American Journal of Plant Sciences, 2014, 5, 2948-2955
Published Online September 2014 in SciRes. http://www.scirp.org/journal/ajps
http://dx.doi.org/10.4236/ajps.2014.520311

Scientific Research

Assessing Post-Conflict Challenges and Opportunities of the Animal-Agriculture System in the Alpine Region of Uvira District in Sud-Kivu Province, D. R. Congo

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Received 13 July 2014; revised 14 August 2014; accepted 1 September 2014

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Abstract

The Alpine region of Uvira District in South-Kivu Province faces low agricultural productivity challenges largely due to human population pressure on the natural resource base. During the dry season, conflicts between crop farmers and livestock breeders are common. This region is located 2500 - 3020 m a.s.l. and is almost inaccessible due to poor road infrastructure. To understand the interactions between natural resources (forests, pastures, soils) and sedentary agriculture, and to propose solutions for sustainable natural resource management, Participatory Rural Appraisal (PRA) sessions covering three farmer group interviews were conducted in July 2010 in Marungu, Kitembe and Kahololo location. The livelihoods of the Banyamulenge have been transformed from pastoralism to a sedentary system with the introduction of crop cultivation after 1980. Maize, bush beans and Irish potatoes are cultivated with limited success because of late crop maturity under the prevailing climatic conditions. Livestock, mainly cattle, sheep and goats is managed under extensive system, relying on natural pasture far from the human settlements. Livestock plays an important role to define people's wealth and is mainly managed by men. There is a real need of forages during the dry season; however, cultivation of forages is unknown. On the other hand, pastures appear to be degenerating due to overgrazing. Access by farmers to efficient and effective agricultural extension services is fundamental in order to promote locally adapted and profitable crop and livestock production while at the same time, sustaining the productive resource base and security.

How to cite this paper: Katunga, M.M.D. and Muhigwa, J.-B. (2014) Assessing Post-Conflict Challenges and Opportunities of the Animal-Agriculture System in the Alpine Region of Uvira District in Sud-Kivu Province, D. R. Congo. *American Journal of Plant Sciences*, **5**, 2948-2955. http://dx.doi.org/10.4236/ajps.2014.520311

Keywords

Livestock, Agriculture, Alpine Region, D. R. Congo

1. Introduction

The highlands of Uvira in South-Kivu province of D. R. Congo (D. R. Congo) face massive problems such as low crop productivity and human pressure on natural vegetation like pastures and forests, similar to those in other highland regions, for example in Nepal [1] [2]. Studies are almost inexistent in this region, not much different from other parts of the country due to a long period of conflicts and wars, especially in the eastern part of D. R. Congo [3]. During the current post-conflict period, this region needs help to stabilize the relationship between the natural resources available and their utilization. Forage availability in terms of quantity and quality to feed animals is limited for the farmers, especially in the dry season when there are many conflicts between crop farmers and livestock holders. Much of the livestock infrastructure in D. R. Congo has been destroyed. The impacts of the decade-long war on the livestock sector have been devastating. Livestock numbers have dramatically decreased due to theft, diseases and out-migration reducing the production capacity in meat, milk and secondary products [4]. In addition, support services from pharmaceutical supplies, veterinarians, government extensions and other general livestock services have collapsed [5]. With regard to natural resource management, bush fire is usually utilized in the cropping system to burn fallow areas. In spite of this situation, the pressure of animals on the pastures is high and forages are not enough to support the number of grazing animals like in Southwestern China [6]. The objective of this study was to understand the concerns and shortfalls of people in crop, livestock husbandry and to develop solutions together with people in this Alpine region for the improvement of their crop and livestock production.

2. Material and Methods

Uvira is one of nine districts of South-Kivu province, D. R. Congo. The three locations visited, Marungu, Kitembe and Kahololo, are administrative sectors of Bafuliru division in the Alpine region located between 2500 m and 3020 m a.s.l. Ruzizi valley is ca. 900 m and surrounded by the midlands up to 1500 m a.s.l., the highlands extend between 1500 - 2500 m a.s.l. Marungu comparatively offers many more administrative opportunities. It is at latitudes 3.13˚S - 28.54˚E ca. 10 km to Kitembe in the North and Kahololo at about 15 km in the East (**Figure 1**).

Climate is Cw Köppen with *Hagenia abyssinica* forest. Temperature is between 10˚C to 17˚C, vegetation cycle is around 270 days and rainfall around 1300 mm (BEST, in prep.) (**Figure 2**).

A team was organized with 5 enumerators, one agronomist from the International Committee of the Red Cross (ICRC) and a supervisor. Training was carried out during one day at ICRC office Bukavu to understand and revisit, if necessary, the guiding questionnaire. Then we walked together with local people to observe the pastures and the vegetation in general. We also met people to understand their life styles. A Participatory Rural Appraisal (PRA) was performed [7] by applying the same tools from 21 July 2010 to 26 July 2010. In each location, three focus groups were formed. The first was composed by men, the second one by women. These first two focus groups worked on agriculture (rainfall, cropping system, forage production and livestock). The third focus group produced the gender wealth classification and elaborated on market issues. After working in groups, a general presentation of each group was usually done on the second day at each location in order to discuss the finding and complete the data. A total of 120 persons were interviewed during the PRA, respectively at Marungu 11 men and 7 women, Kitembe 30 men and 20 women, Kahololo 25 men and 27 women. Numbers of animals were converted into Total Livestock Unit (TLU). Factors of conversion used were for cattle 0.7, goat and sheep 0.1, pork 0.2, hen 0.01, duck 0.02 TLU [8]. Yearly total income per household is estimated on the basis of daily consumption where very low is 200 - 350 $, low 350 - 1049 $, medium 1050 - 1750 $, upper >1751 $ [9]. A correspondence analysis of TLU in wealth classification was done in Past version 2.14 with data from the three locations on rich, medium, poor and very poor people.

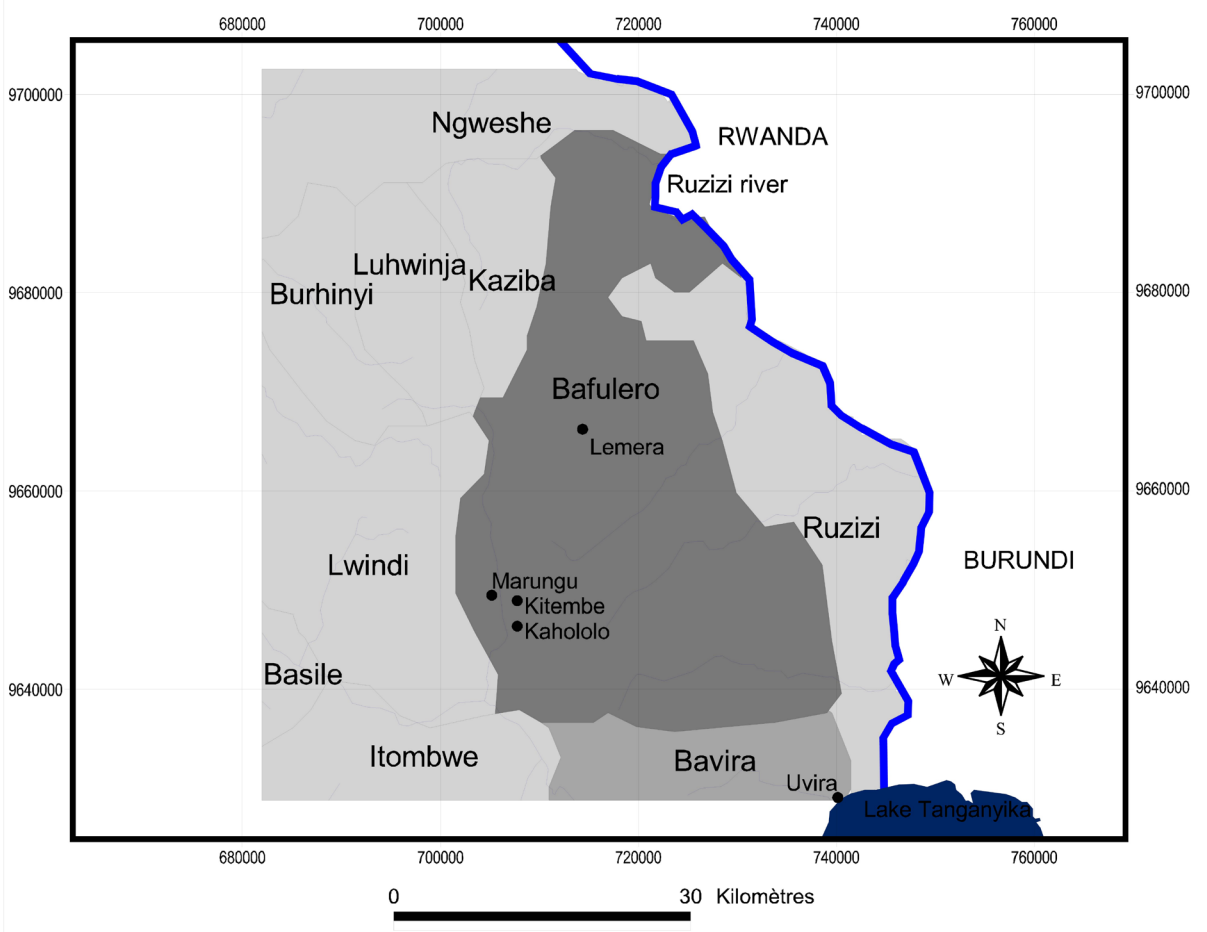


Figure 1. Location map of the study area.

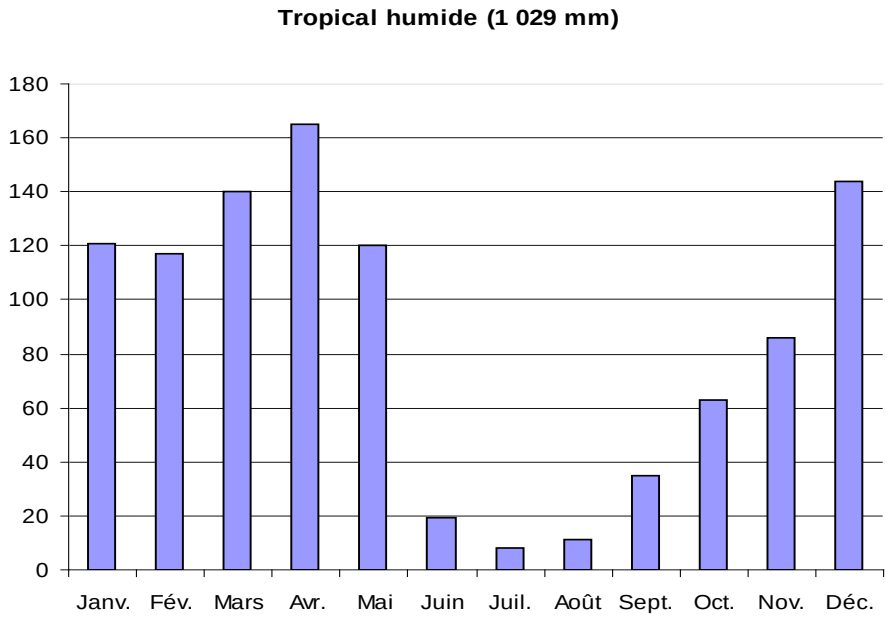


Figure 2. Rainfall pattern during the average year in Marungu region (BEST, in prep.).

3. Results

3.1. Crop Cultivation

Rainfall follows a bimodal pattern. In the three locations, the long rainy season is from October to January and the short rains from mid February to June. Dry seasons are, from July to September and in mid February. Some climate change is perceived because, in 2009, the beginning of the rainy season was in September. Trees are cut for firewood, construction, boards and pastures creation. The crops mentioned by people are Irish potatoes, maize, beans, cowpea, cabbage and the newly introduced carrots, amaranths, onions and spring onions. The main crops are maize, Irish potatoes and bush beans, while cowpeas are less cultivated. Potatoes and maize were said to be introduced around 1985 by a local NGO "Groupe Milima". Maize is harvested after a long period of 12 months. Onions have recently been introduced to Kitembe by a farmer, whereas amaranth and spring onions have been introduced by another farmer to Kahololo. These crops show a good production. Before 1985, the Banyamulenge only lived in a pastoral system and they usually shifted where they could find forages for their cattle. With these crops introduced, they started to integrate crop cultivation into their system; so now they become sedentary. All the people (*i.e.*, Banyamulenge, Bafuliru, Banyindu, Bashi, etc.) who live in the "Division" of Kigoma have a crop field. The main challenge is that the crops take a long period to grow, especially bush beans and maize. The seeds seem to be degenerated and should be replaced. The cropping calendar is essentially similar in the three locations (**Table 1**). Except for maize, all main crops have two sowing periods: during the long rains (LR) and the short rains (SR). Harvesting (H) is done all over the year. In the dry season (DS), activities are mainly harvesting, sowing (S) and weeding (W) is done in November, December, February and March. Spring onions and amaranths offer the opportunity to be planted in the SR and, therefore, help to distribute labor throughout the year. No fertilizer is utilized to enhance the crop production and soil erosion on slopes is not prevented at all.

During the post-harvest period, maize is manually ground at home in a mortar or in a mill at Marungu. Maize, cowpea and bush beans are kept in bags in the house. Irish potatoes are kept by exposing them under a rack in the house. Sometimes, the farmers hire people from Walungu District for cultivation. Fruits are not cultivated in any of the three locations, except for the naturalized *Physalis peruviana* that is collected in the bush. There is a narrow link between the Alpine region and the midlands. At Kahololo, farmers do their crops production in the midlands and they spend at least two hours each day to reach their fields. Many crops which are not cultivated in the Alpine region come from the midlands and lowlands; e.g. cassava, cassava leaves, some bush beans, fruits and other various products for their trade.

3.2. Livestock Husbandry

The livestock system practiced in Kigoma is extensive. At Marungu and Kahololo, cows, goats and sheep are led far from the homesteads and the cows are left on the pastures without a cowboy, except when the owner comes to watch them or lead them for drinking water. At Kitembe, all animals are kept with a cowboy, due to land pressure except during the rainy season goats and pigs are reared near the homesteads or in zero-grazing when crop residues and potato vines are available in April and May. Only Bafuliru and Banyindu seem to be pig

Table 1. Cropping calendar in the locations.

	J	F	M	A	M	J	J	A	S	O	N	D
Rainfall	LR	DS/SR	SR	SR	SR	SR	DS	DS	DS	LR	LR	
Crop												
Maize		W	W			H	H	S/H	S		W	W
Bush bean		S/H	S/H				H	S/H	S		W	W
Cowpea		S/H	S				H	S/H	S		W	W
Potatoes	H	S/H	S/H			H	H	S/H	S		W	W
Cabbage	H	S/H			H	H		H		S	W	W
Onions		S/H	S					H		S	W	W
Spring onions				S								
Amaranth				S								

farmers. Cowboys come from the same farm or other farms in the village. At Marungu, there are some cowboys from Rwanda, Burundi or Walungu District.

In the three locations, the ranking of animals according to their numbers deceasing in order was as follows: sheep, goats, cattle, poultry and pigs (**Table 2**). This finding was surprising because all people from this region think that cattle should keep the first place. The sheep appear to be of an African breed because of their fat tail or not. The cattle are apparently hybrids from several strains with an Ankole basis; therefore, it is not easy to determine straightaway their breeds or types. Inbreeding is not prevented from, and the males of all livestock species come from either the same farmer or the neighbors. Milk production is about 270 - 540 L during 270 days per lactation. The interval of births and age at first calving (**Table 2**) confirm that livestock husbandry in the three locations is still traditional. The interval of births of 24 - 36 months and the time of weaning of 12 - 18 months of cows is the same at Marungu and Kitembe, but somehow shorter at Kaholoolo. The reason could be the better availability of forages in Kaholoolo than in the two other locations. Otherwise, the livestock production parameters gathered were very similar among the three locations. People reported numerous livestock diseases. Cows usually suffer from tuberculosis (TB), contagious bovine pleuropneumonia (CBPP), anthrax, worms, three-day or Pappataci fever, tick diseases, conjunctivitis or vaginal prolapse. Goats usually suffer from parasitic botflies (Oestridae) and worms. Sheep suffer from varicella infection, worms and scabies. The main diseases of the pigs are African Swine Fever and worms, while poultry usually suffers from New Castle Disease. To prevent from diseases, some vaccinations have been carried out. The ICRC has previously performed vaccination against CBPP and will soon do a combined vaccination against CBPP and Anthrax. The natural grasslands are composed of productive and palatable grasses like *Pennisetum clandestinum*, *Panicum repens* over a long growing season, *Digitaria vestita*, *Cynodon dactylon*, however, also *Carex* sp. (Cariceae) and *Mariscus umbellatus* (Cyperaceae) occur. Other frequent species like *Exotheca abyssinica* and *Aristida* sp. are grazed well only when young because with maturity they develop tough leaves. Generally pastures appear to be deteriorating due to overgrazing and *Pennisetum clandestinum* have a high risk to diminish or even disappear. Forages are normally most abundant during the rainy season from October to May, while there is a lack of feed during the dry season (July to September). Animals are usually left in the fallow after crop harvest. Crop residues are those of maize, vines and peelings of potatoes, and cabbage leaves. Due to lack of forages mainly in dry season, there are always conflicts between crop farmers and livestock breeders. Otherwise, all the pastures collectively belong to the community, and the various animal species cohabit within the herds of the tribes who live in the region. Bush fires are always used to burn the pastures during the dry season. Among the people interviewed, there was neither any knowledge about forages cultivation in the three locations, nor had they ever heard about other forage technologies, like silage, hay or even cut and carry. In general, cattle do not receive any nutrition supplement to their basic diet of grazed pastures. The dairy cattle and their calves are kept near the houses and fed on fallowed fields. Sometimes, however, they are fed a supplement of maize grain and salt provided by some farmers. With the lack of feed, sedentary life leads to more conflicts between crop farmers and livestock breeders.

Table 2. Interval of birth, weaning and wealth animal classification in the locations.

Parameters	Animal species	Marungu	Kitembe	Kaholoolo
Interval of births (months)	Cattle	26 - 36	24 - 36	24
	Sheep	12	12	6 - 12
	Goat	12	6 - 12	6 - 12
	Pig	6	9 - 12	6
	Poultry	3	3 - 4	4
Age at first calving (months)	Cattle	12 - 18	12 - 18	8 - 12
	Sheep	5	5	5
	Goat	5 - 6	6 - 7	5 - 6
	Pig	2	2	2
	Poultry	3	2	2
Animal classification according to their number	Cattle	3	3	3
	Sheep	1	1	1
	Goat	2	2	2
	Pig	5	5	5
	Poultry	4	4	4

By overgrazing and burning, the pastures are deteriorating and ought to be improved by better management. This also applies for the forest.

3.3. Wealth Classification

Regarding the local wealth classification, animals play a very important role for the people in the region to define their wealth. Cattle have a big importance in each location, but there is a difference among the location. Kahololo seems to have more animal than the two other locations. It is followed by Marungu and Kitembe.

Rich farmers at Kahololo are confirmed to be wealthier, see **Table 3**. Marungu takes the second place followed by Kitembe. Cattle still keep the good wealth classification. But, according to a woman from Marungu, the farmers who have a large number of cows are living like the other farmers without any social improvement. Their nutrition and their houses are the same like those of all the other farmers in the village. But they have a possibility to send their children away for education to even study up to university level. **Figure 3** shows the TLU per specie in wealth classification.

The choice of cattle and goat is prominent with Marungu rich, Kahololo rich and Kahololo medium; sheep by Kitembe medium and Kitembe rich; pig by Marungu very poor and poultry by Kahololo poor, Marungu very poor.

3.4. Market Issues

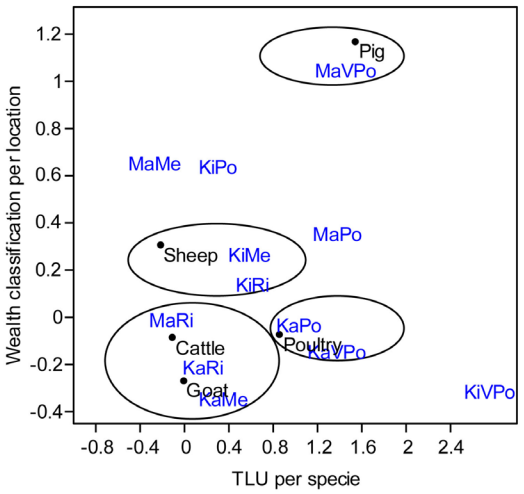
All three locations have weekly market days, where products are sold and others are purchased. Bush beans and cowpeas are sold in July and September, whereas potatoes are sold all the year round. Buying potatoes is mainly in May and September. Maize is sold from November to May and is bought from July to September. As part of the market, the animals are sold in the village by exchanging them with crop production during the harvest period. To sell all the categories of animal, young, female or male, etc. depends on the needs of the farmer. Animal prices are almost the same in the three locations and even in Bukavu town. A cow weighing 250 - 300 kg is paid 350 - 400 $, goat and sheep of 25 - 30 kg is paid 40 $, goat and sheep 30 $; pig of 90 - 100 kg is paid 100 - 120 $, cock of 1.5 - 2 kg is paid 10 $ and egg 0.9 $. Usually, neither milk nor skins are sold. Beef meat of cattle is seldom sold, except when the animal was ill. But goat/sheep meat and pork are available on the local market. There is a good market connection between the Alpine, midlands and lowlands.

3.5. Challenges

The most important challenges encountered by the farmers in each location are lack of extension services and security issues. Looting of crops and animals during the wars has reduced the assets even though there still is an insufficiency of pastures. In Marungu, crops are often destroyed by the animals. And, due to lack of fodders in

Table 3. Total livestock unit (TLU) per location.

Locality		Rich	Medium	Poor	Very poor
Marungu	Cattle	80	25	2	0
	Sheep	90	55	5	2
	Goat	70	0	4	1
	Poultry	0	0	7	1
	Pig	0	0	2	1
Kitembe	Cattle	50	6	1	0
	Sheep	45	15	5	0
	Goat	40	10	3	0
	Poultry	30	7	0	2
	Pig	10	2	1	0
Kahololo	Cattle	150	50	3	0
	Sheep	150	15	3	1
	Goat	200	30	1	1
	Poultry	50	15	5	2



Variances explained by the two first axes is 80.3%,
MaRi = Marungu rich,
MaMe = Marungu Medium,
MaVPo = Marungu very poor,
KiRi = Kitembe rich,
KiMe = KitembeMedium,
KiVPo = Kitembe very poor,
KaRi = Kahololo rich,
KaMe = Kahololo Medium,
KaVPo = Kahololo very poor

Figure 3. Correspondence analysis of wealth animal classification.

the dry season, the animal production is low. Similarly, in Kitembe, the lack of fodders in the dry season has been highlighted. In addition, people raised the issue of a lack of organization and the conflicts between crop farmers and livestock breeders. In Kahololo, finally a number of difficulties were named. People perceive the impossibility of locally processing maize as an issue. There are diseases and pests. Old persons lack assistance. Generally, there is a lack of fertilizer, manure is not largely used. There is a shortage of improved seeds and medicines.

4. Discussion

Deforestation, overgrazing and soil erosion, loss of soil fertility characterize the environment of the three locations. They are alarming indicators in term of sustainability due to rapid population pressure like in Southwestern China [6]. Manure is not well valorized while it should have been used to improve soil fertility alongside with agroforestery system [10]. Potatoes and bush beans are almost the same in a similar ecological region of Pakistan, [11] except for wheat that is not yet disseminated in these three locations. The goats seem to be East African goats [12]. The genetic potential of animals can be improved mainly if the management of animal-agriculture system changes towards the intensification system [4]. The interval of birth in the dairy cows is still too long; in Algeria it is estimated 1.45 years [13]. The natural grasslands are composed of productive and palatable grasses like *Pennisetum clandestinum*, *Panicum repens* over a long growing season [14]. How will communal pastures be used in the future when people move towards zero-grazing, etc.? However, the typical *Exotheca* sp. grasslands have a low carrying capacity; typically one animal per five to ten hectares and the nutritive value of the grasses is low throughout the year [14]. There is a lack of market access [7] and animal production is low. Agroforestery provides a promising resources-centered technology to meet the twin goals of productivity and conservation [6]. To solve problems met in this region, the security should be the first one to be guaranteed. Moreover, inaccessibility to education is preventing development in these mountainous communities. Roads should be rehabilitated. The agroforestery applied with the strengthening of the extension services (genetic improvement of livestock, animal health, improvement of crops and forage crops, organizing post-harvest and market) must be efficient for the farmers while capacitating them. Agriculture techniques and improved livestock husbandry profitable to the environment should be enhanced.

5. Conclusion

Crops are not diversified and productivity is low, mainly for maize and bush beans. However, some introductions of new crops have given people the chance to access to other markets. Erosion control is not implemented. The animal husbandry in the Alpine region of Uvira is extensive. Diseases and insufficient animal feeding are among the main gaps of the livestock development. Pastures suffer from overgrazing and destruction of the vegetation cover. Cows have the highest wealth classification. In spite of the practice of the common livestock

husbandry in the region, forage cropping is unknown. Better security and good roads should improve the market in the region. In this ecological zone, the Government Extension services and NGOS such as CIALCA, INERA, ICRC and other extension services should help the farmers in their animal-agriculture production.

Acknowledgements

The research was funded by Economy and Food Security of ICRC Delegation in Bukavu in The Democratic Republic of Congo with the collaboration of the National Institute of Agriculture Studies and Research (INERA) Mulungu, D. R. Congo. Special thanks are addressed to especially Simon Piers, Jadot Batila and *in memorium* Pascal Barholere of ICRC for their good collaboration.

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