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Production Systems and Contribution on Characterization of Local Chickens in Smallholder Farmer in Sud-Kivu Province, Democratic Republic of the Congo (DRC)

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Abstract

Sud-Kivu province in DRC faces to malnutrition of his population. Agriculture and especially livestock have a low yield due to bad government, low diseases control, lack of feed, inappropriate chicken's accommodation. Importation of food is very high. A survey was implemented on local chickens rearing in Bukavu town and his hinterland territories of Kabare, Walungu and Kalehe in Sud-Kivu. Conducted at the household level, standard methods of interviews and structured questionnaires were used on characterization chicken's production systems and commercialization. Survey began on 2nd and finished on 22th April 2016. Results showed in terms of hatching, weaning, laying, health, accommodation, eggs production, weights and prices of eggs, hen and coq that local chickens still were mostly reared in traditional systems. Chicken's products prices were high. To start a good program of chicken industry in this province and as well as in entire the country, selection of local chickens should before be carried out on characterization of production systems and genetic molecular analysis.

Subject Areas

Zoology

Keywords

RDC, Survey, Chickens, Production Systems, Market

1. Introduction

Livestock production in Sud-Kivu DRC decreased drastically due to looting during the various wars ended in 1999, even if now, some troubles persist in eastern part of the country. The diminution of livestock is also due to the consequence of low extension services [1], lack of animal feed, bad governance, lack of farmer's support, low diseases control etc. Despite these bad performances, livestock still been managed on extensive system [2]. In Sud-Kivu, consumption of red meat, pork and chicken was low in all Mandate Areas with an exception of Ruzizi plains where the average consumption frequency of red meat was 4 times a month [3]. Meanwhile, Sud-Kivu and all the country have a huge agricultural potential characterized by sufficient rainfall, a major river system, a high diversity of soils and broad sunshine [4]. The rate of malnutrition among the population is very high 15% [5]. To fight hunger and proteins malnutrition, monogastric animals like chickens can help to produce quickly quality meat and eggs. In this way, chickens shall be encouraged to fight against malnutrition and poverty. The aim of this study was to contribute on local chicken characterization production systems based on the KAFACI project on the promotion of good management for increased productivity of market oriented small scale chicken producers in DRC.

2. Material and Methods

2.1. Region Surveyed

Sud-Kivu province covers 69,130 km^2 and population is estimated at 6,432,984 people. This province is located in eastern part of DRC between 1˚36' of latitude South and 5˚ of latitude South at one hand and 26˚47' of longitude East and 29˚20' and longitude East at the other hand [6]. Survey was implemented in Bukavu principal town and his hinterland of around 50 km, see **Figure 1** in the territories of Kabare, Walungu and Kalehe.

2.2. Survey Method Applied

Interview was carried out on 2nd to 22th April 2015 using standard methods of interviews and structured questionnaires at the household level. Site sampling was randomly done. Questionnaire was submitted to 18 sites; in Bukavu town and his hinterland for at all 180 stakeholders with 10 households per street and village.

2.3. Data Analysis

Data were collected on the socio demographic characteristics, on production practices adopted by farmers, stock size and composition, management and housing systems adopted, feeding systems, diseases, weights and prices taken on chicken products. Then, households were interviewed in Bukavu town in 9 streets and in his hinterland 9 villages. The number of animals was converted

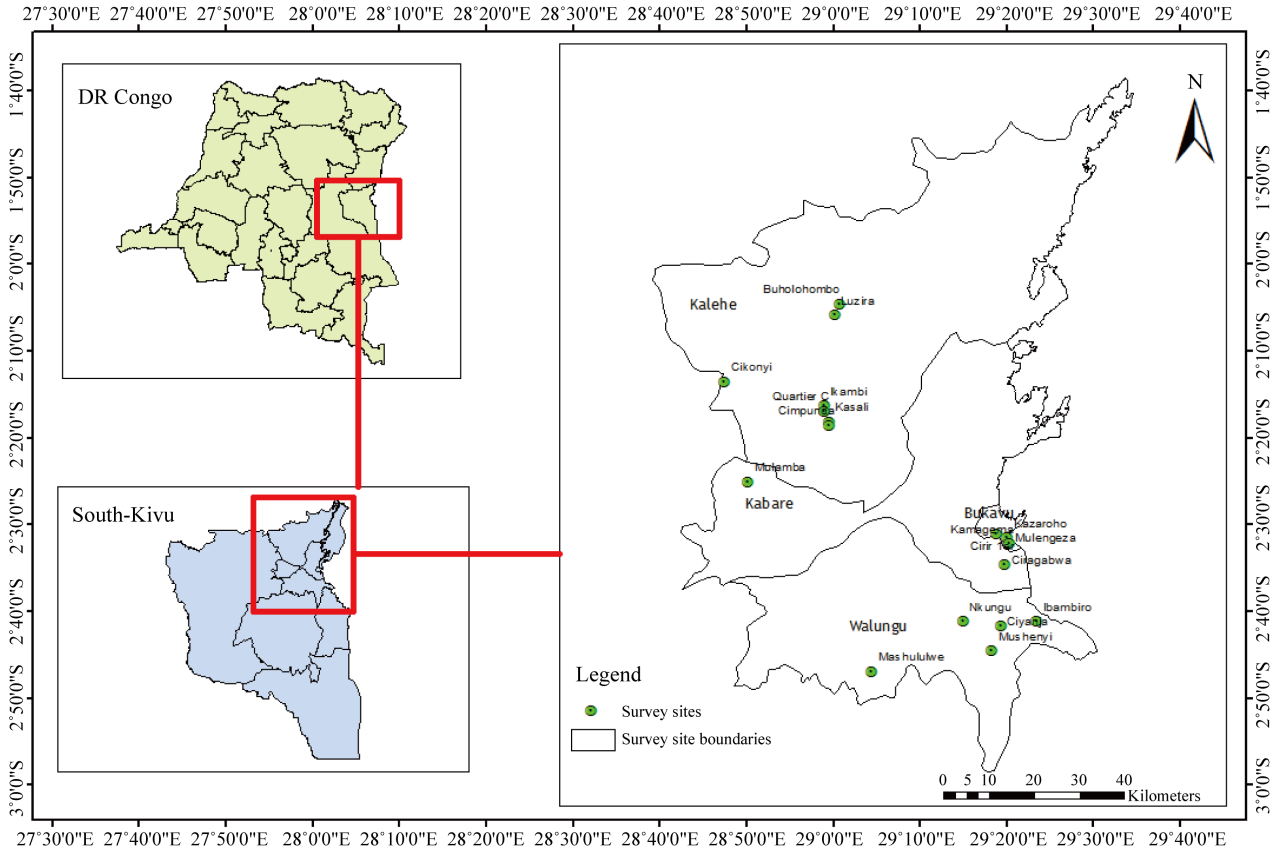

Figure 1. Sites localisation of survey in Sud-Kivu.

into Tropical Livestock Unit (TLU), where cattle are weighed with 0.7, sheep/goat 0.1, swine with 0.2 and chicken 0.01 [7], duck was assigned 0.02 TLU, rabbit 0.01 TLU, cavy 0.005 TLU [8]. Materials used were GPS and an electronic scale "Electronic Kitchen scale SF-400" to weight eggs and chickens. Data were analyzed using descriptive analysis such as frequency distribution, percentages and means comparison on IBM SPSS Statistics version 20 software.

3. Results

3.1. Social Farmer's Characterization

Regarding on **Table 1**, gender issue represented male at 66.3% and female 36.7%. Gender balance is observed in six sites, eleven had at least 40% of females and one had 60% of females. The average age of the farmers was 39.3 ± 14.5 years, although there were significant ($P < 0.05$) differences in the average age of the farmers across the sites. Mushenyi site had the oldest farmers with an average of 49.3 ± 9.5 years when the youngest was in Kasali site with 23.6 ± 11.4 years. The education level indicted that majority of farmers did the secondary school 41.7% followed by primary school 31.7, illiterate 22.2% and university 4.4%. The chicken's experience from grouping age demonstrated that 0 up to 5 years the average of years' experience in chicken production was 2.6 ± 1.5 years,

Table 1. Socio economic farmer's characterization.

Streets and villages	Gender		Farmer's age	Education				Years experience		
	Male	Female		Illiterate	Primary	Secondary	University	Up to 5	6 - 10	Above 10
Buholohombo	7	3	42.6 ± 12.7	1	2	7		1.5	7.5 ± 0.7	28.4 ± 9.7
Cikonyi	6	4	43.4 ± 13.0	2	5	3		3.0 ± 1.7	7.0 ± 1.4	29.0 ± 10.2
Cimpunda	5	5	33.5 ± 13.7		2	6	2	1.8 ± 0.9	6.0	30.0
Cirhagabwa	5	5	42.9 ± 16.8	4	5		1	2.3 ± 1.9	10.0	20.0 ± 6.1
Ciriri	6	4	35.9 ± 14.4	2	8			2.9 ± 2.0	8.7 ± 2.3	
Ciyanja	8	2	43.1 ± 16.3	5	2	3			8.0	26.0 ± 14.0
Ibambiro	5	5	39.3 ± 21.4	4	3	3		3.7 ± 1.5	8.0 ± 2.8	26.2 ± 21.2
Ikambi	6	4	30.0 ± 12.9	2	1	7		3.0 ± 1.2	7.0	26.4 ± 11.3
Kamagema	5	5	38.1 ± 12.1	1	1	7	1	1.0	7.0 ± 1.4	25.3 ± 8.6
Kasali	9	1	23.6 ± 11.4		4	5	1	1.6 ± 0.9	7.5 ± 2.1	19.0 ± 1.4
Kazaroho	4	6	30.2 ± 9.2	1	2	7		2.2 ± 1.6	7.3 ± 2.3	30.0
Luzira	5	5	39.5 ± 11.9	3	2	4	1	3.3 ± 0.6		19.1 ± 5.6
Mashululwe	6	4	34.3 ± 12.2	2	6	2		2.3 ± 2.3	8.0	18.5 ± 6.7
Mulamba	5	5	45.8 ± 17.2	2	5	3		3.5 ± 2.1		27.5 ± 12.5
Mulengeza	8	2	43.0 ± 9.6	2	2	5	1	3.7 ± 0.6	10.0	21.3 ± 7.6
Mushenyi	9	1	49.3 ± 9.5	3	3	3	1			29.3 ± 9.8
Nkungu	9	1	47.2 ± 15.8	4		6		5.0	10.0	35.9 ± 11.6
Quartier C	6	4	38.1 ± 12.7	2	4	4		3.3 ± 1.7	9.5 ± 0.7	
Total	114 (66.3)	66 (36.7)	39.3 ± 14.5	40 (22.2)	57 (31.7)	75 (41.7)	8 (4.4)	2.6 ± 1.5	8.1 ± 1.7	15.0 ± 13.5
Test Stat. Value (F)			2.086*							

*Significant at P<0.05, values in parentheses are percentages.

6 to 10 years 8.1 ± 1.7 years and above 10 years, 15.0 ± 13.5 years.

3.2. Livestock Production

Various animals are reared in the study area, see Table 2. According to the TLU, the highest mean is recorded to swine 2.3 ± 2.0 TLU, followed by cattle 2.2 ± 2.9 TLU, sheep 0.32 ± 0.3 TLU, goat 0.31 ± 0.2 TLU and chicken 0.26 ± 1.7 TLU were both significant ($P < 0.05$) differences in TLU average across the sites, duck 0.12 ± 0.5 TLU, cavy 0.09 ± 1.5 TLU and Rabbit 0.04 TLU. Swine, goats and chickens were more reared in the region than the other animal species.

3.3. Animals species Reared

Table 2 shows the animal species.

Table 2. Animals species (TLU).

Sites	Swine	Cattle	Sheep	Goat	Duck	Chickens	Cavy	Rabbit
Buholohombo	12.0			0.40 ± 0.1		0.08 ± 0.1	0.05	
Cikonyi	1.0	2.1		0.32 ± 0.1		0.19 ± 0.3	0.01	
Cimpunda				0.30		0.09 ± 0.6	0.05	
Cirhagabwa	2.3 ± 1.8			0.17 ± 0.1		0.11 ± 0.1	0.01	
Ciriri	1.3 ± 0.7	1.17 ± 0.8	015 ± 0.1	0.20 ± 0.1		0.14	0.05 ± 0.5	0.09
Ciyanja	1.6 ± 0.5			0.38 ± 0.2	0.06	0.58 ± 0.4	0.21 ± 0.3	0.03
Ibambiro	4.5 ± 0.7			0.27 ± 0.1		0.05	0.04 ± 0.2	0.28 ± 0.2
Ikambi	1.01	1.05 ± 0.5		0.36 ± 0.1	0.13 ± 0.6	0.20 ± 0.2	0.08	0.06
Kamagema	2.0 ± 1.0		0.40	0.28 ± 1.6		0.75 ± 0.4		0.15
Kasali	2.0			0.40		0.07	0.03	
Kazaroho	2.1 ± 2.0			0.18 ± 0.1		0.11 ± 0.7		0.37
Luzira	2.4 ± 2.6	7.35 ± 9.4	1.0	0.48 ± 0.3		0.09 ± 0.1	0.05	0.01
Mashululwe	2.1 ± 2.0	0.93 ± 0.4	0.2	0.28 ± 0.2		0.06	0.21 ± 0.3	0.15
Mulamba	2.8 ± 2.2	3.68 ± 2.3		0.30 ± 0.1		0.07 ± 0.5	0.05	0.04 ± 0.2
Mulengeza				0.20 ± 0.1	0.07	0.05 ± 0.3	0.12	0.05
Mushenyi	4.0 ± 1.0	1.47 ± 1.2		0.48 ± 0.2		0.09 ± 0.1	0.05 ± 0.4	0.63 ± 0.4
Nkungu	1.7 ± 0.8	1.58 ± 0.9	0.2	0.25 ± 0.1		0.09 ± 0.6	0.15 ± 1.7	0.04
Quartier C	1.0	0.7		0.40 ± 0.4		0.11 ± 0.7	0.10	0.12
Total	**2.3 ± 2.0**	**2.22 ± 2.9**	**0.32 ± 0.3**	**0.31 ± 0.2**	**0.11 ± 0.6**	**0.09 ± 0.1**	**0.09 ± 1.5**	**0.04**
Test Stat. Value (F)				1.819*		1.881*		

*Significant at $P < 0.05$.

3.4. Chicken Husbandry, Feed, Health

Regarding Table 3, the average of clutches per year was 2.8 ± 0.5. Duration of clutch was 18.8 ± 6.1 days, eggs number per clutch was 14.7 ± 4.2. For incubation, the average of eggs number incubated per hen was 8.8 ± 2.3, number of eggs hatched 7.9 ± 2.3. The weaning period was 88.2 ± 21.7 days where chick's number at the weaning period was 5.2 ± 2.8. The rate of mortality was 34.1% ± 25.2%. Across the sites and when we consider the different parameters analyzed, there were high significant ($P < 0.001$) differences in the average. Ciyanja site had a low rate of mortality 5.6% ± 2.4% and Buholombo the highest with 68.7% ± 9.7%.

At Table 4, hen usually laid egg once each day (61.1%) and the mortality incidence per season was 68.5% in wet season.

Table 5 shows that the averages of chicken products weight were respectively 42.3 ± 5.1 g of egg, 442.4 ± 205.3 g of chicks at weaning pediod, 1265.5 ± 282.1 g of hen and 1571.4 ± 483.0 g of cock. The weight performances within the sites were performed for egg in Mushenyi 46.6 ± 5.2 g, chicks at weaning period in

Table 3. Parameters carried out on local chicken's production (averages).

Sites	Clutch number per year	Duration of clutch (days)	Eggs number per clutch	Eggs number incubated per hen	Eggs number hatched per hen	Weaning time (days)	Chicks number at weaning period	Mortality rate
Buholohombo	2.8 ± 0.4	23.2 ± 7.4	15.1 ± 3.1	9.5 ± 1.6	8.5 ± 1.6	81.0 ± 21.4	5.2 ± 3.0	68.7 ± 9.7
Cikonyi	3.3 ± 0.5	25.4 ± 6.7	19.4 ± 1.9	11.9 ± 2.3	10.5 ± 1.4	87.0 ± 17.0	9.6 ± 3.6	25.8 ± 10.8
Cimpunda	2.9 ± 0.6	18.7 ± 3.7	12.9 ± 3.5	7.9 ± 2.6	6.7 ± 2.1	57.0 ± 11.8	4.8 ± 2.3	28.2 ± 17.2
Cirhagabwa	3.0 ± 0.0	23.4 ± 8.0	15.5 ± 4.6	8.4 ± 1.3	7.8 ± 1.8	78.0 ± 25.3	5.9 ± 2.3	33.9 ± 20.4
Ciriri	3.0 ± 0.0	15.5 ± 4.1	15.5 ± 3.9	9.8 ± 1.2	9.4 ± 1.5	83.3 ± 20.0	6.0 ± 2.0	34.4 ± 20.1
Ciyanja	2.0 ± 0.0	13.8 ± 0.7	10.6 ± 3.2	7.5 ± 2.3	6.1 ± 2.3	112.5 ± 18.4	3.3 ± 2.4	5.6 ± 2.4
Ibambiro	2.9 ± 0.3	20.1 ± 3.6	12.2 ± 3.2	7.6 ± 1.3	5.9 ± 1.2	114.0 ± 12.6	3.4 ± 1.2	49.0 ± 20.7
Ikambi	3.0 ± 0.0	22.3 ± 5.0	16.9 ± 3.5	9.3 ± 2.4	8.0 ± 2.3	79.5 ± 20.1	5.0 ± 2.5	66.2 ± 28.4
Kamagema	2.4 ± 0.5	16.0 ± 3.2	12.8 ± 4.4	8.4 ± 2.5	7.2 ± 2.5	96.0 ± 21.4	5.2 ± 2.3	17.4 ± 13.9
Kasali	2.8 ± 0.4	16.8 ± 3.2	13.8 ± 3.5	9.7 ± 2.1	7.5 ± 2.9	64.5 ± 10.1	5.3 ± 2.3	32.0 ± 16.6
Kazaroho	3.0 ± 0.0	20.3 ± 3.9	11.8 ± 4.2	7.5 ± 2.8	6.4 ± 2.5	111.0 ± 14.5	3.5 ± 1.3	57.1 ± 13.2
Luzira	2.1 ± 0.3	19.5 ± 7.2	19.2 ± 2.5	7.9 ± 1.5	7.0 ± 1.4	81.0 ± 14.5	4.3 ± 1.4	10.1 ± 9.0
Mashululwe	2.8 ± 0.4	17.3 ± 6.5	13.6 ± 4.3	8.4 ± 1.8	8.0 ± 1.8	93.0 ± 9.4	6.5 ± 4.3	18.2 ± 16.0
Mulamba	2.5 ± 0.5	16.5 ± 5.3	10.9 ± 1.7	8.6 ± 2.3	8.0 ± 2.1	99.0 ± 14.5	4.8 ± 2.7	26.9 ± 27.5
Mulengeza	3.0 ± 0.0	18.1 ± 6.0	16.8 ± 3.5	9.5 ± 2.8	8.7 ± 2.3	87.0 ± 9.4	5.2 ± 4.2	48.5 ± 30.2
Mushenyi	3.0 ± 0.0	19.8 ± 8.4	15.6 ± 4.1	9.2 ± 2.8	8.3 ± 2.3	96.0 ± 12.6	5.5 ± 2.1	39.2 ± 25.4
Nkungu	2.6 ± 0.5	15.4 ± 4.4	13.8 ± 3.5	9.2 ± 2.3	8.5 ± 2.8	99.0 ± 14.5	4.9 ± 2.0	39.0 ± 9.9
Quartier C	3.1 ± 0.3	16.1 ± 2.7	17.6 ± 3.2	9.5 ± 1.8	8.4 ± 1.6	78.0 ± 21.0	5.6 ± 3.0	9.9 ± 11.3
Total	2.8 ± 0.5	18.8 ± 6.1	14.7 ± 4.2	8.8 ± 2.3	7.9 ± 2.3	88.2 ± 21.7	5.2 ± 2.8	34.1 ± 25.2
Test Stat. Value (F)	8.689***	3.258***	5.313***	2.465***	2.786***	8.231***	2.757***	9.761***

*** Significant at $P < 0.001$.

Nkungu 700.0 ± 349.6 g, hen in Ciyanja 1771.0 ± 177.9 g and cock in Kamagema 2305.0 ± 670.8 g. There were high weights significant ($P < 0.001$) differences in average across the sites of egg, chicken at weaning period, hen and cock.

3.5. Parameters of Local Chicken Production

The common chicken accommodations at Table 6 were chickens in the human house 29.4% followed by adobes kitchen and free-range 23.9% and house adobe and enclosure 7.8%.

3.6. Chicken Feeding Systems

The feeding systems at Table 7 were dominated by the pure free-range 42.7%, followed by free-range with grains given to the chickens 36.7%, enclosure with concentrate 11.1%, confined poultry where chickens were entirely nourished on concentrate 5.0%.

Table 4. Laying frequency and incidence of mortality per season.

Sites	Laying frequency per week			Mortality incidence per season	
	Once each day	Once each 2 days	Once each three days	Wet season	Dry season
Buholohombo	6	4		6	4
Cikonyi	9	1		8	2
Cimpunda	3	7		8	2
Cirhagabwa	10			6	1
Ciriri	9	1		8	2
Ciyanja	4	6		6	
Ibambiro	1	9		7	3
Ikambi	6	4		4	4
Kamagema	6	3	1	6	4
Kasali	7	3		7	
Kazaroho	2	8		9	1
Luzira	2	8		7	3
Mashululwe	9	1		4	6
Mulamba	6	4		4	
Mulengeza	6	4		5	5
Mushenyi	8	2		5	5
Nkungu	9	1		10	
Quartier C	7	3		1	9
Total	110 (61.1)	69 (38.3)	1 (0.6)	111 (68.5)	51 (3.5)

Values in parentheses are percentages.

Table 5. Weights of chickens and egg (g).

Sites	Egg	Chicks weaning	Hen	Cock
Buholohombo	40.0 ± 3.9	392.8 ± 124.9	1271.9 ± 152.9	1683.1 ± 327.6
Cikonyi	42.2 ± 6.7		1146.9 ± 131.8	993.5 ± 42.1
Cimpunda	45.4 ± 1.0	269.0 ± 27.9	1050.0 ± 119.9	1583.0 ± 288.6
Cirhagabwa	44.2 ± 6.3	297.8 ± 286.0	1146.6 ± 249.0	1035.6 ± 111.6
Ciriri	41.2 ± 4.8	538.9 ± 153.7	1540.0 ± 263.3	1740.0 ± 275.7
Ciyanja	37.5 ± 2.8	566.2 ± 91.6	1771.0 ± 177.9	1864.0 ± 215.3
Ibambiro	41.9 ± 4.3	340.9 ± 75.1	830.5 ± 113.1	904.2 ± 190.5
Ikambi	43.7 ± 2.9	359.0 ± 69.1	1357.3 ± 227.0	1685.2 ± 150.1
Kamagema	43.6 ± 3.6	534.1 ± 160.3	1731.0 ± 341.8	2305.0 ± 670.8
Kasali	45.9 ± 0.6	298.9 ± 15.7	1177.5 ± 147.8	1773.0 ± 143.8
Kazaroho	44.3 ± 3.9	223.3 ± 2.9	1147.7 ± 322.6	1866.6 ± 672.0
Luzira	40.3 ± 4.7	590.5 ± 350.2	1257.8 ± 255.4	1748.6 ± 299.4
Mashululwe	34.9 ± 4.0	470.6 ± 67.5	1256.0 ± 201.7	1430.0 ± 316.4
Mulamba	41.3 ± 2.1	288.9 ± 40.8	1207.6 ± 78.8	1762.0 ± 183.5
Mulengeza	45.7 ± 3.1	556.7 ± 201.6	1307.6 ± 188.6	1795.2 ± 283.0
Mushenyi	46.6 ± 5.2	580,8 ± 158.2	1232.3 ± 169.0	1775.2 ± 222.9
Nkungu	38.3 ± 6.5	700.0 ± 349.6	1380.0 ± 253.0	1690.0 ± 303.5
Quartier C	42.5 ± 4.7	637.5 ± 7.8	1471.0 ± 262.1	1197.5 ± 872.4
Total	42.3 ± 5.1	442.4 ± 205.3	1265.5 ± 282.1	1571.4 ± 483.0
Test Stat. Value (F)	4.839***	7.025***	8.685***	8.353***

***Significant at $P < 0.001$.

Table 6. Chicken accommodations.

Chicken houses	Sites																		Total
	A*	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	
Chickens accommodated in human house	2		3	10	2	2	5		3	8	4	1	3	1	3	2	2	1	53 (29.4)
Adobes kitchen and free-range	5				4	4	2					5	7	5	2	2	7		43 (23.9)
House adobe and enclosure	1				1	1	2	3			1	3		3	1				16 (8.9)
Kitchen and free-range		1	1		1	1		2	2	1	1	1		1	1		1		14 (7.8)
Planck's house and free-range		1			1	1		2	2	1					1	3		1	13 (7.2)
House adobe and enclosure		8									1				1				10 (5.6)
Planck's house and enclosure					1	1		2	2		3				1				10 (5.6)
On a tree			6				1									2			9 (5.0)
Bricks house and enclosure	1							1	1									2	5 (2.8)
Bricks kitchen and free-range																		5	5 (2.7)
House on bricks and pavement	1																	1	2 (1.1)
Total																			180 (100)

*A = Buholohombo, B = Cikonyi, C = Cimpunda, D = Cirhagabwa, E = Ciriri, F = Ciyanja, G = Ibambiro, H = Ikambi, I = Kasali, J = Kazaroho, K = Luzira, L = Mashululwe, M = Mulamba, N = Mulengeza, O = Kamagema, P = Mushenyi, Q = Nkungu and R = Quartier C, Values in parentheses are percentages.

Table 7. Local chicken feeds.

Feeding systems	Sites																		
	A*	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	Total
Pure free-range	9		2	1	6	7	10	9	3	2	1	3	6	7	4	6	9	3	85 (42.7)
Free-range with grains		9	2	9		2			2	7	4	6		3	6	4	1	5	66 (36.7)
Enclosure and concentrate		1	4		3	1		1	3	1	5		1					1	20 (11.1)
Confined poultry and concentrate	1		2		1				2			1						1	9 (5.0)
Total	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	

*A = Buholohombo, B = Cikonyi, C = Cimpunda, D = Cirhagabwa, E = Ciriri, F = Ciyanja, G = Ibambiro, H = Ikambi, I = Kasali, J = Kazaroho, K = Luzira, L = Mashululwe, M = Mulamba, N = Mulengeza, O = Kamagema, P = Mushenyi, Q = Nkungu and R = Quartier C, Values in parentheses are percentages.

With regard on Table 8, extension services didn't work normally; 91.7% of farmers were not assisted by them. Interviewees who didn't adhere to farmer's association represented at 98.5%.

3.7. Chicken Marketing

Regarding Table 9, the averages price were respectively of egg 0.20 ± 0.8 $, hen 6.5 ± 1.8 $ and cock 9.7 ± 1.9 $. There were high significant ($P < 0.001$) differences in the average of all chicken's prices products across the sites. Then, prices are variously represented through the sites. Within the sites, hens from Ibambiro and Kasali were more profitable, it is the same to Buholohombo and Luzira for the cock and Ikambi the egg. Majority of chicken farmers had between

Table 8. Extension services.

	Response	Sites																	
		A*	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	Total
Visit and support	Yes			2	1		1					2			2	1		3	3	15 (8.3)
	No	10	10	8	9	10	9	10	10	10	10	8	10	10	8	9	10	7	7	165 (91.7)
Farmer's association	Yes											1					1			2 (1.5)
	No	10	9	3	2	10	7	8	3	10	3	5	10	10	5	10	9	10	10	134 (98.5)

*A = Buholohombo, B = Cikonyi, C = Cimpunda, D = Cirhagabwa, E = Ciriri, F = Ciyanja, G = Ibambiro, H = Ikambi, I = Kasali, J = Kazaroho, K = Luzira, L = Mashululwe, M = Mulamba, N = Mulengeza, O = Kamagema, P = Mushenyi, Q = Nkungu and R = Quartier C, Values in parentheses are percentages.

Table 9. Chickens products prices and farmers income.

	Chicken's products prices ($US)			Monthly income ($US)				
Sites	**Hen**	**Cock**	**Eggs**	**30**	**31 - 100**	**101 - 200**	**201 - 300**	**301 - 400**
Buholohombo	7.1 ± 0.9	11.8 ± 0.9	0.25 ± 0.1	1 (4.7)	3 (7.9)	4 (6.4)	1 (3.4)	1 (20.0)
Cikonyi	5.8 ± 1.5	7.2 ± 2.3	0.15 ± 0.0		3 (7.9)	4 (6.4)	2 (6.7)	
Cimpunda	7.3 ± 0.4	10.7 ± 0.9	0.18 ± 0.6		4 (10.5)	3 (4.8)	3 (10.0)	
Cirhagabwa	5.1 ± 1.1	7.7 ± 01.3	0.25 ± 0.0	2 (9.5)				
Ciriri			0.16 ± 0.5	1 (4.8)	3 (7.9)	3 (4.8)	1 (4.8)	1 (20.0)
Ciyanja	5.5 ± 1.7	8.8 ± 0.6	0.28 ± 0.5	5 (23.8)				
Ibambiro	9.6 ± 0.3	11.8 ± 1.3	0.28 ± 0.1		2 (5.3)	5 (7.9)	2 (6.7)	1 (20.0)
Ikambi			0.30 ± 0.0	1 (4.8)	2 (5.3)	3 (4.8)	1 (3.3)	
Kasali	8.3 ± 0.6	9.2 ± 1.4	0.25 ± 0.1	2 (9.5)	5 (13.1)	2 (3.2)		1 (20.0)
Kazaroho	4.2 ± 0.0	9.8 ± 0.5	0.10 ± 0.0			5 (7.9)	3 (10.0)	
Luzira	8.7 ± 0.2	11.4 ± 1.4	0.25 ± 0.0	1 (4.8)	2 (5.3)	6 (9.5)	1 (3.3)	
Mashululwe	5.5 ± 0.0	9.9 ± 0.5	0.15 ± 0.0	2 (9.5)	1 (2.6)	4 (6.3)		
Mulamba	7.6	10.0	0.29 ± 0.3		1 (2.6)	5 (7.9)	9 (30.0)	
Mulengeza	6.6 ± 0.8	8.5 ± 1.1	0.25 ± 0.0		3 (7.9)	5 (7.9)	1 (3.3)	
Kamagema	7.9 ± 1.7	9.8 ± 2.2	0.25 ± 0.0	3 (14.3)	1 (2.6)	2 (3.2)	3 (10.0)	1 (20.0)
Mushenyi	7.3 ± 1.4	9.5 ± 2.2	0.24 ± 0.1	2 (9.5)	3 (7.9)	3 (4.8)	2 (6.7)	
Nkungu	5.8	7.8	0.15 ± 0.5	1 (4.8)	3 (7.9)	5 (7.9)	1 (3.3)	
Quartier C	4.5 ± 0.0	9.7 ± 0.9	0.10 ± 0.0		2 (5.3)	4 (6.3)		
Total	6.5 ± 1.8	9.7 ± 1.9	0.20 ± 0.8	21 (13.3)	38 (24.1)	63 (39.9)	30 (19.0)	6 (3.8)
Test Stat. Value (F)	28.061***	9.9676***	83.450***					

***Significant at $P < 0.001$, values in parentheses are percentages.

up 101 to 200$ per month 39.9%. They are followed by those who had between 31 to 200$ per month 24.1%.

4. Discussion

4.1. Livestock as an Asset to Push out Malnutrition and Poverty

Farmers interviewed were yet young 39.3 years. Respondents' mean age was 40.9

years in Sud-Kivu [9]. The gender issue on chicken farmers interviewed was dominated by 60.6% of males but in the same province, [10] observed that is was 54.3% of females who were interviewed on monogastric animal farmers. In Senegal poultry production is mainly managed by women and children [11]. Even if majority of chicken's farmers did at least the secondary school, 22.2% of illiterates are yet enough among farmers. According to the animal species, four sites had a good diversification. In TLU classification, swine got the first place followed by cattle. Cattle are symbol for peasants' social status and their possession reflects the wealth class that people belong to according to their self-perception [12]. Unhappily, cattle are not intended for regular consumption. The relationships of TLU with both education level and land size available point at multidimensional poverty restricting livestock husbandry [9]. This is why cattle are replacing slowly by other animal species such as swine in the region. The local chicken rate of mortality in Sud-Kivu is 34.1%. The characteristics of these local chickens in Sud-Kivu are almost similar to those observed in Africa where 40% of the chicks die within the first 8 - 12 weeks, hen lay in 3 - 4 clutches of 10 - 15 eggs each clutch a year and that is 30 to 60 eggs per year, hen weight 1170 to 1500 g as observed [13] [14]. To fight malnutrition and poverty, DRC government should promote chicken industry. As reproduction cycle of ruminants is long, a particular attention should be paid to promote the monogastrics animals. Non ruminants are prolific, robust animals have excellent meat quality; they can play an important role in fighting food insecurity [9]. We need a good program of local chickens characterization coupled with genetic molecular analysis in the entire Sud-Kivu province and why not in all the country before the selection begins.

4.2. Regular Income Generation

Majority of chickens traders had a revenue up 101 to 200 $ that is almost similar to Ethiopian where poultry farmer was between 91 to 150 $ per month [15]. Chicken products prices are high in Bukavu town and his hinterland when in Tanzania, coq is cost 7 $ and hen 4.3 $ [13]. A poultry trader makes a monthly profit of 200 Birr (22 USD) [15]. The traditional system must be improved. It is possible in DRC to make benefit of 7 $ monthly the first year and 107.3 $ per month the second year on local chickens with at beginning of ten hens and one cock [16]. But also semi-intensive and intensive systems with improved chickens should be promoted to produce more food and income.

5. Conclusion

Survey described the local chickens systems in Bukavu and his hinterland located in Sud-Kivu DRC in terms of chicken production systems. The characteristics observed were on interviewees that male were more involved on local chickens than the female. Most of them were in secondary school and they were young yet. On local chickens production; the rate of mortality is high 34.1% ±

25.2% mostly in wet season and chicks were more concerned. Local chickens lived on scavenging; accommodation was inadequate for the chickens. Weights of eggs, chicks at weaning period and hens were respectively 42.3 ± 5.1 g, 442.4 ± 205.3 g, 1265.5 ± 282.1 g and cock 1571.4 ± 483.0 g. However, chickens products prices were high. Breeders and country deciders should continue with the local chicken characterization in the entire province. To start a good program of chicken industry in this province and as well as in all the country, selection of local chickens should be implemented on the basis of morphometric and genotypic.

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Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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