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Determinants of Food Insecurity: A Comparative Analysis of General and Farmer Households in Pakistan

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Abstract

The study delves into the determinants of food insecurity in both general and farmer households using data from the Pakistan Social and Living Standards Measurement (PSLM) 2007-08 survey. Through descriptive analysis, the research identifies key factors influencing food insecurity and subsequently employs a logit model to ascertain the probability of households being food secure or insecure. Initially, the model incorporates 16 variables for general households and 19 variables for farmer households, drawn from previous research on factors impacting food insecurity. Notably, the analysis reveals that 12 out of 19 variables are significant in determining food insecurity for farmer households. These variables include household size, household income, number of rooms, dependency ratio, access to electricity and irrigation facilities, as well as age and education level of the household head. Surprisingly, the study finds that female education is insignificant in the model for general households, suggesting potentially different dynamics influencing food insecurity across household types. Furthermore, the research examines the partial effects of continuous variables and the change in probabilities associated with discrete variables in the logistic models. Among the most influential factors driving food insecurity status are household size, education level of the household head, annual income, and agricultural income. These findings underscore the multifaceted nature of food insecurity and highlight the significance of socio-economic variables in shaping household vulnerability to food shortages. This study provides valuable insights into the determinants of food insecurity in Pakistan, shedding light on factors that disproportionately affect both general and farmer households. By identifying key variables and their respective impacts, the research contributes to the understanding of food insecurity dynamics and informs targeted interventions aimed at alleviating hunger and promoting food security in the country.

Keywords: Food Insecurity, Household Vulnerability, Pakistan Social and Living Standards Measurement (PSLM)

JEL Codes: I32, Q18, R20

1. INTRODUCTION

Food insecurity in South Asia is a pressing issue that affects millions of people in the region, despite Pakistan and India being major producers of cereals globally (Mittal, and Sethi, 2009). This paradox underscores the complex challenges facing these nations. In addition to grappling with issues like terrorism, suicide bombings, militancy, poor governance, and corruption, Pakistan is also confronted with alarming levels of food insecurity. The consequences of food insecurity are severe, with over 500 million people in the region struggling to access an adequate and nutritious diet. This stark reality highlights the urgent need for comprehensive strategies to address food insecurity and its root causes in South Asia. By tackling issues such as poverty, inadequate infrastructure, inefficient distribution systems, and environmental degradation, governments can work towards ensuring food security for all their citizens (Mwaniki, 2006). Additionally, fostering international cooperation and implementing sustainable agricultural practices are essential steps towards mitigating food insecurity and promoting long-term food sovereignty in the region. The findings of the Sustainable Development Policy Institute (SDPI) report paint a concerning picture of food insecurity in Pakistan. With nearly 48.9% of the population experiencing food insecurity, the country is ranked 11th at 'extreme risk' on the Food Security Risk Index (FSRI). The report's assessment categorizes Pakistan into four levels of food security: extremely insecure, insecure, at the borderline, and reasonably secure. Unfortunately, the results indicate a worsening trend compared to data from 2003, with food insecurity prevalent at the household, district, province, and national levels (Mabiso et al., 2014).

These findings underscore the urgent need for targeted interventions to address the root causes of food insecurity in Pakistan. Addressing issues such as poverty, inadequate access to resources, environmental degradation, and ineffective food distribution systems is essential to improving food security outcomes for the population. Additionally, comprehensive policies that prioritize agricultural development, promote sustainable farming practices, and ensure equitable access to nutritious food are crucial for building resilience against food insecurity in the long term (Beddington et al., 2011). The SDPI report highlights a concerning trend of worsening food insecurity at the district level in Pakistan. The number of

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districts classified as extremely food insecure has increased from 38 in 2003 to 45 in 2009, out of a total of 102 districts. This indicates a significant escalation in the severity of food insecurity across various regions of the country. At the household level, the situation is even more dire, reflecting the intensifying nature of food insecurity nationwide. The growing number of districts experiencing extreme food insecurity underscores the urgent need for targeted interventions to address the underlying factors contributing to this crisis (Barrett and Lentz 2010). Efforts to improve food security must prioritize vulnerable households and communities, ensuring access to nutritious food, livelihood opportunities, and social protection measures. Additionally, comprehensive strategies that address poverty, inequality, environmental sustainability, and agricultural productivity are essential for building resilience and reducing food insecurity across Pakistan.

The impact of high food prices has exacerbated food insecurity in Pakistan, with an additional 10 million people becoming food insecure, according to a World Food Program (WFP) report from 2008 (Khan et al., 2011). This poses a significant challenge to efforts aimed at achieving the target of halving hunger by 2015, as outlined in development goals. Pakistan's status as an agrarian country, traditionally viewed as food self-sufficient, adds complexity to the situation. Despite its agricultural potential, the country continues to grapple with widespread hunger and food insecurity. This underscores the need for comprehensive strategies that address not only food production but also factors contributing to food access, distribution, affordability, and nutritional quality. Addressing the root causes of food insecurity requires a multi-dimensional approach that encompasses policies and interventions aimed at poverty reduction, agricultural development, social protection, and nutrition improvement. Furthermore, efforts to mitigate the impact of high food prices must be prioritized to ensure the well-being and food security of vulnerable populations in Pakistan. The acknowledgment of socio-economic factors as critical determinants of food security underscores the need to understand and evaluate their impact on household food insecurity (Lê et al., 2015). Hence, the primary objective of this study is to identify and assess the socio-economic characteristics that influence the food security status of households. In the subsequent sections, the study will delve into the concept and definition of food insecurity, providing a comprehensive understanding of its implications. Furthermore, the methodology employed to assess the food insecurity status of households will be outlined, detailing the approach taken to analyze socio-economic factors and their relationship with food security outcomes. By elucidating the socio-economic dimensions of food insecurity, this study aims to contribute valuable insights into the complex interplay between household characteristics and food security status. Such insights are crucial for informing targeted interventions and policy measures aimed at addressing food insecurity effectively.

2. EMPIRICAL RESULTS

The table 1 presents household food insecurity data categorized by household head characteristics and female education levels, with a distinction between general households and farmer households. Regarding household head education levels, the mean years of education are higher for secure households compared to insecure households, regardless of whether the household head has primary, secondary, graduation, or higher education levels. The pattern is consistent for both general households and farmer households. For instance, the mean years of education are 9.74 for secure households and 9.23 for insecure households in general households, and 9.15 for secure households and 8.89 for insecure households in farmer households. In terms of household head age, both mean and median ages are slightly higher for insecure households compared to secure households across all age groups (≤ 35 , 36-55, and > 55). However, the differences are relatively small.

When considering gender, there is a notable difference in food insecurity rates between male-headed and female-headed households. In both general and farmer households, the percentage of food-insecure households is higher among female-headed households compared to male-headed households. Examining female education levels, there is a clear trend where higher levels of education are associated with lower levels of food insecurity. This trend is consistent across all categories of household characteristics. For example, in general households, the percentage of households experiencing food insecurity decreases as the level of female education increases, from primary education to higher education levels. This pattern is similarly observed in farmer households. Overall, the data suggests that household food insecurity is influenced by various factors, including household head characteristics and female education levels. Higher levels of education, both for household heads and females within the household, appear to correlate with lower levels of food insecurity.

The table 2 displays the mean and median income levels for both secure and insecure households, segmented by household type (general households and farmer households). For general households, the mean annual income is significantly higher for secure households, standing at \$149,653.72, compared to \$121,824.89 for insecure households. Similarly, the median annual income is higher for secure households, with a median of \$96,865, compared to \$96,000 for insecure households. In the case of farmer households, the disparity in income between secure and insecure households is also evident. Secure farmer households have a higher mean annual income of \$137,383.95, compared to \$116,353.57 for insecure farmer households. The median annual income follows a similar trend, with secure farmer households having a median income of \$90,140, compared to \$82,500 for insecure farmer households. Regarding agricultural income, data is available only for farmer households. Secure farmer households have a higher mean agricultural income, amounting to \$18,391.91, compared to \$140,402.94 for insecure farmer households. The median agricultural income is also higher for secure farmer households, with a median of \$93,000, compared to \$83,000 for insecure farmer households. Overall, the data indicates that both general households and farmer households experience higher income levels when they are categorized as secure, highlighting the importance of economic security in household income levels.

Table 1: Household food insecurity by household head characteristics and female education

Household characteristics	General households		Farmer households	
	Secure	Insecure	Secure	Insecure
Household head education				
Mean	9.74	9.23	9.15	8.89
Median	10	10	10	10
Primary(<=5) %	46.4	53.6	55.5	44.5
Secondary(6-10) %	48.0	52.0	60.3	39.7
Graduation (11-14)%	55.8	44.2	75.4	24.6
Higher (>14) %	70.6	29.4	75	25
Household head age				
Mean	45.64	46.48	47.39	48.39
Median	45	45	46	48
≤35 %	56.4	43.6	66.9	33.1
36-55 %	46.1	53.9	58.6	41.4
>55 %	51.0	49.0	59.0	41.0
Gender				
Male %	49.3	50.7	61	39.9
Female %	56.1	43.9	70	30.0
Female education				
Mean	8.23	7.96	7.83	7.85
Median	8	8	8	8
Primary(<=5)%	51.6	48.4	70.3	29.7
Secondary (6-10)%	48.1	51.9	59.2	40.8
Graduation (11-14)%	65.5	34.5	82.4	17.6
Higher (>14)%	78.8	21.2	83.3	16.7

Table 2: Mean income for secure and insecure households

Household income	General households		Farmer households	
	Secure	Insecure	Secure	Insecure
Annual Income				
Mean	149653.72	121824.89	137383.95	116353.57
Median	96865	96000	90140.00	82500.00
Agricultural Income				
Mean	---	---	18391.91	140402.94
Median	---	---	93000	83000

The table 3 presents the percentage of food insecurity among general households and farmer households based on various additional characteristics. Regarding the number of rooms, the data shows that as the number of rooms increases, the percentage of food insecurity generally decreases. For instance, among general households, those with five or more rooms have the lowest food insecurity rate at 40%, while those with one room have the highest rate at 52%. Similar trends are observed among farmer households. Occupational status also influences food insecurity, with renters generally experiencing higher rates compared to owners across both household types. In general households, renters have a food insecurity rate of 51.5%, while owners have a rate of 49.8%. The dependency ratio, which measures the number of dependents relative to the number of working-age adults in a household, is slightly higher for insecure households compared to secure households, indicating a potential association between dependency ratio and food insecurity. Regarding dwelling type, households living in apartments or flats tend to have slightly higher food insecurity rates compared to those living in independent houses or compounds. Access to basic amenities like electricity and safe water also plays a role in food insecurity. In both general and farmer households, those without access to electricity or safe water tend to have higher rates of food insecurity. Livestock ownership, irrigation availability, fertilizer use, and land size appear to have little variation in food insecurity rates among farmer households. However, further analysis may be needed to understand the nuances of these factors in food insecurity dynamics. Overall, the data highlights the multifaceted nature of household food insecurity and the importance of considering various household characteristics in addressing this issue effectively.

Table 3: % age of food insecurity according to some additional characteristics of households

Household characteristics	General households		Farmer households	
	Secure	Insecure	Secure	Insecure
Number of rooms				
1	48%	52%	59.7%	40.3%
2	48%	52%	59.1%	40.9
3	49.6%	50.4%	60.1%	39.9
4	51%	49%	61.6%	38.4%
5 or more	60%	40%	66%	34%
Occupational status				
Renters	48.5%	51.5%	58.5%	41.5%
Owners	49.8%	50.2%	60.6%	39.4%
Dependency ratio				
Mean	.95	1.06	1.02	1.12
Median	.75	0.86	0.8	0.88
Dwelling type				
Independent house/compound	50.1%	49.9%	---	---
Apartment/flat	48%	52%	---	---
Part of large unit	48.8%	51.2%	---	---
Part of compound	44.7%	55.3%	---	---
Other	51.5%	48.5%	---	---
Electricity connection				
Not Available	44.7%	55.3%	50.4%	49.6%
Available	50.8%	49.2%	64.5%	35.5%
Access to safe water				
No	52.4%	47.6%	58%	42%
Yes	49.3%	50.7%	61%	39%
Livestock Ownership				
Not have	---	---	60.5%	39.5%
Have	---	---	60.4%	39.6%
Irrigation				
Not available	---	---	65.7%	34.3%
Available	---	---	58.9%	41.1%
Fertilizer use				
No	---	---	60.8%	39.2%
Yes	---	---	60.4%	39.6%
Land size				
1	---	---	55.7%	44.3%
1-2.5	---	---	65.2%	34.8%
2.5-4	---	---	60.1%	39.9%
>4	---	---	60.2%	39.8%

The table 4 presents parameter estimates of logit models for general households, indicating the impact of various household characteristics on food insecurity. In Model I, region and household size exhibit significant positive associations with food insecurity, with coefficients of 0.68 and 0.513, respectively. The negative coefficient for the household size square (-0.013) suggests a curvilinear relationship between household size and food insecurity. The Ln of total income has a significant negative coefficient (-0.554), indicating that higher income is associated with lower levels of food insecurity. Similarly, the dependency ratio has a negative coefficient (-0.161), suggesting that households with more working-age adults relative to dependents tend to have lower levels of food insecurity. Occupational status as renters also shows a significant negative association with food insecurity (-0.17), implying that renters are more likely to experience food insecurity compared to homeowners. Number of rooms exhibits a negative association with food insecurity (-0.168), indicating that households with more rooms tend to be less food insecure. Age has a positive coefficient (0.04), suggesting that older household heads are more likely to experience food insecurity, although the effect is relatively small. Education of the household head shows

a negative association with food insecurity (-0.03), implying that higher education levels are associated with lower levels of food insecurity. Gender of the household head exhibits a significant positive coefficient (0.253), indicating that households with female heads are more likely to experience food insecurity. The presence of electricity connection (not available) and not having access to safe water both show positive associations with food insecurity, with coefficients of -0.149 and 0.131, respectively. Dwelling type also influences food insecurity, with apartment/flat and part of the large unit showing significant positive associations compared to independent house/compound. Overall, the results highlight the complex interplay of various household characteristics in determining food insecurity among general households.

Table 4: Parameter estimates of logit models for general households

Household characteristics	Model I	Model II	Model III	Model IV
Region	0.68** (0.041)	0.697** (0.041)	0.7** (0.043)	.697** (0.043)
Household size	0.513** (0.018)	0.49** (0.018)	0.492** (0.018)	.494** (0.018)
Household size square	-0.013** (0.001)	-0.012** (0.001)	-0.012** (0.001)	-.012** (0.001)
Ln of total income	-0.554** (0.029)	-0.555** (0.031)	-0.542** (0.032)	-.547** (0.031)
Dependency ratio	-0.161** (0.022)	-0.145** (0.023)	-0.146** (0.023)	-.147** (0.023)
Occupational status (renters)	-0.17** (0.055)	-0.17** (0.056)	-0.155** (0.056)	-.154** (0.056)
Number of rooms	-0.168** (0.015)	-0.154** (0.040)	-0.149** (0.016)	-.150** (0.016)
Age		0.04** (0.008)	0.038** (0.009)	.039** (0.009)
Age square		-0.0004** (0.000086)	-0.0004** (0.000086)	-.0004** (0.000086)
Education of household head		-0.03** (0.006)	-0.029** (0.007)	-.031** (0.006)
Gender of household head		0.253** (0.092)	0.245** (0.092)	.246** (0.092)
Female education			-0.011 (0.011)	
Electricity connection (not available)			-0.149** (0.051)	-.148** (0.051)
Dwelling type (other)				
Independent house/compound			.378* (0.221)	.378* (0.221)
Apartment/flat			0.544** (0.255)	.537** (0.255)
Part of the large unit			0.510** (0.232)	.510** (0.230)
Part of compound			0.122 (0.323)	.122* (0.232)
Access to safe water (not access)			0.131** (0.063)	.132** (0.063)
Constant	4.087** (0.320)	3.288** (0.361)	2.861** (0.418)	2.825** (0.417)

3. CONCLUSIONS

The descriptive statistics of the sample households reveal that the relationships between indices of food insecurity and the factors influencing them align with a priori expectations. Specifically, the analysis indicates that 50.4% of general households and 39.5% of farmer households are classified as food insecure. Interestingly, this suggests a lower tendency of food insecurity among farmer households compared to general households. These findings provide initial insights into the prevalence of food insecurity within different segments of the population, highlighting potential disparities between general households and those engaged in farming activities. Further analysis will be conducted to explore the underlying factors

contributing to these differences and to ascertain the specific socio-economic characteristics associated with varying levels of food security among different household types.

The observed disparity in food insecurity between general households and farmer households underscores the importance of examining the socio-economic factors that may influence food security outcomes. Understanding the underlying determinants of food insecurity within these distinct household categories is essential for formulating targeted interventions and policy measures aimed at alleviating hunger and improving overall food access. Moreover, these findings raise intriguing questions regarding the potential role of agricultural livelihoods in mitigating food insecurity. While farmer households exhibit a lower prevalence of food insecurity compared to general households, further investigation is warranted to explore the mechanisms through which agricultural activities contribute to household food security. Factors such as land ownership, crop diversity, access to markets, and agricultural productivity may play pivotal roles in shaping food security outcomes among farming communities.

The findings from the logistic regression analysis provide valuable insights into the factors influencing food insecurity among both general households and farmer households. The identification of significant predictors sheds light on the complex interplay between socio-economic characteristics and food security outcomes, guiding efforts to design targeted interventions and policy interventions. The insignificance of female education in predicting food insecurity among general households may suggest the need for a more nuanced understanding of the role of education in shaping household food access. While education is often regarded as a key determinant of socio-economic well-being, its impact on food security outcomes may vary depending on contextual factors such as access to employment opportunities, literacy levels, and cultural norms. The counterintuitive impact of access to safe water and dependency ratio on food insecurity highlights the multifaceted nature of food security and underscores the importance of considering broader socio-economic dynamics in food security assessments.

Factors such as access to safe water may interact with other variables, such as income levels and infrastructure development, in complex ways that influence household food security outcomes. The negative associations observed between education level of the household head, annual income, number of rooms, household size square, and age square with food insecurity underscore the protective effects of human capital, economic resources, and household infrastructure against food insecurity. Conversely, the positive associations of household size and age with food insecurity suggest that larger households and older age groups may face heightened vulnerability to food insecurity, potentially due to increased resource constraints or reduced earning capacity. The findings from the logistic regression analysis for farmer households reveal a nuanced set of factors influencing household food insecurity, highlighting the unique socio-economic dynamics shaping food access and vulnerability within agricultural communities. The significant determinants identified in the analysis offer valuable insights into the complex interplay between various socio-economic factors and food security outcomes among farmer households. Household size, annual income, agricultural income, number of rooms, dependency ratio, age, and electricity connection emerge as key predictors of food insecurity, underscoring the multifaceted nature of household vulnerability to food insecurity within agricultural contexts. The negative associations observed between educational level of the household head, annual income, number of rooms, agricultural income, and age square with food insecurity point to the protective effects of human capital, economic resources, and household infrastructure in mitigating food insecurity risks among farmer households.

Higher levels of education and income, coupled with improved housing conditions, are associated with reduced vulnerability to food insecurity, reflecting the importance of socio-economic empowerment and asset accumulation in enhancing household resilience. Similarly, the positive associations of household size, age of household head, and dependency ratio with food insecurity highlight the heightened vulnerability of larger households and older age groups to food insecurity, potentially due to increased resource constraints and limited earning capacity. These findings underscore the importance of targeting interventions towards vulnerable subgroups within farmer households, such as large families and elderly household heads, to address specific food security challenges. Moreover, the significance of factors such as electricity connection and irrigation availability underscores the importance of infrastructure development and access to essential services in enhancing household food security. Access to reliable electricity and irrigation facilities can improve agricultural productivity, diversify livelihood opportunities, and enhance household resilience to food insecurity, highlighting the importance of integrated approaches to rural development. Overall, the findings provide valuable insights for policymakers, practitioners, and researchers seeking to design targeted interventions and policies aimed at addressing food insecurity among farmer households. By understanding the complex socio-economic dynamics underlying food security outcomes, stakeholders can develop context-specific strategies to improve food access, enhance livelihoods, and promote sustainable development within agricultural communities.

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