



# Traditional Livestock System and Pathologies Risk in the Small-Scale Pig Farming in Kamituga Sub County, Eastern Democratic Republic of the Congo

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## Abstract

Livestock is one of the main sources of animal protein and contributes significantly to livelihood farmers. The objective of this study is to assess the influence of the traditional pig farming system on the risk of pig diseases in Kamituga in the South Kivu province. The present study was carried out in Kamituga among farmers who had at least 1 pig during the study period. The methodology was based on a survey combined with observations by means of a survey questionnaire that had previously been drawn up and sent to the herders. Results show that the major part of the farmers practice swine rearing because this activity constitutes a source of income for them (49%) of our respondents who affirm that climatic factors favored diseases and constitute the main cause for the pathologies of pigs farming in the study area and 5% of the communities members showed the traditional system in divagation is the second source of pig diseases. African swine fever was the most frequent dis-

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ease in free-ranging pigs in Kamituga with a rate of 42%, followed by diarrheal symptoms of various origins with a frequency rate of 29% and finally endo/ectoparasitic infestations.

## Subject Areas

Agricultural Science

## Keywords

Livestock System, Pig Farming, Pathology, Mwenga

## 1. Introduction

Pig farming represents an important source of nutritional protein from its composition and organoleptic highly qualities appreciated by households but also by its remarkable important source of livelihood for the poor communities in the tropical regions [1]. In the world, most pig farms are run by family households, with a variety of production methods ranging from extensive farming to industrial off-farm production [2].

In the Democratic Republic of the Congo, traditional free-range pig farming is based on traditional livestock technologies and is mainly carried out by small-scale farmers in rural areas who do not respect any livestock health standards; it supplements agricultural or artisanal activities with local breeds of a limited yield and with the associated livestock health risks for the households dependent on the latter [3] [4]. The local breeds of pigs are popular because of their adaptability and suitability to the environment, as well as their capacity to use all household and harvest waste and in some cases even certain types of feed. Though this type of breeding does not generate a high production cost for the owner, but the minimum sanitary requirements for breeding must be strictly respected in order to improve its production and limit the disease risks due to a lack of monitoring [5]. The origin of the latter is in fact an often unsanitary husbandry habitat, a feed of low nutritional value with less well balanced rations, essentially fiber and composed of artisanal agri-food processing, crops and fodder and fruits, and rarely the feed with agro-industrial sub-products and mineral supplements [5].

However, the free-range system of livestock farming system presents the several problems. The problems are related to the monitoring and preventive treatment of livestock diseases, the transmission of zoonosis, the use of genetic resources of pigs with low animal performance, the scarcity of veterinary products to preserve the good animal health, the most frequent of which are parasites and African swine fever, which is economically devastating and dangerous for the economy and for public health [6] [7] [8]. To these can be added the accidents and destruction of crops that stray animals can cause, with majors consequences for the recurrence of conflicts between farmers and pastoralists [9] [10]

[11].

The Past studies by [3] [12] [13] on preventive measures in pig farming show that the most farmers do not pay any particular attention to livestock health, *i.e.* that preventive care is practically absent. On the other hand, in rural areas, farmers use traditional medicinal plants and other traditional products to treat their animals [14]. In Kamituga, the increase of swine pathologies is due to the breeders' way of pigs' herds. This in turn would be influenced by the lack of a healthy rationing plan, the quasi non-existence of a monitoring and zoo-sanitary management model with a correlation to low production and the risk of zoonosis. This paper aims to analyses the influence of the traditional free-ranging livestock production system on the recrudescence of pathologies in pigs' farms in Kamituga, South Kivu.

## 2. Material and Methods

### 2.1. Region Surveyed

The current study was conducted in the Kamituga in the chiefdom of Wamuzimu ("collectivité/chefferie") in the territory of Mwenga (27°30'29" East longitude and 2°36'4" South latitude), Eastern part of Democratic Republic of the Congo [15] (Figure 1). In addition, Mwenga is located between. Mwenga territory is characterized by a varied relief with an altitude of 1500 m, the low plain with an altitude of ±680 m, and the Itombwe highlands in the East with an altitude of 2800 m. Generally, Mwanga is characterized by a the humid tropical climate with high rainfall (1600 and 2200 mm/year) and high temperatures in the western part [15] [16]. The eastern part has a mild climate, tempered by the altitude, with a 3-month dry season and a 9-month rainy season. The temperature in Mwenga averages 23°C with a maximum of 37°C and a minimum of 21°C [17]. Mwenga's soils are fertile and alluvial, offering excellent conditions for the development of many crops: cassava, rice, maize, peanuts, etc. as main staple food for local communities, but soil erosion is the main challenge for this [18].

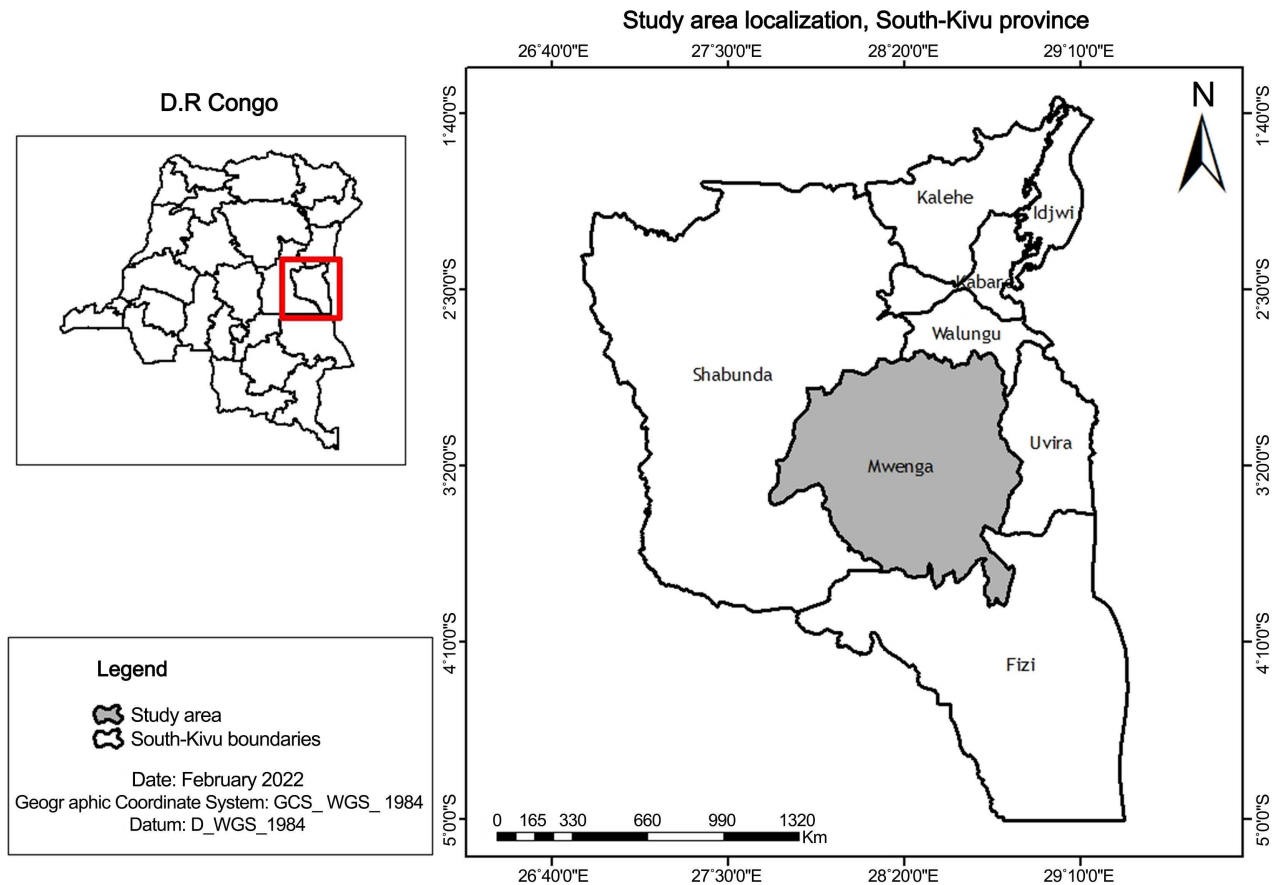
### 2.2. Data Collection and Analysis

Data collection was based on the individual interview using a questionnaire combination of observations in Kamituga during November 2018. The questionnaire was developed and sent to the pastoralists for respond to all question based on sociodemographic characteristics, livestock management system, sanitation system, feeding system, etc. A representative sample of 50 pigs' herds taken at random from each group was selected. The collected data were submitted to descriptive statistical analysis and the test of correlation and significant differences were verified by the Statistical Package for the Social Science.

## 3. Results

### 3.1. Socio-Economic Characteristics of Pigs' Farmers

Pig production is a major source of livelihood for Kamituga's farmers (up to



**Figure 1.** Study area localization in the South Kivu province.

85%). It is most practiced by farmers aged 42 years, mainly women (52%) and with at least 3.6 years of experience. It was noted that 72% of the farmers in this part of the country were involved in free-range livestock farming systems. However, it was also observed that there is a system of semi-stable and stable farming. The latter are practiced at low impact, representing 19% and 9% respectively. In addition to pig farming, farmers are interested in agricultural activities. They practice cassava (41%) and groundnuts (18%) as monocultures, or intercropped (18%). Agriculture is the main activity (41%) for the majority of pig farmers in our study area, but others practice artisanal gold mining combined with agriculture (34%), teaching (14%), teaching combined with agriculture (3%), and only small-scale gold mining (8%). Pigs (52%) and pigs and ducks (31%) are the most common types of livestock production, although pigs and cows (5%) and pigs and goats (21%) are also practiced in our study area. In addition, 85% of the farmers in the study area practice pig farming mainly for household income, while 12% and 3% practice it to generate income and meat and only meat. The majority of pigs are raised in the traditional system (79%). (**Table 1**)

### 3.2. Livestock Management

It was found that the majority of farmers obtain parents from their own farms (37%), although some are purchased on the market (27%). When selecting par-

ents, livestock farmers base their decision either on sex (42%) or on size (13%). In the case of animal feed, 37% of farmers use cassava peelings and 33% crop residues, as shown in **Table 2**.

**Table 1.** Socio-economic characteristics of pigs' herds.

Parameters	Groupements		
	Baligi	Buse	Overall
<i>Age (year)</i>	41.02 ± 13.6	44.2 ± 14.2	42.1 ± 13.9
<b>Sex</b>			
Man (%)	54	62	58
Woman (%)	46	38	42
<b>Occupation</b>			
Teaching	16	12.0	14.0
Agriculture (%)	40	42.0	41.0
Agriculture/Teaching (%)	0.0	6.0	3.0
Mining/agriculture (%)	36.0	32.0	34.0
Artisanal mining (%)	8.0	8.0	8.0
<b>Field ownership</b>			
Yes (%)	80	68	73
No (%)	20	32	27
<b>Major crops</b>			
Cassava (%)	30	52	41
None (%)	2	0	1
Banana (%)	2	2	2
Groundnut (%)	24	12	18
Cassava-groundnut intercropped (%)	16	20	18
Cassava and maize intercropped (%)	24	12	18
Cassava-Maize-Groundnut	2	2	18
<b>Other animal species</b>			
Pig (%)	56	48	52
Pig and cattle (%)	4	6	5
Pig and Duck (%)	32	31	31
Pig and Goat (%)	8	16	12
<i>Livestock experience (year)</i>	3.7 ± 0.6	3.5 ± 0.7	3.6 ± 0.6
<b>Livestock goal</b>			
Income (%)	86	84	85
Income source and meat (%)	14	10	12
Meat (%)	0	6	3
<b>Livestock system</b>			
Traditional system (%)	66	78	72
Semi stabled (%)	24	14	19
Stabled (%)	10	8	9

**Table 2.** General information on livestock management.

Parameters	Divagation	Semi-stable	Stable system	Overall
<b><i>Parents sources</i></b>				
Pay (%)	33	21	11	29
Pay and in the farming (%)	20	31	56	25
Pay and Donation (%)	3	0	0	2
NGO (%)	4	0	0	3
Donation and in the farming (%)	0	11	0	2
In the farming (%)	37	37	33	37
Donation (%)	3	0	0	2
<b><i>Criteria for selecting parents</i></b>				
Sex (%)	31	8	3	42
Sex and size (%)	30	8	2	40
Sex, size and Prolificité (%)	1	0	1	2
Sex, size, color and age (%)	1	0	0	1
Sex and age (%)	1	1	0	2
Size (%)	8	2	3	13
<b><i>Feeding mode</i></b>				
Oilseed cake (%)	3	0	0	2
Peelings and crops residus (%)	15	5	0	12
None (%)	1	16	0	4
Cassava peels	31	42	66	37
Crops waste alone (%)	38	26	11	33
Crops and household waster (%)	0	0	22	2
Household waster alone (%)	5	10	0	5

### 3.3. Origine of Pig Diseases

These results (**Table 3**) show that 49% of the pigs farmers reported that climate is the principal source of disease in pigs living in free-range system and 5% showed that livestock systems are the secondary source of disease in pigs.

### 3.4. Pathologies Identification

Four pathologies were detected in pigs' population living in free-range system in Kamituga: ascariadiosis and diarrhea symptoms in pigs reared in the study area (37%) and African swine fever (4%). However, pediculosis was also identified but at very low prevalence. In addition, Ascariadiosis and African Swine Fever (9%), Ascariadiosis and pediculosis (7%), Ascariadiosis alone (8%), diarrhea and ASF (2%), Diarrhea alone (2%), diarrhea and pediculosis (4%), ASF and pediculosis (3%) and ASF alone (24%) are the common pathologies on the pig farming in the study area. (**Table 4**)

**Table 3.** Origin of pathologies according to the farming system.

Parameters	Divagation (%)	Semi-stable system (%)	Stable system (%)	Overall (%)
<i>Origine of diseases</i>				
Magic and lack of sanitation	1	0	0	1
Magic	0	1	0	1
Lack of sanitation	22	6	0	28
Lack of sanitation and climate	7	4	2	13
Climate	36	8	5	49
Lack of housing	3	0	0	3
Livestock system	3	0	2	5

**Table 4.** The most common pathologies and symptoms observed in Kamituga pig farming according to the livestock system.

Parameters	Divagation (%)	Semi-stable system (%)	Stable system (%)	Overall (%)
<i>Majors pigs diseases</i>				
Ascaridiosis and Diarrhea	22	10	5	37
Ascaridiosis and ASF	4	4	1	9
Ascaridiosis and Pediculosis	6	1	0	7
Ascaridiose	6	2	0	8
Diarrhea and ASF	2	0	0	2
Diarrhea	2	0	0	2
Diarrhea and Pediculosis	4	0	0	4
ASF and Pediculosis	2	0	1	3
ASF	21	1	2	24
Pediculosis alone	3	1	0	4

### 3.5. Prevalence of Pigs' Pathologies

African Swine Fever (ASF) and diarrheal symptoms were the most frequent diseases in pigs farmed in the grazing area of Kamituga, representing 42% and 29% respectively. In addition, ascaridiosis and ASF (8%), ascaridiosis alone (7%), ascaridiosis and diarrhea (9%), ascaridiosis and pediculosis (1%), diarrhea alone (1%), ASF and pediculosis (2%) and pediculosis alone (1%) are the frequent pathologies in the study area. (**Table 5**)

### 3.6. Level of Disease Prevalence

As presented in the **Table 6**, almost all age categories of pigs in living in the free-range area are affected by diseases (35%). However, it was observed that sows are the most vulnerable (25%).

**Table 5.** Symptoms and frequent pathologies in the small-scale pig farming in Kamituga.

Parameters	Divagation (%)	Semi-stable system (%)	Stable system (%)	Overall (%)
<b><i>Frequent diseases</i></b>				
Ascaridiosis and ASF	6	1	1	8
Ascaridiosis	4	2	1	7
Ascaridiosis and Diarrheal	7	2	0	9
Ascaridiosis and Pediculosis	1	0	0	1
Diarrhea and ASF	22	4	3	29
Diarrheal	1	0	0	1
ASF	28	10	4	42
ASF and Pediculosis	2	0	0	2
Pediculosis	1	0	0	1

**Table 6.** The age range of the most pigs affected in Kamituga according to the type of farming.

Parameters	Divagation (%)	Semi-stable system (%)	Stable system (%)	Overall (%)
<b><i>Category of animal affected</i></b>				
Sow (female)	19	3	3	25
Boar	11	8	2	21
Piglet	14	2	2	18
All	28	6	1	35
Sow and Piglet	0	0	1	1

### 3.7. Period of Appearance of Pathologies

The dry season is the most suitable period for the propagation of pathogens in pigs living in the free-range system (90%). However, other pathogens can be seen in the rainy season (10%). (Table 7)

### 3.8. Treatment of the Pathologies

Table 8 shows that 49% of the interviewees use traditional treatments for affected animals. On the other hand, 26% of them do not use any treatments to the affected animals.

### 3.9. Prevention of Pathologies

These results (Table 9) indicate that 37% of the respondents use preventive measures on a regular basis. However, 14% of the respondents practiced stabled housing as a preventive measure. Quarantine practice (23%), pest control (16%) and vaccination practice (10%) are also used as a preventive measure against pig's disease in the study area.



**Table 7.** The period of appearance of the most frequent pathologies in Kamituga according to the farming system.

Parameters	Modality	Divagation (%)	Semi stabulation (%)	Stabulation (%)	Overall (%)
Onset period	Dry season	68	13	9	90
	Rain season	4	6	0	10

**Table 8.** Treatment of the most frequent pathologies in Kamituga according to farming systems.

Parameters	Divagation	Semi-stable	Stable	Total
<b><i>Veterinary control treatment</i></b>				
Traditional	31	12	6	49
Parasite control	23	2	0	25
None	18	5	3	26

**Table 9.** Preventive strategies against diseases according to the pig farming system in Kamituga.

Parameters	Divagation (%)	Semi-stable (%)	Stable alone (%)	Overall (%)
<b><i>Preventive measure</i></b>				
Quarantine	20	2	1	23
Pest control	14	1	1	16
Vaccination	4	3	3	10
Stabulation	6	7	1	14
None	28	6	3	37

## 4. Discussion

These results on the socio-economic characteristics of pig farming show that pig farming systems are traditional and that they are a source of livelihood for the households of pig farmers in Kamituga. This results are similar with similar research has found by [19] in Benin where this activity play an important socio-economic role to contribute in education, health, etc. This activity is generally practiced by people aged 42 years, the majority of whom are women with a percentage of 52%; their experience in the pig production sector is on average at least 3.6 years. Similar observations on the socio-economic situation in the pig production system have been made by [4] [20], echoing those of the [21] in support of this study among Kamituga farmers. Results of [14] in Benin converge with the situation in Kamituga, where it was noted that livestock production is mainly of the divagation type and is the most common in this part of the country (D.R. Congo), with a rate of 72%, with semi-stable livestock production, which is intermediate and well adapted. These practices have a low impact on production, as research results show [11] [22]. In addition to pig farming, far-

mers integrate field activities such as cassava monoculture (41%), and groundnut (18%), or intercropped for diversifying livestock income and supplying feed for pigs.

Our results on the origin of pig diseases by finding that 49% of the respondents indicated that climatic factors are the main source of diseases in free-ranging pigs system and 5% indicated that livestock farming systems are the secondary source of diseases in free-ranging pigs, these results are in conformity with those of [23]. In the study area, the complete feeding is practice by the majors' pigs' herds, but theirs travel long distance to obtain this and the fodder cost is the one of the main livestock production in the small-scale farming with 1 to 5 pigs. In the Walungu territory for example, [24] [25] indicated that the fodder scarcity is one of the majors livestock challenges limiting production in the small-scale farming. In context of forage scarcity, [26] showed that some farmers feed their animals fodder collected along rivers, especially during the dry season in fodder-deficient areas.

Our results on the rate and preventive disease in the small-scale pig farming in Kamituga indicated that the ascariasis and the diarrheic symptoms are the majors' pathologies with high frequency (37%) compared to the ASF (4%) others pathologies. In addition, the pediculosis is present in the study with a low production loses. These results are similar of many researchers as [27] in Tanzania. Many study on the pig farming traditional system in the others regions tropical zones near agro-climatic conditions of the DR Congo particularly our study area mentioned that the climatic factors constitute the of major and dangerous causes of good health stability for high production for all animals species [1] [5] [21] [27] [28] [29] especially in conflict or post-conflict areas where all factors of animal production are limited [30].

## 5. Conclusion

The present study on the impact of traditional livestock based on the free-ranging type on the permanent pigs' pathologies in Kamituga is the part of animal production and health discipline. The principles results indicated that the pigs living in divagation (free-ranging), in semi-stable and in stable alone represent 72%, 19% and 9% respectively. However, 85% of practice pig production is for livelihood income. In addition, 49% of pigs' farmers indicated that the climatic factors are one of the majors' causes of pigs' pathologies in the pig traditional farming system and 5% of pigs' pastoralists indicated that the livestock system causes disease. ASF is the frequent disease in the pigs farming (42%) with divagation as livestock system in the study area and the diarrheic symptom is the second frequent pig pathology with a rate of 29% for all pigs' farming selected during study area.

## Conflicts of Interest

The authors declare no conflicts of interest.

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