Analysis of Livelihoods and Food Security among Rural Households of Khyber Pakhtunkhwa, Pakistan

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ARTICLE DETAILS

History

Revised format: Nov 2021

Available Online: Dec 2021

Keywords

Livelihoods, Food Security, Farm and Non-Farm Strategies, Calorie intake method, Logit model

JEL Classification

Q5, R2, R210

Purpose: This study was an effort with the aim to study livelihoods and food security status in rural areas of Khyber Pakhtunkhwa province, Pakistan.

Design/Methodology/Approach: Three districts of the province were confined and research data from randomly selected 336 households were collected. Livelihoods was analyzed by investigating livelihood strategies pursued by the households while food security status was measured through calorie intake method.

Findings: The study examined that diversified livelihood strategies were pursued by the households; and noticed that farm was the prime strategy of 34.52% households while non-farm was the strategy of 65.48% households. The incidence of food secure and insecure households was 57.44% and 42.56%, respectively; and FSI of the food secure households averaged 1.26 and food insecure households averaged 0.79.

Implications/Originality/Value: There is dire need to provide opportunities for a sustainable livelihood strategy at household level that could ultimately move them from worse to better food security status.

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Recommended citation: Nabi, K. & Shafi, M. M. (2021). Analysis of Livelihoods and Food Security among Rural Households of Khyber Pakhtunkhwa, Pakistan. *Journal of Accounting and Finance in Emerging Economies*, 7(4), 945-954.

Introduction

The concepts of livelihood are varying widely and dynamic as they are depending on the level of development of the targeted region or country (UNODC, 2011). The livelihood has broader meaning than income and include everything necessary for living. It encompasses the activities that undertake as well as planned by men and women to build their livelihoods and that create household's survival means (DFID, 1999).

A significant outcome of the livelihood is the provision of basic requirements such as food. It implies that household and all individuals of the household can always create, acquire, or to get adequate, healthy, and culturally acceptable food at all times. Reduced food intake (both quality and quantity) can have an impact on health, well-being and capacity to work, which can then loop back to increase susceptibility (Pasteur, 2002). The keys of risks to people's food security are determined by their livelihoods (Lovendal et al., 2006). Food security is mainly depending upon the people's livelihood strategies and possession and access to livelihood assets (Farooq, 2009). Addressing the issue of food insecurity without taking into account the accompanying security of the livelihoods of households may be insufficient for making appropriate and effective policy recommendations (Oni and Fashogbon, 2013).

Understanding livelihood dimensions to food security; in which people's struggle with assets to generate activities for income and fulfil the basic need of a secure food; is very promising to deal with food security concerns (Scoones, 2009). The nexus between livelihoods and food security is not simple and is altered by varieties of factors that change across contexts and over time. At household level, food security can be determined by food consumption, and this could be affected by household's livelihood strategies and earnings.

People of Pakistan are facing many challenges in livelihoods and food security as the country confronted (and still continue to confront) the crises of food, fiscal, fuel, functional democracy, fragility of climate and frontier (referring to the war on terrorism across the border between Pakistan and Afghanistan). The cumulative effect of these crises is intimidating to livelihoods and food security, particularly in rural Khyber Pakhtunkhwa province. Rural population of the province are facing disparities in use and allocation of overburden resources. These people are engaged in a variety of livelihood activities to get food though coping many challenges and threats to livelihoods. The situation within the province and its surrounding developing a sense of inefficient availability and use of livelihood resources as well as worsen food insecurity among the rural households.

Analyzing livelihoods of rural people are important because it helps to understand people's livelihoods strategies intend to produce better food to understand livelihoods and food security among the rural households of Khyber Pakhtunkhwa province of Pakistan, the study was carried-out in Peshawar valley with the objectives; to investigate livelihood strategies that rural population are engaged with, and to study food security situation.

Materials and Methods

Three districts of the Peshawar valley namely Charsadda, Nowshera and Mardan were the universe of the study in which total 6 villages were randomly selected. Due to a variety of factors such as human and financial constraints, selecting all of the households in the study area is a big challenge. Therefore, proportional allocation technique (Cochran, 1977) was applied and data were collected from five percent households in each village. Household was taken as unit of analysis, and primary data was gathered from 336 randomly selected households. Different statistical techniques were used and data were analyzed using both descriptive and analytical approaches. Analysis was made with the help of MS Excel and SPSS, in accordance with the objectives of the study.

Rural households were engaged in a variety of livelihood strategies having broader categories of farm and non-farm. The sub-strategies under each broader group that were pursued by the households were also investigated. On the other hand, calorie intake approach was employed to assess food security status, as used by Karim et al. (2018), Aziz et al. (2016), Bashir et al. (2013) and Kuwornu et al. (2013). The data of food consumption by each household were transformed into calories per day per adult equivalent with the help of Food Composition Table for Pakistan

(Department of Agricultural Chemistry, Khyber Pakhtunkhwa Agricultural University Peshawar, 2001), and Pakistan basic adult equivalence scale (GoP, 2016) that assigned a weight of 0.8 to each individual below age of 18, and weight of 1 to each individual age 18 and above. The threshold level of 2350 Kcal/adult equivalent/day (GoP, 2016) was applied and food security index was computed to divide households into food secure and insecure. The formula of the index is given as:

$$Z_i = \frac{Y_i}{R} \quad \text{.....(1.1)}$$

Where;

Z_i = Food Security Index of i^{th} household
 Y_i = Actual Daily Calorie Intake of i^{th} households
 R = Recommended Daily Calorie Requirement of i^{th} household

When;

$Z_i \geq 1$, the status of food is considered to be secure for i^{th} household and
 $Z_i < 1$, the status of food is considered to be insecure for i^{th} household

A household is therefore food secure whose daily calorie intake per adult equivalent are equal or higher than recommended daily calorie per adult equivalent and those whose daily calorie intake per adult equivalent are below the recommended daily calorie required were considered food insecure households.

Logistic regression was used following Bashir et al. (2013), Oni and Fashogbon (2013), Alemu (2012), Arega (2012), Bashir et al. (2012), and Titus and Adetokunbo (2007). The model can be written as:

$$L_i = \ln\left(\frac{P_i}{1-P_i}\right) = \beta_0 + \sum_{i=1}^7 \beta_i X_i + \sum_{i=1}^2 \beta_i D_i + \varepsilon_i \quad \text{.....(1.2)}$$

Where,

$\left(\frac{P_i}{1-P_i}\right)$ = Odds ratio and $\ln\left(\frac{P_i}{1-P_i}\right)$ is called logit or log odds and act as dependent variable

P_i is the probability of i^{th} household to become food secure and X_i and D_i is the vector of the independent variable of that household, Therefore,

The parameter β_0 gives the log odds of a household being food insecure (when X_i or $D_i = 0$),

β_i shows how these odds differ for food secure households (when X_i or $D_i \neq 0$) and

ε_i represents error term

By incorporating independent variables (X_1 : Household Size, D_1 : Primary livelihood activity of farm, D_2 : Secondary livelihood activity engagement, X_2 : Household monthly income, X_3 : No. of economically active member, X_4 : Education level of household head, X_5 : Age of household head, X_6 : Ruminant possession, X_7 : Dependency ratio) in equation (1.2), the model can be expressed as:

$$\log it (P_i) = \beta_0 + \beta_1 X_1 + \beta_2 D_1 + \beta_3 D_2 + \beta_4 X_2 + \beta_5 X_3 + \beta_6 X_4 + \beta_7 X_5 + \beta_8 X_6 + \beta_9 X_7 + \varepsilon_i \quad \text{..... (1.3)}$$

Results and Discussion

Table 1 presents that household size in the study area was averaged 8.03, range 2 to 20 individuals in a household and standard deviation 3.07. Adult equivalent per household was between 2 to 18 and averaged 7.19 in overall sample households. A household was comprised men, women and children in an average of 1.86, 1.98 and 4.18, standard deviation of 1.10, 1.16 and 2.16, respectively. The average of male (4.0) was more or less the same with the average of female (4.03). The finding was confirmed by Pakistan Bureau of Statistics (Census Report, 2017) found that household size is 7.99 in rural Khyber Pakhtunkhwa province. In the study area, on average household earning members was 2 with minimum 1, maximum 6 and standard deviation

of 1. The percentage of dependency per household averaged 76 percent with minimum 40 percent and maximum 93 percent with standard deviation 12. This was observed that high dependency and either one or two earners in majority of households can result feeble livelihood strategies with unfavorable livelihood outcome of the households.

Table 1
Household' Composition and Size

Particulars	Members per household			
	Average	Minimum	Maximum	Std. Deviation
Men	1.86	-	6	1.10
Women	1.98	1	6	1.16
Children	4.18	-	11	2.16
Total	8.03	2	20	3.07
Male	4	1	11	1.91
Female	4.03	1	11	1.87
Adult Equivalent	7.19	2	18	2.75
Earning member	2	1	6	1
Dependent member	6	1	17	3
Dependency ratio	0.76	0.40	0.93	0.12

Results in Table 2 and Table 3 depict that diversified livelihood strategies were pursued by the rural sample households; not merely engaged in farm but a large portion of households were involved in non-farm activities while some others adopted both. It was noticed that farm strategy was the prime strategy of 34.52% households and non-farm was the 65.48% households. The study captured sub-strategies for both of farm and non-farm and provide details that crop production was the dominant strategy among farm where 43.97% households were engaged. Beside this, farm labour engaged 31.90% households, farm trade 12.93% households, and each “farm service work” and livestock engaged less than 10% households. The non-farm leading and second highest sub-strategy were “casual labour” and “small-scale business” that offering a source of primary livelihood strategy to 20.19% and 17.73% households, respectively. Similarly, explored categories and sub-strategies of the secondary livelihood strategy adopted by the households present that 53.27% of the households were engaged in secondary livelihood strategy though a large proportion of households i.e. 46.73% were having no secondary livelihood strategy. Pursuing secondary strategy, 27.08% of the households performed farm strategy while 26.19% non-farm strategy.

Table 2:
District Wise Household's Primary Livelihood Strategy

Livelihood strategy	District			Total
	Charsadda	Mardan	Nowshera	
Farm	34 (27.87)	35 (38.46)	47 (38.21)	116 (34.52)
Non-farm	88 (72.13)	56 (61.54)	76 (61.79)	220 (65.48)
All	122 (100)	91 (100)	123 (100)	336 (100)

Table 3:
District wise Household's Secondary Livelihood Strategy

Secondary Livelihood strategy	District			Total
	Charsadda	Mardan	Nowshera	
Farm	19 (15.57)	20 (21.98)	52 (42.28)	91 (27.08)
Non-farm	29 (23.77)	16 (17.58)	43 (34.96)	88 (26.19)
No secondary strategy	74 (60.66)	55 (60.44)	28 (22.76)	157 (46.73)
All	122 (100)	91 (100)	123 (100)	336 (100)

Food security status of the households is presented in Table 4. Data shows that the incidence of food secure and food insecure households in the area were 57.44% and 42.56%, respectively. Food security index of the food secure households averaged 1.26 with standard deviation of 0.18, while averaged 0.79 with standard deviation of 0.12 for food insecure households. Based on surplus index, food secure households consumed daily calorie per adult equivalent in excess by 26% of the threshold level. Whereas food insecurity gap represents that food insecure households consumed daily calorie per adult equivalent by 21% less than the threshold level. The measurement consigned that the daily calorie intake per adult equivalent of the overall households was averaged 2327 kcal with minimum 1198 kcal and maximum 5720 kcal, and specifically for food secure households and food insecure households averaged 2965 kcal and 1854 kcal, respectively. These results are more or less similar with the findings of the study conducted by Aziz et. al. (2016), found that daily calorie intake per adult equivalent among the food insecure households were 1803 kcal in Pakistan; and the incidence of food insecure households were 67 percent in Pakistan and 65 percent in Khyber Pakhtunkhwa province. Figure 1 presents household's food security status in comparison with average calorie intake of each of the status category.

Table 4:
Food Security Status of the Sample Rural Households

Description	Food Security Status	
	Food Secure Households	Food Insecure Households
Food Security Index (Mean)	1.26	0.79

Standard deviation of Food Security Index	0.18	0.12
Food security surplus index / food insecurity gap	0.26	0.21
Calorie intake per day per adult equivalent (average)	2965	1854
Percentage of household	42.56	57.44
Number of households	143	193
Overall calorie intake per day per adult equivalent (average)	2327

Figure-1: Household food security status in comparison with average calorie intake

Logit model was fitted to estimate the effects of the hypothesized explanatory variables on the probabilities of being food secure or not., Goodness-of-fit was assessed for the overall fit of the models via Omnibus tests of model coefficients, Hosmer and Lemeshow test, pseudo R^2 and classification table. It was concluded from the results i.e. prediction success of 70.5%, Omnibus tests χ^2 values 86.062 (p -value 0.000), Cox & Snell R^2 0.226 and Nagelkerke R^2 0.304, that the fitted model is good model. Among the total (9) hypothesized variables, significant variables with respect to the households' food security at less than 5% probability level are "household size", "monthly income of the household" and "age of the head of household". Variable's coefficient with positive signs that showed direct relationship with household food security; are "secondary livelihood activity engagement", "income of the household", "education level of household head", "age of household head", and "possession of ruminant(s)".

Table 5
Logit Model Estimates for Factors Affecting Households' Food Security Status

Variables	Coefficient (B)	Standard error (S.E.)	Wald	Sig. (p - value)	Odds (Exp(B))
Model I:					
Constant	1.348	3.029	.198	.656 ^{NS}	3.849
Household Size	-.443	.146	9.271	.002*	.642
Primary livelihood activity of Farm	-.485	.307	2.489	.115 ^{NS}	.616

Secondary livelihood.136	.307	.195	.659 ^{NS}	1.145
activity engagement				
Household monthly income .000	.000	17.457	.000*	1.000
No. of economically active-.214	.503	.181	.671 ^{NS}	.808
member				
Education level of household.026	.016	2.717	.099 ^{NS}	1.027
head				
Age of household head .039	.012	10.369	.001*	1.040
Ruminant possession .485	.315	2.374	.123 ^{NS}	1.625
Dependency ratio -1.061	3.981	.071	.790 ^{NS}	.346

*Significant at 5%, ^{NS}Non-significant

Note:

X₁ (Household Size)

D₁ (Primary livelihood activity of farm)

D₂ (Secondary livelihood activity engagement)

X₂ (Household monthly income)

X₃ (No. of economically active member)

X₄ (Education level of household head)

X₅ (Age of household head)

X₆ (Ruminant possession)

X₇ (Dependency ratio)

X₁ (Household Size)

The results of the model show that households size had negative sign of coefficient; implies that household size is inversely related with the level of food security of the sample households. This implies that household having large size tends to be food insecure than those with small size. This suggests that a household with large number of persons per household could face most likely food insecurity and most probably would demand more for livelihood outcome in term of food from the adopted livelihood strategy. For household size the value of odds (0.642) is in favor of household gradual movement towards decreasing food security status if the size increases while keeping other variables constant. These results confirmed by the findings of the study conducted in Pakistan by Anwar et.al. (2017), Aziz et. al. (2016) and Bashir et.al (2012) reported negative relationship between food security level and total household members.

D₁ (Primary Livelihood Activity)

The negative sign of coefficient indicates that farm activity of the household is inversely related with food security. This implies that those households with primary livelihood activity of farm tend to be food insecure than those with the non-farm livelihood activity. Restricted access to and degradation of limited agricultural land, low outcome of the farm activities, and large household size could be the most probable reasons for lack of access to adequate food. The findings supported by Osarfo et al. (2016) stated that higher probability of involvement of households in non-farm activities had improved food security status than that of involvement in farm activities.

D₂ (Secondary Livelihood Activity)

Beside primary livelihood strategy, in secondary strategy few do farm activities, few non-farms while quite a few don't have any secondary activity, however engagement in more than one activity don't mean to achieved a minimum required outcome by the rural household. The positive sign of coefficient indicates directly relationship among the household' engagement in secondary livelihood activity with food security in term of increases calories intake. Manlosa et al. (2019) who reported that more livelihood strategies improve food security. Aziz et. al. (2016), households pursued multi and diversified livelihood strategies have lesser probability of being food insecure than those relying on single strategy.

X₂ (Household Monthly Income)

The variable has positive influence on food security status of the rural households and statistically significant at less than 5% probability level. These results indicate that increase in household' monthly income will increase the probability of being food secure (odds-ratios of 1.000035). These results are confirmed by Ahmed et al. (2017) rural household' food security

status had a significant and positive relationship with household monthly income.

X3 (No. of economically active member)

Sign of the coefficient implies that household' food security has inverse relation with income earning member of household. The inverse relation might be due the cause of low productivity from limited livelihood capital, self-employment or underemployment, high inflation rate, limited opportunities to work, non-sustainable source of income, and inflate spending on non-food items. Ahmed et al. (2017) stated that poor health (Ullah & Muhammad, 2020), and sanitation conditions, low purchasing power, and high food prices and increase in debit may adversely affect household' food security status. Bashir et al. (2012) found that total earner in a household was non-significant in rural households of South and Central Punjab.

X4 (Educational Level of Household Head)

The result implies that household with high educational level by the head of household are more likely to be food secure than those who have low level of education. The odd ratios (1.026) reveal that holding other variables constant, a change in household head education level by one unit will increase probability of household' being food secure. These findings are in line with the study of Manlosa (2019), found a positive association of educational attainment of the household head with food security. Abdullah et al. (2017) stated that education can contribute to improve food security level in rural northern areas of Pakistan.

X5 (Age of Household Head)

The variable has significantly positive relationship with food security status; and clarify that increase of household' head age could increase the level of food security and decrease the level of food insecurity of that household in rural areas. The odds ratios i.e. 1.039 portray favor of impact on level of rural household food security if a unit changed in age of household head. Abdullah et al. (2017), households with older head had better food security status as compare to the younger head in rural northern areas of Pakistan. Arene (2010) found that older household heads had higher probability of being food secure than the younger one.

X6 (Ruminants)

Possession of ruminant in sample rural household is considered being an important factor for increasing level of household food security. Ruminant possession showed direct and significant relationship at 5% significance level, with food security. Keeping other things constant, possession of livestock by rural household more probably secure the food of that household as odds of the possession of livestock is 1.619. This was confirmed by Bashir et al. (2013) ruminants play a significant and positive role in food security of the rural households in Punjab province of Pakistan.

X7 (Dependency Ratio of Household)

Dependency ratio of the household as negative sign of coefficient showed an inverse relationship with food security of the household; means that with increase in household dependency ratio would more probably decrease level of food security or increase level of food insecurity. High dependency ratio could be resulted a worse condition of the level of food security as this could put pressure on consumption rather than production of the limited strategies. The odds ratio of dependency ratio represents that keeping other things constant, with the increase of one unit of dependency ratio is more probably to decrease food security level by factor of odds 0.341 and vice versa. The findings are in line with the study of Aziz et. al. (2016), household is more likely of being food secure having lesser dependency ratio and vice versa.

Conclusions and recommendations

Diversified livelihood strategies were pursued where a large portion of the households were

involved in non-farm strategies against the farm. Sub-strategies of the farm and non-farm were investigated where crop production and “casual labour” were the leading strategies, respectively. Around half of the households derive their livelihoods adopting single strategy while others engaged in more than one strategy. Significant variables with respect to the status of household’s food security are “household size”, “monthly income of the household” and “age of the head of household”. Variable’s that showed direct relationship with household food security; are “secondary livelihood activity engagement”, “income of the household”, “education level of household head”, “age of household head”, and “possession of ruminant(s)”. The study suggests that there is dire need to invest in livelihoods means in order to improve and increase the sustainability of livelihood strategy for a better livelihoods’ outcome of the population, Food insecure households must be treated through provision of opportunities of sustainable livelihood strategy which will ultimately move households from worse to best food security outcome

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