



# What Premiums are Livestock Farmers Willing to Pay for Indemnity Insurance in the West Region, Cameroon?

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## Authors' contributions

This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.

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## ABSTRACT

Poultry and pig farmers in the West Region of Cameroon inherently face risks. Notwithstanding, no insurance company offers indemnity insurance to cover these risks. This study investigates the premiums poultry and pig farmers are willing to pay for insurance and the determinants of these premiums. A quantitative design was employed, involving a sample of 484 poultry and pig farmers selected through cluster and snowball sampling techniques from the Mifi, Koung-Khi, Bamboutos, and Upper-Plateau Divisions. Primary data were collected using structured questionnaires (of which 430 questionnaires were retrieved), and quantitative analyses were conducted using the Chi-Square, Logistic Regression, and Integrated Value Mapping Tests. This study revealed that most farmers (40.7%) are willing to pay \$79 (50,000CFA) for indemnity insurance. For poultry farmers, household and flock size are significant determinants. Production factors influenced the premiums

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they are willing to pay for insurance than socioeconomic factors, with a predictive power/explanatory power of 33.9% and 9.5%, respectively. The Integrated Value Mapping (IVM) combining the predictive effects of both components was 38%, implying that 62% variability was not explained, as there are other factors to reckon with. For pig farmers, years of farming experience, annual farming income, division, household and flock size are significant determinants of the premium farmers are willing to pay for insurance. Socioeconomic factors predicted their willingness to subscribe to insurance almost at the same degree as production factors, with a predictive power/explanatory of 61.6% and 62.4%, respectively. The Integrated Value Mapping (IVM) combining the predictive effects of both components was 74.3%, implying that 25.7% variability was not explained as there are other factors to reckon with. This study recommends that the government and development partners should establish premium-subsidised indemnity insurance initiatives, especially for small-scale farmers.

*Keywords: Determinants; insurance; livestock; poultry; premium; pig and willingness.*

## 1. INTRODUCTION

The pig and poultry sectors are strategic in Cameroon's economy as they contribute to food security, poverty alleviation and economic growth. There are over 3,000,000 pigs and about 72,000,000 poultry birds in Cameroon (Ministry of Livestock, Fisheries and Animal Industries and Livestock Sector Improvement and Development Project (MINEPIA / PADFEL, 2015) cited in the Platform for Agricultural Risk Management-PARM [1]. In 2012, meat production amounted to more than 230,000 tons, of which 38.7 % was poultry meat and 8.2% was pork (Ministry of Economy, Planning and Regional Development/Rural Sector Development Strategy (MINEPAT / SDSR) 2016 cited in PARM, 2017). The total number of controlled chickens was 72,758,691 in 2013 (68.9% broilers, 25.6% traditional chickens, and 5.5% laying hens). Controlled egg production was 65,116 tons in 2013. According to the Poultry Interprofessional of Cameroon (French acronym IPA VIC) [2]. cited in Viban and Mfondo [3]. there are 9,000 poultry farms and the sector employs about 320,000 persons. Furthermore, annually, poultry farmers produce 46.43 million broilers and 119,340 tons of table eggs. With a national consumption of 3.48 kilograms of chicken/person/year, national production needs to be strengthened for chicken consumption/person/year to attain the average world consumption of 13.6 kg per person [3].

Domestic production is concentrated mainly in the country's West Region, even though the Littoral, Center, and North-West Regions contribute significantly to poultry and pork meat production [1]. The West Region is the largest pig production region, with a herd estimated at 3,500,000 heads, providing 4/5 of pigs commercialised in the country [4].

The government, non-profit organisations, and the private sector of Cameroon consider poultry farming as a way out of youth unemployment and poverty alleviation. For this reason, the government implemented programs to promote poultry and pig farming (among other entrepreneurial initiatives). Some of these programs include the Rural and Urban Youth Support Program (French acronym PAJER-U), Integrated Support Project for Actors in the Informal Sector (French acronym PIAASI), and Youth Agropastoral Entrepreneurship Promotion Program (French acronym PEA-J). Furthermore, low public-sector salaries, underemployment, and unemployment have pushed Cameroonians into poultry and pig farming.

Smallholder and poor farmers are vulnerable due to inadequate resources to take preventive measures or absorb shocks [5]. There is still a considerable protection gap, with many farmers ill-prepared to withstand losses in an epidemic [6]. Livestock farming insurance (LFI) is a risk management tool that can help Cameroon bridge the protection gap, strengthen the resilience of farmers, and chart a sustainable development path for the livestock sector.

No insurance company in Cameroon and the West Region offers indemnity insurance. Notwithstanding, most poultry and pig farmers (51.2%, 220) are unwilling to get LFI because they did not know its importance, they are smallholder farmers who preferred other strategies to manage risk than LFI and perceived that LFI could be expensive. Only 33.5% (144) are willing to get LFI, with a more significant proportion of poultry farmers (39.0%, 90) willing to get LFI than pig farmers (27.1%, 54). This is because they understood the power of LFI to

enhance their production system. Farmers in the Mifi Division are more willing to pay for LFI than those in the Bamboutos, Upper-Plateau and Koung-Khi Divisions. The influence of production factors was more pronounced for poultry farmers, while socioeconomic characteristics had a more significant impact on pig farmers' willingness to subscribe to LFI [7].

Despite information on poultry and pig farmers' willingness to get LFI, no information is known about the premiums poultry and pig farmers are willing to pay for LFI and the determinants of these premiums. This study investigates the premiums that poultry and pig farmers are willing to pay for livestock farming insurance and the determinants of these premiums in the Mifi, Koung-Khi, Bamboutos and Upper-Plateau Divisions of the West Region of Cameroon. Farmers' willingness to get LFI can increase when they have a better understanding of LFI through the actions of extension services. Notwithstanding, insurance companies need to know what farmers are willing to pay independent of their willingness to pay for LFI. This information can be used to design insurance premium subsidies for poultry and poultry farmers.

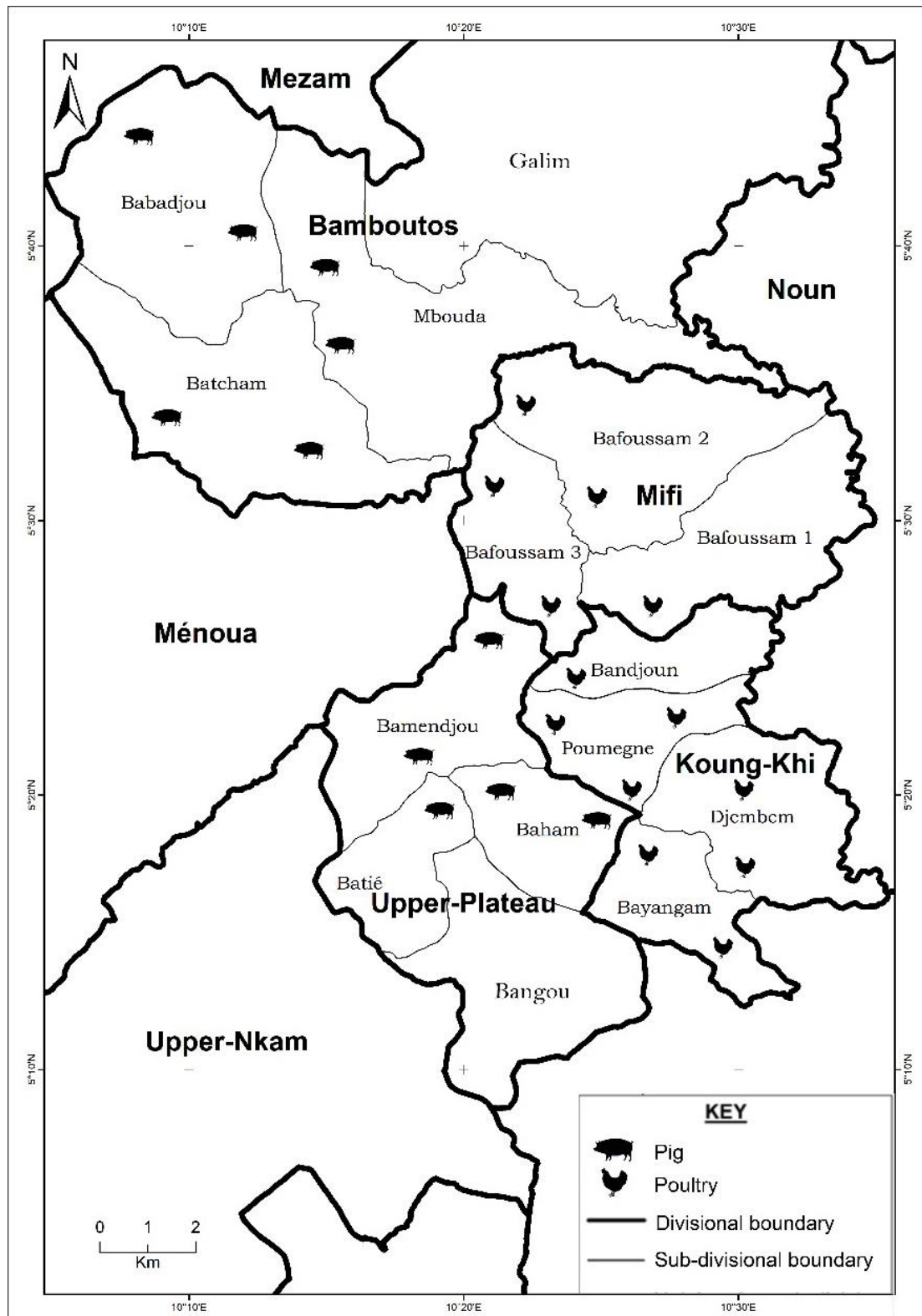
## 2. MATERIALS AND METHODS

### 2.1 Study Area

This study was conducted in the Mifi (5° 28' 45" N, 10° 25' 11" E), Koung-Khi (5° 22' 29" N, 10° 24' 43" E), Bamboutos (5° 37' 34" N, 10° 15' 17" E) and Upper-Plateau (5° 20' 05" N, 10° 22' 06" E) Divisions of the West Region of Cameroon as shown in Fig. 1.

The Mifi and Koung-Khi Divisions are the leading poultry production areas, and the Bamboutos and Upper-Plateau Divisions are the leading pig production areas [8]. Between 2014 and 2019, pig farmers raised 854,232 pigs in the West Region. Between 2014 and 2019, pork production in the Bamboutos and Upper-Plateau Divisions was 507.38 tons, and that of the West Region was 3,400 tons. From 2014-2019, 41,639,496 chickens were grown in the West Region. Poultry farmers produced 16,887.9 tons of poultry meat from 2014 to 2019. In the Mifi and Koung-Khi Divisions (area of focus for poultry farming), 1,116.3 tons were produced from 2014 to 2019, making up 6.6% of total poultry meat production in the West Region. In the West Region, poultry farmers produced 4,542,167,237 eggs between 2014 and 2019 [8,9,10,11].





**Fig. 1. Map of the West Region of Cameroon, showing case study divisions.**

Source: National Institute of Cartography (2020) and Fieldwork (2020)

NB: The symbols on the map illustrate the leading poultry and pig production areas and do not represent the number of chickens and pigs per surface area

## 2.2 Research Design and Sample Size Determination

This study employed a quantitative research design. Due to the absence of reliable data on the number of poultry and pig farmers per division, the sample size was estimated based on the total number of households involved in livestock farming on the one hand and the pig and poultry production in the West Region on the other. The calculated sample size was 422 poultry and pig farmers but was increased by 10 per cent to 484 farmers to ensure that the questionnaire return rate was not less than 80%.

## 2.3 Data Collection Procedure

The data collection process involved administering 484 structured questionnaires using a two-stage sampling technique. The cluster sampling technique was initially employed to identify the four primary divisions in which farmers are engaged in poultry farming (Mifi and Koung-Khi Divisions) and pig farming (Bamboutos and Upper-Plateau Divisions). Subsequently, an equal number of questionnaires were distributed in each case study division and they were administered to poultry and pig farmers using a snowball sampling technique. Of the 484 questionnaires distributed, 430 were returned, resulting in a percentage success rate of 89%.

## 2.4 Data Analysis

The data analysis involved several statistical techniques to examine the relationship between poultry and pig farmers' socioeconomic and production characteristics and the premiums they are willing to pay for LFI. The Chi-Square Test assessed the association between these factors and the premiums that farmers are willing to pay for indemnity insurance. Additionally, a Binary Logistic Regression Model was employed to evaluate the predictive effects of socioeconomic and production factors on farmers' premiums to pay for LFI. To further investigate the significant factors influencing the premiums that farmers are willing to pay for LFI, an Integrated Value Mapping (IVM) analysis was conducted. The IVM analysis aimed to identify whether socioeconomic or production factors played a more prominent role in influencing the premiums farmers are willing to pay for LFI. By integrating the predictive effects of both components, the IVM analysis provided insights into the relative contribution of each category (socioeconomic or

production factors) in shaping the premiums farmers are willing to pay for LFI.

## 3. RESULTS AND DISCUSSION

### 3.1 Premiums Poultry and Pig Farmers are Willing to Pay for LFI

The premiums that poultry and pig farmers are willing to pay for LFI per year indicates the degree of sensitisation that has to be done regarding LFI and the premium subsidies that can be designed for LFI. This information lets insurance companies quickly anticipate participation rates and adjust their insurance schemes. The premiums that farmers are willing to pay for LFI ranged from less than 50,000FCFA to 700,000FCFA, as shown in Table 1.

It was realised that the higher the insurance premiums, the fewer farmers are willing to pay for LFI. Most farmers (40.7%, 175) are willing to pay 50,000FCFA or less annually to cover the risks in their livestock farms. The percentage of poultry farmers (20.9%) was almost the same as that of pig farmers (19.8%). Furthermore, 31.6% (136) are willing to pay between 50,001 and 100,000CFA to get LFI. Moreover, 12.8% (55) are willing to pay 100,001-300,000FCFA for LFI. More poultry farmers (6.5%, 28) are willing to pay higher than pig farmers (6.3%, 27). The majority of farmers in the West Region are smallholders who have family production units and do not earn a significantly high income from farming, which is the reason for the low premiums they are willing to pay for LFI. Those with considerably larger units who understood the importance of LFI are willing to pay higher. Insurance companies can determine the cut-off premiums based on the premiums farmers are willing to pay, specific insurance modalities per flock size and premium subsidies.

Table 2 shows the distribution of premiums that poultry and pig farmers are willing to pay in the Mifi, Koung-Khi, Upper-Plateau and Bamboutos Divisions.

Most farmers in the Mifi Division (17.0%, 73) are willing to pay less than 50,000CFA for LFI. This was followed by farmers in the Bamboutos (14.0%, 60). Furthermore, farmers in their majority in the Mifi Division (14.0%,60) are willing to pay 50,001-100,000CFA, followed by farmers in the Bamboutos (7.9%, 34). More farmers in the Mifi (4.0%,17) and Upper-Plateau Divisions (3.5%, 15)

are willing to pay 100,001-300,000CFA. Moreover, most farmers in the Upper-Plateau (1.2%, 5) and the Mifi Divisions (0.9%, 4) are willing to pay 300,001-500,000CFA for LFI. Only 0.2% (1) of farmers located in the Mifi Division are willing to pay 500,001-700,000CFA. Furthermore, the majority of farmers 4.2% (18) in the Koung Khi Division, 3.5% (15) in the Upper-Plateau, 2.3% (10) in the Mifi and 2.1% (15) in the Bamboutos Divisions are undecided on the premiums they are willing to pay for LFI.

### 3.2 Determinants of the Premiums Poultry and Pig Farmers are Willing to Pay for LFI

#### 3.2.1 Poultry farmers' socioeconomic factors and premiums willing to pay for LFI

The association between poultry farmers' socioeconomic characteristics and the premiums they are willing to pay for LFI is shown in Table 3, and Wald Statistics of Binary Logistic Regression depicting the predictive effect of socioeconomic factors controlled for each other on the premiums farmers are willing to pay for livestock insurance is shown in Table 4.

The premium poultry farmers are willing to pay for LFI was significantly associated only with household size. The higher the household size, the higher the premium they are willing to pay for LFI (P=0.000). Many families depend on poultry farming because it is their main economic activity. Poultry farmers will pay a significant premium to avoid significant periods of business interruption due to livestock losses.

The influence of the significant determinants highlighted above was appraised while controlling for each other to silence the confounders using the Wald test of Logistic Regression.

Wald Statistics highlighted household size as a significant and critical determinant (OR >1; LB>1).

#### 3.2.2 Poultry farmers' production factors and premiums willing to pay for LFI

The association between poultry farmers' production characteristics and the premiums they are willing to pay for LFI is shown in Table 5, and Wald Statistics of Binary Logistic Regression depicting the predictive effect of production factors controlled for each other on the premium farmers are willing to pay for livestock insurance is shown in Table 6.

The premiums farmers are willing to pay for LFI are significantly associated with the following determinants: number of farms, total size of the flock, and setting type. Poultry farmers with more than one farm are more willing to pay higher (P=0.028) than those with one farm. Farmers with many farms have more income than farmers with just one farm and can draw resources from other farms to cover their strategic farms. Livestock losses can be more significant for farmers with several farms than those with one. Furthermore, farmers with a flock size greater than 5,000 chickens are willing to pay higher (P=0.001). This is because of the significant level of investment made in these farms. Moreover, farmers in rural settings are willing to pay higher premiums than those in peri-urban areas (P=0.000). Large poultry farms are often located in rural areas due to space requirements. Poultry farmers with large farms have invested lots of money and will not want to loss it due to risk factors. They prefer to pay a significant premium to transfer risk to insurance companies.

The influence of the significant determinants highlighted above was appraised while controlling for each other to silence the confounders using the Wald test of Logistic Regression.

**Table 1. Premiums (CFA) poultry and pig farmers are willing to pay per year for LFI (per livestock category)**

Livestock category	Stats	≤50,000	50,001-100,000	100,001-300,000	300,001-500,000	500,001-700,000	Undecided
Poultry	n	90	79	28	5	1	28
	%	20.9%	18.4%	6.5%	1.2%	0.2%	6.5%
Pig	n	85	57	27	6	0	24
	%	19.8%	13.3%	6.3%	1.4%	0.0%	5.6%
<b>Total</b>	<b>n</b>	<b>175</b>	<b>136</b>	<b>55</b>	<b>11</b>	<b>1</b>	<b>52</b>
	<b>%</b>	<b>40.7%</b>	<b>31.6%</b>	<b>12.8%</b>	<b>2.6%</b>	<b>0.2%</b>	<b>12.1%</b>

Source: Fieldwork (2020)

**Table 2. Premiums poultry and pig farmers are willing to pay for LFI in the Mifi, Koung Khi, Upper-Plateau and Bamboutos Divisions**

Divisions	Stat	≤50,000	50,001-100,000	100,001-300,000	300,001-500,000	500,001-700,000	Undecided
Mifi	n	73	60	17	4	1	10
	%	17.0	14.0	4.0	0.9	0.2	2.3
Koung Khi	n	17	19	11	1	0	18
	%	4.0	4.4	2.6	0.2	0.0	4.2
Bamboutos	n	60	34	12	1	0	9
	%	14.0	7.9	2.8	0.2	0.0	2.1
Upper-Plateau	n	25	23	15	5	0	15
	%	5.8	5.3	3.5	1.2	0.0	3.5
<b>Total</b>	<b>n</b>	<b>175</b>	<b>136</b>	<b>55</b>	<b>11</b>	<b>1</b>	<b>52</b>
	<b>%</b>	<b>40.7</b>	<b>31.6</b>	<b>12.8</b>	<b>2.6</b>	<b>0.2</b>	<b>12.1</b>

Source: Fieldwork (2020)

**Table 3. Association between socioeconomic characteristics of poultry farmers and the premiums willing to pay for LFI**

Determinants	Categories	Premiums farmers are willing to pay for LFI		N	χ <sup>2</sup> -test (df=0.05)
		≤50000	>50000		
Gender	Male	55.4% (62)	44.6% (50)	112	χ <sup>2</sup> =0.403 P=0.526
	Female	46.7% (7)	53.3% (8)	15	
Age	18-37	70.4% (19)	29.6% (8)	27	χ <sup>2</sup> =4.302 P=0.231
	38-47	44.7% (17)	55.3% (21)	38	
	48-57	54.0% (27)	46.0% (23)	50	
	58+	50.0% (6)	50.0% (6)	12	
Household size	1-2	67.3% (33)	32.7% (16)	49	χ <sup>2</sup> =13.510 P=0.001
	3-4	54.0% (34)	46.0% (29)	63	
	5+	13.3% (2)	86.7% (13)	15	
Years of experience	1-5	80.0% (12)	20.0% (3)	15	χ <sup>2</sup> =5.169 P=0.270
	6-10	51.4% (18)	48.6% (17)	35	
	11-15	55.3% (21)	44.7% (17)	38	
	16-20	46.4% (13)	53.6% (15)	28	
	21+	45.5% (5)	54.5% (6)	11	
Highest level of school attained	Never been to school and primary	56.8% (25)	43.2% (19)	44	χ <sup>2</sup> =0.229 P=0.892
	Secondary	53.6% (37)	46.4% (32)	69	
	High school, vocational training and university education	50.0% (7)	50.0% (7)	14	
Main occupation	Poultry farm	57.3% (63)	42.7% (47)	110	χ <sup>2</sup> =5.018 P=0.285
	Crop Farmer	27.3% (3)	72.7% (8)	11	
	Casual labourer	100% (1)	0.0% (0)	1	
	Employee	33.3% (1)	66.7% (2)	3	
	Businessperson	50.0% (1)	50.0% (1)	2	
Marital status	Single	54.3% (19)	45.7% (16)	35	χ <sup>2</sup> =1.629 P=0.443
	Married	56.8% (46)	43.2% (35)	81	
	Widowed	36.4% (4)	63.6% (7)	11	
Annual poultry income	< 1 million	50.0% (3)	50.0% (3)	6	χ <sup>2</sup> =0.036 P=0.849
	1 million +	54.0% (61)	46.0% (52)	113	
Monthly household income	<500,000	45.5% (5)	54.5% (6)	11	χ <sup>2</sup> =3.081 P=0.214
	500,000-1,499,000	85.7% (6)	14.3% (1)	7	
	1,500,000+	54.5% (55)	45.5% (46)	101	

Source: Fieldwork (2020)

**Table 4. Wald Statistics of Binary Logistic Regression depicting the predictive effect of socioeconomic factors on the premiums that poultry farmers are willing to pay for LFI**

Determinants	B	S.E.	Wald	df	Sig.	Exp(B)	95% C.I. for EXP(B)	
							Lower	Upper
Household size	.148	.269	18.259	1	.000	3.150	1.861	5.333

Source: Fieldwork (2020)

**Table 5. Association between poultry farmers' production characteristics and premiums willing to pay for LFI**

Determinants	Categories	Premiums farmers are willing to pay for LFI		N	χ <sup>2</sup> -test (df=0.05)
		≤50000	>50000		
Evaluation of risk management strategies	Adequate	53.5% (61)	46.5% (53)	114	χ <sup>2</sup> =1.010 P=0.315
	Inadequate	70.0% (7)	30.0% (3)	10	
Source of labour	Family	56.7% (59)	43.3% (45)	104	χ <sup>2</sup> =3.565 P=0.168
	Employees	27.3% (3)	72.7% (8)	11	
	Both	58.3% (7)	41.7% (5)	12	
Number of farms	One	63.6% (42)	36.4% (24)	66	χ <sup>2</sup> =4.809 P=0.028
	More than one	44.1% (26)	55.9% (33)	59	
Total size of flock	≤5000	68.2% (45)	31.8% (21)	66	χ <sup>2</sup> =10.217 P=0.001
	>5000	39.3% (22)	60.7% (34)	56	
Division	Mifi	55.8% (67)	44.2% (53)	120	χ <sup>2</sup> =1.168 P=0.280
	Koung-khi	33.3% (2)	66.7% (4)	6	
Setting type	Peri-urban	66.7% (60)	33.3% (30)	90	χ <sup>2</sup> =18.946 P=0.000
	Rural	24.3% (9)	75.7% (28)	37	
Species	Local chicken	55.5% (65)	44.5% (52)	117	χ <sup>2</sup> =0.906 P=0.636
	Broilers	40.0% (4)	60.0% (6)	10	
Source of capital	Personal savings	67.6% (25)	32.4% (12)	37	χ <sup>2</sup> =3.342 P=0.188
	Personal savings and loan	49.3% (37)	50.7% (38)	75	
	Loan only	53.8% (7)	46.2% (6)	13	

Source: Fieldwork (2020)

**Table 6. Wald statistics of Binary Logistic Regression depicting the predictive effect of poultry farmers' production factors and the premiums they are willing to pay for LFI**

Determinants	B	S.E.	Wald	df	Sig.	Exp(B)	95% C.I. for EXP(B)	
							Lower	Upper
Number of farms	-.042	.514	.007	1	.935	.959	.350	2.628
Total size of flock	1.203	.514	5.476	1	.019	3.330	1.216	9.123
Setting type	.177	.136	1.681	1	.195	1.193	.914	1.558

Source: Fieldwork (2020)

**Table 7. Model summary of the influence of socioeconomic and production factors on the premiums poultry farmers are willing to pay for LFI**

Predictive component	Omnibus Tests of Model Coefficients	Predictive Power / Explanatory Power (Nagelkerke R Square)
Socioeconomic factors	P=0.477	9.5%
Production factors	P=0.000	33.9%
IVM	P=0.010	38.0%

Source: Fieldwork (2020)



After controlling determinants for each other, Wald Statistics highlighted only the total size of the flock as a significant and critical predictor (OR >1; LB>1).

### 3.2.3 Model summary (poultry farmers)

The model summary for socioeconomic and production factors was computed using the Integrated Value Mapping (IVM) approach, as shown in Table 7.

Production factors predicted the premiums that poultry farmers are willing to pay for LFI more than socioeconomic factors, with a predictive power/explanatory power (PP/EP) of 33.9% and 9.5%, respectively. The Integrated Value Mapping (IVM) approach, combining the

predictive effects of both components, was 38.0%, implying that 62.0% variability was not explained as there are other factors to reckon with.

### 3.2.4 Pig farmers' socioeconomic factors and premiums willing to pay for LFI

The association between pig farmers' socioeconomic characteristics and the premium they are willing to pay for LFI is shown in Table 8. The premiums pig farmers are willing to pay for LFI are significantly associated with the following variables: sex, age, household size, main occupation, marital status, annual farming income and years of work experience.

**Table 8. Association between socioeconomic characteristics of pig farmers and the premiums willing to pay for LFI**

Determinants	Categories	Premiums farmers are willing to pay for LFI		n	χ <sup>2</sup> -test (df=0.05)
		≤50000	>50000		
Sex	Male	51.7% (89)	48.3% (83)	172	χ <sup>2</sup> =5.105 P=0.024
	Female	78.9% (15)	21.1% (4)	19	
Age	18-37	77.8% (49)	22.2% (14)	63	χ <sup>2</sup> =31.756 P=0.000
	38-47	53.8% (35)	46.2% (30)	65	
	48-57	37.7% (20)	62.3% (33)	53	
	58+	0.0% (0)	100% (10)	10	
Household size	1-2	80.6% (87)	19.4% (21)	108	χ <sup>2</sup> =69.582 P=0.000
	3-4	22.4% (17)	77.6% (59)	76	
	5+	0.0% (0)	100% (7)	7	
Years of experience	1-5	79.7% (51)	20.3% (13)	64	χ <sup>2</sup> =40.408 P=0.000
	6-10	61.1% (33)	38.9% (21)	54	
	11-15	33.3% (13)	66.7% (26)	39	
	16-20	23.1% (6)	76.9% (20)	26	
	21+	12.5% (1)	87.5% (7)	8	
Highest level of school attained	Never been to school and primary education	51.2% (43)	48.8% (41)	84	χ <sup>2</sup> =0.644 P=0.881
	Secondary education	56.4% (57)	43.6% (44)	101	
	High school, vocational training and university education	66.7% (4)	33.3% (2)	6	
Main occupation	Pig farmer only	54.2% (58)	45.8% (49)	107	χ <sup>2</sup> =12.182 P=0.016
	Crop and livestock farmers	70.4% (19)	29.6% (8)	27	
	Casual labourers	75.0% (12)	25.0% (4)	16	
	Employees	44.0% (11)	56.0% (14)	25	
	Businessperson	25.0% (4)	75.0% (12)	16	
Marital status	Single	67.6% (50)	32.4% (24)	74	χ <sup>2</sup> =8.368 P=0.015
	Married	45.6% (47)	54.4% (56)	103	
	Widowed	53.8% (7)	46.2% (6)	13	
Annual farming income (FCFA)	< 1 million	85.0% (85)	15.0% (15)	100	χ <sup>2</sup> =78.981 P=0.000
	1 million +	20.9% (19)	79.1% (72)	91	
Monthly household income (FCFA)	<500000	57.0% (102)	43.0% (77)	179	χ <sup>2</sup> =7.370 P=0.007
	500000 +	16.7% (2)	83.3% (10)	12	

Source: Fieldwork (2020)

Males are willing to pay higher than females (0.024) because they are the primary decision-makers and managers. Men are more inclined to engage in actions that protect their families and investments. The older the farmer, the higher the premium they are willing to pay for LFI ( $P=0.000$ ) because they have gained the wisdom to know that the combination of risk transfer, mitigation and coping strategies are essential for the optimum protection of their farms. The higher the household size, the higher the premium farmers are willing to pay for LFI ( $P=0.000$ ). Furthermore, the higher the years of work experience, the higher the premiums farmers are willing to pay for LFI ( $P=0.000$ ). Older farmers and those with more experience are willing to pay higher premiums because they better understood the risks they faced. Thus, they would pay significant money to transfer their risks to insurance companies. Businesspersons are willing to pay the highest, followed by employees ( $P=0.016$ ), because they have income from other activities to invest in pig farming. These categories of people do not put all their energy into managing their farms because they are engaged in other activities. Given that they had extra income from another activity, they are willing to pay a significant premium to transfer their risks to insurance companies and make up for a potential failure in their management practices. Moreover, married farmers are willing to pay the highest for LFI ( $P=0.015$ ) because their families greatly depend on this economic activity. The higher the income from pig farming, the higher the premiums farmers are willing to pay for LFI ( $P=0.000$ ), the same with monthly household income ( $P=0.007$ ). High-income farmers had more discretionary income to pay significant premiums for LFI. Furthermore, they will not want to lose their socioeconomic status associated with their income from LFI.

The Wald Statistics of Binary Logistic Regression depicting the predictive effect of socioeconomic factors controlled for each other on the premiums farmers are willing to pay for LFI is shown in Table 9. The influence of the significant determinants highlighted above was appraised while controlling for each other to silence the confounders using the Wald Test of Logistic Regression.

After controlling determinants for each other, Wald Statistics highlighted three significant determinants (years of farming experience,

household size and annual farming income). Beyond this, they are all critical determinants ( $OR >1$ ;  $LB >1$ ).

### 3.2.5 Pig farmers' production factors and premium willing to pay for LFI

The association between the production characteristics of pig farmers and the premiums they are willing to pay to get livestock insurance is shown in Table 10.

The premium pig farmers are willing to pay for LFI was significantly associated with the following determinants: source of labour, number of farms, flock size, division and source of capital.

Those who employed family labour on their farms are willing to pay less, while those who used employees are willing to pay higher ( $P=0.000$ ). Family labour can easily be controlled and will be more faithful in carrying out their duties than employees. Employees might be more careless than family members because they do not own the business. Farmers with more than one farm are willing to pay higher ( $P=0.007$ ). Also, those with more than 30 pigs are willing to pay higher ( $P=0.000$ ). Farmers in the Upper-Plateau Division are mainly willing to pay higher ( $P=0.000$ ) because they had bigger farms. Those who took loans only as their main source of capital are willing to pay higher ( $P=0.002$ ) not to default on the payment of their loans due to business interruptions linked to several risk factors.

The Wald statistics of Binary Logistic Regression depicting the predictive effect of production factors controlled for each other on the premiums farmers are willing to pay for LFI is shown in Table 11. The influence of the significant determinants highlighted above was appraised while controlling for each other to silence the confounders using the Wald Test of Logistic Regression.

After controlling determinants for each other, Wald Statistics highlighted the total size of the flock and division as significant determinants of the premiums pig farmers are willing to pay for LFI. Beyond this, two of them are critical predictors ( $OR >1$ ;  $LB >1$ ).

**Table 9. Wald statistics of binary logistic regression depicting the predictive effect of pig farmers' socioeconomic factors**

Determinants	B	S.E.	Wald	df	Sig.	Exp(B)	95% C.I.for EXP(B)	
							Lower	Upper
Gender	-.348	.737	.223	1	.637	.706	.167	2.995
Age	.465	.326	2.036	1	.154	1.593	.840	3.018
Household size	1.827	.466	15.395	1	.000	6.213	2.495	15.474
Years of experience	.416	.225	3.405	1	.045	1.516	1.004	2.357
Main occupation	.069	.181	.146	1	.702	1.072	.751	1.528
Marital status	-.112	.447	.062	1	.803	.894	.372	2.149
Annual farming income	1.746	.453	14.849	1	.000	5.731	2.358	13.927
Monthly household income	.872	1.34	.423	1	.516	2.392	.173	33.158

Source: Fieldwork (2020)

**Table 10. Association between production factors for pig farmers and premiums willing to pay for LFI**

Determinants	Categories	Premiums farmers are willing to pay for LFI		N	χ <sup>2</sup> -test (df=0.05)
		≤50000	≥50000		
		Evaluation of risk management strategies	Adequate		
	Inadequate	64.0% (32)	36.0% (18)	50	
Source of labour	Family	81.1% (86)	18.9% (20)	106	χ <sup>2</sup> =70.896 P=0.000
	Employees	0.0% (0)	100% (12)	12	
	Both	24.7% (18)	75.3% (55)	73	
Number of farms	One	57.0% (102)	43.0% (77)	179	χ <sup>2</sup> =7.370 P=0.007
	More than one	16.7% (2)	83.3% (10)	12	
Total size of flock	≤30	63.8% (104)	36.2% (59)	163	χ <sup>2</sup> =39.221 P=0.000
	>30	0.0% (0)	100% (28)	28	
Division	Bamboutos	55.1% (54)	44.9% (44)	98	χ <sup>2</sup> =17.919 P=0.000
	Upper-Plateau	39.1% (25)	60.9% (39)	64	
Setting type	Peri-urban	55.2% (37)	44.8% (30)	67	χ <sup>2</sup> =0.025 P=0.875
	Rural	54.0% (67)	46.0% (57)	124	
Species	Local species	70.0% (14)	30.0% (6)	20	χ <sup>2</sup> =3.333 P=0.189
	Exotic species	48.0% (36)	52.0% (39)	75	
	Crossed species	56.3% (54)	43.8% (42)	96	
Source of capital	Personal savings	63.3% (50)	36.7% (29)	79	χ <sup>2</sup> =12.853 P=0.002
	Personal savings and loan	68.3% (28)	31.7% (13)	41	
	Loan only	38.2% (26)	61.8% (42)	68	

Source: Fieldwork (2020)

**Table 11. Wald statistics of binary logistic regression depicting the predictive effect of pig farmers' production factors**

Determinants	B	S.E.	Wald	df	Sig.	Exp(B)	95% C.I.for EXP(B)	
							Lower	Upper
Source of labour	.361	.283	1.621	1	.203	1.434	.823	2.500
Number of farms	1.519	1.060	2.052	1	.152	4.568	.572	36.506
Total size of flock	3.317	.604	30.187	1	.000	27.573	8.445	90.020
Division	.628	.192	10.697	1	.001	1.873	1.286	2.729
Source of capital	-.613	.376	2.660	1	.103	.542	.260	1.132

Source: Fieldwork (2020)

**Table 12. Model summary of the influence of socioeconomic and production factors on the premiums pig farmers are willing to pay for LFI**

Predictive component	Omnibus Tests of Model Coefficients	Predictive Power / Explanatory Power (Nagelkerke R Square)
Socioeconomic factors	P=0.000	61.6%
Production factors	P=0.012	62.4%
IVM	P=0.000	74.3%

Source: Fieldwork (2020)

### 3.2.6 Model summary (pig farmers)

The model summary for socioeconomic and production factors was computed using the Integrated Value Mapping (IVM) approach, as shown in Table 12.

Socioeconomic factors predicted willingness to subscribe to a livestock insurance scheme almost at the same level as production factors, with a predictive power/explanatory (PP/EP) of 61.6% and 62.4%, respectively. The Integrated Value Mapping (IVM) combining the predictive effects of both components was 74.3%, implying that 25.7% variability was not explained as there are other factors to reckon with.

## 4. DISCUSSION

This study revealed that poultry and pig farmers are willing to pay a low premium (less than \$79 (50,000CFA) per year to cover the risks faced in their farms. This finding aligns with a study conducted by Aina, Ayinde, Thiam, Muchandondwa and Miranda [12]. in which Nigerian farmers are willing to pay index LFI premiums at \$26.11 (N23,500) per year for a livestock value of \$555 (N500,000). Oduniyi, Antwi and Tekana [13]. realised that few farmers are willing to pay at most \$42 (R600) as LFI was a new concept. According to Amelia, Mashyuri and Suryantini [14]. cattle farmers who did not participate in LFI are willing to pay \$1.5 (22,600 IDR), while those who participated are willing to pay higher \$2.34 (36,320 IDR). Mame [15]. realised that 50% of farmers are willing to pay at least 3,000 CFA (\$6) to get farming insurance, despite the type of animals reared and the type of insurance cover that the insurance company proposed to them. According to Wan [16]. pig farmers are willing to pay an average premium of ¥14.4 (\$2) and an average preferred coverage level of ¥1191 (\$167). These premiums are influenced by farmers' trust in insurance companies, household income, and knowledge about breeding sow insurance. According to Osman [17]. most farmers are willing to pay

significant premiums for total insurance coverage, and the willingness to pay declined when coverage was 80%, while other farmers are unwilling to pay when insurance coverage was below 70%. Furthermore, Pengfei, Lingling, Dongqing, Shi and Yueying [18]. realised that more people are willing to get insurance when premium prices decreased. Moreover, Suharyanto and Zikril [19]. noticed that farmers are willing to pay lower premiums than those paid at that time as they wanted more subsidies from the government. In this study, education was not a significant determinant, while total flock size was a significant determinant for pig and poultry farmers. Furthermore, household size was a significant determinant of the premium poultry farmers are willing to pay for insurance. According to Jules, Fabrice and Joseph [20]. education and farm size are significant determinants of the premium farmers are willing to pay for insurance. Furthermore, household size did not determine the premiums farmers would pay for insurance [21].

## 5. CONCLUSION

The higher the insurance premium, the lower the number of farmers willing to pay for LFI. Most farmers (40.7%, 175) are willing to pay 50,000 CFA or less annually for LFI, with a proportion of 20.9% for poultry farmers and 19.8% for pig farmers. The Bamboutos and Mifi Divisions are the main pig and poultry production areas, with many small-scale farms that could not afford to pay more than 50,000 CFA for some and 100,000 CFA for others. Furthermore, some pig farmers with relatively large farms in the Upper-Plateau, Bamboutos and Mifi Divisions are willing to pay higher premiums for LFI.

Regarding poultry farmers' socioeconomic factors, the Chi-Square Test and Wald Statistics highlighted household size as a significant and critical determinant. For production factors, Chi-Square indicated that the premium farmers are willing to pay for a livestock insurance scheme was significantly associated with the number of farms, the total size of the flock, and the setting

type. After controlling determinants for each other, Wald Statistics highlighted only the total size of the flock as a significant and critical predictor. Production factors predicted the premium poultry farmers are willing to pay for LFI more than socioeconomic factors. However, other factors that are not explained influenced farmers' decisions.

For pig farmers' socioeconomic factors, the Chi-Square Test indicated that sex, age, household size, years of experience, principal occupation, marital status and annual farming income are essential determinants of the premiums that farmers are willing to pay for LFI. After controlling determinants for each other, Wald Statistics highlighted three significant determinants (years of farming experience, household size and annual farming income). Beyond this, they are all critical determinants. For production factors, the Chi-Square Test indicated that the premiums farmers are willing to pay for a livestock insurance scheme, which was significantly associated with farmers' source of labour, number of farms, flock size, division of operation, and source of capital. After controlling determinants for each other, Wald Statistics highlighted the total size of the flock and division as significant determinants of the premium farmers are willing to pay for LFI. Beyond this, two of them are critical predictors. Socioeconomic factors predicted farmers' willingness to subscribe to a livestock insurance scheme almost at the same level as production factors. As was the case with poultry farmers, other factors that are not explained influenced farmers' decisions.

## 6. RECOMMENDATION

Based on the findings, it is recommended that the Cameroon Ministry of Finance (MINFI), in collaboration with the Ministry of Livestock Fisheries and Animal Husbandry (MINEPIA), the World Bank and insurance stakeholders, should establish premium subsidies for small-scale poultry and pig farmers. Efforts should be made to educate farmers about the importance of insurance as a risk management tool. These measures will increase the participation rate of farmers in LFI initiatives.

## COMPETING INTERESTS

Authors have declared that no competing interests exist.

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