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Evaluation of plastic waste in pasture areas and frequency of foreign bodies in the rumen after slaughter in urban areas: Case of Bukavu and its hinterland

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Abstract

Insufficient grazing land and lack of fodder is a situation that makes animals vulnerable, pushing them to ingest inedible substances. The environment of Bukavu and its outskirts is threatened by pollution whose plastic and other waste are sources of diseases of ruminants or imported and local cattle and goats contract diseases due to the consumption of certain waste. The latter are found scattered almost everywhere (tracks, trails, fields, pastures) and their scale is taking on a pace that worries domestic ruminant breeders. In a coupled observation survey, we worked on a sample of 1270 cases of slaughter in a slaughterhouse and restaurants in urban areas, and also two killings in rural areas to assess the frequency of foreign bodies in ruminants after slaughter and classify them according to their nature. Then, we had to identify the stimuli that lead animals to ingest indigestible non-food substances and that are a cause of morbidity and mortality. By the method of transect we appreciated the presence of this waste that ruminants consume by mania. The results are as follows: Out of 1,270 cases of slaughter, we found 179 cases of the presence of foreign bodies, *i.e.* 35% in Mugogo, 31% in Mudaka, 19% at the Ruzizi II slaughterhouse and 15% for restaurants in the city of Bukavu. According to the nature of the foreign bodies found after slaughter, it appears that the black bag component is in large quantity (24.25 ± 7.676) followed by mosquito net (18.5 ± 7.416), then other bag (13.25 ± 7.847) and finally fabric (10 ± 4.397). *In vitro*, the coca cola drink has little effect on foreign bodies soaked in rumen juice. The transect shows a high load of plastic waste and linen along the tracks and around markets and grazing places both in the city of Bukavu and in the peripheral territories shows a preponderant presence of bags (0.738 ± 0.425) followed by linen (0.362 ± 0.119). For an average weight of 960 grams per waste collected.

Keywords: Ruminants, foreign bodies, waste, plastic, pasture

Introduction

Capriculture is an economic activity practiced by the majority of farmers in Africa. Almost all the animal species well adapted to their environment are found there, but unevenly distributed [1, 2].

Livestock in intensive production systems often suffer genetic erosion that threatens biodiversity and productivity [3]. The need to preserve biodiversity makes it possible not to endanger current ecosystems [4] at a time when the diversity of animal resources is unanimously accepted as a prerequisite for improving animal productivity and food security [5]. The farming method is called upon to adapt and even improve to respond qualitatively and quantitatively in terms of production to the desiderata of the population [6]. It is certain that many obstacles must be overcome to achieve this ideal and for this reason, man must work, manage and even shape the land at his disposal in order to produce food.

The breeding of domestic ruminants and more particularly of goats constitutes a source of endogenous potential for food production both for these animals themselves and for humans [7]. We cannot highlight the richness, the quality of products of animal origin for the benefit of several families whose goat would be a source of income to meet their food needs, especially in products of animal origin [8].

The climate and the vegetation being favorable, the goats keep all their chance to prosper. Insufficient food intake causes them to eat anything they encounter in the environment^[9], snoop around in wild dumps, ingest foreign bodies and other indigestible and non-biodegradable substances^[1, 10]. Also those that are fed low mineral feed on poor pasture. In the gastric reservoirs, these foreign bodies are the basis of both mechanical and functional discomfort^[11].

There are problems in the diet but also in the farming methods, which delay the evolution of the breeding of domestic ruminants and which influence the conversion of nutrients^[12]. The animal does not gain weight despite all the care given to it. It is necessary to seek to understand the phenomena that often lead to physiological misery until the death of animals despite pest and infection control^[13]. At autopsy or slaughter, the presence of foreign bodies is observed which takes up a large part of the gastric space and which disrupts the functioning of digestion^[14].

When complaining about the presence of foreign bodies, one can ask oneself a question about their prevalence but also assess the potential quantity of waste to which the animals are exposed. Scavenging, especially with regard to small ruminants in urban areas and villages^[10], predisposes to picas following mineral deficiency^[15].

The production of ruminants requires energy but above all proteins, unlike maintenance which requires energy, from which it is necessary to provide quality feed^[3].

Like other cities in the country, Bukavu faces a sanitation problem. Its inhabitants throw away huge quantities of waste every day^[16] of which plastics are part of solid waste and management seems precarious. With the very strong expansion of the plastics trade in Bukavu, the plastic bag invades the city and becomes a potential source of pollution when its recycling is underdeveloped^[17].

We find the waste thrown by the population in Lake Kivu and consequently, following this bad practice we are witnessing the pollution of the water^[18] and all this leads to the degradation of the ecosystem or the lake environment^[16].

To alleviate this scourge, waste management can be one of the means that can be used to reduce pollution or completely contain it^[19]. Recycling is a solution that makes it possible to manage waste sustainably. This is a strategy that consists of collecting and processing waste to reintroduce it into the production cycle^[20].

With the presence of waste of all kinds in the form of public or wild dumps^[21], it is remarkable that the city of Bukavu presents a health hazard. Waste is found, circulates and is scattered everywhere in nature, in large quantities next to houses, along roads and in pasture areas where they will be ingested by ruminants. They cause damage by discomfort in the gastric reservoirs.

Materials and Methods

Location

This study took place in the city of Bukavu and its hinterland, *i.e.* going as far as the market of Mugogo territory of Walungu and the market of Mudaka territory of Kabare in the province of South Kivu, East of the Democratic Republic of Congo.

South Kivu is one of the twenty-six provinces of the DRC. It is located in the east of the country between 0°00'58" North latitude, 4°51'21" South latitude and 26°10'30"-29°58' East longitude. It is bordered to the north by the province of North Kivu, to the south by Tanganyika, to the west by Maniema and to the east by the Republic of Rwanda from which it is separated by the Ruzizi River and Lake Kivu, the Burundi and Tanzania, separated from South Kivu by Lake Tanganyika. The province of South Kivu occupies 3% of the surface of the country, or 69,130 km² (Mastaki, 2006; UNDP, 2009)^[16]. It includes 8 territories including Kabare in which the city of Bukavu is located. Bukavu is the capital and located between 2° 31' south latitude and 28°50' longitude at 1460 m altitude. It is bounded to the east by Lake Kivu and the Ruzizi River. Temperatures are moderated by the altitude and the presence of the lake. The average temperature is 20.5°C, the absolute maximum between 28.5 and 34°.

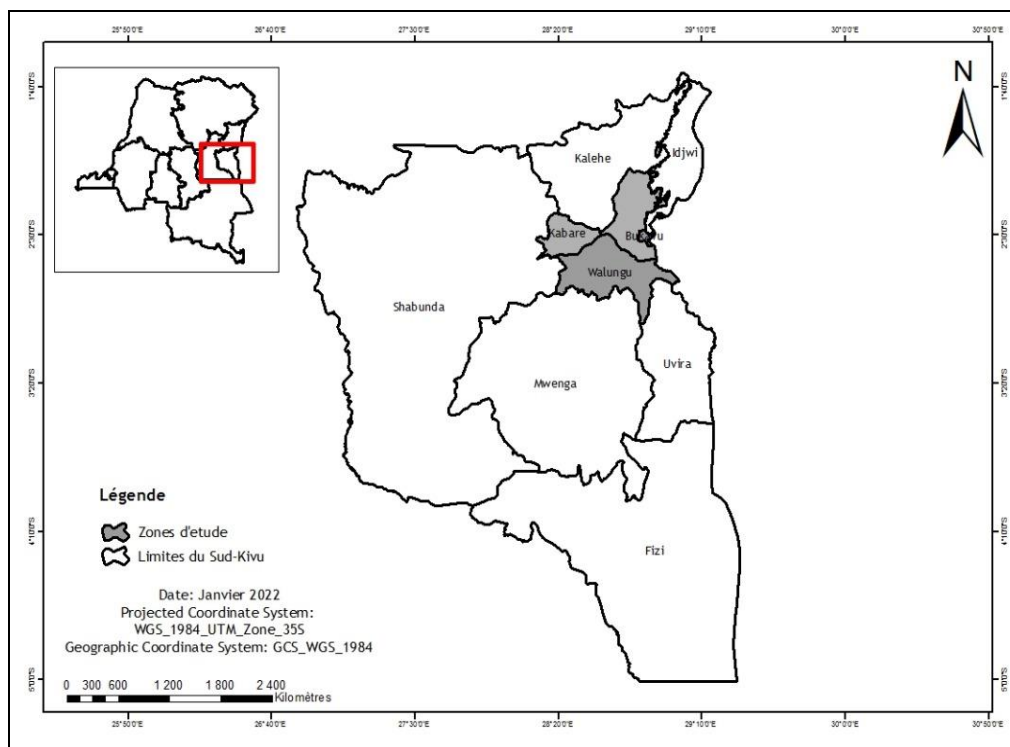


Fig 1: Map of South Kivu Province, Eastern Democratic Republic of Congo

Methods

Collection of data on the prevalence rate of foreign bodies found at slaughter

An investigation was made into the causes of death of animals for slaughter or breeding and in which foreign bodies were found after death or slaughter, followed by observation of the clinical appearance of cattle and goats for slaughter imported or from the local environment and simulation of the diagnostic protocol applied to live cattle ^[11].

Verification and extraction of foreign bodies in the contents of the rumen of slaughtered animals on a sample of 15 cows per site and per market until reaching our sample. The collection was made at the slaughterhouse of Ruzizi II, the killings of Mugogo, Mudaka, and from the Restaurants of Bukavu where goats are slaughtered.

Foreign bodies were weighed and then categorized: plastics (plastic, fabrics/linen, mosquito net).

Collection of data to identify the risk factors of gastric

obstruction by plastic waste/laundry, and analysis of the dynamics of the degree of pollution on the tracks and grazing areas

With a survey questionnaire that includes questions to which the restaurant managers answered us, once in the restaurants for an incidence study (present) in relation to animals that are clinically suspect and after slaughter, we verify the presence of foreign bodies in the rumen, we clear them to understand their nature ^[22] after we weigh nature by nature then the overall weight, then we do a summary frequency survey of a quantitative nature to estimate the frequency and abundance ^[23]. According to Aubel ^[24], the qualitative method makes it possible to grasp a situation from a subjective analysis of the respondents.

The survey took place in the three communes including: Ibanda, Bagira and Kadutu. The presence of foreign bodies is established and their frequency calculated according to their nature. With a GPS, we located each restaurant to have the samples.

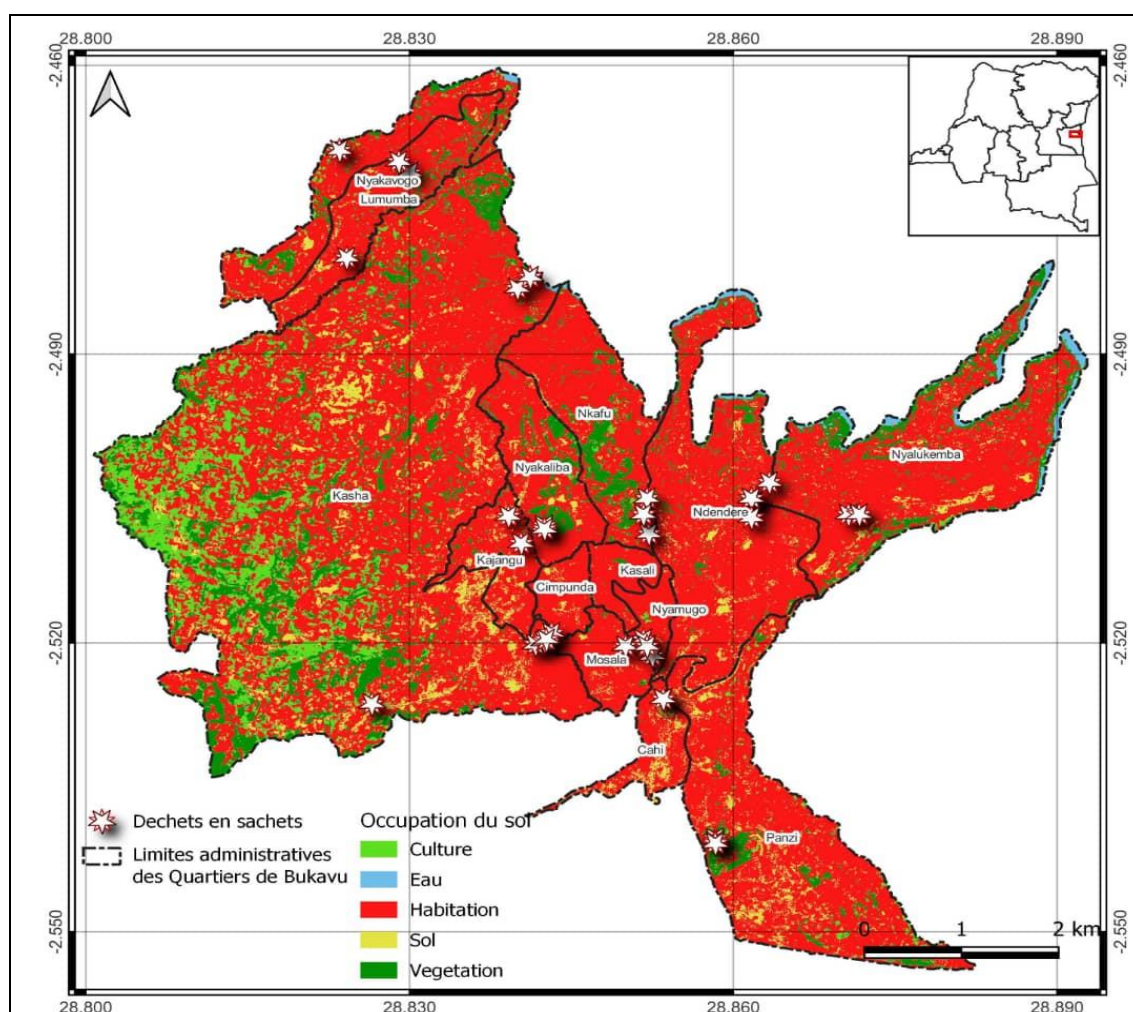


Fig 2: Location map of sites where foreign bodies were present after felling

After collecting the data, we grouped them and tabulated the cumulative frequencies of the responses collected in the field during the survey in order to interpret to find the results. The data was processed in R to determine the degree of significance.

Identification of stimuli

To find out what drives ruminants and goats in particular to swallow waste, we thought about diet, breed, origin or

accidents. We were able to achieve this through different techniques. - Participatory observation: by getting to know the environment, the attitudes of the people who live there and the affection for the profession relating to the breeding or trade of ruminants. Free interview: it allowed us to be in contact with the people who work in Kachoma in the city of Bukavu and its outskirts, the area of our investigation. Thanks to this technique, people were interviewed freely and individually. This gave us a general idea. The goal was to

know under what circumstances animals swallow non-food substances.

Transect method

The transect was based on pastures where we took a distance of 100 m interspersed in three quadrats (point 0 m, 50 m and 100 m) going from a traffic track to the inside of a pasture. The quadrats have been measured and the size of each is 20 m x 20 m or 400 m². To better understand where the affection that the ruminant, especially the goat, develops comes from

[25], it was necessary to think of going to observe the places of pasture, in particular in the farms and the community pastures as well as the green spaces in the agglomerations. Generally, there is little opportunity for a pasture to be soiled so that the solid waste (rubber and linens) can pose a hazard to animals [26]. Observations focused on solid plastic waste and linens. We have classified places at risk of contamination, in particular tracks connecting pastures and homes, markets near pastures, greenery around public landfills, individual trash cans in rural areas, gardens protected by mosquito nets.

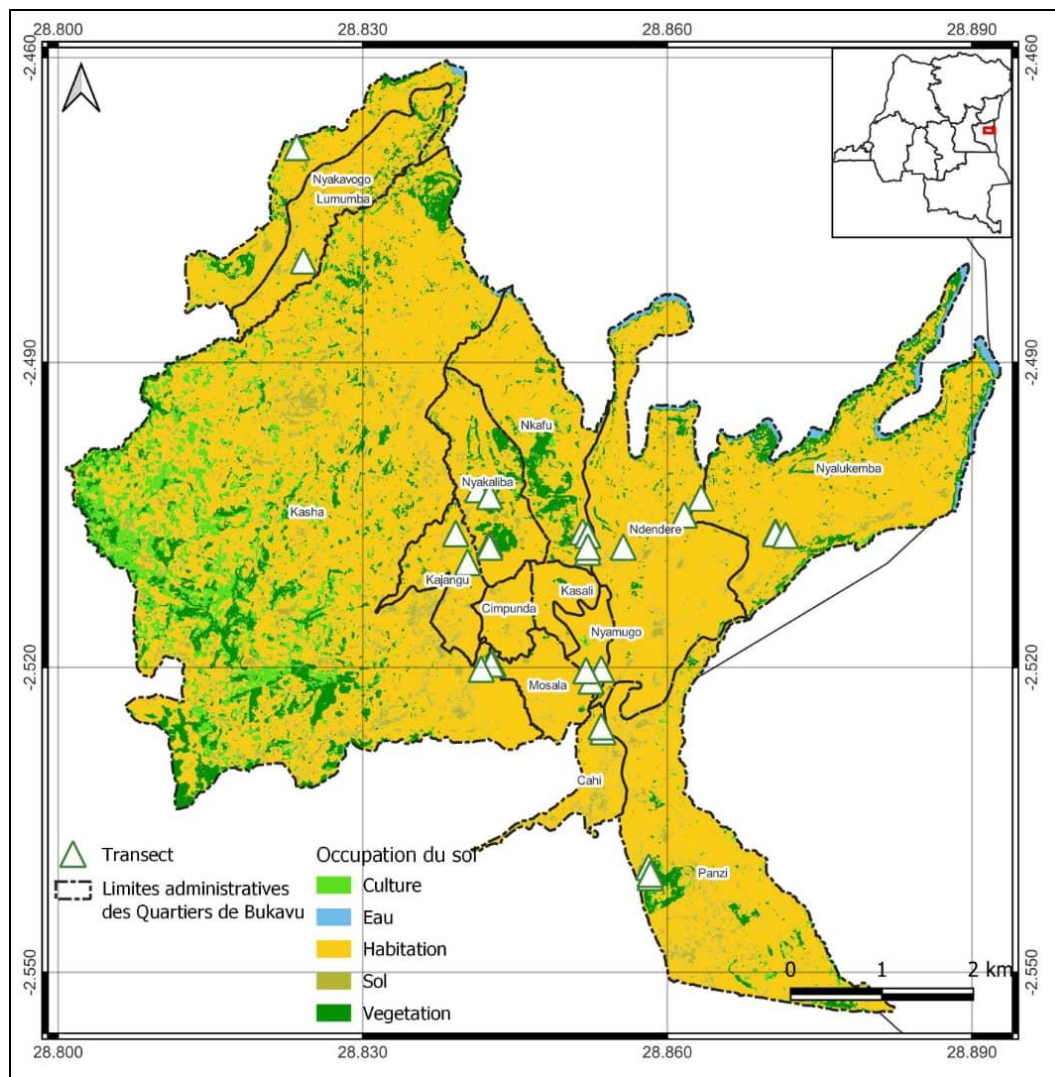


Fig 3: Location map of sites that have been the subject of an assessment of waste in pasture areas

We took Bukavu as the marketing center for cows and goats coming from 3 axes: Kabare, Walungu and Rwanda. We have targeted specific places to observe and take samples. In the pastures, we took care to sample from a distance of up to 5 m from the track, 50 m and 100 m. Along the trajectory leading to the markets, we favored the quarantine and transit posts for animals (livestock) and the surroundings of the live cattle markets. Only two types of waste interested us, namely rubber / plastic and linens. We sampled using the quadrat method, followed by sorting and weighing. In Bukavu we observed the market on foot at the slaughterhouse and at Muhanzi beach and among small breeders whose goats are confined and then released or stray. Snooping caught our attention, so we incorporated into the methodology to find out how landfills are used as places where people urinate or deposit alkaline materials.

The question of identifying or assessing the risk of disease [27] has forced us to seek to understand what attracts animals to consume what is generally not edible. In urban areas the existence of gardens that are protected with mosquito nets or cloths, we have noticed that either we urinate on these fabrics, or we throw kitchen fluids in them, all kinds of dust stick to them. Finally, in garbage cans, peelings of fruits and tubers, nuts, bran and other agricultural waste mixed with miscellaneous waste increase the risk. Animals in deficiency, others by mania swallow everything. The scale was the equipment to obtain the weight of each type of waste collected and the overall weight.

Statistical analysis

We used descriptive statistics using sector graphs, the mean and standard deviation by the Excel 2016 spreadsheet.

Results

Prevalence of causes of gastric obstruction in ruminants

Number of animals slaughtered in Bukavu and its hinterland

Figure 4 presents a situation in relation to cattle which are generally slaughtered in slaughterhouses or at the slaughterhouse, while goats are slaughtered rather in restaurants, very rarely in certain markets. This study focuses

on domestic ruminants while targeting the goat in the city. It is necessary to note that the problem of ingestion of indigestible waste concerns both large and small ruminants. In the city of Bukavu, almost all the cattle in trade come from outside. Foreign bodies are also observed. Being the gateway, we took into account the slaughter areas located first in the radius and where the animals are transported on foot.

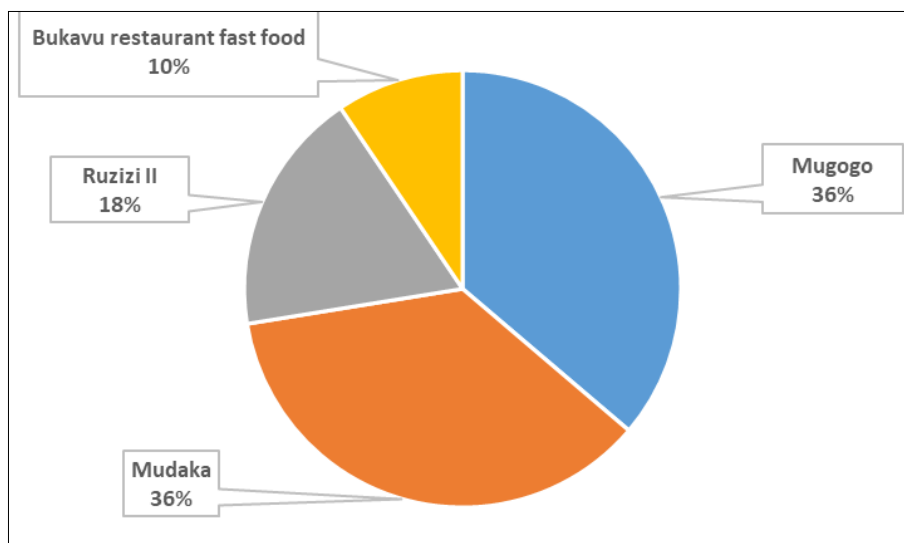


Fig 4: Portion by value of ruminants (cows and goats) slaughtered in the targeted killings in Bukavu and its hinterland (n=1270)

Frequency of foreign bodies found after slaughter of cattle and goats

Figure 5 shows that when in cows the proportion of foreign

bodies found is successively high at 35%, 31% and 19%, in restaurants it reaches 15%.

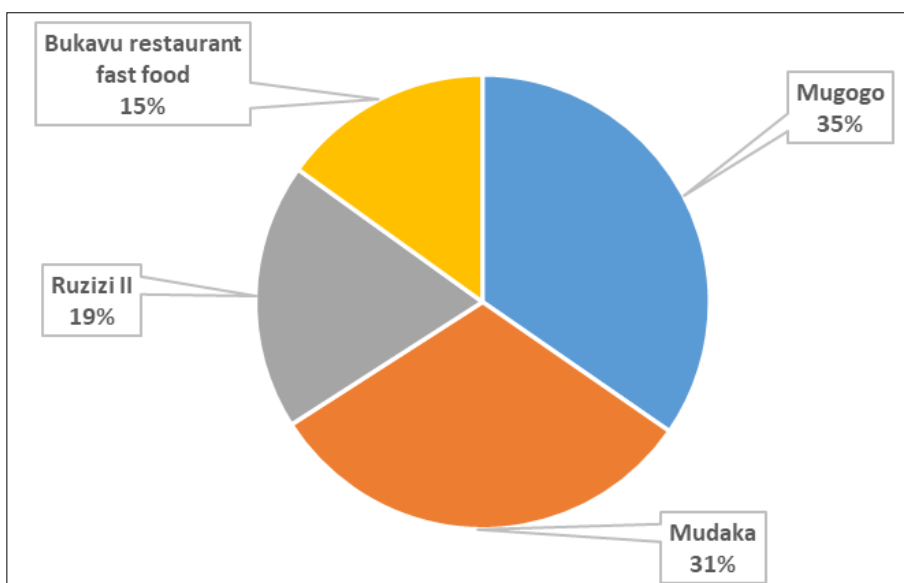


Fig 5: Frequency of foreign bodies found after slaughter

Proportion of slaughtered ruminants and foreign bodies found after slaughter

This figure shows that the rate of all types of foreign bodies without distinction after slaughter is 12%.

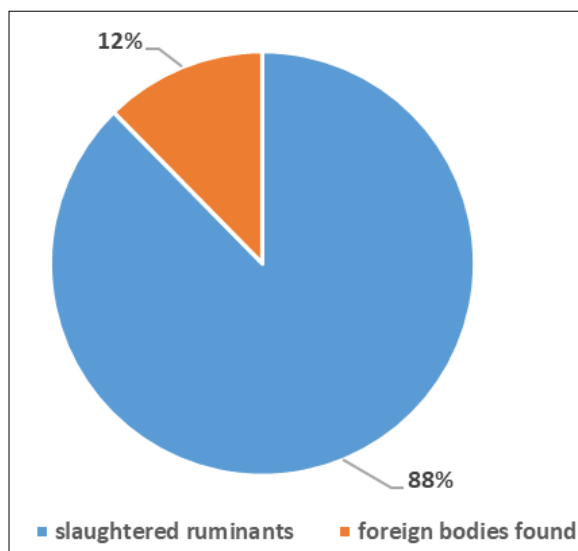


Fig 6: Proportion of ruminants slaughtered and foreign bodies found after slaughter in the targeted sites

Frequency of foreign bodies by their nature and average

Table 1 presents the frequency of foreign bodies found in

slaughtered animals, including cows at Mugogo, Mudaka, Ruzizi II slaughterhouse (large ruminants) and in Restaurants (small ruminants).

Table 1: Nature and frequency of foreign bodies found in different markets and in Bukavu

Sites	Mosquito net	Black Bag	Other Bag	Fabric
Mugogo	27	34	19	15
Mudaka	18	26	21	12
Ruzizi abattoir	20	16	7	8
Restaurants	9	21	6	5
Means±standard deviation	18.5±7.416	24.25±7.676	13.25±7.847	10±4.397

In view of this table of number of times that the nature of CE appears, it appears that the black bag component is in large quantity (24.25±7.676) in the composition of foreign bodies found after slaughter followed by the mosquito net component (18.5±7.416), then the other bag (13.25±7.847) and fabric (10±4.397).

Effect of action of the coca cola drink on extracted waste or foreign bodies (EC)

Table 2 sheds light on the observation of the modification process that foreign bodies undergo in the presence of rumen juice and in contact with the coca cola drink *in vitro*. A rumen-like environment was simulated in plastic bottles. Temperature is a factor that we did not incorporate to approximate homeostatic conditions.

Table 2: Degree of degradation of foreign bodies found in the rumen after slaughter in different markets

Nature du corps étrangers	Situation au départ		Après 3 jours	Après 7 jours	Après 1 mois	2 mois et plus
	Intact	Dégradé				
Black bag or limpid		**	2	2	2	2
Green bag or mock		**	1	1	1	1
Mosquito net	*		0	0	0	0
Sac à linge	*		0	0	0	0
Cotton fabric		**	2	2	2	2
Nylon fabric	*		0	0	0	0
Other:- sole	*		0	0	0	0
- raffia rope	*		0	0	0	0

Legend

*: no degradation process, **: start of degradation, 0: No change, 1: Insignificant change and 2: Slight change

Apart from the change observed following mixing of the gastric pouches and which often reveals a mass of bags woven into cords or macerated in a ball of variable dimensions and this on a case-by-case basis, the case of recent ingestion shows the plastic or the fabric in its intact form. However, a

slight degradation is observed.

Number of cases found in combination of waste

The table below shows the number of cases found depending on the nature of the foreign bodies.

Table 3: Frequency of the combination of the nature of the foreign bodies

Sites	Foreign bodies found	Double combination	Triple combination	Quadruple combination
Mugogo	62	29	11	8
Mudaka	56	11	6	2
Ruzizi	34	8	5	3
Restaurants	27	3	0	1
Means±standard deviation		12.75±11.325	7.33±3.214	3.5±3.109

With regard to this table the combination of the foreign bodies found, the presence of double according to the nature takes precedence (12.75±11.325) followed by triple (7.33±3.214) and quadruple (3.5±3.109).

Average weight of foreign bodies extracted after slaughter in kg

The figure presents the comparison of the average weight of foreign bodies in kg found after slaughter in cows and goats.

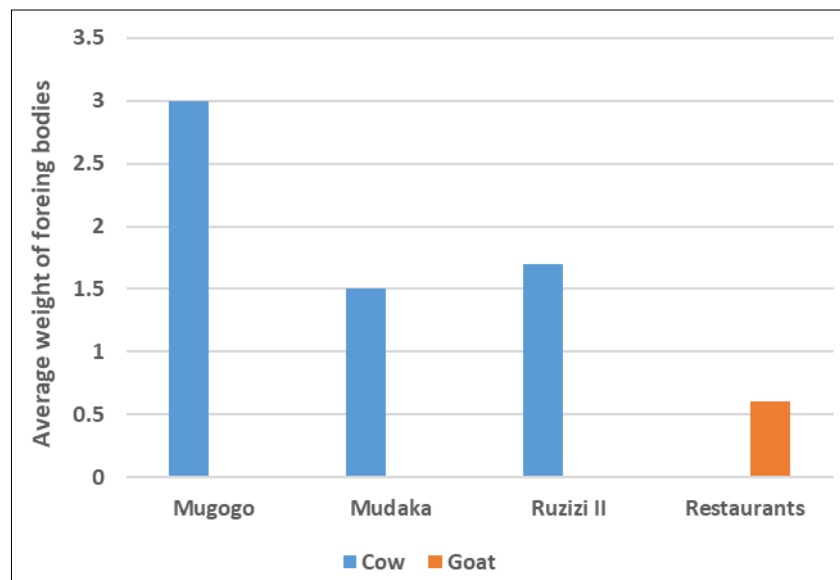


Fig 7: Average weight of foreign bodies after slaughter

Risk factors for gastric obstruction by foreign bodies Observation of respondents on the presence of foreign bodies after the slaughter of goats

Our work was done on the search for foreign bodies in the

rumen of a goat in urban and rural areas in Bukavu, Kabare and Walungu after slaughter.

The following results were found:

Table 4: Identity of Respondents

		Effective (n = 50) Frequency (%)			Test X ²	p-value
		Commune of Ibanda	Commune of Bagira	Commune of Kadutu		
Sex of respondents	Man	8(16)	10(20)	8(16)	2.4573**	0.2927
	Female	12(24)	5(10)	7(14)		
Age of respondents (years)	20 -30	10(20)	8(16)	9(18)		
	31 -40	6(12)	5(10)	3(6)		
	41 -50	4(6)	2(4)	3(6)		
Matrimonial statut	Single	11(22)	9(18)	10(20)		
	Maried	8(16)	5(10)	4(8)		
	Widower or divorce	1(2)	1(2)	1(2)		
Size of the households	2 - 4	8(16)	4(8)	3(6)		
	5 - 7	5(10)	2(6)	3(6)		
	8 - 10	3(6)	2(4)	7(14)		
	11 and more	4(8)	7(14)	2(4)		
level of education	Primary	4(8)	3(6)	5(10)		
	Secondary	13(26)	10(20)	6(12)		
	University	3(6)	2(4)	2(10)		
types of houses	Simple	5(10)	9(18)	8(16)		
	Villa	8(16)	4(8)	4(8)		
	floor	7(14)	2(4)	3(6)		

Figures in parentheses indicate Percentage. ** indicate the 5% significance level.

For sex between men and women there are significant differences in the three communes namely: Ibanda, Bagira and Kadutu, *i.e.* men dominate the activity than women with X² test calculated of 2.4573 ** and a p-value of 0.2927 and mostly single followed by married then widowed and divorced; the results concerning the size of the households of

the respondents show the majority of 2 to 4 people followed by 8 to 11 and more people then 5 to 7 people. Regarding the level of education, the majority of respondents have a secondary education level; and finally for the types of houses we note that simple houses dominate over the rest.

Ordure**Table 5:** Filth

		Effective (n = 50) Frequency (%)			Test X ²	p-value
		Commune of Ibanda	Commune of Bagira	Commune of Kadutu		
Management of ordure	Yes	12(24)	13(26)	12(24)	4.8704**	0.08758
	No	8(16)	3(6)	1(2)		
Management mode of ordure	Subscription at structure in charge of rubbish collection	6(12)	12(24)	5(10)		
	Nature dumping	12(24)	3(6)	7(14)		
	Burying, marsh and other	2(4)	1(2)	1(2)		
Use of ordure in horticulture activities	Yes	0(0)	1(2)	0(0)	2.381**	0.3041
	No	20(40)	14(7)	15(30)		

The numbers in parentheses indicate the Percentage. ** indicate the 5% significance level.

Regarding the mode of waste management, there are significant differences from which in the three municipalities the respondents confirm that they have the management modes and subscribe to the collection structures. For waste management, the calculated X² is 4.8704** with a p-value of

0.08758 and for the management mode that dominates in the three municipalities is subscription to a structure responsible for collection as well, associated with dumping in nature in Kadutu and Bagira; Regarding the recovery of ordure in market gardening fields, most of our respondents, 40% in Ibanda, 7% and 30%, manage their filth in one way or another.

Risk factors**Table 6:** Existence, nature and distributivity of foreign bodies after slaughter (Number)

		Effective (n = 50) Frequency (%)			Test X ²	p-value
		Commune of Ibanda	Commune of Bagira	Commune of Kadutu		
Presence of foreign bodies in the rumen of goats	Yes	19(38)	15(30)	15(30)	1.5306**	0.4652
	No	1(2)	0(0)	0(0)		
Frequency of foreign bodies in the rumen of goats	Rare	0(0)	2(4)	1(2)		
	No frequent	10(20)	4(8)	7(14)		
	Usually	10(20)	9(18)	7(17)		
Nature of foreign bodies in the rumen of goats	Synthetic rubber	14(28)	6(12)	7(14)	3.5695**	0.1678
	Other plastic	6(12)	9(18)	8(16)		
Number of time observe	Per day	3(6)	2(4)	1(2)		
	Per week	11(22)	13(26)	13(26)		
	Per month	5(1)	0(0)	1(2)		
	Per year	1(2)	0(0)	0(0)		
Existence pastorale land	yes	0 (0)	1(2)	2(4)	2.7187**	0.2568
	No	20(40)	14(28)	13(26)		
Killing of an animal the very same day and in diet	Yes	3(6)	3 (6)	4(8)	0.72917	0.6945
	No	17(34)	12(24)	11(22)		
Animal of origine	Muhanzi	12(24)	5(10)	9(18)		
	Kibonge	5(10)	9(18)	6(12)		
	Rwanda	1(2)	0(0)	0(0)		
	Elakat	2(4)	0(0)	0(0)		
Sélection des animaux	Yes	20(40)	14(28)	14(28)	1.3889	0.4994
	No	0(0)	1(2)	1(2)		
Standard of selection	Size	1(2)	0(0)	0(0)		
	Age	1(2)	1(2)	2(4)		
	Size or mass	18(36)	14(28)	13(26)		

The figures in parentheses indicate the Percentage.

** indicate the 5% significance level.

The results in relation to the presence of foreign bodies in the rumen of goats show that the majority of respondents confirm by yes, that they observe the presence of foreign bodies in the rumen of goats during slaughter, the calculated X² is 1.5306** with a p-value of 0.4652, the municipality of Ibanda ranks first with 38% followed by two others with 30% everywhere. The regular frequency occupies the first place with 20% in Ibanda, 18% in Bagira and 17%, then not very regular and finally rare. For the nature of these bodies, there are

significant differences between the sites, the bags occupy a prominent place with 28% in Ibanda, 14% in Kadutu and 12% in Bagira; followed by other plastic foreign bodies of various kinds. The majority of respondents met, 26% in Bagira, 26% in Kadutu and 22% in Ibanda, show that at least every week the presence of foreign bodies is observed in the rumen of goats. We note that there is no place of pasture before slaughter, the respondents say no, the goats are therefore slaughtered in a state of diet. The results in relation to the

origin of the goats show that there are significant differences and there, most of the slaughtered goats transit through the Muhanzi market followed by Kibonge, then Elakat and Rwanda. Almost all respondents use criteria for selecting goats to be slaughtered; they are mainly interested in the size or mass of the selected animal.

Dynamics of the degree of pollution by waste consumed by ruminants on tracks and grazing areas in Bukavu and its hinterland

The figure of Degree 1/ along the track from the edge shows a preponderant presence of bag (0.738 ± 0.425) followed by fabric (0.362 ± 0.119).

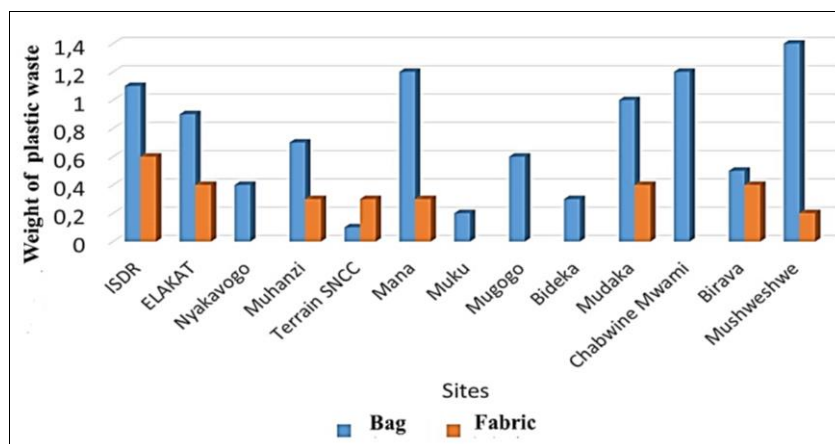


Fig 8: Frequency of litter collected in pasture areas

The figure of Degree 2/ at 50 m from the track shows the presence of the waste concerned with a reduction in quantity,

the mosquito net (0.45 ± 0.071) dominates, followed by the bag (0.3444 ± 0.371) and fabric (0.3 ± 0.00).

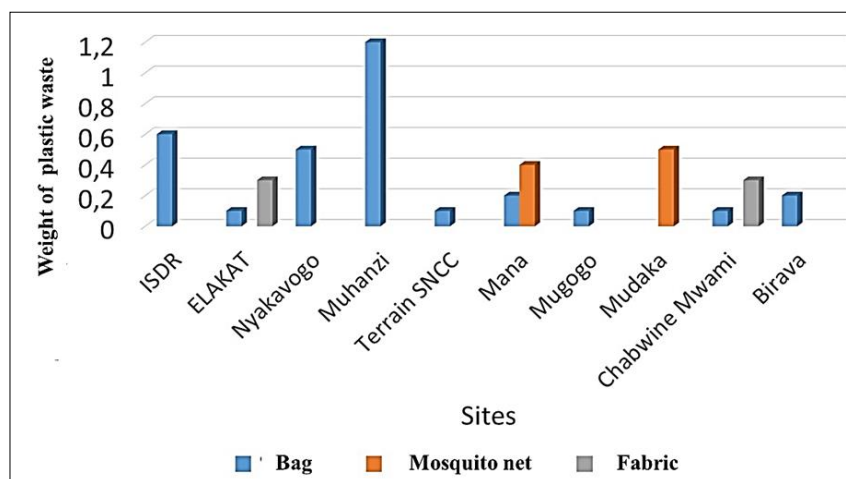


Fig 9: Distributivity of waste according to whether it is plastic, fabric or mosquito net.

The figure of Degree 3/ at more than 100 m shows that the waste concerned becomes rare, first the mosquito net

(0.633 ± 0.208), followed by fabric (0.35 ± 0.071) and finally the bag (0.157 ± 0.053).

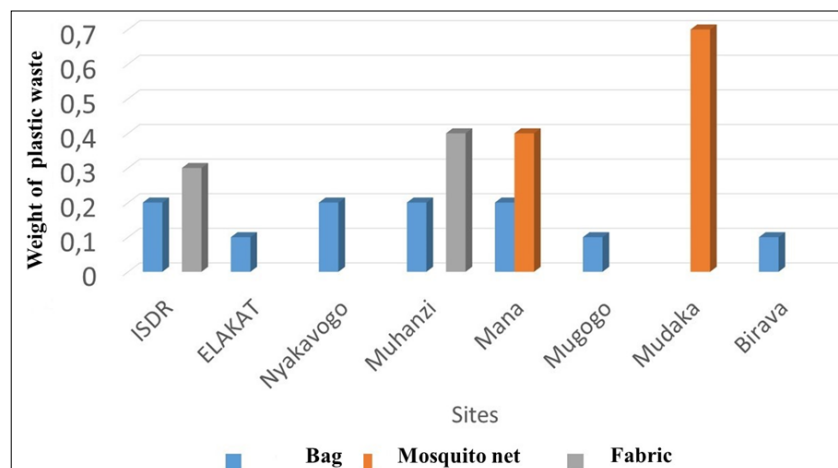


Fig 10: Weight of solid plastic waste and linens in grazing and ruminant transit areas

Table 8: Average weight of waste found according to the distance from the targeted tracks

Sites	Degree 1/ along the track				Degree 2/ at 50 m from the track				Degree 3/ at more than 100 m			
	Total	Bag	Mosquito net	Fabric	Total	Bag	Mosquito net	Fabric	Total	Bag	Mosquito net	Fabric
ISDR	1,7	1,1	0	0,6	0,6	0,6	0	0	0,5	0,2	0	0,3
ELAKAT	1,3	0,9	0	0,4	0,4	0,1	0	0,3	0,1	0,1	0	0
Nyakavogo	0,4	0,4	0	0	0,5	0,5	0	0	0,2	0,2	0	0
Muhanzi	1,0	0,7	0	0,3	1,2	1,2	0	0	0,6	0,2	0	0,4
Terrain SNCC	0,4	0,1	0	0,3	0,1	0,1	0	0	0	0	0	0
Mana	1,5	1,2	0	0,3	0,6	0,2	0,4	0	0,6	0,2	0,4	0
Muku	0,2	0,2	0	0	0	0	0	0	0	0	0	0
Mugogo	0,6	0,6	0	0	0,1	0,1	0	0	0,1	0,1	0	0
Bideka	0,3	0,3	0	0	0	0	0	0	0	0	0	0
Mudaka	1,4		0		0,7		0,5		0,7	0	0,7	0
Chabwine Mwami	1,2	1,2	0	0	0,4	0,1	0	0,3	0	0	0	0
Birava	0,9	0,5	0	0,4	0,2	0,2	0	0	0,1	0,1	0	0
Mushweshwe	1,6	1,4	0	0,2	0	0	0	0	0,8	0	0,8	0
Means	0,96	0,66	0	0,19	0,32	0,23	0,069	0,046	0,28	0,08	0,14	0,05

When evaluating the quantity of solid waste encountered along the tracks and grazing areas, ISDR, mushweshwe and

Mana dominate. At 50m it is Mudaka, ISDR and Mana. Finally 100m Mushweshwe, Mudaka and Mana.

Table 9: Abundance and dispersal in the open pasture of farms

Sites	Total Weight (g)	Bag (g)	Mosquito net (g)	Fabric (g)
Mushweshwe	0	0	0	0
Kashusha/Olive	200	200	0	0
Cagombe	100	0	0	100
Maka	0	0	0	0

Compared to farms, that of Kashusha /Olive being close to public dump sites has a high density of various wastes including those that ruminants can swallow up to 200 g and in Cagombe 100 g, Maka and Mushweshwe remaining exempt.

Discussion

In countries where plastic substances are accepted as packaging and after various services they are found in the form of waste, it is difficult to remove animals from contact with this waste [27]. During transport by trek, hungry animals, not supplemented with salts during transit and quarantine, are forced to graze and often manifest pica by ingesting various wastes, including plastics and fabrics.

Faced with the presence of renewable or non-renewable natural products, and non-renewable synthetics, when they are used they enter the cycle of matter [28]. The opinion on the voluntary administration of plastics does not find its place, especially since it is noted that animals in the stable are exposed to deficiencies with the resulting consequences [26].

Soiled pastures and paths strewn with waste are unavoidable risks. Although there are measures prohibiting the circulation and sale of plastic bags, the application of the edict of the provincial entity is not in force to the detriment of farms and far from the asset environment [18]. In the treatment of solid waste, apart from the recycling of plastics and glassware, the recovery of organic waste in the production of organic fertilizers would [29] contribute to the development of animal husbandry in stalls around the agglomerations whose farmers accept to contribute. Choose to manure fodder crops [30].

Foreign bodies in the rumen of both large and small ruminants consisting of non-degradable substances remain a persistent problem and the definitive solution of which requires surgery (Pongombo, 2020) [25] while the proposed diagnostic model is essentially clinical.

Our study was carried out in the city of Bukavu. It allowed us to reassure ourselves that after slaughter, we observe foreign bodies in the rumen of goats from trade and put up for

consumption in the city of Bukavu. Initially in the city we see a strong production of various waste managed in several ways. Around public dumps, animals consume it by default.

The non-management of waste [31] and the farming system in the environment of our study predisposes the animals and essentially the small ruminants to ingest indigestible bodies thrown in the routes, particularly in the garbage cans, pastures where the goats in ramblings ingest them.

After slaughter, the presence of foreign bodies in the rumen sufficiently attract our attention, which has been the subject of several authors to carry out research to deduce the harmful consequences of these foreign bodies within the animal.

In countries where plastic substances are accepted as packaging and after various services they are found in the form of waste, it is difficult to remove animals from contact with this waste. In Bukavu we notice almost everywhere the presence of waste everywhere so much that the traffic of vehicles, the wind, the training in the gutters transport them and disperse them in the environment. During transport by trek, hungry animals traveling long distances to the interior of the province, without supplements at the place of transit and quarantine, are forced to graze and often manifest the perversion of the habitus. They thus eat various wastes including rubbers and fabrics [10].

Unable to respect the management of solid waste, the town hall resorts to private individuals who do so without enough professionalism, which means that we notice places not indicated or at least those intended for the purpose of constituting public dumps. Thus, around these landfills certain plants grow there taking advantage of the leachate (fertilizer). The presence of renewable or non-renewable natural products, such as biodegradable waste and non-renewable synthetic products, including rubber that enters the material cycle during their use [32].

Often people keep saying that some breeders purposely feed their animals plastic compounds or other wastes that cannot be digested or at least break down in the digestive tract during

transit. To see the very minimal importance around 1% of the bags that are thrown in nature ^[20], the animals have access to them during fodder or grazing along the paths, around garbage cans and wild dumps.

Pastures and paths strewn with waste are unavoidable risks. Indeed, the capricious food of goats would be called into question in a context where the animals which, to cope with certain deficiencies, eat foreign bodies apart from grass. The town hall of Bukavu had banned the sale of plastic packaging, however with salt or oil they become attractive to ruminants who eat them at will and get used to taking them. This leads to a failure in the suggestions for therapeutic management ^[25, 10]. This rather requires radical sanitation upstream ^[16] by removing waste of all kinds from garbage cans, paths and pastures, especially in urban agglomerations ^[31]. In most of the foreign bodies found, and whose frequency shows that rubber predominates, recycling is a form of recovery of this waste ^[20].

In view of their low quantity in all the waste, it is possible to correlate their recycling with that of organic waste in the production, on the one hand, of pockets and, on the other hand, of substrates for organic manures which would be used in agroforestry and fodder crops.

The problem of foreign bodies remains intact as observed in all the killings in Bukavu. It should be noted that the slaughtered animals come from farms regardless of origin and that in the event of a diagnosis, the definitive solution requires surgery ^[25] with ruminotomy constituting an alternative in areas where no precaution is taken upstream ^[33], the analysis of memorials and the clinic having facilitated the diagnosis ^[34].

Thus the curative therapy of foreign bodies has been attempted empirically by the administration of certain potions in vain ^[10]. It is clear that the plastic resists so much that nothing destroys it now in the rumen of animals, its frequency is very significant at slaughter as is the case during ruminotomy ^[33].

We remain of the opinion that the management of solid household and miscellaneous waste must take into account all the links on the one hand and on the other hand that the rationing of animals, including the supplement, should be a concern for farmers in order to avoid the recurrence which in the long run can make the local goat disappear.

In countries where plastic substances are accepted as packaging and after various services they are found in the form of waste, it is difficult to remove animals from contact with this waste. During transport by trek, hungry animals, not supplemented with salts during transit and quarantine, are forced to graze and often manifest pica by ingesting various wastes, including plastics and fabrics. These bodies encountered in the rumen can cause digestive damage, which can lead to a complicated general attack that ends in a drop in zootechnical performance and the death of the animal.

Regarding the thesis of Zegels (2016) ^[28], the opinion on the voluntary administration of plastics does not find its place, especially since it is noted that animals in housing are exposed to deficiencies with the resulting consequences.

In the treatment of solid waste, apart from the recycling of plastics and glassware ^[29] the recovery of organic and miscellaneous waste ^[36].

Conclusion

At the end of this study, we followed the state of slaughter animals admitted to the slaughterhouse and in the killings of

the city of Bukavu and its outskirts to understand the presence of foreign bodies in the rumen of slaughtered animals, their frequency and the resulting animal health problems.

The presence of these foreign bodies gives a strong signal in taking this condition into account as a danger in ruminant and particularly goat farms.

The provenance of slaughtered and slaughtered cattle suggests that it is not only imported animals that give a positive diagnosis but also animals from local markets. The breeding of ruminants, especially goats, is characterized by bad behavior dominated by wandering.

In the elaboration of the diagnostic model in the form of a simple protocol of differential with the affections of chronic appearance among others the verminoses, the nutritional diseases and the transmissible parasitoses, it is certain that the presence of plastics (rubber) in the rumen after sufficient time creates discomfort in the digestive tract. Abdominal palpation, in some cases, led to a presumptive diagnosis which was confirmed from two angles: after slaughter of cattle and goats or after surgery.

The solution proposed as a degradation product has no *in vitro* effect on the sachets and other substances that we have found.

Also in authorized straying, as is the case in some entities, the animals do not receive a food supplement and seek it at all costs in an environment which, moreover, is much polluted with indigestible and non-biodegradable foreign bodies. The bait stimulus appears to be oil, salt, dried urine, or any sort of substance that may cause palatability in animals.

The environment is sufficiently soiled by garbage, including bags. Poor livestock management predisposes goats to various diseases, goats carrying foreign bodies, although this goes unnoticed until they fall into mortal physiological misery.

To carry out prophylaxis, it is advisable to clean up the environment by organizing collection in areas where solid waste is scattered, then proceed to the destruction or recycling of any waste of any origin whatsoever (plastic, fabric, metal ...) in urban areas and continue far into pastures and fields. For farms in stalls, ensure proper management.

We can only suggest sanitation, which is of paramount importance, and a suitable breeding method according to zootechnical standards, without which the surgical approach cannot, in fact, be a palliative, especially since animals accustomed to consuming foreign bodies always do it when an opportunity presents itself. Nevertheless, a pure research on ruminotomy would intervene within the framework of the protection of the genetic potential and the non-extinction of the goat and the cow imported intended for the breeding.

Thus we strongly recommend to prevent the wandering of the animals, to improve the food ration and well balanced, to make the deworming (internal and external) periodic and to vaccinate all the animals against the endemic diseases taking into account the conditions of breeding.

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