EXPLORING THE DRIVING FACTORS REGARDING CHICKPEA FARMERS' DECISION TO INTEGRATE INTO THE WHOLESALE MARKETS: A MICRO LEVEL ANALYSIS IN THE THAL REGION, PAKISTAN

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Abstract
This research investigates the driving factors, more specifically impact of distance to wholesale market and education level for chickpea grower's wholesale market participation in the Thal region of Punjab, Pakistan. The study used the cross-sectional data of 225 chickpea growers, collected through multi-stage sampling techniques in year 2023 from 5 tehsils (Bhakkar, Mankera, Drya Khan, Chobara and Noorpur) of three districts; Bhakkar, Layyah and Khushab. Unlike existing studies which typically used binary choice of farmer participation, this research investigates three levels of participation; no participation, low participation and high participation. In this study the dependent variable is qualitative in nature with limited response which suggest maximum likelihood estimation technique and ordered logistic regression approach is most appropriate for examining the factors for chickpea farmer market engagement. Most socioeconomic and market factors are consistent with economic theory and existing literature such as; farmers level of income, land size, animal ownership, and price difference showed positive and significant impact on level of participation. However, increased level of education, and farmer's own use of capital induced the farmer's preferences to sell in the local market over the wholesale market. Moreover, this research interestingly found that chickpea growers located away from secondary markets are more likely to participate in wholesale market, possibly just because off local collector offering less incentives and be more exploitive. These results have important implications for policymakers with an objective is to enhance market access for chickpea growers.

Keywords; wholesale market participation, socioeconomic factors, chickpea farmer, Ordered logistic regression

Introduction
Chickpeas (Cicer arietinum) are an important pulse crop in the agrifood landscape of the Thal region of Punjab. Chickpeas significance not only prevails due to its high nutritious value in food consumption but also for their sustainable cropping system and economic contribution for the grower in the rural region (Ullah et. al 2020). The crop's economic significance for local farmers also increases due to the limited cultivation options in the Thal region, where chickpeas crop is a major source of farmers' livelihood. The growing chickpea demand in both the domestic and international market, due to its popularity and health benefits, has created significant economic opportunities for grower to participate into the wholesale markets from subsistence level (Abbas et.al, 2017). Chickpea farmers are the focal point to meet growing chickpea demand in Pakistan, but they respond to incentives through favorable prices which they could not get from local collectors. Farmers' market participation varies with different crops and areas around the world.
Market participation is an important agribusiness concept, that refers to the integration of subsistence or semi-subsistence grower into the markets of agricultural goods, with the objective of enhancing their economic returns resulting in minimizing poverty level (Otekunrin et al,

2019). The farmer's ability of efficient and effective market participation can facilitate him to obtain better product prices and optimal crop revenues. For profit maximization, farmers must take a rational decision while making a choice for selling their output. Markets situated in the center of the district are known as primary or wholesale markets which are usually farther than local markets. The role of buyer depends on the place where economic transactions happen (Abebe et, al. 2016). In local markets, collectors and commission agents determine prices and terms of trade. Their role becomes relatively more exploitive if primary markets are at long distance (Zamasiya et al, 2014). Generally, farmers sell their product on temporary markets, local collectors and nearby commission agents which results in narrow profit margin and limited benefits to the growers. However, obtaining better prices based upon market choice with the appropriate market channels (Rana, M., & Maharjan, K. L. 2022).

The determinants of chickpea farmers' market participation are classified into socioeconomic factors, market factors and institutional factors. In socioeconomic factors land size, number of households in a family, farmers age, education level, farmer income level, and animal ownership are important factors (Rana, M., & Maharjan, K. L. 2022; Zamasiya et al, 2014). On the other hand, external factors include, distance from the wholesale market, transportation cost, infrastructure, chickpea prices, extensions services and market information. Among these socioeconomic and external factors effecting level of participation, distance from the farm to wholesale market appears to have researcher's particular interest factor. According to conventional theories distance consider as barrier to market participation but under few studies farmer prefers to sell in wholesale markets from longer distance (Zamasiya et al, 2014). In the Thal region of Punjab, the dynamic of distance may vary for farmer's opportunities to get optimal prices though wholesale market participation. Remaining variables in many studies showed positive and significant relationships among farmer income, land size, animal ownership, farmers' age, and farming experiences (Jensen et al, 2009).

Despite many government farmers' support programs including value chain improvement initiatives in Pakistan, chickpea farmers still show a limited participation in the wholesale markets. Small farmers remain inadequately integrated into the wholesale markets and their living standard have not improved as significantly as other farmers' over the period of time.

A limited literature exists in the context of chickpea crop in Pakistan, predominantly considering the production-related aspect of the crop. These studies mainly focused the factors related to chickpea production, economic significance for chickpea production, as well as opportunities and constraint regarding pulses production in Pakistan (Nisar et al, 2007; Ullah et, al, 2020: Abbas et, al, 2017; Asghar et al, 2021). there is notable dearth of literature which emphasis the researcher interest toward the research gap in the dynamics of chickpea farmer integration to the wholesale market at micro-level. Answering this question is important, particularly when the Thal region is one of the most deprived areas with marginal lands (desert) in Punjab and where livelihoods of farmers primarily depend on chickpea revenues. This context emphasizes the significance of studying socioeconomic dynamics of the chickpea grower for participation in the wholesale markets in this region. The basic objective of this research is to investigate the influencing factors for chickpea farmers' decision to make choice regarding participation in the wholesale markets at three different levels; no participation level, low participation level and high participation level, in the Thal region of Punjab, Pakistan.

Literature Review:

Market participation for agriculture product has been extensively investigated by the researchers, specifically for the case of developing countries, in which the small growers face many barriers to

sell their product into formal markets. For the rural development an any country, market participation plays a significant role, because the farmer livelihood is strongly based upon the agriculture income, price of the output and time of selling product (Gabisa, B. B., & Mengistu, D. 2024). However, the market participation factors differ significantly based on socioeconomic, institutional and market factors belong to the farmers (Rana, M., & Maharjan, K. L. 2022). Much of the literature covers the market participation decision of the smallholder in term of either grower participate in the market or not, which oversees the significance of levels of participation that farmer may choose.

Farmer market participation research, specifically for legume growers, have emphasized the role of access the market, prices gap in influencing factors for farmer decision regarding participation. Such as, Akrong, R., et, al. (2021) concluded that among determinants of formal market participation, transportation costs and distance to market decide the farmer market engagements. Furthermore, commercialization of agro-product research suggests farmer attitude toward selling through proper channel can significant impact on farmer earnings, even though farmer face many challenges as market price fluctuations, access the credit, access to market and lack of marketing experiences (Akrong, R et, al. 2021;). The studies related to smallholder in the marginal lands like the Thal region, often capture the production aspect of chickpea in the hot weather conditions with low rain (Nasir et, al 2008; Ullah et, al 2020; Abbas et al,. 2017).

More specifically, the market participation decision of chickpea grower has gather interest due to the crop signification as nutrition rich food as well as the only viable cultivation option for smallholder in the marginal land. Few studies from the other regions in Pakistan, focused on maize, rice and mangos market engagements, socioeconomic variable such as farmer's age, education level, income, asset ownership, landholding play a substantial role in market integration (). Moreover, financial and market factors such as access to credit, excess to market, prices and financial flexibility are more effective (Zamasiya et al, 2014).

However, the existing literature show a clear gap regarding multi-level market engagement in agriculture. Various studies highlighted the market participation as binary option, but smallholder sometimes operate at different level of participation based on market conditions and their resources (Ahmed et. al, 2016). Additionally, very limited studies differentiate between local and wholesale market participation, even though the farmers' market decisions are significantly influenced by price differential. This classification is relevant in the Thal region where farmer has limited cultivation option and chickpea is major source of livelihood.

Research Gap and Future Direction:

This research fills the gap by investigating chickpea growers' market participation at three levels, no participation, low participation, and high participation instead of using binary choice yes/no framework. This also compare the local versus wholesale market participation, which provide more clear understanding of market dynamics. The focus on the Thal region of Punjab, covering three districts is an addition to limited research on market engagement in the marginal lands.

Further studies can be based on longitudinal data to capture the market dynamics over the period of time, also policy intervention that can facilitate the farmers' wholesale market participation for chickpea grower. The role of emerging technologies, such as online selling, use of mobile and other value chain analysis can be done in this areas.

Data and Methodology

This study was carried out in the Thal region, one of the major chickpea cultivation area of Punjab Pakistan. The Thal region is semi-arid zone consist of marginal lands, where chickpea is only

profitable cropping option for the farmer, and 88% of total chickpea production of the Punjab takes place in four districts Bhakkar, Khushab, Jhang and Layyah (Asghar et. al, 2021). Multistage sampling technique is most appropriate for analyzing characteristics of chickpea farmer (Asegie et.al 2023). At first stage, out of 12 tehsils of four districts, five tehsils were selected from three districts Bhakkar, Khushab and Layyah; these five tehsils are; Bhakkar, Drya khan, Mankera, Noorpur and Chobara of the Thal region. The farmers from these five tehsils are sharing almost same culture, cultivation process and socioeconomic characteristics. Secondly data were collected from 50 farmers in each tehsil at their place with help of local supporter and five numerators through face to face interviews based on questionnaire. Data collection process was completed in five months from March 13, 2023 to September 5, 2023, and total sample of 225 responded were gathered in this process.

The dependent variable farmer's wholesale market participation rate and farmer's value addition practices rate has limited options and it can be ranked in categories. The dependent variable has ordinal outcome, that suggests ordered logistic regression to investigate the impact of explanatory variables. The estimated results will show the influencing factors for wholesale market participation.

Wholesale market participation variable is categorical variable in which it has three responses,0 for no participation, 1 for low participation and 2 for high participation. Probability of farmer participation can be estimated through linear probability model;

Due to number of problems in linear probability model such as; non-normal distribution and heteroscedasticity of error term, probabilities may be lying outside the standard probability range linear probability model is not very attractive. Fundamental issue of LPM is that, it assumed;

$$P_i = E[Y] = F(X_1\beta) \qquad\qquad 1$$

$$P_i = \Delta(\beta'X) \qquad\qquad 2$$

If P is the probability of success than, (1-P) represents probability of failure. Ratio of success to failure is called odds ratios given as follows;

$$\ln\left(\frac{P_i}{1-P_i}\right) = \lambda_i\beta'X \qquad\qquad 3$$

$$P(Y_i = 0) = \frac{1}{1+\sum_{k=1}^{j} e^{\beta'_k X_i}} \quad , \quad P(Y_i = j) = \frac{e^{\beta'_j X_i}}{1+\sum_{k=1}^{j} e^{\beta'_k X_i}} \qquad\qquad 4$$

Sometimes multinomial choice variables are inherently ordered, due to ordinal nature of the dependent variable we start with the binomial probit model.

$$Y^* = \beta'x + \varepsilon \qquad\qquad 5$$

Where y is defined as $Y = 0 \ if \ Y^* \le 0, Y = 1 \ if \ 0 < Y^* \le \mu_1, Y = 2 \ if \ \mu_1 < Y^* \le \mu_2$

Except LPM, maximum likelihood (ML) method is also used as preferable choice for the purpose of estimation for all qualitative response models. The joint probability, or likelihood function for ML is as follow;

$$\prod_{i=0}^{2} P_i(y_i) = \prod_{i=0}\{1 - P(y_i)\}\prod_{i=1}^{2} P_i(y_i) \qquad\qquad 6$$

$$P(y=j) = F(\beta'X) \ and \ P(y=0) = 1 - F(\beta'X) \qquad 7$$

After taking the logs of likelihood function we get equation 8,

$$\ln \lambda = \sum_{i=0}^{n} \left\{ y_i \ln F(\beta'X) + (1-y_i) \ln (1-F(\beta'X)) \right\} \qquad 8$$

$$\ln \lambda = \sum_{y_i=0} \ln(1-\Phi_i) + \sum_{y_i=0} \ln \Phi_i \qquad 9$$

The first and second order condition for maximization can be written as;

$$\frac{\partial \ln \lambda}{\partial \beta} = \sum_{y_i=0} \left(\frac{-\Phi_i}{1-\Phi_i} \right) X_i + \sum_{y_i=0} \frac{\phi_i}{\Phi_i} X_i = \sum_i \lambda_i X_i \qquad 10$$

$$H = \frac{\partial^2 \ln L}{\partial \beta \, \partial \beta'} = \sum_i \lambda_i (\lambda_i + \beta'X_i) X_i X_i' \qquad 11$$

In the light of equation 3 4 & 5 the estimated equation for wholesale market participation can be written as follow where wmp represents Y, all explanatory variable are X_i and βs will explain the degree of responsiveness either through slope coefficients or odds ratios;

$$wmp_i = \beta_{1i} + \beta_{2i}age + \beta_{3i}edu + \beta_{4i}land + \beta_{5i}income + \beta_{6i}pdif + \beta_{7i}dist + \beta_{8i}selfinv + \beta_{9i}animalown + \mu_i$$

12

Where y represents wmp and is defined as
$Y = 0 \ if \ Y^* \le 0, Y = 1 \ if \ 0 < Y^* \le \mu_1, Y = 2 \ if \ \mu_1 < Y^* \le \mu_2$

Where wmp is dependent variable and β are coefficient parameters in this model detail of explanatory variable are given in the table.

Variable Description

Variable name	Description
Wholesale Market participation	Wholesale market participation rate by the chickpea farmers in the Thal region which is measured in percentage and categorized into three 0 participation, positive but below 50% wholesale market participation (low participation) and 50% or above 50% market participation.
Age	Age of the farmer head measured in years (who is decision maker about chickpea cultivation, selling and other farming matters)
Education	Education of the farmer is categories into six categories, 0 for illiterate, 1 for primary education, 2 for middle level, 3 for matric level, 4 for intermediate level, 5 for graduate or above level.
Land cropped area	Cropped area is categorized into four categories; 1 areas below 10 acres, 2 area between 10-25 acres, 3 for area between 25-50 acres and 4 for area above 50 acres
Animal ownership	A dummy variable 1 if farmer own livestock 0 if he does not.
Own investment	This variable is dummy variable which has two responses 0 for farmer has not used his own capital for chickpea production and 1 if farmer used his own capital (financial capital)
Distance	Distance of the farmers land to wholesale market is measured in kilometers
Price	This variable is price difference between wholesale price and price in the local market

difference	(price difference=wholesale price –local price)
Chickpea income	Farmer income from chickpea sale in a year.

Results and Discussion:

In this section empirical results are presented though tables. Table 1 consists of summary statistics of used variable in a data for continues and dummy variables. The categorical variables are represented in Table 2.

Table. 1. Descriptive Statistics

Variable	Mean	Std. Dev.	Min	Max
Distance	19.592	9.823	1	50
Price difference	616.889	335.349	0	2000
Income from cultivation	243573.33	452709.66	10500	4108500
Local market price	16059.556	879.839	14000	18300
Wholesale market price	16651.556	847.836	14200	18500
Self-investment (Dummy)	.662	.474	0	1
Animal ownership (Dummy)	.751	.433	0	1

Table 1 shows descriptive statistics of explanatory variables, where distance is measured in kilometers, where the average distance from wholesale markets is 19.6 kilometers and the maximum distance is 50 kilometers. Prices and income are measured in Pakistani rupees, while the variable "self-investment" and "animal ownership" are dummy variables with value 0 and 1.

Table. 2. Details of categorical variable

Categorical Variables	Freq.	Percent
Literacy level of chickpea farmer		
Illiterate	38	16.89
Primary level	44	19.56
middle level	49	21.78
Matric level	33	14.67
intermediate level	19	8.44
graduate or above	42	18.67
Age group of chickpea farmer		
young age less than 31 years	20	8.89
middle age between 31-40 years	56	24.89
upper middle age 41-50	76	33.78
old age above 50 years	73	32.44
Area cultivated for chickpea		
Land up to 10 acres	54	24
Land between 10-25 acres	78	34.67
Land between 25-50 acres	44	19.56
Land 50 acers or above	49	21.78

Table 2 shows the frequency and percentage of farmers' literacy level, the age group of chickpea growers and chickpea cultivated area in the sample of 225 respondents. This table shows that the majority of famers have an education level up to high school. Most farmers in this data set are in

the age group of 30 to 50 years, and cultivated area between 10-25 acres is most common among farmers.

Table. 3 Description of Dependent variable

Chickpea farmer participation level in wholesale market	Freq.	Percent
No participation in wholesale market	107	47.56
Low Participation (Positive number below 50%)	90	40.00
High Participation (participation rate 50-100%)	28	12.44
Total	225	100.00

Farmers sell their production either locally or in the wholesale markets. Farmer participation in the wholesale market data is available in percentage form. If the farmer sells all his product in the local market, his participation percentage is zero and if he sells all his product in the wholesale market, his participation percentage is 100%. Therefore, this variable is ranked into three level of participation: no participation in the wholesale market, participation below 50% is considered low participation, and when farmers sell their production more than 50% in the wholesale market it is considered high participation. The level of participation in the wholesale market response is shown in Table 3 with frequency and percentage.

Table. 4. Matrix of Correlations

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
(1) mp	1.000								
(2) Age	0.018	1.000							
(3) edu	-0.122	-0.201	1.000						
(4) land	0.199	0.198	-0.142	1.000					
(5) income	0.154	0.024	0.222	0.185	1.000				
(6) pdif	0.210	-0.020	-0.110	0.268	-0.071	1.000			
(7) dist	0.219	-0.130	-0.011	0.025	0.096	0.265	1.000		
(8) animal_own	0.133	0.185	-0.140	0.202	-0.121	-0.005	-0.359	1.000	
(9) self-inv	-0.221	-0.060	0.026	-0.116	0.016	-0.057	-0.037	-0.141	1.000

Table 4 indicates the correlation matrix between the variables. Farmers' participation in the wholesale market is positive for all variables except education and self-investment. while farmer age has an only weak correlation with farmers' participation level. The table 4 also shows that education has a negative association with distance to wholesale market, age level, and animal ownership. While the distance from wholesale market, and price difference (local vs wholesale) are positively correlated in these data. Farmer's income from cultivation is strongly and positively correlated with farmers' education level and is also positively correlated with the level of participation in the wholesale market. Income level has a weak relationship with other variables.

Table 5 presents the results of the ordered logit regression models. The chi-squared test value of 61.885(p-value=0.000) showed the model fits the data well compared to null hypothesis that highlights the importance of categorical analysis based on ranking (knight et al., 2005). The value

of the cutoff points is used for comparing wholesale market participation levels. In this model these cutoff points satisfy the ranking condition as the participation level increases, the value-to-intercept coefficient also increases 2.416 and 4.882 respectively.

Table 5. Ordered logistic regression

Participation in wholesale market	Odd Ratios	St.Err.	t-value	p-value
Age	0.9485	0.1374	-0.70	.483
Edu	0.8585**	0.0735	-1.94	.053
Land	1.282*	0.1832	1.73	.082
Income	1.0001***	0.000	2.68	.007
Pdif	1.0012**	0.004	2.21	.027
Dist	1.0383***	0.019	3.54	.000
Animal_own	3.2794***	1.287	3.03	.002
Self_inv	0.3850***	0.1108	-3.34	.001
/Cut 1	2.476	.9		
/Cut 2	4.938	.942		
Mean dependent var	0.655	SD dependent var		0.692
Pseudo r-squared	0.141	Number of obs		223
Chi-square	61.885	Prob > chi2		0.000
Akaike crit. (AIC)	395.812	Bayesian crit. (BIC)		430.884
*** p<.01, ** p<.05, * p<.1				

Table 3 presents the results of the ordered logit regression models. The chi-squared test value of 61.885(p-value=0.000) showed the model fits the data well compared to null hypothesis that highlights the importance of categorical analysis based on ranking (knight et al., 2005). The value of the cutoff points is used for comparing wholesale market participation levels. In this model these cutoff points satisfy the ranking condition as the participation level increases, the value-to-intercept coefficient also increases 2.416 and 4.882 respectively.

Most variables in the model are statistically significant except for the age of the chickpea farmer. Land size, farmer income level, price difference, and animal ownership are significant and positively associated with farmer participation level. These results are consistent with economic theory and established by mostly studies in the influencing factors of farmer market participation literature (Zamasiya et, al.2014; R. Akrong et, al, 2021, Abebe, 2016). The results also conclude that the farmer which use his own capital for chickpea cultivation is less likely to sell its output in the whole market and prefer selling locally. But farmers' education level is negatively associated while farmer distance to whole market is positively associated with farmer level of market participation. These results are different from mostly studies in the existing literature (Sher, A et al, 2020; Akrong et, al, 2021; Rana & Maharian 2022). For one-unit increase in chickpea farmer's level of education, we expect less than 1 (0.862 increase) coefficient in log odds, reflecting lower participation in wholesale market. These results are consistent with negative association of farmer level of education with food market participation in Ogun state as well as household market participation for cattle supply in southern Ethopia (Egbetokun et, al 2012; Gabisa, , & Mengistu, 2024). The correlation analysis also verifying that farmer education level is negatively associated

with farmers' participation in the wholesale market. In this study chickpea farmers, farm distance to the wholesale market is positively related. The farmer has the choice of selling his produce between the local or wholesale market, these results show that farmer prefer selling in wholesale market from longer distance as compare to nearby. It has been established that farmers prefer selling in primary market participation from longer distance because local traders play comparatively exploitive role through determining prices and deciding terms of trade independently without considering primary markets and farmer if transaction take place farther from the wholesale markets (Zamasiya et, al.2014; R. Akrong et, al, 2021, Abebe, 2016). The price difference is also larger from a wider distance, which is why the results of price difference are consistent with economic theory, as the price difference between the local market and the wholesale market become wider the farmer prefers to sell his product in the wholesale market to get better economic returns. The farmer's income from the chickpea crop is positively related to his participation in the wholesale market, because the larger quantity will provide him higher income and the farmer with a high volume is prefers to sell his product in the wholesale market. The results also show that if the farmer uses his own capital for chickpea production, he prefers to sell his output in the local market while if he grew the crop with credit, he is more inclined to sell in the wholesale market (Egbetokun et, al, 2012; Rana & Maharian 2022). Animal ownership is a dummy variable that serve as indicator of the farmer's financial condition, and is positively related with the farmer's participation in the wholesale market. It shows that if the farmer is financially stable he will prefer to sell his product in the wholesale market, while if he is in need of money he will prefer to sell in the local market.

Conclusion

This research offers an important analysis of driving factors which influence the chickpea farmer's decision to choose markets in the Thal region of Punjab, for selling their output between local and wholesale markets. Some socioeconomic factors such as; land size, level of farmer income, animal ownership are positively impact on the wholesale participation level. Considering financial factors, the farmers who uses his own capital for cultivation and marketing he prefers selling in the local market whereas the farmer who use credit is more inclined toward wholesale markets. Whereas level of education reveals a negative association to wholesale market participation level. This finding concludes that more educated growers may have better negotiations abilities to settle the terms of trade in the local markets with more opportunities that is why, they prefer selling locally. Moreover, positive association between wholesale market participation and distance to markets concludes how local market inefficiencies and exploitative role force the farmer to engage in the wholesale market for better economic incentives. This finding is correlated with positive impact of price difference with wholesale market participation, which emphasize the higher the difference between local and wholesale market higher the level of participation. When local and wholesale markets are closely located, mostly there is very little profit margin for local collector and the price difference is very little, whereas this difference become higher as the wholesale markets are getting farther from the range of growers.

The research results suggests, improving access to credit and addressing the local inefficiencies prevailing in the local markets could help the to improve the livelihood of the chickpea grower by enhancing the level of participation in efficient markets and achieve better economic returns of their output. These findings have some significant implications for policymakers such as; enhance credit availability to the farmers, improve local market efficiencies through transparency and empower the local farmer through price information.

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