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Perceived Benefits Versus Perceived Risks: Rejuvenating Contract Farming Practices For Tobacco Growers In Khyber Pakhtunkhwa Province, Pakistan

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Abstract: *Identifying strategies to cope with risks and selecting methods to reduce, transfer and/ or bear risks are considered to be the most crucial decisions for an agricultural producer. The choice of risk management strategies is of vital importance for the feasibility and continuation of the farm level practices. This study examined a sample of tobacco farmers (n = 202) in major flue-cured Virginia (FCV) tobacco growing districts of Khyber Pakhtunkhwa Province of Pakistan. A comprehensive interview schedule was used to collect data face to face related to the different components of perceived benefits from contract farming. Similarly, data on farmers' perceptions for different calamitous risk sources were collected based on their incidence and severity on a Likert scale from 1 to 5 (very low–very high) to observe the significance of these risk sources in terms of its potential impact on the tobacco production. The incidence and severity rating for each of the risk sources are then used to determine the risk treatment priorities and to suggest the relevant risk treatment responses for each of the risk sources. The analysis indicates that, although the sampled farmers are effectively managing the price risks related to tobacco crop as far as their responses regarding the perceived benefits from contract farming are concerned; many catastrophic risk sources pertaining to tobacco crop are still needed to be managed properly. The goal of this study is identifying various calamitous risk sources perceived by tobacco growers in Pakistan and suggesting different treatment actions is needed for such type of risk sources. The policy implication of this study is rejuvenating the existing risk management practices adopted by the tobacco growers.*

Keywords: Contract farming; Perceived benefits; Risk perception, Risk assessment; ordered logit model.

1. Introduction:

Among the most essential and complex decisions, an agricultural producer have to make is the choice of a combination of risk management instruments to provide the best income safety net for their particular circumstance (Ke andWang, 2002). The first step is to identify strategies to cope with risks and select methods to reduce, transfer and/ or bear business and financial risks (Drollette, 2009).The choice of risk management strategies is of vital importance for the feasibility and continuation of the

farm business because the decisions are made mostly by a single person aiming not only at maximizing production and profit but also to sustain the farm level practices (Willock et al., 1999).

The issue of income gains to small farmers from participation in agro-food supply chains in developing countries, specifically in contract farming arrangements, has acquired much significance in recent times (Minot, 2007; Swinnen, 2007; Reardon and Gulati, 2008; Barrett et al., 2012; McCullough et al., 2010). According to Simmons (2003), farmers are majorly attracted to enter into contract farming because of the perceived benefits in term of easy access to market and credit facilities, better managed risk and provision of information, logistic, extension and necessary transfer of technology from agribusiness. In Ghana, buyers provide mid-season technical services and inputs. In Madagascar, processing firms provide agricultural extension services as part of their monitoring activities (Bellemare, 2010). In Mozambique, members of Farmers'Organizations use more purchased inputs—seemingly due to lower unit prices—and enjoy the higher value of production (Bachke, 2010). In India and Nicaragua, contract pricing provides a *de facto* (albeit incomplete) hedge against price volatility (Barrett et al., 2012). In order to economize on production and transaction costs, transaction parties (bilaterally or unilaterally) choose the most efficient institutional and organizational structure (Williamson, 1988). This so-called governance structure can be defined as the set of rules by which an exchange is administered (Hendrikse, 2003).

One of the important determinants of risk behaviour is risk perception, and many studies have investigated this relation (Boholm, 1998; Renn, 1998; Slovic, Fischhoff, and Lichtenstein, 1982). As agriculture sector is increasingly confronted with risk and uncertainty arising from various sources such as production risk, price volatility, personal risks and policy changes, therefore, it offers an interesting case study to investigate risk behaviour (Hardaker et al. 2004). The measurement of risk perception and its link to actual risk behaviors have been extensively discussed and being labeled as the most significant achievements in risk research in the past decade (Renn, 1998).

Owing to financial constraints, the capacity of Pakistan to tackle agriculture-related risk factors is limited at national as well as at farm level (Abid et al., 2015). The inadequate knowledge on farmers' risk perception is one of the most significant challenges faced by the policy makers and researcher in developing a proper risk management system for the farmers (Flaten et al., 2005; Nicol, Ortmann&Ferrer, 2007)

There are many sources of risk and uncertainty in agriculture, forcing farmers to make decisions in a risky and ever changing environment. These risks and uncertainties are conventionally categorized into the management areas of production, marketing, and finance (Boehlje and Eidman, 1994). Among these, production risk is the most important that is related to the possibility of variations in crop yields. Causal factors include uncertain weather conditions and incidence of disease and pests (Musser and Patrick, 2002).

Tobacco is one of the few crops in Pakistan that has yield per hectare comparable to international standards (Ali et al., 2015). Almost 350,000 people, directly and indirectly, are working in the tobacco industry and they generate a total annual income of over Rs. 30 billion, which is a source of livelihood for 1.2 million people (Pakistan Tobacco Industry, 2010). Tendai (2017) evaluated that the higher risk associated with tobacco crop has compelled a good number of insurance companies to pull out of the tobacco industry. Additionally, it was concluded that it is not only the hailstorms being a threat to tobacco production, but sometimes farmers also lose a good part of their tobacco crop if the tobacco leaves get fire in the drying furnaces at the final stage during the curing process. These two are just among some other risk sources having a potential for causing widespread catastrophic losses in tobacco production. In Pakistan, contract farming is one of the common risk management tools adopted by tobacco growers. Therefore, this research is mainly focused on addressing three questions associated with tobacco cultivation 1); what are the important components of perceived benefits from contract

farming? (2) What is the risk perception of tobacco growers for different calamitous risk sources? (3) What are policy measures needed for restructuring contract farming practices through its perceived benefits components as well as the farmers' risk perception for different risk sources related to tobacco production?

This paper is organized as follows: Section 2 describes the research methodology focusing on the study area and sampling methods, provides an explanation for perceived benefits from contract farming, measurement of risk perception and the methodology used for prioritizing risk sources and the relevant treatment options. Section 3 presents the results and discussion related to farmers' perceived benefits from contract farming, their risk perception for different calamitous risk sources and the risk assessment with treatment priorities. Section 4 discusses the conclusion and policy implications based on the findings of this study.

2 Research Methodology

This section outlines the methods used for this research. This section presents the study area and sampling method, sample size, data collection methods and analysis of the data. The detailed methodology used to reach the final conclusion is discussed below.

2.1 Study Area and sampling method

A multistage sampling technique was used for selection of the study area and the sampled respondents. In the first stage, KP was purposely selected for data collection owing primarily to the fact that around 76-78% of Pakistan's entire tobacco crop and nearly all of the FCV tobacco is produced in KP province (Pakistan Tobacco Company, 2012). The yield/ hectare of tobacco produced in KP province is 14% higher than the global average and 22 % higher than the national average (Lu et al., 2017). Also, KP is a risk prone area for different types of weather related risk sources that includes flood, heavy rains/ hailstorms, and cyclone, etc. The province faced 8 major flood incidences in the last 25 years of which flood in 2010 was the worst (ACF, 2011). Figure 1 shows a map of Pakistan, with KP province and selected districts for this study.

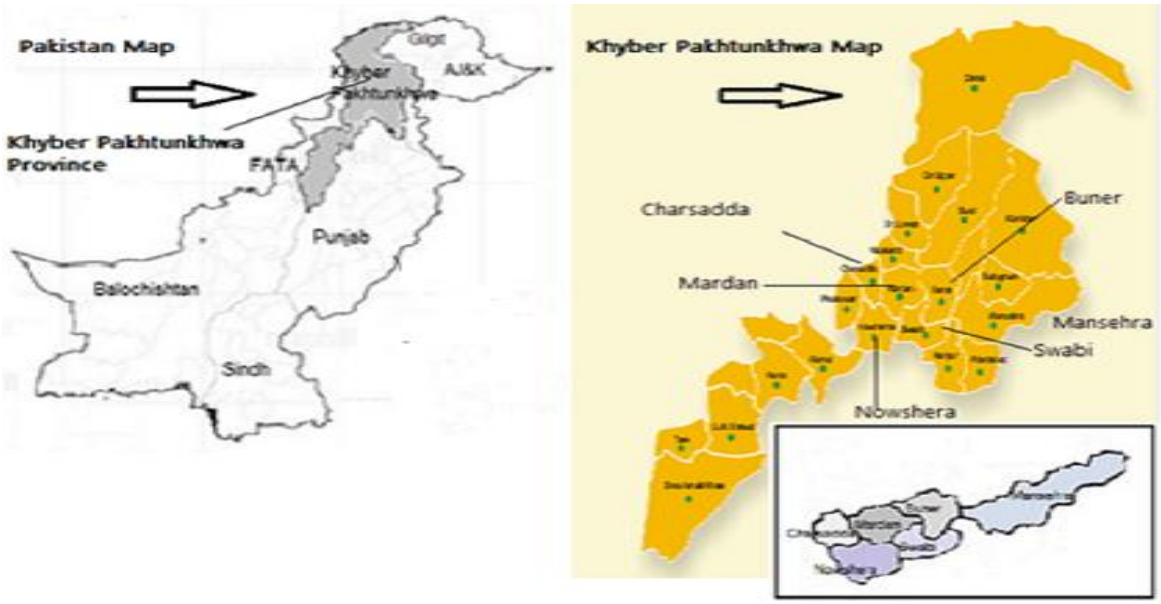

Figure1Map of Pakistan with Khyber Pakhtunkhwa Province.

Table1 Production data on tobacco (in a million kg) with Khyber Pakhtunkhwa's share for the year 2009-14.

(A): Tobacco production data in Pakistan with KP contribution for the year 2009-14.			
Year	Total production	Khyber Pakhtunkhwa production	%age share in country's production
2009-10	120.03	94.25	78.52
2010-11	102.99	78.31	76.04
2011-12	98.29	75.17	76.48
2012-13	126.80	95.54	75.35
2013-14	137.51	100.79	73.30
5 Years Average	117.12	88.81	75.94

(B): Production of tobacco in selected districts for Khyber Pakhtunkhwa (famous for FCV tobacco).					
Sampled districts	2009-10	2010-11	2011-12	2012-13	2013-14
Swabi	47.16	42.66	39.22	49.92	54.97
Mardan	17.62	10.68	9.12	11.84	12.01
Charsadda	10.06	10.51	9.15	11.18	11.51
Nowshera	2.95	2.54	3.49	3.71	3.98
Mansehra	5.35	3.68	4.65	6.70	7.13
Buner	6.09	5.09	4.76	7.15	7.00
Total	89.23	75.16	70.39	90.50	96.59
Percentage share in KP	94.68	95.98	93.63	94.73	95.84

Source: Pakistan Bureau of Statistics (PBS) 2015 and Pakistan Tobacco Board (PTB) 2013-16.

In the second stage, major tobacco producing districts for FCV tobacco namely, Swabi, Mardan, Charsadda, Nowshera, Buner and Mansehra (PTC, 2012; Ali, Altaf, and Farooq, 2014) shown in Figure 1 were selected based on their significant contribution to the overall FCV tobacco production. The details of production data for the last five years with a percentage share of the selected districts for FCV tobacco (that accounts for more than 94.84% of the tobacco production in KP province) are shown in table 1.

In the third stage, a sample size of 202 FCV farmers was drawn using the Yamane (1967) formula from a total of more than 22,500 FCV tobacco growers reported by Pakistan tobacco board in the target area.

The approach used to calculate the sample size is given as;

$$n = \frac{N}{(1 + N.e^2)} \qquad (1)$$

Where "N" is the total number of farming household in the study area, "n" is the sample size and "e" is the margin of error set at 7%, i.e. 0.07 for FCV sample (Hussain&Thapa 2012; Saqib et al., 2016).

A sample of 202 farmers was drawn by dividing the selected FCV tobacco producing districts into two groups. The first group included district Swabi which produces nearly fifty percent of the total tobacco grown in KP province (see table 1 for production data in the selected districts).Therefore, almost half of the FCV sampled respondent, i.e. 102 tobacco growers were selected from ten different union councils in Swabi district. While for data collection purpose the other five FCV tobacco producing districts were included in the second group. A total of 100 sampled tobacco growers were selected, i.e. 20 growers from each of the five districts and two union councils from each district were included in the overall sample for FCV tobacco.

The data was collected through a comprehensive interview in April-July, 2015. The interview schedule included all the relevant information needed regarding the perceptions of the farmers about different risk sources for tobacco crop and the information related to various components of perceived benefits from contract farming. The data was mainly collected by visiting tobacco grower's home or meeting them at different tobacco purchase centers of the buying companies.

2.2 Perceived benefit from contract farming

As already been discussed, the new agricultural economy is characterized by the rising influence of contract farming (Opara, 2003) and there is a continuous switch from buying through spot-market transactions to contractual agreements with farmers, often through specialized intermediaries (Balsevich et al.2006; Berdegué et al., 2005; Neven et al., 2009; Rao and Qaim, 2011). With few exceptions (Blandon et al., 2009; Guo et al., 2007; Masakure and Henson, 2005), available studies explain farmers' participation in modern supply chains through the farm, household, and contextual characteristics.

The measurement of risk perceptions and their link to actual risk behaviors have been extensively discussed and being labeled as the most significant achievements in risk research in the past decade (Renn, 1998). For instance, perceptions and preferences have been used most often to explain the adoption decisions for different risk management tools (Hansson and Lagerkvist 2012; Petrolia, Landry, and Coble 2013; Wang et al. 2012). However, the potential impact of perception of risk management instruments on the decision to use those instruments has rarely been addressed (Ye et al. 2017). How do the farmers perceive risk management instruments, and how does their perception influence the adoption of risk management instruments, e.g. the perceived benefits and costs of using those instruments (Soane, Dewberry, and Narendran 2010)? This study provides empirical evidence of the interaction between contract farming's perceived benefits and its adoption as a risk management tool.

For this purpose, following Guo et al. (2007), the tobacco growers were asked to rank the individual components of perceived benefits from contract farming using a three-point Likert scale, i.e. none, somewhat or significant. The data extracted with the three-point Likert scale was then utilized to estimate an ordered logit model for establishing the association among tobacco growers regarding their behavior related to perceived benefits from contract farming.

The data was used by a proportional Odds cumulative logit model (McCullagh&Nelder, 1989) with five dummy variables to distinguish among the six reported components of the perceived benefits. The model used has two intercepts (one for each of the logit equations) and 5 slopes, for a total of 7 free parameters. By comparison, the saturated model, which fits a separate 3-categories multinomial distribution to each of the six contract farming perceived benefit components, has 6 x (3-1)= 12 parameters to be estimated. Therefore, the overall goodness-of-fit test will have 12 – 7 = 5 degree of freedom.

The Logit equation would be then;

$$L_1 = Log \frac{P(Y \leq 1)}{P(Y > 1)} = \alpha_1 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \beta_5 X_5 \quad (2)$$

$$L_2 = Log \frac{P(Y \leq 2)}{P(Y > 2)} = \alpha_1 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \beta_5 X_5 \quad (3)$$

$$.L_n = Log \frac{P(Y \leq n)}{P(Y > n)} = \alpha_1 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \beta_5 X_5 \quad (4)$$

2.3 Risk perception

Assessing risk provides insight regarding the likelihood (as how likely something is going to be wrong) and what will be the related consequence (impact) of that risk source (Wang and Roush, 2000)? A risk factor (RF) is extracted based on the product of likelihood (P) and consequence (C) for each of the

individual risk sources perceived by the tobacco growers(Cooper et al., 2005). In this study a risk matrix is constructed (see figure 2) and farmers' perceptions for different risk sources in tobacco production (in terms of incidence and severity) are categorized as risk of flood, heavy rains/ hail storm, heavy winds, pest and diseases, fire (in curing furnaces) and risk of drought.Following Ullah et al., (2015) data was collected from farmers to score the incidence and severity of each source of risk on a Likert Scale from 1-5 (very low-very high) to observe how significantly each source is considered in term of its potential impact on the tobacco production . These scores were combined in a risk matrix (Lansdowne, 1999; and Cooper et al., 2005) and were categorized as low if ranges from 2-5 and as high if ranges from 6-10. Obviously, the risk categories located in the 'high risk' zone needs an immediate response and continuous surveillance to mitigate its severity. The below risk assessment framework can be used as a conceptual framework for assessing the sources of agriculture risks.

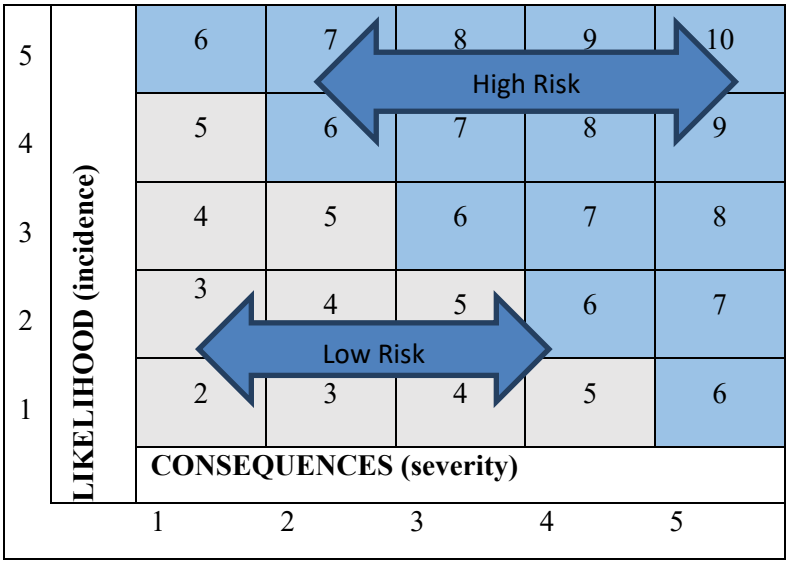

Figure2 Incidence-severity risk matrix (adapted from Ullah, et al. 2015)

2.4 Prioritizing Risk and treatment options

Furthermore, the incidence and severity for each source of risk on a Likert Scale from 1-5 (very low-very high) are used to determine the risk priorities. They also work as a guide to the kind of risk treatment responses that may be relevant to each of the risk sources (Hunter etal., 2003; Cooper et al., 2005). The conceptual design (shown in figure 3) provides a treatment option by prioritizing the different risk sources related to tobacco on the basis of their incidence and their relative severity in four different ways.

The first category of risk sources falls in the "routine area" of the treatment option design with a low incidence and low severity. The second category of risk sources is included in the 'problem area" with normal-high incidence but with low severity, and it needs proper financing to reduce the level of incidence for that risk source. The third category of the risk sources with a low incidence and high severity comes in a 'catastrophe area," and it needs some type of insurance schemes for minimizing the losses incurred as a result of high severity for those risk sources. The fourth category of risk sources with a high incidence and severity are included in "extreme risk area," and these risk sources need to be treated on priority bases in comparison to the other risk sources.

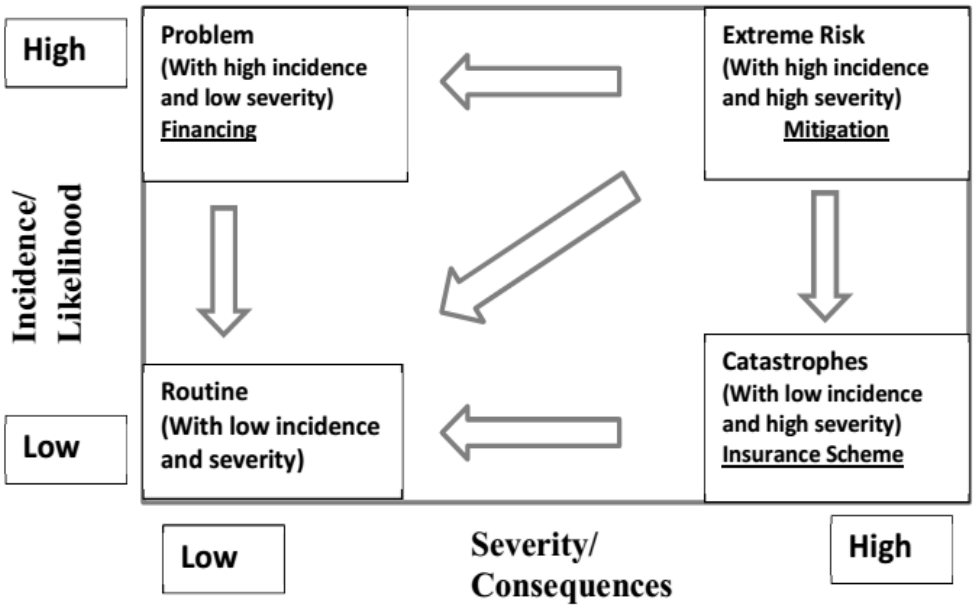

Figure3 Incidence-severity risk matrix for treatment options(adapted from Cooper et al., 2005).

3 Results and discussion

It is necessary to ensure that farmers in the tobacco producing area are well prepared for any catastrophic risk sources that they might experience. This study provided an insight into the existing risk management tool adopted by tobacco growers and the need for rejuvenating them or introducing new risk management tools to effectively and efficiently respond to any of the risk sources perceived by the tobacco growers.

3.1 Contract farming perceived benefits

This part presents a number of potential benefits that the tobacco growers perceived from contract farming. The different components of perceived benefits from contract farming were included on the basis of initial information collected from all the stakeholders involved in tobacco production in Pakistan. The major perceived benefits as per tobacco stakeholders were a reduction in production cost for tobacco, improving quality of tobacco crop, the yearly increase in sale price for tobacco, price protection due to a contract agreement, reduction in marketing costs and engaging family labor in tobacco contract farming practices. The tobacco growers were asked to quantify the potential components of perceived benefits from contract farming, using a Likert scale on a scale with three parameters. The details of the individual responses by the tobacco growers for each component of the perceived benefits are given in table 2.

From table 2 that records the number of tobacco growers who rated a particular perceived benefit of contract farming on a Likert scale, we can easily see that price protection was the most important perceived benefit component in contract farming for tobacco growers in the study area.

Our results are in line with the findings of Guo, Jolly & Zhu (2009), while the reduction in marketing cost is the least important perceived benefit component. Ton et al. (2018) also reported the protection from price risk as one of the important motivations for the contracting farmers. However, for the other components, the hierarchy of perceived benefit is not entirely straight forward. Therefore, for our comparison purpose the saturated model, which fits a separate 3-categories multinomial distribution to each of the six contract farming perceived benefit components, has 6 x (3-1)= 12 parameters to be estimated and the overall goodness-of-fit test would have 12 – 7 = 5 degree of freedom.

Table2 Distribution of farmers based on their perceived benefits from contract farming (only contract farmers).

Components of perceived benefits	None	Somewhat	Significant	Mean (SD)
Reducing production cost	152	41	09	1.29 (.545)
Quality improvements	35	125	42	2.03 (.618)
Increase sale price	33	94	75	2.21 (.702)
Price protection	03	29	170	2.83 (.417)
Reducing marketing cost	167	30	05	1.20 (.457)
Engage family labor	91	95	16	1.63 (.627)

Source: Derived from the survey data, 2015

A positive β indicates that a higher value of *X* leads to greater perceived benefit. Noting that (F) being set as the reference perceived benefit component and looking at all the five coefficients (i.e. β_1 =-1.259,β_2 = 1.163, β_3 = 1.687, β_4 = 3.977, $\beta5$ = -1.725), we see that the implied ordering of perceived benefits from contract farming for the tobacco growers on overall basis is D>C>B>F>A>E. The proportional odd cumulative logit model estimates that price protection is the most important benefit of contract farming being reported/ perceived by the tobacco contract farmers followed by an increase in buying prices of tobacco on yearly basis and quality improvement in tobacco leaves during production. Moreover, being a labor, intensive crop contract farmer ranked engagement of family labor as a perceived benefit for contract agreement and growing tobacco crop. The least perceived benefit reported was a reduction in production and marketing cost due to contract farming practices.

3.2 Perceived Calamitous risk sources for tobacco farmers

Knowledge of farmers' risk perception for different sources related to tobacco crop is one of the important factors in their decisions regarding adoptions of risk management tools. The different calamitous risk sources considered in this study are a risk of flood, the risk of heavy rain/ hailstorms, the risk of heavy winds, the risk of pest and diseases, the risk of fire in furnaces (for curing tobacco leaves) and risk of drought. A risk matrix (already discussed in methodology section) based on the product of likelihood (P) and consequence (c) was used for figuring out the farmers' risk perceptions regarding the above mentioned risk sources related to tobacco crop. The individual responses from the sampled respondents for different risk sources related to tobacco crop were collected on a Likert scale (as far as the incidence and severity of the each of risk sources is concerned) and are presented in table 4.

Table3 Parameter estimates from proportional Odds cumulative logit model for contract farmers.

Perceived benefits (Rating)	**Overall sample**			**95% confidence interval**	
	Coefficient	**Standard error**	**Wald**	**Lower Bound**	**Upper Bound**
(A) Reduce production cost	-1.259***	(0.211)	35.58	-1.668	-.840
(B) Improve quality	1.163***	(0.196)	35.15	0.764	1.531
(C) Increase sale price	1.687***	(0.201)	70.17	1.270	2.058
(D) Price protection	3.977***	(0.253)	246.53	3.447	4.440
(E) Reduce marketing cost	-1.725***	(0.230)	56.31	-3.927	-2.427
(F) Engage family labors	0[A]				
Threshold parameters					

μ_1	-0.171	(0.137)	1.570	-0.432	.103
μ_2	2.306***	(0.166)	193.418	1.947	2.597
Log Likelihood	67.045				
LR $Chi^2(5)$	778.125***				
Goodness-of-Fit					
Pearson $Chi^2(5)$	10.087*				
Deviance $Chi^2(5)$	9.705*				
Pseudo R^2					
Cox and Snell	0.510				
Nagelkerke	0.576				
McFadden	0.329				
No. of observations	202				

A: The parameter is automatically set to zero for comparison purpose in SPSS. *,** and *** represent statistical significance at 10%, 5% and 1% level respectively.

These scores combined in a risk matrix were categorized as low if it is between 2 and 5 and high if it is from 6 to 10. Our analysis shows that among the six reported calamitous risk sources perceived by tobacco growers, the risk of rain/hailstorm, heavy wind, pest and diseases and risk of fire are considered to be high risk sources by more than forty five percent of the respondents, as far as their incidence and parallel severity is concerned. Tendai (2017) also reported the risk of hailstorm and fire (in curing furnaces) as the major threats for tobacco growers. On the other hand, less than forty percent of the tobacco growers considered flood and drought to be a high risk source for FCV tobacco crop. Obviously, the risk categories located in the 'high risk' zone needs an immediate response and continuous surveillance to mitigate its severity. This risk assessment framework can be used as a conceptual framework for assessing the sources of agriculture risks.

Table 4 Calamitous risk sources for tobacco crops (incidence/severity responses).

Calamitous risk sources	**Ranking (Likert Scale)**					**Risk perception (%)**	
	Very Low (1)	**Low (2)**	**Normal (3)**	**High (4)**	**Very High (5)**	**Low (1-5)**	**High (6-10)**
(i). Risk of flood						64.3	35.7
Incidence	45	105	51	1	0		
Severity	12	33	110	44	3		
(ii). Risk of rain/ hailstorm						22.8	77.2
Incidence	9	68	112	13	0		
Severity	3	12	82	96	9		
(iii). Risk of heavy wind						21.8	78.2
Incidence	5	51	134	12	0		
Severity	0	10	73	110	9		
(iv). Risk of pest and diseases						9.4	91.6
Incidence	4	15	25	118	40		
Severity	0	3	23	78	98		
(v). Risk of fire (in drying furnaces)						53.5	46.5
Incidence	186	15	0	0	1		
Severity	0	0	0	108	94		
(vi). Risk of drought						60.4	39.6
Incidence	18	131	52	1	0		
Severity	5	33	117	47	0		

Source: Own calculation based on survey data, 2015

3.3 Risk Assessment and Treatment Priorities

As already been discussed about the different calamitous risk sources considered in this study are a risk of flood, the risk of heavy rain/ hailstorms, the risk of heavy winds, risk of pest and diseases, the risk of fire in furnaces (for curing tobacco leaves) and risk of drought. The individual responses from the sampled respondents regarding the incidence and severity for each of the risk source can be used by "Incidence-severity risk matrix for treatment options" (already discussed in methodology section) for prioritizing the different risk sources. For instance, based on the data available in table 4, the incidence and the severity rating for each of the risk sources are used to determine the risk priorities. They also provide a guide to the various kinds of risk treatment responses that may be relevant for each source of risk.

Referring to figure 3, the risk of flood with incidence (normal-low) and severity (normal- low) on Likert scale is placed in the "routine area" which can be managed on ad hoc basis. Risk of rain/ hailstorms, risk of heavy winds, risk of fire (in drying furnaces) and risk of drought with their incidences (normal-low) and severity (normal-high) on the Likert scale is placed in the "catastrophe area". Effective preparation and crises management are valuable options for the catastrophic risks. The introduction of insurance scheme in agriculture for such type of risk sources is appropriate. Likewise, the other extreme risk source for tobacco growers is risk of pest and diseases with a high incidence and relatively high severity is placed in the "extreme risk area". Being a monocrop, tobacco crop is vulnerable to a variety of pests and diseases, which require the application of large quantities of chemicals (Lecours et al., 2012). Detailed risk treatment action is required for such type of risk sources. Efficient pest management practices needs to be introduced and supported by contracting companies. The treatment must be directed to mitigate the initial incidence and the corresponding severity of pest and diseases.

Conclusion

Tobacco being a high-value cash crop is of high economic significance in Pakistanand the most common and prevalent risk management tools for the tobacco growers in the area is contract farming. Different components of perceived benefits from contract farming were ranked through ordered logit regression analysis and price protection was concluded to be the most important perceived benefit component in contract farming while reduction in marketing cost is the least important perceived benefit component. The other perceived benefits include increased sale price, improvement in quality, engagement of family labor and reduction in production cost of tobacco. Our analysis further concluded that most of the farmers ranked pest and diseases, heavy wind and heavy rain/ hailstorm as a high risk source for tobacco crop; while, less than half of the sampled respondent considered flood, drought, and fire in curing furnaces as a high risk source for tobacco crop. Similarly, the information gleaned through the assessment of different risk sources (as far as their incidence and severity are concerned) is of great importance in prioritizing the different treatment option in mitigating the severity of varying risk sources. Based on our incidence-severity risk assessment matrix, the risk of pest and diseases was termed as an extreme risk source; therefore the treatment to mitigate its effect must be a priority in different treatment options available. Similarly, the risk of rain/hailstorms, the risk of heavy winds and risk of fire (in drying furnaces) along with the risk of drought were concluded to be the catastrophic risk sources, and these risk sources need a different type of insurance schemes. Likewise, the risk of flood was considered to be some of the routine risk sources, therefore, the treatment options for these sources requires the least priority.

The analysis and ranking of the perceived benefit from contract farming suggest that the government should also focus on methods of production which may improve the quality of tobacco with a parallel decrease in production cost rather than concentrating only on price protection. Likewise, establishing a convenient procurement mechanism at farm gate can help in decreasing the marketing cost. Moreover,

based on the findings of this study our risk assessment matrix suggests a different mode of financing for reducing the severity of each of the risk source by taking into considerations their priority for treatment options. Similarly, keeping in view the severity of some of the risk sources (for instance risk of fire) discussed in this study there is a need of introducing tobacco crop's insurance (either by the tobacco purchasing companies or Pakistan tobacco board) to compensate tobacco growers in case of crop losses. Changes in the existing contract design will help increase the attractiveness of contracts and thus ensure the positive role of contract farming supporting inclusive growth for the tobacco growers.

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