https://doi.org/10.52131/joe.2024.0603.0234

*i*RASD Journal of Economics

Volume 6, Number 3, 2024, Pages 710 – 724

Journal Home Page:
https://journals.internationalrasd.org/index.php/joe

Livestock Entrepreneurs' Willingness to Pay (WTP) for Livestock Insurance: The Role of Capital and Financial Burden of Lumpy Skin Disease

Tusawar Iftikhar Ahmad[1], Samar Abbas[2], Muhammad Azhar Bhatti[3], Rehana Kousar[4]

[1] Associate Professor, Department of Economics, The Islamia University of Bahawalpur, Pakistan. Email: tusawar.iftikhar@iub.edu.pk
[2] PhD Scholar, Northwest A&F University, China. Email: samarabbas256@nwafu.edu.cn
[3] Lecturer, Department of Economics, The Islamia University of Bahawalpur, Pakistan. Email: azhar.bhatti219@gmail.com
[4] MPhil Scholar, Department of Economics, The Islamia University of Bahawalpur, Pakistan. Email: rehanakosar35@gmail.com

ARTICLE INFO

Article History:
Received: June 15, 2024
Revised: September 05, 2024
Accepted: September 08, 2024
Available Online: September 10, 2024

Keywords:
Livestock Insurance
Willingness to Pay
Human Capital
Natural Capital
Financial Capital
The Financial Burden of Disease

JEL Classification Codes:
D24, E24, O16

Funding:
This research received no specific grant from any funding agency in the public, commercial, or not-for-profit sectors.

ABSTRACT

In Punjab, Pakistan, livestock business owners are at high risk of losing their primary source of income due to the continually emerging lumpy skin disease. The sustainability of such financial risks can be managed through insurance; thus, this study explores the willingness of the 454 livestock entrepreneurs to pay for livestock insurance. Using an independent samples t-test, the study confirms that willingness to pay has a positive relationship with the size of owned farmland, total herd size, and annual income from crops, which are statistically significant at 1%. However, conventional attributes such as age, education, and off-farm income have no significant effect on willingness to pay at a 10% significance level. From the results of this study, insurance policies should be designed to facilitate the participation of entrepreneurs with larger farms and herds and higher crop income in livestock insurance programs.: This could positively affect the finances and the region's future of livestock business people.

Corresponding Author's Email: azhar.bhatti219@gmail.com

Citation: Ahmad, T. I., Abbas, S., Bhatti, M. A., & Kousar, R. (2024). Livestock Entrepreneurs' Willingness to Pay (WTP) for Livestock Insurance: The Role of Capital and Financial Burden of Lumpy Skin Disease. *IRASD Journal of Economics*, *6*(3), 710–724. https://doi.org/10.52131/joe.2024.0603.0234

1. Introduction

Pakistan's agricultural economy is supported by livestock farming, particularly in rural regions, where it is a significant source of income and sustenance for millions of households. Livestock farming is the backbone of Pakistan's agricultural economy. As a result of the livestock industry's contribution of 14.36% to the national GDP and 62.68% to the agricultural output, the Pakistan Economic survey (2023) highlights this sector's significance to the country's economy. However, livestock farming in Pakistan is afflicted by a variety of dangers, including epidemics such as Lumpy Skin Disease (LSD), which has a significant influence on the productivity of livestock and the income of farmers. The presence of these dangers highlights the necessity of

implementing comprehensive risk management solutions, one of which is livestock insurance, a promising product that is not widely implemented.

In Punjab, the most crucial province of Pakistan and the country's largest livestock producer, small and prominent livestock entrepreneurs are in massive danger due to LSD, a viral disease that directly impacts the country's economy in terms of losses to farmers through reduced milk production, weight loss and in some cases even death. As with most insurance products, insurance indemnifying livestock may be deemed to provide a protection floor. Nonetheless, the willingness to pay (WTP) for such coverage is still low among the concerned livestock entrepreneurs. Therefore, to capture the various determinants of WTP for livestock insurance in this context, it is necessary to conduct a multi-faceted analysis of human, natural, and financial capital and how they bear the cost of LSD.

Availability or otherwise of human capital tends to influence the WTP significantly for insurance, especially in the agricultural segment. Cross-sectional research works across many countries have also looked at diverse variables, including age, education, farming experience regarding livestock, and insurance adoption among farmers. In Swaziland, Singh (2017) also argued that young farmers had a low propensity to invest in livestock insurance, which agrees with Mahboob, Rehman, Hamid, and Saeed (2019) in the case of Pakistan. Likewise, Xiu, Xiu, and Bauer (2012) found the exact relationship between age and WTP for insurance as the farmers' age decreased, perhaps indicating that they are less risk-averse than the older farmers. However, empirical evidence from Nigeria prepared by Akintunde (2015) revealed a direct correlation between age and WTP, meaning the youths were less willing to go for livestock insurance than the older farmers.

Education is also a key factor that determines WTP for livestock insurance. It is worth highlighting that, according to numerous scientific publications, education positively impacts insurance. Similarly, the study conducted by Singh (2017) revealed that farmers in Swaziland, Aina, Ayinde, Thiam, and Miranda (2018) in West Africa and Dong, Jimoh, Hou, and Hou (2020) in China established that Education levels do have a positive effect on farmers' decision-making to take up livestock insurance. By contrast, specific research in Pakistan has found negative influences of education on WTP since better-educated farmers may employ other instruments to mitigate risks (Mahboob et al., 2019). However, there is a disagreement about the role played by education in the ability of a farmer to comprehend and exercise the use of insurance products.

Farming experience is also one of the components of human capital, and it has attracted much attention from researchers. This study is supported by Akintunde (2015) on Nigeria and Kurniaty, Masyhuri, and Jamhari (2021) on Indonesia, showing that the farmer's experience leads to investment in Livestock insurance. To some extent, it is true to assume that experienced farmers are fully aware of the threats of stock-breeding and the possible advantages of insuring animals. However, Mahboob et al. (2019) have shown that literate and experienced farmers depend on traditional risk management coping strategies instead of relying on formal risk management instruments such as insurance, implying a non-linear relationship between farming experience and WTP.

There is also a strong relationship between natural capital, as measured by farmland, the size of the herd, and WTP for livestock insurance. Livestock insurance is accepted more willingly by the bigger size of land size, as shown by the literature review from China by Dong et al. (2020), Namibia by Teweldemedhin and Kafidi (2009), and India by Chand, Kumar, Bhattarai, and Saroj (2016). This has been due to the notion that large tracts of cultivation usually relate to more income generation and provide adequate resources to cater to insurance costs. In the case of Punjab, where land is considered a valuable resource, it would be expected and logical that the livestock entrepreneurs with larger farms would have a high WTP for Livestock insurance.

In the same way, herd size has been established to have the most significant influence over WTP for livestock insurance. Research carried out in the regions of Indonesia by Nugrahaini, Masyhuri, and Suryantini (2021), Kurniaty et al. (2021), and China by Dong et al. (2020) have confirmed a positive correlation between herd size and WTP, as increased size means a higher level of proven rode investment and therefore means higher exposure to the risk. On the other hand, Akintunde (2015) conducted a similar study in Nigeria, where he discovered that farmers who owned many cattle were less willing to pay for livestock insurance because they use informal risk management more often.

Other significant factors determining WTP for livestock insurance are financial capital, crop income, livestock, and off-farm income. Singh (2017) concluded that the Swaziland farmers were willing to pay more for insurance if they had higher income from the farms, and similarly, Subedi and Kattel (2022) in context to the Nepalese farmers and O'Reilly, Bishu, Lahiff, and Gebregziabher (2018) in Ethiopian farmers. Those who meet the preparedness requirements for undertaking livestock entrepreneurship and get more significant benefits from crops and animals will likely have more cash to spend on protection measures, including insurance. Like Pakistan's case, Mahboob et al. (2019) also established a positive correlation between farm income and WTP, thus supporting the argument that adequate capital increases a farmer's capacity to manage risks.

Farm and non-farm income are other variables that have yielded inconclusive results in the literature. Hence, Kurniaty et al. (2021), established in Indonesia, and O'Reilly et al. (2018) in Ethiopia revealed that higher non-farm income triggers an increased WTP for livestock insurance, whereas Dong et al. (2020) in China observed an inverse relation. This implies that farmers with income from other sources are likely to be conversant with insurance since they will have an alternative source of income that they will use to offset the expenses they are likely to incur when they lose their livestock.

Another factor that relates to decision-making about insurance and which is of paramount importance for livestock entrepreneurs' WTP is the cost of LSD. LSD, caused by capripoxvirus, leads to reduced milk production, weight loss, and loss of stock through deaths, thus leading to huge economic losses. This paper has discussed some literature by researchers that have analyzed how disease burden impacts insurance. Mahboob et al. (2019) in Pakistan also established that livestock entrepreneurs affected by diseases that led to losses were more willing to insure livestock. Likewise, Nugrahaini et al. (2021) found that farmers who spent much on animals' health were more likely to consider insurance as a risk mitigation method.

In light of the said goals, this study attempts to contribute to the existing literature by identifying the factors that affect the livestock entrepreneurs' WTP level regarding livestock insurance in Punjab, Pakistan. Particularly the human, natural, and financial capital, as well as the financial cost of LSD, as the determinants of insurance adoption. This research aims to fill this gap by synthesizing prior research conducted in different locations to offer a detailed analysis of the factors influencing livestock insurance in a sensitive region where such products are most required.

2. Literature Survey and Research Hypotheses Formulation

Subedi and Kattel (2022) in Nepal, Kurniaty et al. (2021) in Indonesia, Liu, Hou, Li, Min, and Mu (2021) in China, Nugrahaini et al. (2021) in Indonesia, Dong et al. (2020) in China, Oduniyi, Antwi, and Tekana (2020) in South Africa's North West areas, Devkota et al. (2020) in Nepal, Mahboob et al. (2019) in (Faisalabad) Pakistan, O'Reilly et al. (2018) in northern Ethiopia, Aina et al. (2018) in west Africa, Koirala and Bhandari (2018) in Nepal, Indra, Ula, and Nugroho (2023) in Indonesia, Bannor et al. (2023) in Ghana, Mehmood, Ullah, e Ali, Baber, and Ashraf

(2022) in Pakistan, are amongst the studies that have explored the factors affecting the livestock farmer's WTP for livestock insurance.

The current study outlines three types of capital: human capital**,** natural capital, and financial capital. Each type of capital has further sub-types. Human capital encompasses factors like the entrepreneur's age, education, farming experience, and household size. Natural capital is determined by farmland and herd size. Financial capital includes income from crops, livestock, and off-farm income sources. This section reviews the relevant studies and the hypotheses formulated with the help of the literature survey.

2.1. Human Capital and Entrepreneurs' WTP for Livestock Insurance

Studies on livestock entrepreneurs' willingness to pay (WTP) for livestock insurance reveal diverse effects of age. Swaziland (Singh, 2017) suggests a negative impact on WTP, aligning with similar findings in China (Xiu et al., 2012) and Pakistan (Mahboob et al., 2019). In contrast, studies from Nigeria (Akintunde, 2015), China (Dong et al., 2020), and Namibia (Teweldemedhin & Kafidi, 2009) highlight a positive correlation between age and WTP. As more evidence favours increasing WTP with an increase in the farmer's age, we have hypothesized a positive relation between age and WTP for livestock insurance.

H_1: There exists a positive effect of livestock entrepreneur's age on the WTP for livestock insurance

Across multiple studies, educational attainment is a key determinant in livestock insurance WTP. Positive effects are observed in Swaziland (Singh, 2017), West Africa (Aina et al., 2018), Nigeria (Akintunde, 2015), China (Dong et al., 2020), India (Khan, Chander, & Bardhan, 2013), Indonesia (Kurniaty et al., 2021; Nugrahaini et al., 2021), and Namibia (Teweldemedhin & Kafidi, 2009). Conversely, studies in Nepal (Koirala & Bhandari, 2018), Pakistan (Mahboob et al., 2019), and Nepal (Subedi & Kattel, 2022) indicate a negative influence of education on WTP. As more evidence favours increasing WTP with an increase in the farmer's education, we have hypothesized a positive relation between the entrepreneur's education and WTP for livestock insurance.

H_2: There exists a positive effect of livestock entrepreneurs' education on the WTP for livestock insurance

The impact of farming experience on livestock insurance WTP is explored in studies from Nigeria (Akintunde, 2015) and Indonesia (Kurniaty et al., 2021). Both studies suggest a positive relationship between farming experience and WTP, indicating that more experienced livestock entrepreneurs are more inclined to invest in insurance. Likewise, we have hypothesized a positive relationship between the entrepreneur's farming experience and the WTP for livestock insurance.

H_3: There exists a positive effect of livestock entrepreneurs' farming experience on the WTP for livestock insurance

Household size plays a significant role in shaping WTP for livestock insurance. Positive associations are identified in studies from Swaziland (Singh, 2017), India (Chand et al., 2016; Khan & Khan, 2006), China (Dong et al., 2020), Indonesia(Kurniaty et al., 2021), and Nepal (Subedi & Kattel, 2022). However, studies from Indonesia (Nugrahaini et al., 2021) and China (Xiu et al., 2012) note a contradictory negative impact. Similarly, we have hypothesized a positive relationship between the entrepreneur's household size and the WTP for livestock insurance.

H_4: A positive effect of livestock entrepreneur's household size (Khan & Khan, 2006) in the WTP for livestock insurance exists.

2.2. Natural Capital and Entrepreneurs' WTP for Livestock Insurance

Farmland size is identified as a positive factor influencing livestock insurance WTP in studies from India (Chand et al., 2016), China (Dong et al., 2020; Subedi & Kattel, 2022), and Namibia (Teweldemedhin & Kafidi, 2009). Larger farmland owners appear more inclined to invest in livestock insurance. The current study has also hypothesized a positive relation between the entrepreneur's farmland size and WTP for livestock insurance.

H_5: There exists a positive effect of livestock entrepreneur's farmland size on the WTP for livestock insurance

The size of the animal herd owned by livestock entrepreneurs demonstrates varying effects on WTP. Positive impacts are noted in studies from China (Dong et al., 2020; Kurniaty et al., 2021; Nugrahaini et al., 2021; Subedi & Kattel, 2022). However, a nuanced negative effect is observed in Akintunde (2015) study, where a larger herd size negatively influences WTP. The current study also hypothesized a positive relation between herd size and WTP for livestock insurance.

H_6: There exists a positive effect of livestock herd size on the WTP for livestock insurance

2.3. Financial Capital and Entrepreneurs' WTP for Livestock Insurance

Farm income is a positive determinant in several studies exploring livestock insurance WTP. Positive relationships are identified in studies from Swaziland (Singh, 2017), India (Chand et al., 2016; Subedi & Kattel, 2022), China (Dong et al., 2020), Indonesia (Kurniaty et al., 2021), and Ethiopia (O'Reilly et al., 2018). Higher farm incomes are associated with an increased willingness to invest in livestock insurance. The study also hypothesizes a positive relation between farm income and WTP for livestock insurance.

H_7: There exists a positive effect of farm income on the WTP for livestock insurance

Non-farm income also contributes positively to livestock insurance WTP. Studies from Indonesia (Kurniaty et al., 2021; Subedi & Kattel, 2022), Ethiopia (O'Reilly et al., 2018), and Pakistan (Mahboob et al., 2019) highlight the beneficial impact of non-farm income on the likelihood of livestock entrepreneurs investing in insurance. However, (Dong et al., 2020; Singh, 2017) study in China reveals a nuanced negative impact, suggesting that non-farm income may not universally drive WTP. The study also hypothesizes a positive relation between non-farm income and WTP for livestock insurance.

H_8: There exists a positive effect of non-farm income on the WTP for livestock insurance

2.4. Synthesis of the Literature Reviewed

The Table below presents 17 studies on the determinants of livestock entrepreneurs' willingness to pay (WTP) for livestock insurance (the dependent variable). Livestock entrepreneurs' age, education, farming experience, household size, size of farmland owned, size of animal herd owned, income from farm sources, and income from non-farm sources are identified as the primary determinants of livestock entrepreneur's willingness to pay for livestock insurance in different countries. The minus (-) and (+) signs indicate the negative and positive effects of the variables on the livestock entrepreneur's WTP for livestock insurance. The Table categorizes the studies (Authors (years)) based on the negative and positive effects of the variables on the livestock entrepreneur's WTP for livestock insurance.

Table 1
Literature Review

Authors (year)	Country	Age	Education	Farming Experience	Household Size	Farmland Size	Herd Size	Farm Income	Non-farm Income
Singh (2017)	Swaziland	-	+	+		+			-
Aina et al. (2018)	West Africa	-	+		+				
Akintunde (2015)	Nigeria	+	+	+	+		-		
Chand et al. (2016)	India				-	+			
Devkota et al. (2020)	Nepal								
Dong et al. (2020)	China	+	+				+		
Khan et al. (2013)	India		-	+		+			
Koirala and Bhandari (2018)	Nepal								
Kurniaty et al. (2021)	Indonesia	+	+	+				+	
Liu et al. (2021)	China	+			+				
Mahboob et al. (2019)	Pakistan	-	-					+	
Nugrahaini et al. (2021)	Indonesia	-	+	+	-		+	+	
O'Reilly et al. (2018)	Ethiopia		+					+	
Oduniyi et al. (2020)	South Africa	-	-						
Subedi and Kattel (2022)	Nepal				+		+	+	
Teweldemedhin and Kafidi (2009)	Namibia	+	-						
Xiu et al. (2012)	China	-	-				+		

3. Conceptual Framework of the Study

The figure presents the study's conceptual framework, intending to investigate the role of capital and the financial burden of lumpy skin disease in livestock entrepreneurs' willingness to pay for livestock insurance. Capital is classified into three types: human, natural, and financial capital. Each type of capital is further sub-classified. The figure is divided into two main sections connected by a large arrow.

On the left side, three types of capital are outlined: human capital**,** natural capital, and financial capital. Each type is broken down into specific elements. Human capital includes factors like the entrepreneur's age, education, farming experience, and household size. Natural capital is determined by farmland and herd size. Financial capital encompasses income from crops, livestock, and off-farm income sources. Below these capitals, there is a section dedicated to the incidence of lumpy skin disease (LSD), focusing on expenses incurred due to an LSD-affected animal.

These factors collectively point towards the right side of the figure, where the livestock entrepreneur's WTP for livestock insurance is placed inside a rectangle, indicating that all these elements contribute to determining this willingness.

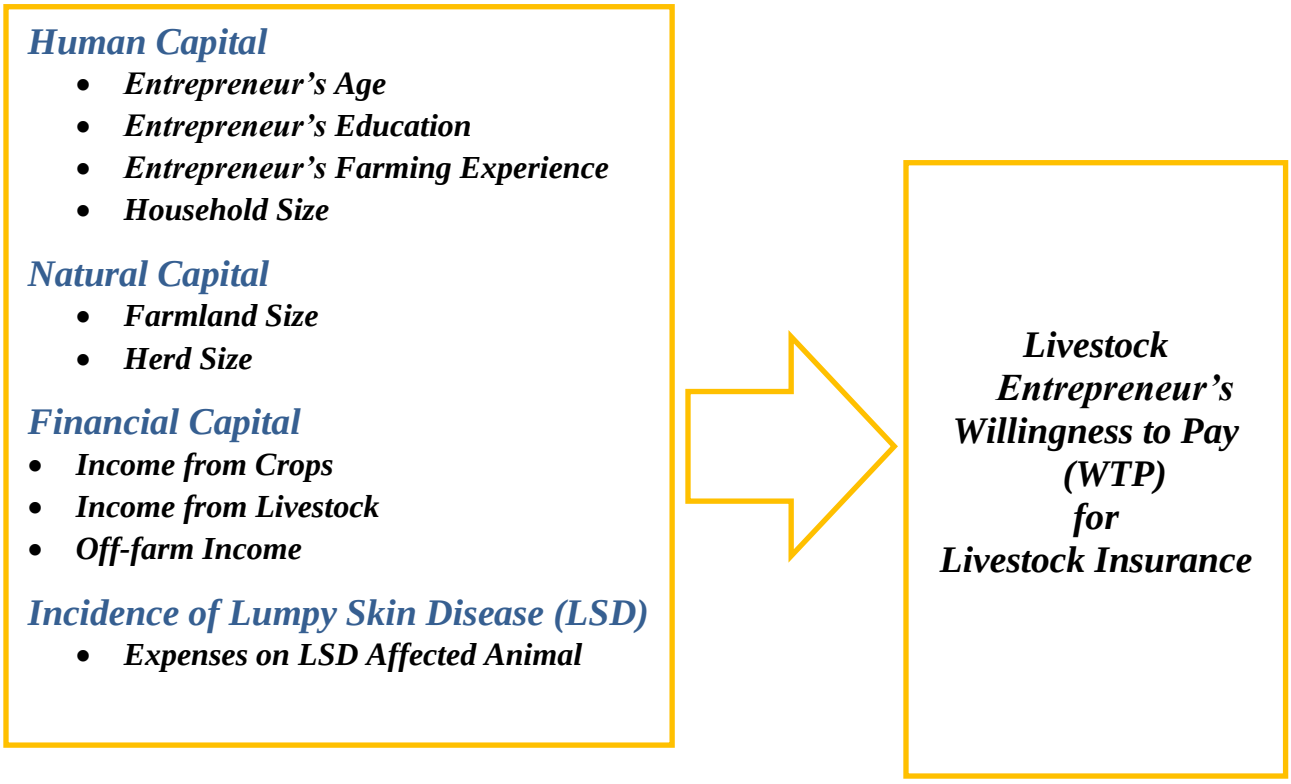

Figure 1: ***WTP for Livestock Insurance-A Conceptual Framework***

4. Data and Methodology

4.1. Sampling and Sample Size

A multi-stage sampling technique was employed to collect data from 456 livestock entrepreneurs. In the first stage, district Bahawalnagar was selected from the southern Punjab. Secondly, three sub-districts of the selected district were chosen from the five sub-districts. Thirdly, from each sub-district, two union councils were chosen. Fourthly, four villages were selected from each union council. Finally, 19 livestock entrepreneurs were chosen from each selected village.

4.2. Operational Definitions of Explanatory Variables

The Table provides an operational definition of various variables, their corresponding SPSS (Statistical Package for the Social Sciences) code, variable names, classifications, expected signs of their relationships, and the outcome or dependent variable of interest.

4.3. Estimation Technique

Student T-test was used to determine the magnitude of the independent variables of this research. A t-test, also called a student's t-test, is a statistical tool for comparing the means of two groups. It finds common application in hypothesis testing, aiming to evaluate whether a specific procedure impacts the target population or if there are significant differences between the two groups. In practice, a t-test can be employed to determine whether a single group's mean differs from a known value, termed a one-sample t-test. Additionally, it helps ascertain if two distinct groups exhibit statistically significant differences in their means, known as an independent two-sample t-test. Furthermore, it can assess whether paired or matched measurements exhibit significant differences, referred to as a paired or dependent samples t-test.

Table 2
Variables Descriptions with Expected Sign

	Variables Name	Definition of the Variable	Expected Sign
Human Capital	Livestock Entrepreneur's Age	used as a continuous variable	+
	Livestock Entrepreneur's Education	taken as the total number of schooling years of a livestock entrepreneur	+
	Entrepreneur's Farming Experience	counted in terms of the number of years spent in livestock entrepreneurship	+
	Household size	measured in the total number of individuals living in the same house	+
Natural Capital	Own farmland size	measured in acres of agricultural land in the ownership of the livestock entrepreneur	+
	Total herd size	measured as the number of animals possessed by the livestock entrepreneurs	+
Financial Capital	Annual Income from Crops	represents net income earned from crop farming; used as a continuous variable and measured in Pakistani rupees	+
	Annual Income from Animals	represents net income earned from livestock farming; used as a continuous variable and measured in Pakistani rupees	+
	Annual Income from Off-farm	represents net income earned from other than crop and livestock farming sources; used as a continuous variable and measured in Pakistani rupees	+
Financial Burden of LSD	Total Expenditure on the animal affected by the Lumpy Skin Disease (LSD)	includes total cost incurred in animal medication, loss of milk production, etc.	+

5. Results

Table 3: Descriptive Statistics

	Descriptive Statistics				
	Independent Variables	**Mean**	**Minimum**	**Maximum**	**Std. Deviation**
Human Capital	Livestock Entrepreneurs Age	44.89	17	90	14.21
	Livestock Entrepreneurs Education	5.21	0	18	4.73
	Entrepreneurs farming Experience	25.51	2	70	13.80
	Household size	7.59	2	25	3.47
Natural Capital	Own farmland size	7.82	0	300	19.03
	Total Herd size	34.88	4	194	26.03
Financial Capital	Annual Income from Crops	419210.50	0	10000000	956358.30
	Annual Income from Animals	458607.50	10000	8500000	592412.40
	Annual Income from Off-farm	669842.10	0	36000000	2292942.00
Incidence of LSD Disease	Total Expenditure on LSD-affected animals	34317.98	0	400000	49643.93

5.1. Interpretation of Descriptive Statistics of Independent Variables

Data was gathered from a sample of 456 livestock entrepreneurs, out of which 262 expressed their willingness to participate in livestock insurance, while the remaining 194 were not inclined towards it. Our investigation focused on several key aspects of these livestock

entrepreneurs. The age range of the sampled livestock entrepreneurs varied from 17 to 90 years, with an average age of 45. Most livestock entrepreneurs had primary-level education, indicating that most respondents had lower levels of formal education. Income earned from crops was measured in Pakistani Rupees, with an average income of Rs 419,210. Similarly, income from animal farming, also in Pakistani Rupees, showed an average income of Rs 458,607.24. Regarding other sources of income, 59.6% of livestock entrepreneurs were found to have off-farm income, while the rest relied solely on agriculture for their livelihoods. The size of households among the livestock entrepreneurs in Bahawalnagar primarily consisted of around 7 members on average. The range of family members varied from 2 to 25, with a sample mean of 7.81, showcasing some diversity in household sizes. The land owned by these livestock entrepreneurs ranged from 0 acres to 300 acres, with an average landholding of 7.81 acres. At the same time, 45% of agriculturalists have land between 1-5 acres. Animal farming experience ranges from 2 to 70 years, with an average farming experience of 25.5 years. Total herd size/livestock portfolio distribution limits from 4 to 194 with an average of 34.5 numbers of herd size.35.1 percent of livestock entrepreneurs were found to use social media, while the remaining 64.9 percent did not use social media. Livestock entrepreneurs faced significant losses due to the prevalence of Lumpy skin disease. When livestock entrepreneurs were asked about the incidence of lumpy skin disease, only 10.5 percent said their animal was saved from the disease, while the remaining 89.5 percent said their animal was affected by it. 45.1 percent of livestock entrepreneurs spend between 2000 and 20000 on LSD-affected animals, 31.6 percent spend between 21000 and 50000 on LSD-affected animals, and 12.8 percent spend over 50 thousand on LSD-affected animals.

5.2. Estimating Livestock Entrepreneurs' WTP For Livestock Insurance

Several questions were addressed to determine livestock entrepreneurs' WTP for livestock insurance. 57.5 percent of livestock entrepreneurs said they were interested, while the remaining 42.5 percent said they were not interested in purchasing insurance.

Table 4
Livestock Entrepreneurs' WTP For Livestock Insurance

	WTP for LS Insurance		
WTP for LS Insurance Variable	**Category**	**Frequency**	**Percent**
1. Already having livestock insurance? If (yes=1, no=0)	No	456	100
2. Are you aware of livestock insurance? If (yes=1, no=0)	No	452	99.1
	Yes	4	0.9
3. Are there insurance companies in your area? If (yes=1, no=0)	No	456	100

Livestock entrepreneurs questioned already having livestock insurance. Almost 100 percent of respondents said that they did not have livestock insurance. Only 0.9 percent of the respondents were aware of livestock insurance, while 99.1 percent were not aware of livestock insurance. Total 100% There are no insurance companies in their area, according to all respondents.

Only 42.5 percent of livestock entrepreneurs said they did not want livestock insurance, while 57.5 percent said they wanted it. According to replies, 42.5 percent of respondents decided not to take insurance, 8.6 percent preferred to pay the premium quarterly, and 48.9 percent preferred to pay the premium yearly. In total, 42.5 percent of respondents were unwilling to take any insurance, 0.2 percent chose health insurance, and 57.2 percent preferred insurance covering all risks.

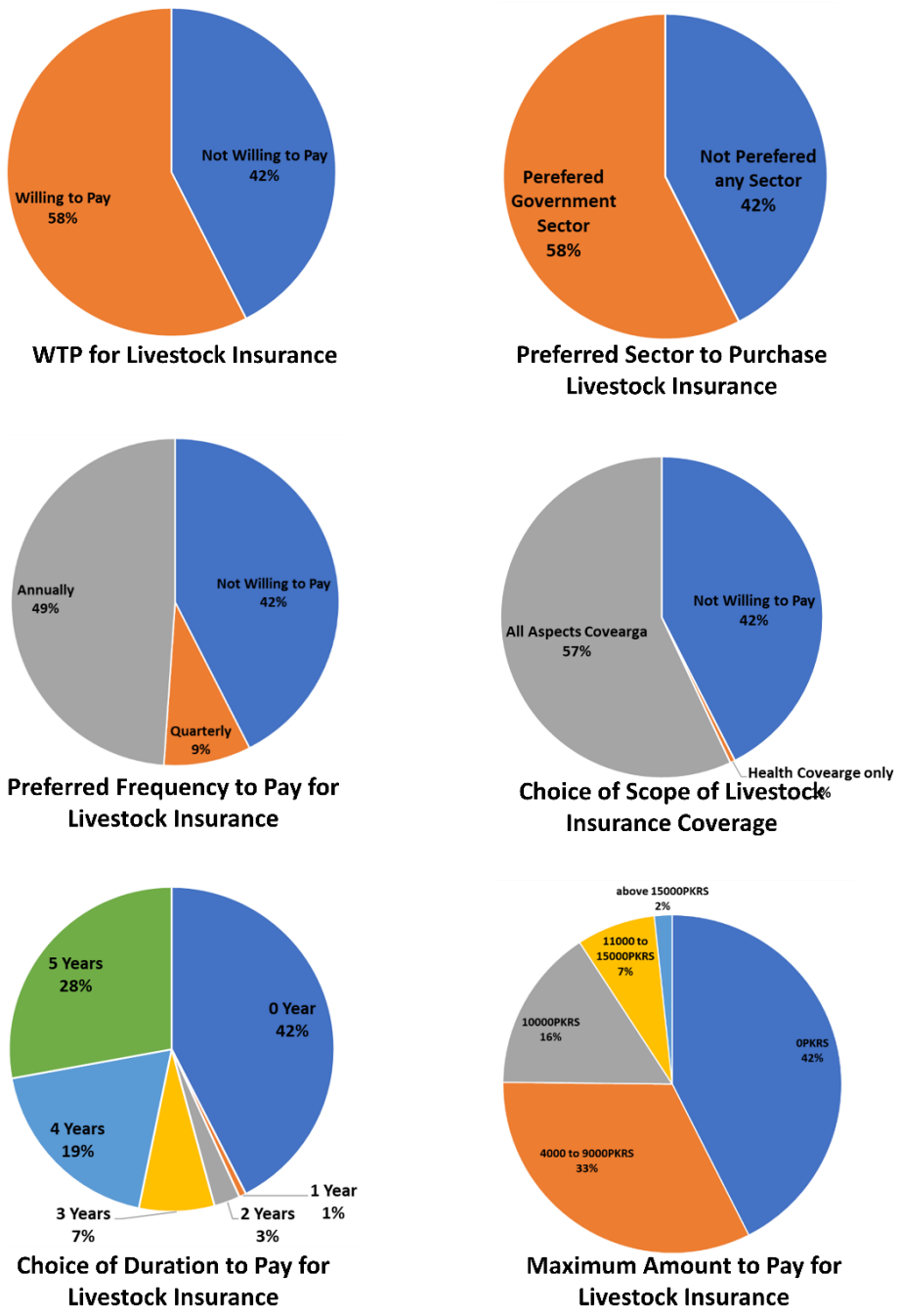

Figure 2: Livestock Entrepreneurs' WTP for Livestock Insurance

As said by respondents, 42.5 percent had no preferred sector for livestock insurance, whereas 57.5 percent selected the government sector. According to the replies, 42.5 percent of respondents were unwilling to take insurance for any set term. 0.7 percent selected one year,2.6 percent liked two years, 7.5 percent preferred three years, 18.9 percent preferred four years, and 27.9 percent respondent preferred five years. According to livestock entrepreneurs, 42.5 percent did not WTP any specific amount for livestock insurance.32.6 percent would spend between 4,000 and 90,000 PKRs, 15.6 percent would pay 10,000 PKRs, 7.5 percent would pay between 11,000 and 15,000 PKRs, and 1.7 percent would pay more than 15,000 PKRs.

Table 5
Regression Results

Category	Group Statistics					t-test for Equality of Means	
	Variable		Mean	Mean Difference	Std. Dev.	t-value	Df
Human Capital	Livestock Entrepreneurs' Age	Yes	43.927	-2.2632	14.0090	-1.684*	454.00
		No	46.191	-2.2632	14.4222		
	Livestock Entrepreneurs' Education	Yes	5.48	0.62	4.69	1.39	454.00
		No	4.86	0.62	4.78		
	Entrepreneurs' farming Experience	Yes	24.68	-1.96	13.15	-1.50	454.00
		No	26.64	-1.96	14.58		
	Household size	Yes	7.71	0.27	3.80	0.83	454.00
		No	7.44	0.27	2.95		
Natural Capital	Own farmland size	Yes	9.86	4.81	24.16	2.69***	454.00
		No	5.05	4.81	7.14		
	Total Herd size	Yes	38.12	7.60	27.88	3.11***	454.00
		No	30.52	7.60	22.66		
Financial Capital	Annual Income from Crops	Yes	537156.49	277233.81	1186160.95	3.09***	454.00
		No	259922.68	277233.81	457320.56		
	Annual Income from Animals	Yes	499370.23	95813.53	530202.27	1.71*	454.00
		No	403556.70	95813.53	664765.52		
	Annual Off-farm Income	Yes	724946.56	129523.88	2728647.46	0.60	454.00
		No	595422.68	129523.88	1521946.01		
Incidence of LSD Disease	Total Expenditure on LSD-affected animals	Yes	421622.14	11731.841	558616.88	2.509***	454.00
		No	339329.90	11731.841	586105.58		
Dependent Variable	Willingness-to-Pay for Livestock Insurance						

5.3. Factors Affecting Livestock Entrepreneurs' WTP for Livestock Insurance: Results of the Student T-test

5.3.1. Human Capital

- **Livestock Entrepreneurs Age**

Livestock entrepreneurs' age has a negative and significant (p-value = 0.093) effect on their willingness to protect, and the WTP money is significant at 10 %. This implies that, as age rises, their WTP for livestock insurance decreases or vice versa. They also have a negative suggestion about farmer age and WTP. This is owed to the reality that young individuals are more adventurous and risk-taking than older adults who are risk avoiders. (Bellante & Green, 2004).These findings are similar to some previously conducted studies by different researchers (Mahboob et al., 2019; Singh, 2017; Xiu et al., 2012) and positively with some previously conducted studies by different researchers as (Akintunde, 2015; Dong et al., 2020; Teweldemedhin & Kafidi, 2009).

- **Livestock Entrepreneurs Education**

The beta coefficient concerning livestock entrepreneurs' education indicates a positive but insignificant (p-value =0.17) relationship with the farmer's WTP for livestock insurance. As education levels rise, so will people's WTP for livestock insurance. Higher-educated livestock entrepreneurs can better handle risk and participate in risk management methods like insurance. Livestock Entrepreneur's education level can increase their capacity to grip and hold new technologies, particularly improvements in farm hazard management with livestock insurance.

This positive sign indicates that as Livestock Entrepreneurs' education increases, their willingness to pay for livestock insurance increases and vice versa. The outcome is same as the finding of some other studies (Aina et al., 2018; Akintunde, 2015; Dong et al., 2020; Khan et al., 2013; Kurniaty et al., 2021; Nugrahaini et al., 2021; Singh, 2017; Teweldemedhin & Kafidi, 2009) and contradictory with (Koirala & Bhandari, 2018; Mahboob et al., 2019; Subedi & Kattel, 2022).

- **Entrepreneurs Farming Experience**

The result shows that animal farming experience has a negative and statistically insignificant (p-value =0.13) relationship with the decision to adopt livestock insurance. This negative sign shows that as farming experiences rise, their WTP for livestock insurance decreases and vice versa. Hence, older and more experienced livestock entrepreneurs are less willing to buy insurance. Our result is similar to the studies of (Akintunde, 2015; Kurniaty et al., 2021).

- **Household size**

The household size result indicates a positive and insignificant relationship (p-value =0.41) with their WTP for livestock insurance. This positive sign indicates that their willingness to purchase livestock insurance increases as the number of dependents or household size increases. These findings are similar to some previously conducted studies by different researchers (Chand et al., 2016; Dong et al., 2020; Khan & Khan, 2006; Kurniaty et al., 2021; Singh, 2017; Subedi & Kattel, 2022) and contradictory with some previously conducted studies by different researchers as (Nugrahaini et al., 2021; Xiu et al., 2012).

5.3.2. Natural Capital

- **Own farmland size**

The beta coefficient of own farmland size indicates a positive and highly significant association (p-value =0.01) with the adoption and livestock entrepreneurs ' WTP for insurance at 1%. This positive sign indicates that, as livestock entrepreneurs' land size increases, the likelihood of their willingness to adopt livestock insurance increases and vice versa. Our result is similar to other studies (Chand et al., 2016; Dong et al., 2020; Subedi & Kattel, 2022; Teweldemedhin & Kafidi, 2009).

- **Total Herd size**

Herd size shows a positive result and highly significant (p-value = 0.00) association with their WTP for livestock insurance at a 1 percent level, separately. This positive sign suggests that, as livestock entrepreneurs ' herd size increases, their willingness to accept WTP for livestock insurance increases and vice versa. This result is similar to the studies of (Dong et al., 2020; Kurniaty et al., 2021; Nugrahaini et al., 2021; Subedi & Kattel, 2022) and opposing of (Akintunde, 2015).

5.3.3. Financial Capital

- **Annual Income from Crops**

Annual income from crops shows a positive and highly significant (p-value = 0.00) association between the adoption and WTP for livestock insurance at 1 %, respectively. This positive sign indicates that as livestock entrepreneurs ' annual income from crops increases, their willingness to buy and pay for livestock insurance increases and vice versa. These findings are similar to some previously conducted studies by different researchers (Kurniaty et al., 2021; Mahboob et al., 2019; Nugrahaini et al., 2021; O'Reilly et al., 2018; Subedi & Kattel, 2022).

- **Annual Income from Animals**

Results of Annual income from animals indicate a positive and significant (p-value = 0.09) connection through the adoption and WTP for livestock insurance at the level of 10 percent. This positive relationship indicates that livestock entrepreneurs ' annual income from animals increases the chances of their willingness to purchase, and WTP also increases and vice versa. Our result is opposed to (Nugrahaini et al., 2021).

- **Non-Farm Income**

Non-farm income had a positive but statistically insignificant relationship (p-value=0.55) with their WTP for livestock insurance. The positive sign indicates that as livestock entrepreneurs' farm income increases, the farmer's adoption of livestock insurance also increases and vice versa. The result is the same as the finding of an earlier study (Kurniaty et al., 2021; Mahboob et al., 2019; O'Reilly et al., 2018; Subedi & Kattel, 2022) and contradictory to some other research (Dong et al., 2020; Singh, 2017).

5.3.4. Incidence of Lumpy Skin Disease

- **Total Expenditure on LSD-affected animals**

Total Expenditure on LSD-affected animals has a positive and highly significant (p-value =0.012) effect on the acceptance of livestock insurance at the level of 1%. This positive sign means that as expenditures increase on LSD-affected animals, their willingness to purchase livestock insurance also increases and vice versa.

6. Conclusion and Policy Recommendations

The research study investigates the willingness of livestock entrepreneurs to pay for livestock insurance, the role of human, natural, and financial capital, and the financial burden of disease in this regard. The study analyzes the data of 454 livestock entrepreneurs and reports the t-test results for equality of means. The findings suggest that the mean difference in age between those who want to get livestock insurance and those who do not is -2.2632 years, and the difference is not statistically significant at the 10% significance level (p-value = 0.093). Similarly, the mean difference in education between the two groups is 0.62 years, and the difference is not statistically significant at the 10% significance level (p-value = 0.17). The mean difference in farming experience between the two groups is -1.96 years, which is not statistically significant at the 10% significance level (p-value = 0.13). The mean difference in household size between the two groups is 0.27, which is not statistically significant at the 10% significance level (p-value = 0.41). However, the mean difference in own farmland size between those who want to get livestock insurance and those who do not is 4.81 hectares, and the difference is statistically significant at the 1% significance level (p-value = 0.01). The mean difference in total herd size between the two groups is 7.60 animals, which is statistically significant at the 1% significance level (p-value = 0.00). The mean difference in annual income from crops between the two groups is 277233.81 Pakistani Rupees, and the difference is statistically significant at the 1% significance level (p-value = 0.00). The mean difference in annual income from animals between the two groups is 95813.53 Pakistani Rupees, and the difference is not statistically significant at the 10% level of significance (p-value = 0.09). The mean difference in annual off-farm income between the two groups is 129523.88 Pakistani Rupees, and the difference is not statistically significant at the 10% significance level (p-value = 0.55). Finally, the mean difference in total Expenditure on LSD-affected animals between the two groups is 11731.841 Pakistani Rupees, and the difference is statistically significant at the 5% level of significance (p-value = 0.012).

In conclusion, the study finds that the willingness of livestock entrepreneurs to pay for livestock insurance is influenced by their farmland size, total herd size, and annual income from crops. Therefore, policymakers should consider these factors while designing livestock insurance policies. The study also suggests that livestock entrepreneurs with more significant farmland and herd sizes and higher income from crops are more likely to pay for livestock insurance.

The study suggests that policymakers should design livestock insurance policies that cater to the needs of livestock entrepreneurs with larger farmland sizes, larger herd sizes, and higher income from crops. The policies should also consider the role of human, natural, and financial

capital and the financial burden of disease in the willingness of livestock entrepreneurs to pay for livestock insurance.

Authors' Contribution

Tusawar Iftikhar Ahmad: Conceptualized the research and supervised the project.
Samar Abbas: Contributed to data collection and drafting sections
Muhammad Azhar Bhatti: Conducted data collection and statistical analysis
Rehana Kousar: Contributed to data analysis interpretation and project management.

Conflict of Interests/Disclosures

The authors declared no potential conflict of interest w.r.t the article's research, authorship and/or publication.

References

Aina, I., Ayinde, O., Thiam, D., & Miranda, M. (2018). Willingness to Pay for Index-Based Livestock Insurance: Perspectives from West Africa. doi:10.22004/ag.econ.277383

Akintunde, O. (2015). Determinants of Poultry Farmers' Participation in Livestock Insurance in Southwest Nigeria. *Asian Journal of Poultry Science, 9*(4), 233-241. doi:10.3923/ajpsaj.2015.233.241

Bannor, R. K., Oppong-Kyeremeh, H., Amfo, B., Kuwornu, J. K., Kyire, S. K. C., & Amponsah, J. (2023). Agricultural Insurance and Risk Management among Poultry Farmers in Ghana: An Application of Discrete Choice Experiment. *Journal of Agriculture and Food Research, 11*, 100492. doi:https://doi.org/10.1016/j.jafr.2022.100492

Bellante, D., & Green, C. A. (2004). Relative Risk Aversion among the Elderly. *Review of Financial Economics, 13*(3), 269-281.

Chand, S., Kumar, A., Bhattarai, M., & Saroj, S. (2016). Status and Determinants of Livestock Insurance in India: A Micro Level Evidence from Haryana and Rajasthan. *Indian Journal of Agricultural Economics, 71*(3), 335-346. doi:10.22004/ag.econ.302218

Devkota, M. D., Ghimire, Y. N., Timsina, K. P., Kandel, M. G., Adhikari, M. S. P., Subedi, M. S., & Poudel, M. H. K. (2020). Livestock Insurance Adoption in Nepal: Lessons Learned. In: GON. WB and NARC. Kathmandu, https://www. researchgate. net/publication ….

Dong, H., Jimoh, S. O., Hou, Y., & Hou, X. (2020). Willingness to Pay for Livestock Husbandry Insurance: An Empirical Analysis of Grassland Farms in Inner Mongolia, China. *Sustainability, 12*(18), 7331. doi: https://doi.org/10.3390/su12187331

Indra, I., Ula, N., & Nugroho, A. (2023). *Implementation of Agricultural Insurance for Sustainable Food Crop in Mutiara Timur and Suka Makmur Sub Districts.* Paper presented at the IOP Conference Series: Earth and Environmental Science.

Khan, M., & Khan, A. (2006). Basic Facts of Mastitis in Dairy Animals: A Review. *Pakistan veterinary journal, 26*(4), 204.

Khan, M. A., Chander, M., & Bardhan, D. (2013). Willingness to Pay for Cattle and Buffalo Insurance: An Analysis of Dairy Farmers in Central India. *Tropical animal health and production, 45*, 461-468. doi:10.1007/s11250-012-0240-z

Koirala, A., & Bhandari, P. (2018). Livestock Insurance a Tool to Reduce Economical Loss of Farmers from Climate Change Related Hazards. *Insights Vet Sci, 2*, 005-008. doi:10.29328/journal.ivs.1001008

Kurniaty, T., Masyhuri, M., & Jamhari, J. (2021). Farmers' Willingness to Pay for Livestock Insurance Programs in Kulon Progo District. *Agro Ekonomi, 32*(1), 52-61. doi:10.22146/ae.59175

Liu, P., Hou, L., Li, D., Min, S., & Mu, Y. (2021). Determinants of Livestock Insurance Demand: Experimental Evidence from Chinese Herders. *Journal of Agricultural Economics, 72*(2), 430-451. doi: https://doi.org/10.1111/1477-9552.12402

Mahboob, M., Rehman, Q., Hamid, K., & Saeed, M. (2019). Insured and Non-Insured Livestock Farmers' Perception toward Livestock Insurance-a Case Study of Faisalabad-Pakistan. *Journal of Livestock Science (ISSN online 2277-6214), 10*, 48-52. doi:10.33259/JLivestSci.2019.48-52

Mehmood, N., Ullah, I., e Ali, M. S., Baber, M., & Ashraf, A. (2022). The Determinants of Food Crop: Farmers' Willingness to Pay in a Hypothetical Crop Insurance Product (a Case Study of District Nowshera, Pakistan). *INTERNATIONAL JOURNAL OF SPECIAL EDUCATION, 37*(3).

Nugrahaini, A. D., Masyhuri, M., & Suryantini, A. (2021). Determinant Factors for Cattle Insurance as a Risk Management Strategy. *Agriekonomika, 10*(1), 113-124. doi:https://doi.org/10.21107/agriekonomika.v10i1.10147

O'Reilly, S., Bishu, K. G., Lahiff, E., & Gebregziabher, M. (2018). Drivers of Farmers' Cattle Insurance Decisions: Evidence from Smallholders in Northern Ethiopia. *Agrekon, 57*(1), 40-48. doi:https://doi.org/10.1080/03031853.2018.1435290

Oduniyi, O. S., Antwi, M. A., & Tekana, S. S. (2020). Farmers' Willingness to Pay for Index-Based Livestock Insurance in the North West of South Africa. *Climate, 8*(3), 47. doi:https://doi.org/10.3390/cli8030047

Pakistan Economic survey, s. (2023). Retrieved from https://www.finance.gov.pk/survey/chapters_23/Highlights.pdf

Singh, A. S. (2017). Factors Affecting Adoption of Livestoc Farmers in Manzini. *Research Journal of Agriculture and, 5*(8), 6-14.

Subedi, S., & Kattel, R. (2022). Determining Factors and Impact of Household Income on Dairy Cattle Insurance in Nepal. *Journal of Agriculture and Forestry University*, 229-238.

Teweldemedhin, M. Y., & Kafidi, L. (2009). Risk Management Strategies of Cattle Farmers in Namibia-Case Study from Omaheke and Otjozondjupa Region.

Xiu, F., Xiu, F., & Bauer, S. (2012). Farmers' Willingness to Pay for Cow Insurance in Shaanxi Province, China. *Procedia Economics and Finance, 1*, 431-440. doi:https://doi.org/10.1016/S2212-5671(12)00049-4