Contents list available http://www.kinnaird.edu.pk/

Journal of Research & Reviews in Social Sciences Pakistan

Journal homepage: http://journal.kinnaird.edu.pk

USE OF EMERGING TECHNOLOGY AND AGRICULTURAL PRODUCT MARKET INFORMATION: EMPIRICAL EVIDENCE FROM PAKISTAN

Nawab Khan[1]*, Tahir Azam [1], Muhammad Khayyam[3], Salman Ali Shah[4], Raheel Anjum[5] & Muhammad Ihtisham[6]

[1]College of Management, Sichuan Agricultural University Chengdu, Wenjiang, Sichuan China
[2]Department of Economics, PMAS-Arid Agriculture University, Rawalpindi, Pakistan
[3]School of Economics and Management, China University of Geosciences, Wuhan, China
[4]School of Business Administration, Zhongnan University of Economics and Law Wuhan, Hubei, China
[5]Abdul Wali Khan University, Mardan, Khyber Pakhtunkhwa, Pakistan
[6]Collage of Landscape Architecture, Sichuan Agricultural University Chengdu Campus, Wenjiang, Sichuan China

Article Info

*Corresponding Author
Email Id: nawabkhan@stu.sicau.edu.cn

Keywords

Agricultural product, Mobile Phone Technology, Market Information, Wheat Price

Abstract

In developed countries, the local agricultural product market is often called an oligopoly market, which prevents growers from selling products at prices below wholesale rates. However, with emerging trends of mobile phones (MP), the marketing situation has been improved and changed. By acquiring market knowledge, this study aimed to explore the use of MP which affects wheat prices in Pakistan. The study was conducted in 40 villages in the four provinces of Pakistan from December 2019 to January 2020. Total 350 growers were selected using multi-stage sampling techniques. By distinguishing how MPs are used, the data were collected from home MP users. The results showed that the utilization of mobile phones is related to the significant increase of wheat prices determined by obtaining market data.

1. Introduction

Due to the high entry costs of consumers like traders, the local agricultural product market is often called oligopsonistic in developing countries. Therefore, growers usually have no choice. However, in doing so, when farmers sell their products on the local agricultural product market, the price will be lower than the competitive equilibrium price (Shimamoto *et al.,* 2015). This position has shifted with the popularization of ICT. This new technology consents growers from selling their products at higher prices in other agricultural markets as they obtained information regarding

market results like selling prices in other markets. The Mobile Phones (MP) is comparatively cheap and does not entail an urban environment; consequently, it is a generally used communication device and utilized by numerous individuals in remote areas. Research conducted by Swaziland and the Dominican Republic indicates that 50-60% of households have their MP in rural areas(Jensen, 2007; Karim *et al.,* 2020; Khan *et al*., 2020). The selling price of agricultural commodities on the local market should escalate by MP contribution to the market's efficient operation through enhancing market knowledge access. In this research, we examine the influence of MP utilization to access market data on wheat sale prices in remote areas of Pakistan. Our analysis demonstrates that the utilization of MP is related to an incline in selling prices. Besides, observation on regardless of whether farmers own MP or not, the acquisition of market information through MP impact the incline in MP sales and the selling price of wheat. The impact of this research work is to differentiate MP utilization for obtaining market knowledge from MP owners. This differentiation indicates the direct influence of established access to information about the market by utilizing MP on agricultural product prices. Previous experiments have tried to separate the difference, while numerous findings concentrate on the MP introduction of household ownership. Our research has two limitations. The first is due to the characteristics of our study design; our findings essentially do not reflect the causal influence of better access to marketplace data via MP on wheat sale prices. However, we investigated the essential correlation between the use of established market data via MP and wheat sales prices, which were not tested in previous studies. Second, the external validity of the study is limited because our data emphasize wheat sales prices in four provinces of Pakistan. The impact of obtaining market-related data through information and communication technology on the sales price of goods depends not only on the characteristics of the goods, whether the goods are fresh but also on eco-friendly situations, for example entering additional markets. The remainder of this article is structured as follows. Next portion, we assess past research prices in emerging countries about market intelligence's impact on the agricultural product market and selling prices. The "Background and data “delivers background data about the Pakistani farming position and summarizes our research survey layout. In the 'Assessment Techniques and Findings’, we elaboration the estimation methods that utilize and analyze the influence of better access to knowledge about the market by the MP utilization on wheat selling price. Finally, the concluding observations are demonstrated in 'Concluding remarks.

2. Literature review

Previous studies have emphasized the influence of market data such as arbitrage and selling price. Its role in arbitrage can be proved as follows. Suppose there is an agricultural product in two markets. In short, I believe that price information will not spread between the two markets, and the transportation costs between demands are high. In addition, assume

that the difference in product prices is due to differences in product supply in the two markets. The growers in the market with the lowest rate will move to another market to sell their agricultural products because they can get the price of the sales data in other markets. Transportation expenses are lesser than the variable prices between these markets. Therefore, Pareto efficiency will be achieved, and the rate variation among markets will reduce due to the occurrence of arbitrage between markets.

Various empirical research has analyzed MP's role in market arbitrage in the advanced countries 'local agricultural products markets. A great illustration of the mechanism is delivered in (Jensen, 2010; Malagatti and Kamble, 2016)research on the market for sardines in the southern Indians state of Kerala. The fishermen have gone to other such markets that acquired time and high costs before introducing MP to obtain data on demands from other local markets (for example, sardines selling price). Furthermore, sardines could perish on the method to other markets. Therefore, even if the sales price is low (for illustration, thereby the excessive supply of sardines), fishermen frequently sell their sardines on the local market. In other words, cross-market arbitrage does not occur by using MP, fishermen can acquire market data without visiting the different markets. When the local market's selling price is the least, they can sell their sardines in other markets at huge prices. Hence, reducing cost disperses between markets and eliminating the excessive supply (or shortage) of sardines in a single local market is due to MP introduction has stimulated arbitrage throughout the market. Consequently, that escalated the consumer surplus and profits of both fishermen.

Similarly, (Aker, 2010) examined that MP use was influenced by the Niger grain market through the reduction of price dispersal across markets. The foremost cost aim for the decrease in cost diversification is the decline in business expenditures (involving search price) for merchants (Tadesse and Bahiigwa, 2015). The author also investigated that for remote markets and markets that can be solely accessed through inferior roads, MP uses significantly impact price on dispersion. Meanwhile, (Aker and Ksoll, 2016; Arimoto *et al.*, 2019; Goyal, 2010) examined the effect of an intervention organized through ITC Ltd., focusing on Madhya Pradesh, India central state, that a massive consumer of soybeans, which not merely provided a cyber-kiosk to enable growers. To obtain data on soybean wholesale prices, warehouses were also delivered to enable farmers to scientifically test soybean quality, and the decline in soybean price differences after the intervention was also investigated (Goyal, 2010). Afterward, regarding the impact of marketplace knowledge on retail rates, particularly considering the influence of MP utilization on the market capacity of the local agrarian product market. Consumers have high entry costs (for illustration, traders incur fixed expenses, like fixed costs for storage facilities and transportation, variable costs, like transportation costs, and to buy agricultural products they required credit), so buyers access to local agrarian markets is

restricted. Consequently, the local agricultural product market was described as a widowed market, and growers were forced to sell there at prices below wholesale. The growers could sell their goods in additional places as market knowledge may reduce consumers' market power in the resident rural market. As a consequence, the consumer must set the price higher than that offered previously. Furthermore, growers communicate with merchants through MP because this exchange reduces traders' transaction costs and escalates the number of traders that move into specific local markets. In succession, this impact reduced the level of market capacity of consumers of community markets. Various researches have analyzed the impact of best accessing data on the market selling prices. For instance, (Svensson and Yanagizawa, 2009; Harris and Achora, 2018) studied the influence of market knowledge transmitted through public FM radio stations on corn plantation rates in Uganda. They discovered that informed growers sell at greater prices. Likewise, (Wyche and Steinfield, 2016) observed that the escalation of wheat selling price by the small farmer is due to MP's popularity in the remote areas of India. Moreover, (Lee and Bellemare, 2013) indicated that if a father or spouse owns MP, growers in the Philippines will sell their yields at a greater price. However, the family ownership of the MP has not corresponded with the selling price. By contrast, (Fafchamps and Minten, 2012; Sekabira and Qaim, 2017) focused on the business services delivery for market information in Maharashtra, Western India, which are based on short message services, weather knowledge, and crop consulting knowledge, which investigated that these influences do not impact the sales of farming commodities. They have discovered that growers are getting these facilities altered the market in which they sold their products. Likewise, according to (Aker and Ksoll, 2016), the interventions provided individuals with the opportunity to utilize shared MP to diversify the variety of crops they grow; however, the probability does not incline by selling these crops the farm gate price that has collected in Niger. Past findings have discovered the causal relationship between the acquisition of market information and sales prices. For instance, the reviews of (Baumüller, 2016; Lee and Bellemare, 2013; Ochiai and Yamazaki, 2013), which used different methods, or field experiments, for example, randomized controlled trials (Fafchamps and Minten, 2012; Aker and Ksoll, 2016). In this study used for this research, we asked the growers whether they have MP and whether they use MP to obtain knowledge about the market when selling the harvested wheat. These inquiries allow us to directly examine MP’s impact on the price of agricultural products to increase market knowledge acquisition.

3. Materials and Methods

3.1. Background and data

Wheat as one of the most essential cereal crops of Pakistan plays a key role in an individual income. About 80% of growers are engaged in wheat cultivation, accounting for about eighty percent of Pakistan’s whole arable land. According to the World Bank "World Development Indicators" by

2020, the value-added of the agricultural sector will account for approximately 18.9% of the gross domestic product (GDP) (GOP, 2020; Khan *et al.*, 2020). Shaukat and Shah (2014) pointed out that the wheat selling prices in remote areas are usually lower than in urban areas in Pakistani food markets. In the absence of wheat growers associations, small-scale farmers have relatively inadequate bargaining power in contrast to buyers, which creates a profitable space for arbitrage. Simultaneously, various growers sell wheat immediately after growth, while other growers sell wheat after drying. Anecdotal indication gathered by (Chhachhar *et al.*, 2017; Hou *et al.*, 2019; Shimamoto *et al*., 2015) suggests that this could be associated with inadequate storage services. Moreover, many farmers who immediately sold wheat may reflect their pressure to repay the money lent for cultivation. For instance, according to this survey we conducted, we found that 25.9% of farmers borrow money for winter sowing. This stress to sell crops immediately means that growers tend to sell crops at prices offered by neighboring consumers (perhaps grain traders) rather than looking for purchasers with greater prices. There are two types of wheat seeds utilized predominantly by the farmers in Pakistan, such as modern and conventional variety seeds. The indigenous varieties were used by the farmers in Pakistan for a long time, latterly a hybrid variety has been introduced in the 1990s (Khan *et al.*, 2020). The success of hybrid varieties is due to numerous reasons, for instance, maximum yield, higher tolerance to abiotic stress, early and late season sowing. The research results are based on the wheat farms conducted in 40 villages of four provinces (Punjab, Sindh, Khaybar Pakhtunkhwa, and Balochistan) of Pakistan from December 2019 to January 2020. It established the living standard in remote areas by implementing postharvest technology interventions through the International Rice Research Institute (IRRI). In this study, we organized data regarding growers 'farming pursuits throughout the previous year, MP owners, and whether the MP utilization to access market knowledge before the sale farmers had harvested the wheat and whether they used postharvest technologies, their non-agricultural means, and social and demographic characteristics. The impacts of sold wheat quantity and household characteristics have controlled selling prices, whereas the survey has allowed us to examine the influence of obtaining market data via MP utilization on the wheat selling price. In this baseline survey, the growers were selected randomly in each village and then gathered in public places. An investigator appointed the individual grower and conducted interviews while keeping a certain distance from other investigators to prevent the growers' wishes from being affected by others. We surveyed 350 growers; however, the year in which the survey precedes all growers have not sold their wheat (some growers produced wheat for their consumption). In our research, the farmers who sold wheat in the previous years were not accounted. Therefore, the primary study contains a sample of 160 growers. Table 1 contains descriptive statistics for growers, the average age of the respondents was

48.50 years old, and they had received an average of 4.85 years of schooling. In our sample, the proportion of male heads is 81.9%, and the average wheat cultivation is 28.3 years.

Table 1: Descriptive statistics (n=160).

Variables	Definitions	Mean (SD)*
Age	Age of the respondents (years)	48.50 (11.91)
Gender	1 If the respondent is male, 0 otherwise	81.9 (20.4)
Education	Formal education of the respondent (years)	4.85 (3.08)
Forming	Forming experience of the wheat respondent (years)	28.28 (12.64)
Non-agricultural work	Whether the head has earning from non-agricultural (1= years, 0= no)	0.17 (0.38)
Non-agric. income	Total non-agricultural income (rupees)	3,6222,44(3,773,738)

Standard divisions (SD)* are in parenthesis.

Our investigation mainly questioned when growers sold wheat. According to our information, most growers sold their wheat instantly after the harvesting other than after dry the wheat after harvest, 266 transactions occurred instantly, and 65 after drying. Table 2 indicates the descriptive statistics that are related to wheat transactions (that contain the characteristics of wheat and wheat plots). The observation number in Table 2 is more than that of Table 1, indicates that some farmers in the previous year sold wheat more than once. The wheat sales at an average price of 957.2 rupees per 30 kg per bag. It should be noted that 82.0% of growers based on MP utilization responded that before selling the harvested wheat, they used MP to access market knowledge. Many possibilities are conceivable because we did not ask who asked the growers to obtain market knowledge. For example, the grower may have visited diverse markets for other growers, grain traders, or buyers. According to the wheat varieties that are sold, 29.3% new variety of wheat sold in the late winter season, new varieties of wheat are 5.6%, 20.7% area new variety of wheat sold in the early winter season, and conventional varieties of wheat grown in winter are 44.4%, respectively. The growers traded an average of 2787.2 kg of wheat in a single transaction in the previous year. The field plot in which farmers grew wheat has an average size was 1.3 hectares, and soil types of 85.7% loam, 14.3% clay, 0.4% sand, and 7.1% other soil types.

Table 2: Descriptive statistics based on individual transaction level (n=266)

Variables	Definitions	Mean (SD)*
	Dependent	
Selling	The selling price of wheat (rupees/30/Kg)	957.19 (194.06)
	Independent	
MP	Usage of mobile phone (MP)	0.820 (0.385)
	Wheat quality	
New variety	The new variety of wheat in the sold winter season (Ujala-15)	0.56 (0.231)
New variety	The new variety of wheat sold in the early winter season (Galaxy-13)	0.207 (0.406)
New variety	The new variety of wheat sold in the late winter season (Shahkar-13)	0.293 (0.456)
Conventional variety	Conventional variety of wheat sold in winter season (Farid-06)	0.444 (0.498)
Plot	Size of plot (ha)	1.284 (1.092)
Wheat	Wheat quantity (kg)	2787.2 (2852.0)
	Soil types	
Sand	Sandy type of soil	0.004 (0.061)
Clay	Clay type of soil	0.143 (0.351)
Loam	Loam type of soil	0.857 (0.351)
Other	Other types of soil	0.071 (0.258)

*Standard divisions (SD) are in parenthesis.

3. Assessment technique and findings

3.1. Major findings

We commence our study by searching the impact of MP utilization for accessing market knowledge for sales pricing of wheat. We estimated the ordinary least square (OLS) by utilizing the following model:

$$\ln p_{ijt}=\beta_0+\beta_1 mobilephone_{ijt}+z_v+u_{ijzt}, \quad (1)$$

Where in p_{ijvt} is the price log at which grower *i* sold a kg of wheat cultivated on plot *j* in the time-period *t;*$mobilephone_{ijt}$ is a dummy variable including whether grower *i* utilized an MP to obtain information about the market before selling wheat cultivated on plot *j* in time-period *t;*z_v is the village area fixed effect, and u_{ijzt} is the disturbance term. In equation 1, consents us to the (period-invariant) each village characterizes (for instance, access to civilized areas) and to evaluate the effect on the selling price by accessing market knowledge. In column one of Table 3, the estimated consequences are accessed by using Equation (1). The impacts are not shown to save space for the village fixed coefficients, and on $mobilephone_{ijt}$ the estimated coefficient is positive and essential. The utilization of MP is related to a 4.8% incline in the estimates coefficient selling price that improved access to market knowledge. The other factors that have been omitted in Equation (1) have the potential to result in an omitted variable bias in the coefficient estimate of $mobilephone_{ijt}$. The education level of growers, for instance, is not

including in this equation. The educated growers have sold their wheat at a more price because they are more likely to utilize MP to access market data. In Equation (1), the estimated coefficient for $mobilephone_{ijt}$is biased upward, in such cases, it is due to the impact of education level. The growers utilizing MP may have selected to sell good quality wheat is another potential means of bias, which again upward the bias of the estimated coefficient for $mobilephone_{ijt}$. We included additional variables like grower's characteristics and wheat quality for removal of these biases, resulting from the following Equation (2), $\mathbf{ln}P_{ijvt} = Y_0 + Y_1 mobilephone_{ijt} + Y_2 selling_{ijt} + Y_3 X_i + Z_v + e_{ijvt}$ **(2)**

In equations (2), the variable vector $Selling_{ijt}$ directly affects the selling price, which includes three dummy variables. This shows whether a new variety of the wheat sold in the winter season, whether a new variety of the wheat sold in the early winter season and whether conventional varieties (the reference group is new wheat sold in the winter season) of the wheat sold in the rainy season. The logarithm of wheat sales (kg), the area of wheat sowing plot (hectares), and three dummy variables, including the type of soil (sand, the clay of the wheat harvest, etc.; the reference group is loam). *Xi* is a vector of grower level covariates, including age and education, a dummy variable showing whether the household head is a male, years of wheat planting, and the logarithm of the farmers 'on-agricultural profits of the previous year (rope); *eijvt* is the error item. The second column of Table 3 shows the evaluation result of equation (2). Consistent with the result of using equation (1), although the coefficient size is now greater than the value in equation (1), the projection coefficient on *mobilephoneijt*is still positive and significant. This assumption indicates that the other uncontrolled aspects of equation (1) may be the reason for the bias in the assessment of *Y1*, and are associated with both the selling price of wheat and the utilization of MP. Afterward, we analyzed the estimated coefficients of other variables. First, starting from the dummy variable of wheat quality, We observed that the conventional wheat varieties' selling price in winter is higher than the selling price of modern wheat varieties in the same season. The results show that analyzing the soil type will not influence the selling price. Besides, the coefficient of the quantitative variable subsequently shows that the grower has received a high price for selling large quantities of wheat. According to an anecdotal survey by (Shimamoto *et al.,* 2015; khan *et al.,* 2020), small-scale growers tend to sell wheat at low prices, which is related to the subsequent consequences. This makes sense because the amount of wheat sold has affected the bargaining power of the grower to the buyer. Finally, no substantial effect of the grower level covariate on the selling price has been found.

Robustness check

We have managed many other estimates for checking the robustness of the results. However, most growers sell wheat to millers, traders, and other buyers. So far, in our calculations, we have not distinguished the growers who sold wheat. Consequently, we limited the number of samples of growers who have sold their wheat to grain sellers

for our first robustness checking. Using the estimation of Equation (2), the grain traders usually buy wheat in the village. Using this sub-sample equivalent to check how the utilization of MP for market evidence impacts the selling costs of the local market. The consequence has shown in the third column of Table 3. The assessed coefficient of $mobilephone_{ijt}$ is smaller than the second column and less significant but still positive. This coefficient implies for obtaining market information by using MP is related to the price inclination of wheat at which farmers sold in community markets.

Table 3: The regression outcomes for the influence of MP usage on selling price.

Columns	**One**	**Two**	**Three**
Coefficient Standard Error	C(SE)	C(SE)	C(SE)
Independent variables			
MP usage	0.04.8* (0.025)	0.054** (0.025)	0.048* (0.028)
Wheat quality			
The new variety of wheat sold in the winter season (Ujala-15)		0.071 (0.068)	0.073 (0.058)
The new variety of wheat sold in the early winter season (Galaxy-13)		0.060* (0.032)	0.053 (0.033)
The conventional variety of wheat sold in the winter season (Farid-06)		0.067*** (0.032)	0.065*** (0.034)
Size of the plot (ha)		0.009 (0.015)	0.012 (0.014)
Wheat quantity (log)		0.027** (0.014)	0.032** (0.014)
Soil types			
Sand		0.013 (0.069)	0.069 (0.061)
Clay		0.015 (0.027)	0.029 (0.028)
Other		0.026 (0.028)	0.031 (0.030)
Farmers characteristics			
Age		0.002 (0.001)	0.002 (0.002)
Gender		0.027 (0.029)	0.033 (.0.034)
Education		0.001 (0.004)	0.004 (0.004)
Wheat farming		0.001 (0.001)	0.001 (0.002)
Non-agric. works		0.019 (0.027)	0.015 (0.026)
Non-agric. income		0.032 (0.022)	0.022 (0.021)
Village fixed effect	Yes	Yes	Yes
Observation numbers	266	266	234
Adjusted R squared	0.123	0.415	0.437

Standard errors (SE) are in parenthesis. The sample in column three is limited to farmers who sold their wheat to grain traders.*, ** and *** presented 10%, 5% and 1% level of significance respectively.

Furthermore, the study has concentrated on wheat sales instantly after harvesting. Some growers in our research have sold their wheat after drying. However, we include growers who sell wheat after drying to the sample utilized estimate in column two for a further robustness check. However, due to the

growers' aggregate wheat after drying, it should be noted that we could not control the plot characteristics, that is, plot size and the soil types where wheat was cultivated. Thus, we drop these variables in Equation (2); however, we include a dummy variable, which shows whether the growers have sold the wheat after drying. The estimated outcomes are illustrated in column one of Table 4, and the assessed coefficient for the utilization of MP is again significant. Finally, in the second column of Table 4, we restrict the sample to growers who sell wheat to grain traders. $Mobilephone_{ijt}$ assessed coefficient of the selling price is over again significant. In summary, $mobilephone_{ijt}$ with different evaluation results can adapt to changes in specifications and samples used.

Table 4: Robustness check

Dependent variable: Logarithm of the selling price (rupees/kg)		
Columns	**One**	**Two**
Coefficient Standard Error	**C(SE)**	**C(SE)**
Independent variables		
MP usage	0.054** (0.022)	0.063** (0.024)
Wheat quality		
New variety of wheat sold in winter season (Ujala-15)	0.085** (0.043)	0.084** (0.038)
New variety of wheat sold in the early winter season (Galaxy-13)	0.076*** (0.029)	0.074** (0.030)
Conventional variety of wheat sold in winter season (Farid-06)	0.0262*** (0.028)	0.0266*** (0.030)
Wheat quantity (log)	0.013 (0.009)	0.017** (0.010)
Whether selling follows drying (1= yes, no= 0)	0.072*** (0.021)	0.072*** (0.025)
Farmers characteristics		
Age	0.002 (0.001)	0.002 (0.001)
Gender	0.005 (0.024)	0.017 (0.029)
Education	0.003 (0.003)	0.004 (0.003)
Wheat forming	0.002 (0.001)	0.001 (0.001)
Non-agric. works	0.020 (0.021)	0.019 (0.023)
Non-agric. Income (log)	0.032* (0.020)	0.019 (0.020)
Village fixed effect	Yes	Yes
Observation numbers	331	291
Adjusted R squared	0.380	0.395

Standard errors (SE) are in parenthesis. The sample comprises those who sold their wheat immediately after harvesting it and those drying at first. The sample in column two is limited to farmers who sold their wheat to grain traders. *, ** and *** presented 10%, 5% and 1% level of significance respectively

Falsification test: The outcomes specify that MP utilization for facilitating access to market knowledge is positively related to sales pricing. Nevertheless, the consequences of the above estimates controlled the quality of wheat and the characteristics of growers. Even though growers

who obtain market data through utilization of MP and whether they like to utilize MP is correlated with an incline in the rates of growers who sell their wheat may be affected by unobservable grower characteristics. Consequently, it may not be possible to reward exogeneity as a significant situation for determining the hypothetical causality. The unobservable heterogeneity among growers will lead to deviations in the estimated coefficients of $mobilephone_{ijt}$, if exogeneity is violated. In this section, we account for numerous possible reasons for exogenous violations.

One probability is that the assessed coefficient on $mobilephone_{ijt}$ could be due to the influence of the difference between growers who do not have their MP or growers who have MP to achieve market data. Suppose the difference is associated with the sale pricing of wheat, in that case, we cannot isolate the impact of the utilization of MP by the difference between those who have and those who do not have their MP for improved market knowledge acquisition. To analyze whether this is the case, we have changed $mobilephone_{ijt}$ in Equation (2). A dummy variable indicates whether the growers own an MP, and the consequence of this assessment is demonstrated in column one of Table 5. The assessed coefficient is constructive but not essential for MP ownership, which means that an incline in wheat sales pricing is not associated with MP ownership. Hence, the difference between growers having an MP and without MP will not lead to deviations in the estimated coefficients of $mobilephone_{ijt}$. This outcome is reliable with findings acquired by (Lee and Bellemare, 2013) used information from the Philippines to find out that there is no essential correlation between the sales pricing and the number of MP owned at the household level. Secondly, due to exogeneity there could be various growers that are inherently more likely to utilize MP or by other sources to access market knowledge and, therefore, they sell wheat with more pricing. As a case point, our measurements do not impact the utilization of MP; however, the impact of accessing market data is regardless of its means utilized. Consequently, by analyzing whether the consequence of our estimation for utilization of MP reflects this propensity to access market data, our investigation on whether other market knowledge means to influence the wheat sales price of a grower, regardless of whether utilization of an MP. For instance, growers sell their wheat at the highest price because they have to access market data from their relatives or other village growers. We should investigate a positive correlation in this case between growers' answers regarding their market knowledge means or the number of knowledge means and their wheat sales pricing regardless of whether they influenced market knowledge by utilization of MP. We change the $mobilephone_{ijt}$in Equation (2) with a dummy variable for checking this possibility that shows whether the grower utilizes a specific means of knowledge that indicates the amount of data means. Mainly, we emphasize two means, like neighbors and other growers. The consequences have been demonstrated in columns

two, three, and four of Table 5. Neither the assessed coefficient of numbers of knowledge means nor the estimated coefficient of knowledge means is essential. According to column five of Table 5, simultaneously, we overcome the household owner of the MP, means of market knowledge, and the number of means data instead of $mobilephone_{ijt}$ in Equation (2). The consequences remained significantly constant from the outcomes in columns one to four of Table 5. Due to the impacts of other means of information, these consequences for the assessed coefficient on $mobilephone_{ijt}$ are not biased.

Table 5: Falsification test for regression outcome for the influence of MP usage on selling price

Dependent variables: Logarithm of the selling price (rupees/kg)					
Columns	**One**	**Two**	**Three**	**Four**	**Five**
Coefficient Standard Error	**C(SE)**	**C(SE)**	**C(SE)**	**C(SE)**	**C(SE)**
			Independent variables		
Whether growers own MP (1= yes,	0.089				0.088
0= no)	(0.063)				(0.062)
			What is your information source on wheat prices?		
Other farmers (1= yes, 0= no)			0.015 (0.023)		0.009
					(0.038)
Relative (1= yes, 0= no)		0.002 (0.019)			0.008
					(0.039)
Number of information sources on				0.005	0.006
wheat price				(0.013)	(0.033)
			Wheat quality		
New variety of wheat sold in winter	0.068	0.070 (0.069)	0.070 (0.068)	0.071	0.067
season (Ujala-15)	(0.069)			(0.069)	(0.069)
New variety of wheat sold in the	0.056*	0.057*	0.056* (0.033)	0.056*	0.056*
early winter season (Galaxy-13)	(0.032)	(0.033)		(0.033)	(0.032)
Conventional variety of wheat sold	0.262***	0.266***	0.0266***	0.266***	0.262***
in winter season (Farid-06)	(0.031)	(0.032)	(0.032)	(0.032)	(0.032)
Size of plot (ha)	0.009	0.008 (0.014)	0.008 (0.014)	0.008	0.009
	(0.015)			(0.014)	(0.015
Wheat quantity (log)	0.030**	0.029 (0.014)	0.030** (0.014)	0.029**	0.030**
	(0.014)			(0.014)	(0.014)
			Soil types		
Sand	0.097	0.100 (0.070)	0.100 (.0.070)	0.097	0.099
	(0.069)			(0.069)	(0.070)
Clay	0.021	0.020 (0.028)	0.017 (0.029)	0.018	0.020
	(0.027)			(0.029)	(0.029)

Other	0.020	0.021 (0.028)	0.021 (0.028)	0.021	0.020
	(0.029)			(0.028)	(0.029)
		Farmers characteristics			
Age	0.001	0.001 (0.001)	0.001 (0.001)	0.001	0.001
	(0.001)			(0.001)	(0.001)
Gender	0.026	0.021 (0.028)	0.023 (0.028)	0.022	0.028
	(0.028)			(0.028)	(0.029)
Education	0.001	0.002 (0.004)	0.002 (0.004)	0.002	0.002
	(0.004)			(0.004)	(0.004)
Wheat forming	0.000	0.000 (0.001)	0.000 (0.001)	0.000	0.000
	(0.001)			(0.001)	(0.001)
Non-agri. works	0.011	0.010 (0.026)	0.011 (0.026)	0.011	0.012
	(0.025)			(0.026)	(0.026)
Non-agric. Income (log)	0.028	0.034 (0.020)	0.036(0.021)	0.037	0.031
	(0.022)			(0.021)	(0.024)
Village fixed effect	yes	yes	yes	yes	yes
Observation numbers	266	266	266	266	266
Adjusted R squared	0.413	0.409	0.4009	0.409	0.406
Descriptive statistics of the independent variable	M(SD)	M(SD)	M(SD)	M(SD)	M(SD)
	0.960	00.541(0.499)	0.682(0.465)	1.2829	
	(0.194)			(0.7353)	

Standard errors (SE) are in parenthesis. The control variables are the same as in column one in Table 3. *, ** and *** presented 10%, 5%, and 1% levels of significance respectively

Third, according to the survey (Wooldridge, 2010), the reason may be the measurement error in $mobilephone_{ijt}$. If the measurement error in the independent variable indicates the classical error in the variable, the measurement error will reduce the evaluation coefficient of the variable. Therefore, if the measurement error in $mobilephone_{ijt}$ can be expected to be the classical error in the variable, the approximate $mobilephone_{ijt}$ coefficient will reduce the deviation. Moreover, here, the evaluation coefficient of the $mobilephone_{ijt}$ represents the lower limit of the evaluation coefficient. Our preliminary analysis of the coefficient of the $mobilephone_{ijt}$ is not affected via the measurement error of the $mobilephone_{ijt}$, and the lower limit evaluation of the $mobilephone_{ijt}$ is positive and meaningful.

The fourth reason may come from reverse simultaneity. For instance, the wheat prices sold by growers living near the market are higher pricing than the costs of wheat sold by growers residing far away from the market. The installation of MP technologies is considered to start earlier in the

villages near the market. Growers who initially sold wheat at higher prices may utilize MP to obtain market knowledge. By contrast, fixed rural impacts allow us to control likely influences. Unfortunately, due to the data set characteristics, we cannot statistically resolve other possibilities associated with reversing causality or simultaneity statistical problems.

3. Conclusions and Recommendations

The local markets for agricultural products in advanced countries are defined as oligopoly markets; consequently, agricultural products are often sold by growers with the lowest prices. There is no exception in the local markets of Pakistan, in this article, we have studied the impacts of MP popularity on wheat pricing in remote areas. We have determined that accessing market data by utilization of MP is related to farmers' wheat escalated selling prices, but the wheat selling prices are not influenced by growers having their own MP. The research results indicate that market information is significantly deleterious in determining the selling price, and that is consistent with previous empirical research. Conversely, regarding our data analysis that caveats should be noted. Our research does not enable us to statistically test the contributing impact on sales pricing by utilizing MP to obtain market information. The predicted effects on wheat selling prices by utilization of MP for access to market knowledge may be influenced by assortment bias. The purpose is that our investigation is modeled on non-experimental information; consequently, the estimates in this research control for observable deleterious sales pricing, like wheat quality and farmer characteristics, though unobservable deleterious of sales pricing may impact on whether farmers access market knowledge by utilization of MP. We conducted counterfeit tests to contemplate the probability that unobservable deleteriousness of sales pricing is biased towards the approximated impact of MP use for obtaining market knowledge. In contrast, the counterfeit tests have not indicated whether growers have their MP or whether the other utilized sources for market knowledge threatened the impact of MP utilization on sales pricing. Secondly, our analysis indicates the average effect on wheat sales prices by utilizing MP for getting market information; however, it is conceivable that these impacts are likely on the situation. For instance, in the villages far from the other markets, the effect of using MP to obtain market knowledge is destined small, and most farmers like to sell their wheat in their villages because of the higher costs of transportation. Unfortunately, our survey collected data have not contained the geographic data information individually for every market; as a result, we cannot analyze the impact of utilization of MP for obtaining market knowledge depends on the distance from the farmer place other markets.

References

Aker, J. C. (2010). Information from markets near and far: Mobile phones and agricultural markets in Niger. American J. Appl. Eono., 2(3), 46-59.

Aker, J. C., & Ksoll, C. (2016). Can mobile phones improve agricultural outcomes? Evidence from a randomized experiment in Niger. Food Policy, *60*, 44-51.

Arimoto, Y., Kono, H., Ralandison, T., Sakurai, T., & Takahashi, K. (2019) price and nonprice information frictions in regional arbitrage: The case of rice traders in Antananarivo, Madagascar. Economic development and cultural change., 67(2), 273-313.

Baumüller, H. (2016). Agricultural service delivery through mobile phones: local innovation and technological opportunities in Kenya technological and institutional innovations for marginalized smallholders in agricultural development. Springer, Cham. 143-162:

Chhachhar, R., Chen, C., & Jin, J. (2017). Performance and Efforts Regarding Usage of Mobile Phones among Farmers for Agricultural Knowledge. Asian Social Sci., 13(8), 1-11.

Fafchamps, M., & Minten, B. (2012). Impact of SMS-based agricultural information on Indian farmers. The World Bank Economic Review, 26(3), 383-414.

Goyal, A. (2010). Information, direct access to farmers, and rural market performance in central India. *American Economic Journal: Applied Economics*, *2*(3), 22-45.

Harris, C. G., & Achora, J. C. (2018). *Designing ICT for Agriculture (ICT4A)* innovations for smallholder farmers: The Case of Uganda. Paper presented at the Proceedings of the XIX International Conference on Human Computer Interaction.

Hou, J., Huo, X., & Yin, R. (2019). Does computer usage change farmers' production and consumption? Evidence from China. China Agric. Econ. Review.

Jensen, R. (2007). The digital provide: Information (technology), market performance, and welfare in the South Indian fisheries sector. The Quarterly J. Econ., 122(3), 879-924.

Jensen, R. T. (2010). Information, efficiency, and welfare in agricultural markets. Agril. Econ., 41*:* 203-216.

Karim, M., Meem, M., Rahman, M., Noman, M., & Huda, S. (2020). Use and role of mobile phone for information services in agricultural activities. Asian J. Agric.Ext. Econ. & Sociology., 102-110.

Khan, N., Siddiqui, B. N., Khan, N., Ullah, N., Ismail, S., Ali, S., & Ahmad, Z. (2020). Impact of newspaper and radio in promoting agricultural information among farmers. A case study of Pakistan. Int. J. Adv. Res. Biol. Sci, 7(4), 192-198.

Khan, M. A., Tahir, A., Khurshid, N., Ahmed, M., & Boughanmi, H. (2020). Economic effects of climate change-induced loss of agricultural production by 2050: A case study of Pakistan. Sustainability. 12(3): 1216.

Khan, N., Siddiqui, B. N., Khan, N., Khan, F., Ullah, N., Ihtisham, M., & Muhammad, S. (2020). Analyzing mobile phone usage in agricultural modernization and rural development. Int. J. Agril. Exten., 8(2), 139-147.

Khan, N., Ismail, S., Wali, A., Kazim, R., & Azam, T. (2020). The influence of information communication technology development on

income inequality. Artech J. Current Bus. Financial Affairs. Artech J. 2 (1), 11-18.

Lee, K. H., & Bellemare, M. F. (2013). Look who's talking: the impacts of the intrahousehold allocation of mobile phones on agricultural prices. J. Deve. Stud., 49(5), 624-640.

Malagatti, S., & Kamble, R. (2016). The role of mobile communication in agriculture sector 'a case study of dharwad district of karnataka state'. Social Sci. humanities. pages?

Ochiai, Y., & Yamazaki, K. (2013). Impact of information and communication technology on crop prices in India. Kokumin Keizai Zasshi. 207(6), 35-51.

Sekabira, H., & Qaim, M. (2017). Mobile money, agricultural marketing, and off-farm income in Uganda. Agric. Econ., 48(5), 597-611.

Shaukat, M. R., & Shah, I. A. (2014). Farmers inclination to adoption of mobile phone agriculture information and trade systems in Pakistan. J. Econ. & Social Stud., 4(2), 191.

Shimamoto, D., Yamada, H., & Gummert, M. (2015). Mobile phones and market information: Evidence from rural Cambodia. Food Policy. 57: 135-141.

Svensson, J., & Yanagizawa, D. (2009). Getting prices right: the impact of the market information service in Uganda. J. European Econ. Assoc., 7(2-3), 435-445.

Tadesse, G., & Bahiigwa, G. (2015). Mobile phones and farmers' marketing decisions in Ethiopia. World development. 68: 296-307.

Wooldridge, J. M. (2010). Econometric analysis of cross section and panel data: MIT press.

Wyche, S., & Steinfield, C. (2016). Why don't farmers use cell phones to access market prices? Technology affordances and barriers to market information services adoption in rural Kenya. Information Tech. for Devel., 22(2), 320-333.