available nutrients in the food consumed (Staaz et al., 2009).

Literature Review

Literature scanning is always important and considered a backbone of research study because it provide platform and grounds to construct study objectives, research questions and methodology framework. Food security and hunger is multifarious phenomenon concealing short-term shocks (floods, droughts, earthquakes, etc.) and long-term (climate change, civil chaos, waning production and un-affordability). The antigenic determinants of food security and hunger are antithetic at individual, household, regional, national and global. The conceptual backdrop may establish from the literature review. There have done a number of analytical studies about food security and policy interventions.

Food availability is essential component of food security and agriculture sector plays cornerstone role as Bashir, et al (2014) focused on crop contribution to food security and found that livestock has positive impact while family size has negative impact on food security through applying days recall method and Binary Logistic Regression. Moreover, animal work per hectare, animal milk per person have mutually positive impact while animal work, meat and milk have negative relation to food security (Mahmood, et al., 2014). Irrigation has fundamental factor for the food production and food availability. While climate change has significant impact on water availability and its quality that is essential for agriculture productivity. Due to climatic changes the heavy rainfall will increase the pollutant loadings that would affect the quality and quantity of raw water for industries, agriculture and many it's other uses likewise drinking purposes, accessibility and quality issues even though the conventional treatments (Cisneros et al., 2014). Boratyńska and Huseynov, (2017) applied the theoretical microeconomic model of Security (Abdulai, 2000) through Utility Maximization Function with constraints. They illustrated the three components of Food Security (Nutrition Availability, Accessibility and Food Utilization). They figured out, Nutrition Availability means sufficient food stuffs at local market with ample food for storage and consumption. They moreover, stressed that food security policies focused market integration through infrastructure, non-government trade supportive initiatives, state trading and public buffer stock. Nutrition Accessibility is related to purchasing powers of individuals that effect by food prices. In developing Countries governments target to lower or stabilize the food prices to improve nutrition access. Food Utilization encompasses to consumption technology that incorporates health shocks that negatively effect on individual organism structure to reduce nutritional absorption capability. Therefore, this is related to quality of food, clean water, micronutrient fortification, medical treatment and distribution of medicines. This is very imperative because regional insecurity is vulnerable and depends upon food insecurity at household level that create law an order situation to improve food accessibility (Falcon and Naylor, 2005).The impacts of changed rainfall patterns on water quality have not been sufficiently studied; heavy rainfall may well increase pollutant loadings, which would impact the quality of raw water for agriculture, industries and other uses as well as for drinking purposes, exacerbating existing access and quality problems, even with conventional treatment (Jiménez Cisneros et al., 2014). Majority of the people consume and meet their nutrition requirements through wheat production. Kumar et al.,

(1992) conducted study in Haryana, Punjab and Utter Pradesh (India) and found by Calorie Consumption Regression Model that canal irrigation had increased the wheat production while inputs index increased the output index due to technological advancement. Qaim and Kouser (2013) endorsed this argument by studying panel data that those people who generated income by crops (Bt-Cotton) production helped to improve food security and quality dietary. Food availability and food accessibility are intermingled and interconnected. Agriculture growth declined in 2009 relative to 2009 while cultivated areas are stagnant throughout decades which may pose chaotic situation to food availability and food affordability (Muhammad, et al., 2014). They analyzed the food accessibility through classification Regression Tree, Optimal Scaling and Factor analysis in East Jerusalem where the most resilient community depends upon food access and income while Gaza Strip, most depends upon social safety nets (Alinovi, et al., 2009).

No doubt price of food items does significantly matter because nutrition requirements for healthy life and health promotion are largely depends upon the food basket availability and accessibility. The rise in prices effects purchasing power of the wheat flour linked with decrease in share of calories taken and negative impact on diet (D'Souza and Jolliffe, 2013). When diet requirements are in deficit to a household member that devastate the overall health structure. MacDonald, et al (2015) stated in case of Cambodia by applying the Descriptive Analysis that the the risk of maternal thinness increases with severity of household insecurity increased also stunting. Moreover, the growth prevention and underweight child will be more exposed to food insecurity estimated results by Hackett, Quinonez and Alarez (2009) through Logit Regression Model and Chi-Square. Maternal food is serious issue but food safety and quality are equally important for healthy and active life (Heady and Ecker, 2012). Hallegatte et al. (2011) used scenario based analysis by applying Integrated Assessment Vulnerability (IAV) in three dimensions; a homogeneous versus a heterogeneous world, growth and poverty versus inclusive development and an environment-oriented versus an environment stressed world. They pointed out that in the first dimension, the developing countries that have spatial and economic spatial structure converge rapidly towards the spatial and economic structure of developed world. In contrast, with more heterogeneous world, developing countries continuously based on agriculture, extraction of raw-material and tourism. These countries largely remain rural and depend high-technology based developed countries. In the second dimension, with inclusive development, extreme poverty alleviated at large while inequality remains within regions and countries. In inclusive world, poor have political participation, government takes into account poverty reduction as a goal, everybody gets basic needs and services of health, education, energy, drinking water, food, sanitation and financial support. However, development remains uneven within countries. In last dimension, they explained that in an environment oriented world, policies lifestyle and technologies bring efficiency in the use of natural resources and bring down environmental stress. In the environmental stress world contains insufficient water for usage, soil depletion, agriculture productivity declines, mobility and energy demands grow and biodiversity losses are at large with ecosystem in serious threat.

The existing literature have partially analyzed the impact of food security and its relation to interventions, more focus has been given on food availability and some on food accessibility, one policy intervention or policy instrument has been focused relating to food security. However, this research study is unique in developing composite analysis of food security linkages to some important public policies at the same time. There has been assessed the climate change policy, fertilizer policy, seed policy, food inflation, health policy and water irrigation policy to analyzed the all dimensions of food security. This research is holistic in nature to assess the impact of public policies on food security.

Methodological Consideration

This chapter is comprised in such a way to investigate the data related matters to materialize the study objectives through calculation and estimation of the collected data along with analyzing and discussing the results. It has also included the area of study, reasons to adopt the targeted area, sample size based on random sampling technique, primary research variables, detection method, techniques and model selection for the desire results.

Theoretical Background

A theoretical account provides useful assistance to construct and shape research agenda to formulize the policies to handle the issue of food insecurity and hunger in country wide. A very fair proportion and length of literature was cited to remain relevant for the analyzing of public polices impacts on good security and hunger in Pakistan. There has devolved a framework to explain the impact of certain public policies on the ingredients of food security like food availability, food accessibility, food utilization and food sustainability keeping in view the objectives of the research study. There are certain approaches for production process that are Cobb-Douglas Production Function (Reidsma et al., 2009, Hong and Tan, 2008). Moreover, Kudaligama and Yangagida (2000) applied the Stochastic Frontier Production Function to study interregional agriculture yield difference at global scale. Generalized Cobb-Douglas Production Function which gives returns to scales (how output varies with inputs). Moreover, consumption theories include consumer in classical thought, the Marxian view, the marginalist revolution, Lancaster's objective theory of demand and Becker' economic theory of taste (Sassatelli, 2007). Food security implies that there should be enough essential food to meet the requirements of the population. For this purpose there require increase in production relative to population, betterment in per capita food supply with controlled and stable prices. However, food security is not alone sufficient to bring radical improvement in the individual status. Many other determinants and various household characteristics like household living condition and consumption patterns along with taste and preferences (Alderman and Garcia 1993, Malik, 1994).

Data Related Framework

Domain of the Study and Ethical Research

The ongoing study has carried out and conducted in 6 villages (4 union councils) of tehsil Bhawana which is in District Chiniot Punjab (Pakistan). Punjab is called the "land of five rivers" that is why it is one of the world's most intensively cultivated and fertile land agricultural areas. District Chiniot has three tehsils Chiniot, Bhowana and Lalian. Tehsil Bhawana is located by the side of Jhang-Chiniot road and on the left bank of the Chenab River. It is located at the coordinates 31°33'58 in North and 72°38'46 in East with an altitude of 157 m (515 ft (GOP, 2011). There are selected 140 respondents purposively from six villages in four union councils of the tehsil Bhowana on the convenient basis (District Chiniot, Punjab, Pakistan). Moreover, there are taken different sample sizes from each village on the basis of population. The sample size is selected by applying statistical formula of Proportionate Random Sampling (**$n = N/ (1+Ne^2)$.** The randomization is a process in which a set of selection of treatment and control group from random population that is well-defined in order to investigate and evaluate the outcome of an intervention (Nugusse and Woldegebrial, 2013). Moreover, treatment group and comparison groups are similar except for the registration in the group (Stern *et al*, 2013). The main objective was to investigate the impact of certain public policies or interventions to assess the status of food security and hunger.

Logit Regression Model

There has been proposed different techniques and methodologies for food security modeling along with its determinants at household levels. The application of Ordinary Least Square (OLS) is illogical when there is confronted a binary or dummy dependent variable. There is main problem faced by researcher in regression model is that variable does not follow normal distribution although it is disturbed as binomial random variable. Moreover, when regression line is connected to data points there emerges the problem of heteroscedasticity that is linear relationship between dependent and independent variable. There comes a problem of normality when there is used OLS and checking the residual distribution. When there is applied OLS with categorical variable (binary dependent variable), there are violated two assumptions. To avoid this problem, there are two other alternative regression models that are suggested when dealing with binary dependent variable. One is Logistic Regression (for small sample size) and other is Probit Regression (use for large sample size). Moreover, in regression analysis, there cannot be made probability statement about the different independent variable on food security. It is so because discrete choice model has feature that gives problematic estimates for the situation of food security while regression approach does not have this characteristic. On the basis of Kurtosis value, there is selected Logit model for the analysis.

$$Li = Ln\ (P_i / 1 -) = FS = \beta_0 + \beta_1 FA + \beta_2 FC + \beta_3 FU + \beta_4 FS + \mu i$$

Where, I = 1, 2, 3……. n (2015 to 2017)
FS= Food Security
FA= Food Availability
FC= Food Accessibility
FS= Food Sustainability

The dependent has different sub-dimensions while each explanatory variable is determined by taking different sub-dimension. Because there cannot be regress the explanatory variables with dependent variable when they have same sub-dimensions or domains. *'Li'* is the logit means log of the odd ratio that is not only linear to explanatory variables but also linear to parameters. It means that log odd in favor of food security changes as the explanatory variable change by a unit, Where P_i is the probability of being food secure while (1- P_i) is the probability of being food insecure. Moreover, β_0 is intercept or constant term which has combine impact of these fixed factor on household food security. The whole function is called Logistic distribution function and it is calculated by Maximum Likelihood (ML) technique. The main advantage of this function is that it provides probability that ranges from 0 to 1 as regression equation that predicts values from negative infinity to positive infinity (Cameron and Trivedi, 2005). The parameters are being estimated by Maximum Likelihood technique on STATA software. The problem of multicollinarity has checked through the Variance Inflation Factor (VIF) for continuous explanatory variables.

$$VIF\ (Xi) = 1/1- R^2$$

Where Xi is the i^{th} quantitative explanatory variable regressed on the other quantitative variables. R^2 is the coefficient of estimation when the variable Xi regressed on the remaining explanatory variables. Moreover, if the VIF value exceeds 10, it means there is signal for existence of strong multicollinearity between the continuous explanatory variables.

Achievement of the Study Objectives

At micro level study, there has collected data through constructing a comprehensive questionnaire in which each area of the study is covered. The data is collected through recall method by comparing the year of 2010 and 2015 about the public policies interventions and their effectiveness. It is done in such a way to achieve the very first objective of the study

that is evaluation of effectiveness of public policies in past and present. The presented data has different main dimensions. These dimensions have sub-dimensions. So I have used dual-cutoff approach to arrange my data. These dimensions have comprised of socio-economic domains. Calories intake which is 2350 Kg per day is consider a measure to analyze the food security situation that is rural-urban, male-female and child-adult equivalent average. There are different methods and techniques to calculate food security like Cost of Calorie Approach (Foster *et al*, 1986). It can be used in the on-going study by determine the food security line.

$\text{Ln } \varepsilon = \alpha + \beta c^{*}$

Where "ε" is the adult equivalent of food (in Pakistan Rupee) and "c*" is the actual calorie consumption per adult equivalent of a household (kilo calories) while α and β are the parameters estimate from the expenditure equation. Moreover, c* is the recommended daily calories level (Food Basket Foundation International, 1995). A household is considered food secure if per capita food expenditure of the household will greater than the cost of minimum calorie required per person in the family is assigned the value "1" and if "0" otherwise (Sultana and Kiani, 2011).

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An insecure score is computed for each village and union councils according to adequacies across all indicators. Mo is calculated in four domains which is followed by the structure of the Adjusted Headcount measure of Alkire and Foster (2011a). Mo = Ho × Ao; where Mo is the intensity of food security. Moreover, Ao is calculated by summation of total domains divided by total population multiplied by number of main dimensions. Furthermore, "4DE= 1-Mo" is sub-index which shows whether people are food secure in across the four dimensions. Headcount ratio (Hp) of food secure in percent is; **Hp = q/n**. Here q is the number of individual or village or union council and n is the total population. The second part is called the intensity of empowered or food secured (Ap). It is the average adequacy score of food secure individual and can be $A_p = \frac{\sum_{i=1}^{n} c_i(k)}{q}$

Where Ci (*k)* is the censored food adequate score of village or union council 'i' and q is the number of secured category. Mo is the product of both Mo = Hp × Ap. At last, 4DE is obtained as 4DE = 1- Mo. A category is insecure if its insecurity is greater than 40 percent. It means that individual category is secured in 4DE if it has adequate achievement in four domains that enjoys an adequacy score of 60 percent to greater of the weighted indicator that sum to 60 percent or more, or has an adequacy of 60 or greater (Alkire and Foster, 2011).

Results and Discussions

Table 1. Food Secure Union Councils (2017) and Food Secure Union Councils (2015)

Union Councils	Sample	No. of person food secure	Intensity of food secure (M0)	Food Index Score in 4DE= 1- Mo	Union Council	Samples	No. of person food secure	Intensity of food secure (M0)	Food Index Score in 4DE= 1- Mo
U.C.27	40	73.5	43.50	56.5	U.C.27	40	53.1	33.32	66.7
U.C.28	33	62.0	30.59	69.5	U.C.28	33	33.3	15.95	84.1
U.C.29	36	63.4	31.26	68.8	U.C.29	36	43.9	26.23	73.8
U.C.30	31	80.8	52.83	47.2	U.C.30	31	50.0	28.84	71.2

Table (1) highlighted the performance of the union councils throughout in 2010 has not remained quite impressive. Specifically speaking the table (2) also shows food security situation in 2017 is fair to middling. The union council No.30 is leading with 80.8 percent people are secure while Union Council No. 27 is behind with 73.5 percent. These union councils are have improved more as they were in 2015. However, Union Council No. 28 and Union Council No. 29 are much better and well improved in 2017 as compared to 2015.

There is significant improvements in socio-economic condition of the villages of these union councils specifically and rest of the union councils generally. The significant improvement has seen in food security is due to recognition of Tehsil status which has given rise employment opportunities to the area. The overall food security situation has catalyzed the significant improvement across the villages because there might improve in government interventions in areas like health, education and facilitation to famers as Government of Punjab has launched Skills Development Fund for Biogas, Supplemented Tube wells Programme and Scaling up Pakistan Approach to Total Sanitation (PATS) as well as many NGOs like Social Welfare Society Bhawana, Young Welfare Society, Friends Welfare Society, Anjuman Tarqi-e-Dehat and Anwar Jannat Memorial Foundation working vigorously in multiple fields to improve people living standard.

Table 2. Logit Regression Results2017

Food Security	Odd Ratios	Coef.	Std.err.	Z	P>|z|	(95% conf. interval)	
Water Irrigation	0.4399	0.8211	0.3882	2.15	0.032	1.570	0.0718
Seed Policy	2.1343	0.7581	0.3184	2.38	0.017	0.1339	1.3823
Fertilizer policy	1.3555	0.3041	0.3836	0.79	0.428	-0.4477	1.0560
Price Support	4.3453	1.4691	0.7177	2.05	0.041	.0623	2.8758
Food Inflation	15.0820	-2.7135	-0.898	-3.02	0.003	-0.9529	-4.4740
Health Policy	7.8816	2.0645	0.7477	2.76	0.005	0.5990	3.5300
Climate Change	1.6490	-0.500	-0.2262	-1.90	0.054	-.01508	1.0155
_cons		-2.9383	1.0525	-2.79	.005	-5.0012	-0.8755
Pseudo R^2	0.2811						
Prob >chi2	0.0001						

Table 3. Marginal Effect of 2017

Variables	Dy/dx	Std.err.	Z	p>|t|	[95% C.I.]		X
Water irrigation	.052	.027	1.92	0.05	0.107	.001	0.628
Seed Policy	0.04	.022	2.14	0.03	0.004	.093	.364
Fertilizer Policy	0.019	.025	0.77	0.44	-0.03	.069	0.871
Price Support	0.083	.040	2.09	0.03	0.005	.162	0.357
Food Inflation	0.419	.184	2.27	0.02	0.05	.780	0.921
Health Policy	0.133	.038	3.43	0.00	0.06	.209	0.528
Climate Change	0.032	0.02	1.77	0.06	-.003	.067	1.271

(*) dy/dx is the discrete change of dummy variables. ** shows insignificant at 10 percent level.

The Odd Ratio Synthesis

The table (3) has presented the whole scenario of 2017 in the studied area. When there is binary dependent variable or dependent in categorical, the parametric quantity having interest is the odd ratio (Hosmer and Lemshow, 2002). The odd ratio 0.43 in table (3) indicates that for an increase in water irrigation, the odd of being food secure will increase on average. It is so because water irrigation is the basic requirement for the production of staple crops and core ingredient of agriculture sector. The objective of World Water Day is to raise awareness about water and food production to more sustainable food production and consumption patterns (FAO, 2012). The increase in production have demonstrative role to play but constraints of finite resources provided by lands, oceans and atmosphere (Conway, 1997). The odd ratio of seed policy is 2.13 that implies the people of being food secure increase with increase in improved seed variety available to farmers. Seed is sine quo non for food availability and also can be effective to increase average production of the small are of land. Improved seeds strengthen production and application of improved staple crops seeds

enhances crop productivity, food security and food self-sufficiency (AusAID). The odd ratio of price support policy is 4.34 and it is significant impact on food security at p-value of 0.04. There are asymmetric courses in which poor face higher prices of food although food prices rise globally but they remain unable to get benefits from decline in global food prices because there is price rigidity (Jaffri *et al.* 2014). Moreover, food inflation odd ratio is 15.08 while its coefficient is negative that means food inflation has negative impact on food security situation. The government in a country can play determining role through interventions as to what agriculture goods are produced and how much to be produced. The government regulates the prices keeping in view the interest of the producers and consumers (Dorosh, 2008). The health policy is very crucial to maintain nutritional level. The odd ratio is 7.88. With the increase in the health facilities, the situation food security will increase in the area. Food security exists when all people all the time have physical and economic access for sufficient, safe, and nutritious food to meet their dietary requirements and there availability fulfill the needs of active and health life (FAO, 1996).

The odd ratio of climate change is 1.64 while its coefficient is negative with significance level of 5 percent. It means that there is negative impact of climate change. The increase in climate change causes reduction in food security in the area and ultimately to average production which has been decreasing due to sudden climatic outburst which eventually has been reducing the net income of the people. People having socio-economic features and resources are crucial and influencing factors for the status of food security (Sanusi *et al*, 2006). The variability in patterns of climate change like monsoon rains, rapid glacier ice melting and subsequent floods in Asia are the greatest threat (Moorhead, 2009) that causing contraction in food production (Bruinsma, 2009). The world can accomplish the goal of sufficient food requirements through adoption of multifaceted approach. There are multiple pathways for green food system and a greener economy (self-reliance). Moreover, sustainability intensification involves a many types of production methods and techniques (Godfray *et al*, 2010). However, individual income, social structure and uncertainty are the crucial factors to meet the daunting challenges of food security and hunger. The studied area has complex juncture of these factors. It is endorsed by Macrae and Zwi (1994) that chronic entitlement failures in which communities, households and individuals' assets have stripped through conflict.

Marginal Effect Analysis

The table (3.4) depicts that marginal effect on food security in 2017. Hence, as food security on average increases as the probability of being water irrigation escalate by 0.05. The marginal effect of seed policy is 0.04, fertilizer policy is 0.01, price support policy is 0.08, food inflation is 0.41, health policy is 0.13 and climate change is 0.03 respectively. There is not only problem in production side due to weak regulation of administration in input market and output market but also the conventional method of seeding processing, sowing techniques, and no change in durations and timings of crops sowing. It has been acknowledged that free market usually adversely affects the poor classes who have least influence on how market are structured and regulated (Anderson, 2009; Aksoy and Beghin, 2005). Food availability is necessary a condition but not sufficient to cope the challenge of food security. Food sustainability is very essential component of food security although it is long tern phenomenon. The climatic change, the degradation of soil fertility, flood and epidemics have been adversely affecting the long scenario of food sustainability and ultimately to food security. A number of studied synthesized that political democracy with its core values is positively correlated with improved physical quality of life, basic needs fulfillment and lower income inequality (Wickrama and Mulford, 1996).

Table 4. Logit Regression Results 2015

Food Security	Odd Ratios	Co	Std.err.	Z	P>|z|	(95% conf. interval)	
Water Irrigation	0.5413	0.6136	0.2600	2.36	0.018	1.1232	0.104
Seed Policy	0.6348	-0.4543	0.2461	-1.85	0.06	-0.9367	0.028
Fertilizer policy	1.8237	0.6008	0.3116	1.93	0.054	-0.009	1.211
Price Support	2.0477	0.7167	0.2880	2.49	0.013	0.1521	1.281
Food Inflation	0.5087	-0.6758	0.3043	-2.22	0.026	-1.2723	-0.079
Health Policy	2.9395	1.0782	0.3207	3.36	0.001	0.4496	1.706
Climate Change	0.5651	-0.5707	0.2277	-2.51	0.012	-1.0171	-0.124
_cons		1.4336	0.6357	2.26	0.024	0.1876	2.679
Pseudo R^2	0.2199						
Prob >chi2	0.0023						

Table 5. Marginal Effect of 2015

Variables	Dy/dx	Std.err.	Z	p>|t|	[95% C.I.]		X
Water irrigation	0.120	.045	2.65	0.008	0.208	.031	0.764
Seed Policy	-.088	.056	-1.57	0.115	-0.190	.021	0.664
Fertilizer Policy	0.117	.065	1.80	0.07	-0.010	.245	0.871
Price Support	0.140	.055	2.51	0.012	0.030	.249	0.657
Food Inflation	-.132	.066	-1.98	0.048	-.263	.001	1.178
Health Policy	0.210	.072	2.92	0.003	0.06	.352	0.714
Climate Change	-.111	0.040	-2.77	0.006	-.190	.032	1.085

(*) dy/dx is the discrete change of dummy variables. ** Shows insignificant at 10 percent level

The Odd Ratio Synthesis

The table (4) highlights the picture of 2015 in the study area. The odd ratio 0.54 of water irrigation in table indicates that for an increase in water irrigation, the odd of being food secure will increase on average while its coefficient is 0.61 that has positive impact on food availability, food utilization, food accessibility and food sustainability across the targeted area. Water is essential component of agriculture sector and productivity is largely depends upon this. In 2015, the odd ratio of seed policy in 0.63 and its coefficient value is 0.45 that is in negative. It is so because people of the area have been using traditional seed and its yield per ace has been decreasing. Moreover, the local market of yield availability has also been remained highly volatile due to high market food and non-food prices. Furthermore, the traditional seeds varieties have been Zinc deficient to increase average production and disease resistant. Harris *et al*. (2007) stated that increasing Zn seed contents by priming seeds solution of ZNSO4 was very cost effective in crop production. The odd ratio of fertilizer policy is 1.82 and its coefficient is 0.60 that shows it has positive impact with ingredients of food security. However, fertilizer market is highly dominated by private companies while role of extension service has been evaporating.

The redistribution of inputs such as nitrogen fertilizer from regions which over fertilized to region where nitrogen supply has been limiting can increase productivity (Mueller *et al*. 2013).The odd ratio of price support policy is 2.04 and its coefficient is 0.71 that shows that it has strong link and positive connection with food security because this intervention by government can influence on people priority cropping pattern. It can influence positively and also negatively. It depends upon how policy is implemented and monitor with accountability of the administration. The food inflation's odd ratio is 0.50 while its coefficient is in negative (-0.67). There is strong relation of food prices with welfare of human beings. The elasticity of food and non-food items showed that net buyers had to c=face the loss while net sellers benefited by price shocks (Janvry and Sadoult, 2008).

The increase in food stuff prices put negative effect on the consumers but the people from the developing countries suffer more than anyone else because they food has major portion of consumption in the household IMF, 2011). Health is the prominent issue and main factor that influences the food security. The odd ratio of health is 2.93 and its coefficient is 1.06. the reduced quality and variety of dietary intake is related to severe food insecurity (Tarasuk, 2001) while according to FAO (2001) food severe in security is continuously insufficient food intake to meet dietary energy requirements while these two concepts are incorporated with a range of adverse psychological, developmental and health outcomes especially in children (Alaimo *et al.* 2001. The odd ratio of climate change is 0.56 while its coefficients are negative (-0.57). It is largely supported by literature review that climate change has been adversely affecting the production and ultimately to food security. The net cereal production is forecasted to reduce at least 4 percent to 10 percent by the end of this century due to climate change in South Asia (Alam *et al*., 2007). Moreover, there might be imminent regional differences in wheat, rice, and maize crop yield due to climate change (Rozenweig *et al*., 200. The whole scenario is conclude that climate change has been casting significant impact on production in which per acre yield has been decreasing as does happen in current season of crop (wheat) cultivation that sudden raining period started. Moreover, there is high rate of market distortion while talking about food stuff purchase and it rose to its climaxes during special events like Ramzan and Eid.

Marginal Effect Analysis

The table (5) shows that marginal effect on food security in 2015. Hence, as food security on average increases, the probability of being water irrigation is increased by 0.12. The marginal effect of seed policy is negative (-0.08), fertilizer policy is 0.11, price support policy is 0.14, food inflation is also negative that is -0.13, health policy is 0.21 and climate change is -0.11 respectively. Fertilizer impact and climate change is negative in 2010. Fertilizer marginal impact is negative because fertilizer management is poor and there are many loopholes in its distribution. Resultantly not only the cost of products are increased but also the environment particularly the water and soil health are also impoverished (PARC, 2013). There is also an issue in the area that is observed by researcher that educated young generation is more interest in white color job than to adopt agriculture as a profession while adult are less keen to adopt fertilizer. The probability of fertilizer technology adoption was influenced negatively by age of household (Martey et al., 2014).

Summary and Conclusion

In this study, it is found that public policies have great significance to cope the challenge of food security although there have certain problems of coordination among institution and their internal conflicts which have been hindering the progress to overcome this issue. It is endorsed by (Hassan, 2015) with other social and agriculture-based scientists during in-depth interviews, methods and techniques applied that there is no issue of food availability in Pakistan rather there is highly market distortion which have been adversely affecting and gearing up poverty and inequality in the country. Food security is a globally daunting challenge to millions of people particularly developing world has been confronting. According to World Health Organization (WHO), Food security means all people at all times have both physical and economic access to enough food for an active and healthy life. Moreover, it includes that the ways in which food is produced and distributed are respectful of the natural process of the earth and thus sustainable. Furthermore, both the consumption and production of food are governed by the social values that are just and equitable as well as moral and ethical. At last there is stated that the ability to acquire food is ensured, the food itself is nutritionally adequate that has personally and culturally acceptable in such a manner

that uphold human dignity. Food security has three important aspects that are available and reliable food supply, the importance of access to food and to sufficient along with safe and nutritious food which must also be culturally acceptable (CAPFS, 1998). Many factor directly and indirectly affect to food availability, food accessibility, food utilization and food sustainability. Water irrigation, cropped area, improved seed and fertilizers usage has direct connection with food availability while these factors also indirectly affect the other dimensions of food security at the same time. Food inflation, income of household and assets have direct linkage to food accessibility and utilization while climate change has direct link to sustainability and also availability of food.

In Pakistan, food availability is not a serious issue rather there are grave problem of accessibility, utilization and sustainability (Abedullah, 2015). There are required adequate linkages or interventions that are direct or immediate and other is medium and long-term interventions. Social protection instruments such as safety nets that's are primarily in the form of cash or food-based transfers can forge a bridge between these two tracks, make transformation in humanitarian aid for degenerative requirements to predictable longer-term development approach that also include public investment in infrastructure (CFS, 2013). However, social protection and government interventions are often uncoordinated, externally funded, short-term and not adequately targeted to food security, nutrition and poverty reduction strategies (Husnain, 2015). There are also such problem in which many agriculturists, food workers and their families face hunger and malnutrition because of minimum wage polices, labor laws and social security system that does not cover rural workers (CAPFS, 2013). There is estimated, calculated and analyzed the study findings and suggestions that will helpful for policy makers to layout a framework based on pro-active approach that should be streamlined with latten and spirit to cope the challenge of food security and hunger for the current scenario and also for forthcoming years.

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