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Socioeconomic Characteristics of Rice Growers and Their Perceptions of Risk Management Strategies

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ABSTRACT
Rice crop is an important grain crop all over the world and innumerable risks can make rice crop highly vulnerable, leading to undesirable impact on crop productivity as well as farmers' livelihood. Risk is a likelihood of a negative outcome which is capable of distorting business ideas especially when such risks are poorly managed. This paper specially examined rice farmers profile, risk sources, risk management strategies and determinants of choice of risk management strategies. Simple random sampling technique was adopted for sample selection. The collected data was analyzed by using descriptive statistics and ordered Probit regression. The likelihood ratio statistics as indicated by χ (48.50) were highly significant (P<0.0019) and this also suggested that the model has a strong explanatory power. Gender, age, extension contacts, education and farming experience were major determinants of risk management strategies. It therefore recommended the provision of accessible and affordable formal education in order to enhance farmers' skills and productivity in rice production.
Keywords: Rice Production, Farmers, Risk Management Strategies.

INTRODUCTION
In Pakistan, rice is an essential cash crop and second staple food after wheat. It earns foremost foreign exchange after cotton. In agriculture sector of Pakistan, rice shares a 3.5% value addition with 0.7% GDP. During the financial year 2020-21, the rice was grown on 3335.1 thousand hectares with total production 8419.7 thousand tons (Economic Survey of Pakistan, 2020-21). According to Government of Punjab statistics (2020-21), the total rice cultivated area in Punjab during the financial year 2020-21 was 5917 thousand hectares. The contribution of Sheikhupura district for rice production during the same fiscal year was 592 thousand hectares. Furthermore, the average yield of Basmati and non-Basmati rice was 40 and 52 kg/acre respectively (Crop Reporting Service, Government of Punjab, 2020-21).

Agriculture is essential for human survival. It not only provides food, fuel and other ecosystem services but a major source of revenue generation as well. In the modern agricultural food system numerous fatalities are caused by unpredictable incidents for which likelihoods are not recognized, even though individual prospects can be pretended by expert opinions (Jaffee and Howard, 2010). Therefore, it is necessary to keep consider that risk is a predictable and inevitable part of life particularly in farming system. Nevertheless, agricultural activity is risk-prone because farmers hardly manage some part of the production process. No doubt, natural disorders are beyond the farmer's control that might have substantial impacts but the risks caused by poor decision-making can be minimized efficiently by proper knowledge, training and risk management strategies. Environmental and climate change associated risks make crops exposed (Iqbal *et al.,* 2016). Timely and precise judgement of risks may also assist farmers to evaluate the probability and magnitudes of related risks (Sjoberg *et al.,* 2004). The assessment of the farmer's perceptions and their response to risks are very important due to its importance in observing the decision-making behavior of farmers at the time of fronting uncertain situation (Drollette, 2009; Flaten *et al*., 2005; Lucas and Pabuayon, 2011).

Concerning food security in Asia, rice has still center of attention. Up till now, the role of rice production is vital in alleviating poverty and hunger. Gradually the poor consume more rice and are usually dependent on rice. Despite the fact is that ninety percent of the world's rice is produced and consumed in the Asia (FAO,2011). Hence, its supply must increase at least by twofold till 2050 to cope with the demand of growing population (Skamnioti and Gurr, 2009). Rapidly increasing population, deteriorating per capita arable land and availability of water are the core dilemmas of agriculture in Pakistan. Water shortage is the main issue for the cereal crops and farmers have to rely primarily on ground water (Erenstein, 2009). As the aggregate agriculture area has remained almost equivalent since liberation in 1947 (Qasim, 2012). However, impressive yield of rice was not achieved under numerous uncertainties. For improvement of rice production practices and per acre yield it is essential to understand the risks of farmers in rice-wheat cropping areas in Pakistan (Awan *et al.,* 2015). Even-though, various studies have been done on numerous aspects of risks in agriculture sector globally. But limited research attention is given to the rice growing households on farm level risk perception and management so far. By keeping this thing in view, the aim of this research study is to determine the rice yield and associated risks factors as well as finding the possible risk management strategies that manipulate the farmers' decision-making process.

MATERIAL AND METHODS

The present research study titled "determinants of rice yield and risk management strategy in Sheikhupura district" was carried out in district Sheikhupura of Punjab province, Pakistan. A random sampling technique was adopted for the study. The data of 125 rice farmers were collected with the help of extension residents. Each farmer is assumed to adopt a certain number of risk management strategies based on the maximization of an underlying utility function. Following (Greydanus *et al.,* 2013), the Ordered Probit model was adopted to evaluate the research data. The reduced form of the unobserved Ordinal Probit model is shown as follows;

$Y^* = Xi\ B + ei,\ e \sim N(0, 1),\ i=1..., N$ …. (1)

Where Yi is the observed ordinal variable which takes on values 1 through 3. The edges divide the real line into a series of regions corresponding to the various ordinal categories. Farmers in the low category adopted fewer risk management strategies while farmers in medium and high categories adopted more and highest number of risk management strategies respectively (Mohammad and Clem, 2006). X1i= Gender (Dummy: 1 for male, 0 if otherwise), X= Marital Status (Dummy: 1 for married, 0 for otherwise), X3= Household Size (Number), X4=Education (Number), X5= Age of Household Head (Years), X6 = Extension Contact (1 for access, 0 if otherwise), X7= Farm Experience (Number). The economic a priori expectation is stated mathematically as shown: X1, X2, X4, X6, X7>0; X3, X5<0.

RESULTS

Distribution of Socio-economics Characteristics:

In Table (1) shows the distribution of socio-economics characteristics with respect to range, frequency and percentage.

Data in Table shows that majority of farmers ranging from 31-40 years' age of the respondent. 26 percent of the respondent ranging from 41-50 years and 25 percent of the respondent ranging from 51-60 years. Small number of the respondents participated in the old age just for caring or look after of their crops. Similarly, large number of the respondents i.e., 90 percent have loam soil for the cultivation of their crops. If soil types have good condition, then farmers get more production of the crops. Small respondent only 10 percent have clay soil for the production of the agriculture crops. Fertility of the soil is very important component for getting high rate of production. 77% of the respondents have fertile soil for the cultivation of crops and only small number of the farmers have average fertile soil due to some reasons for the cultivation of their crops. Similarly, 90 percent of the respondents have soil which is free from salts and 2 percent of the respondents have saline soil. 9 percent of the respondents have saline sodic soil in their area. Farmers have different soil salinity status due to diverse distribution of the areas. Table showed that majority of the farmers have facilitation of canal and tube well water for the irrigation of their crops. 90 percent of the farmers have both source of irrigation. 9 percent of the respondents have only tube well water for crop irrigation due to far distance from canal. Only 1 percent of the farmers have canal water. In this category have small farmers which have no more sources for using modern technology like turbine. The table further reveals that 93 percent farmers have the respondents have their own tube well for the irrigation of their crops and only 8 percent of the farmer have no ownership. The above data indicates that 76 percent of the respondents used tube well water alone for irrigation of the crops and 22 percent of the respondents used alternate time of tube well irrigation water for the crops. Small number of the respondents have conjunctive use of irrigation water for their crops. Results of the above table showed that 80 percent of the respondent have own tractor for the cultivation of the crops and 20 percent of the respondent haven't their own tractor.

Also, data in Table reveals that large number of respondents get their seed from the extension department. 20 percent of the respondent take seed from progressive farmer and 14 percent of the respondent take seed from seed companies. Small number of the farmer take seed from their fellow farmer. Percentage distribution of responses with respect to source of technical advice in the above table showed that 67 percent of the respondents take from agriculture technical staff. According to the respondents that every month later have meeting of government staff which deliver the lecturer to the farmers about pest attack and other serious diseases of the crops. If some farmers didn't attend that meeting than they take advice from fellow farmers. Government staff distribute pamphlet to farmer for all the schedule of the seasonal crops. The table shows that almost 80 percent of the respondent have interaction with agriculture department at field assistant level and 20 percent of the respondents have interaction with agriculture department at AO level. No respondent has interaction at ADA level and at DDA level. Percentage distribution of responses with respect to risks in rice crop yield in the above table showed that 50 percent of the respondents have risks in the rice crop yield and 50 percent of the respondent don't have any risks in the rice crop yield.

Table 1. Distribution of Socio-economics Characteristics

Characteristics	Range	Frequency	Percentage
Age of Farmers	0-20	1	0.8
	21-30	14	11.2
	31-40	34	27.2
	41-50	33	26.4
	51-60	32	25.6
	61-70	11	8.8
Soil Type	Loam	113	90.4
	Clay	12	9.6
	Sandy	0	0
Soil Fertility Status	Fertile	96	76.8
	Average Fertile	29	23.2
	Poor	0	0
Soil Salinity Status	Free from Salts	112	89.6
	Saline	2	1.6
	Saline sodic	11	8.8
Source of Irrigation	Canal	1	0.8
	Tube well only	11	8.8
	Canal + Tube well	113	90.4
Tube Well Ownership	Yes	116	92.8
	No	9	7.2
Type of Tube Well	Peter engine driven	102	81.6
	Tractor driven	10	8
	Electric tube-well	13	10.4
Quality of Tube Well Water	Fit	86	68.8
	Marginally Fit	39	31.2
	Unfit	0	0
Use of Tube Well Water	Alone	95	76
	Alternate time	28	22.4
	Conjunctive use	2	1.6
Tractor Ownership	Yes	98	78.4
	No	27	21.6
Source of Seed Purchasing	Research department	0	0
	Ext. Department	80	64
	Seed companies	17	13.6
	Progressive farmer	24	19.2
	Fellow farmer	4	3.2
Consultation with Agric. Depart.	Yes	84	67.2
	No	41	32.8
Interaction with Agric. Department	Daily	0	0
	Weekly	50	40
	Monthly	75	60
Level of Interaction with Agriculture Department	At field assistant level	98	78.4
	At AO level	27	21.6
	At ADA level	0	0
	At DDA level	0	0
Response W.R.T Risks in Rice Yield	Yes	62	49.6
	No	63	50.4

Sources of Risks in Rice Production:

The sources of risks indicated by the farmers are presented in Table (2). Technical, market, social and financial risks were the major sources of risk identified by farmers; with social risk and technical risk having the highest responses. Within the social risk, illness/death (48%) and farm theft (33.6%) were the biggest challenges faced by the farmers. The result on illness/death could be linked to the drudgery that is inherent in farming in the rural areas. Flood and drought, which are climatic variables, had 47 and 45 responses each in the technical risk category.

Table 2. Sources of Risks in Rice Production

Type of Risk	Frequency	Percentage	Type of Risk	Frequency	Percentage
Production Risks			**Social risk**		
Pests and diseases	33	26.4	Poor infrastructure	40	32
Flood	47	37.6	Farm theft	42	33.6
Drought	45	36	Aging	20	16
Market Risks			Illness	60	48
Input/output price fluctuation	125	100	**Financial risk**		
Preference for foreign rice	37	29.6	High interest rate	51	40.8

Source: Field survey data: *Multiple responses were recorded.

Risk Management Strategies:

Risk management strategies by the rice farmers are presented in the Table (3). From the result, while all the respondents identified use of improved/resistant variety, use of agrochemicals, use of fertilizer and mixed cropping as major risk management strategies, a considerable proportion (86.4%) of them indicated cooperative marketing as risk management strategies.

Table 3. Risk management strategies adopted by the rice farmers

Risk Management strategies	Frequency	Percentage	Risk Management Strategies	Frequency	Percentage
Use of improved variety	125	100	Cooperate marketing	108	86.4
Use of agro chemical	125	100	Input/output storage	75	60
Use of fertilizers	125	100	Farm insurance	35	28
Mixed cropping	125	100	Forward contracting	75	60
Non-farm business	45	36			

Source: Field survey data: *Multiple responses were recorded.

The likelihood ratio statistics as indicated by Chi (48.50) are highly significant at p<0.0019. This suggests that the model has a strong explanatory power. Based on the results, the observed factors that were significantly related to the choice of risk management strategies in the low class were gender (at 1%), age (at 5%) and extension contact (at 5%) and farming experience (at 1%). From the result, a male rice farmer in low level had the probability of moving to the next level by 0.715 more than female rice farmers. Similarly, for one-unit increase in age and farming experience, the probability of moving to the next level was expected to increase by 0.64% for age and decrease by 0.5% for farming experience. Also, the rice farmers on the low-level class that had more access to extension services had the probability of moving to the next level by 0.2 higher than those with less access to extension services Table (4).

Table 4. Marginal effects of ordered probit risk management strategies model

Variables	Low level	Middle Level	High Level
Gender	7150715 (5.96) *	.0963577 (2.35) **	.5108511 (-3.25) *
Marital status	0692028 (-0.45)	.0521517 (-2.10) **	.0907204 (0.45)
Household size	0061719 (-0.15)	.0901191 (-6.99) *	.008091 (0.15)
Education	0052692 (-0.38)	.0016384 (-0.37)	.0069075 (3.80) *
Age	.0064108(1.98) ***	.0019933 (0.95)	.0084042 (-4.38) *
Extension contacts	-.0204062 (-2.04) **	.006345 (-2.02) **	.0627512 (4.77) *
Farm experience	0050515 (-3.67) *	.0015707 (-0.65)	.0099222 (2.72) *
Log likelihood	159.721448		
LR chi2	48.50		
Prob>chi2	0.001927		
Pseudo R2	0.5205		

Source: Field Survey Data, 2020. Notes: *, **, *** = significant at 1%, 5%, and 10% significant level, respectively.
Figures in parentheses = z-

DISCUSSION

These findings are consistent with (Ben-Chendo *et al.,* 2016) who found that most farmers highlighted the technical risk consisting of pest/diseases among others as the major source of risk in paddy production. Climate change has been

severally identified as a major affecting the production and productivity of farmers. The farmers could lose their entire crop to these two production challenges.

As expected, at this level, the results on gender and household size are consistent with a priori expectation while for farming experience, the sign negated a priori expectation, though it supports findings by (Osuji *et al*., 2017) who reports farmers with low experience generally lack some farming skills and consequently need to resort to risk management strategies more than those with more farming experience.

The choice in the middle class were negatively and significantly related to gender and marital status at 5% levels of significance and positively and significantly related to extension contacts at 5% and household size at 1%. The result of the relationship between household size and level of choice of risk management strategies was negative and this is consistent with findings of (Osuji *et al*., 2017). Following his argument more people in the family means more people to feed and less money to move to the higher level of choice of risk management strategies. For a male rice farmer in the middle class, the probability of moving to a higher class was 0.096 less than his female counter pact. For rice farmers who are married in the middle class, the probability of moving to a higher class was expected to decrease by 0.052. For a unit increase in the number extension contact and number of household size in the middle class, the probability of moving to the next level were expected to decrease by 0.63% and 9% respectively.

The choice of risk management strategies in the high class were negatively and significantly related to gender and age at 1% level of significance and positively and significantly related to education and farming experience at 1%. These results are consistent with the signs of their coefficients except for gender and household size. Against *a priori* expectation, household size had a positive and significant relationship with risk management strategies however this is in line with the findings of (Seyi and Tosin, 2015). For male rice farmers, the probability of moving to a higher class was expected to be smaller by 0.09 than their female counter pact. Also, for a unit increase in the number of extension contact, farming experience and years spent in school, the probability of moving to the next level was expected to increase by 6.2%, 0.9% and 0.7% respectively. The more experienced a farmer is the more exposed he is to different risk management strategies. Similarly, for a unit increase in age, the probability of moving to a higher level was expected to decrease by 0.0084. The result on number of years spent in school is in line with the result from (Torkamani and Ezatabadi, 2001) who found a positive relationship between adoptions of risk management strategies with education. The inverse relationship between age and choice of risk management strategies is similar to findings by (Ghorbani and Jafari, 2009) who concluded that the age of the farmer had a significant negative effect on risk management. Also, farming experience was found to increase the likelihood of moving to a new level of risk management strategies

CONCLUSION AND RECOMMENDATION

Sources of risk as well as the corresponding risk management strategies were identified. Based on the findings, the paper concluded that education and experince helps the farmers in choosing the right and most effective risk management strategies. However, marital status and household size exert least effective in this regard. Similaly, age is also higly influencing factor in choosing the best risk management stretegy. Therefore, it is highly recommended the provision of affordable formal and non-formal education to rice farmers. Furthermore, Adequate extension services should be made available in order to enhance farmers' skills in risk management. Agriculture extension department and adaptivec research farms can play a major role to educate the farmers about risk manaement streteies and make it easier for them to enhance the productivity of rice crop withour effecting the quality of crop.

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السمات الاجتماعية والاقتصادية لمزارعي الأرز وتصوراتهم لاستراتيجيات إدارة المخاطر

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الملخص

محصول الأرز هو محصول حبوب مهم في جميع أنحاء العالم ، ويمكن أن تؤدي المخاطر التي لا حصر لها إلى جعل محصول الأرز ضعيفًا للغاية ، مما يؤدي إلى تأثير غير مرغوب فيه على إنتاجية المحاصيل وكذلك على سبل عيش المزارعين. المخاطر هي احتمال حدوث نتيجة سلبية قادرة على تشويه أفكار العمل خاصةً عندما تتم إدارة هذه المخاطر بشكل سيئ. تناولت هذه الورقة بشكل خاص ملامح مزارعي الأرز ، ومصادر المخاطر ، واستراتيجيات إدارة المخاطر ومحددات اختيار استراتيجيات إدارة المخاطر. تم اعتماد تقنية أخذ العينات العشوائية البسيطة لاختيار العينة. تم تحليل البيانات التي تم جمعها باستخدام الإحصاء الوصفي وترتيب الانحدار الوراثي. كانت إحصائيات نسبة الاحتمالية كما هو موضح بواسطة (48.50) χ ذات أهمية عالية (P <0.0019) وهذا يشير أيضًا إلى أن النموذج لديه قوة تفسيرية قوية. كان الجنس والعمر والاتصالات الإرشادية والتعليم والخبرة الزراعية من المحددات الرئيسية لاستراتيجيات إدارة المخاطر. ولذلك أوصت بتوفير تعليم رسمي يمكن الوصول إليه وبأسعار معقولة من أجل تعزيز مهارات المزارعين وإنتاجيتهم في إنتاج الأرز.

الكلمات المفتاحية: إنتاج الأرز ، المزارعون ، استراتيجيات إدارة المخاطر