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RESEARCH ARTICLE

NOTE ON AVAILABLE FEED FOR LIVESTOCK IN EASTERN SENEGAL AND UPPER SENEGAL RIVER BASIN.

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Abstract

Extensive farming in the Sahel is mainly limited by natural or human-induced constraints. Aridity and over-exploitation of rangeland factors induces availability of feed resources for livestock.

Objectives:- this is a contribution note of livestock feed constraints, including: (i) identification of main constraints for animal feeding in that area; (ii) assessing the amount of biomass produced and opportunities use of this characteristics pasture of Sahel region.

Method:- with herbaceous biomass sampling sheet and interviews with groups of farmers in the study area, it was possible to estimate the quantity and quality of forage grass available on natural pasture during the dry season.

Results:- biomass production hardly exceeds one ton per hectare in the dry season, averaging between 600 and 800 kg / ha consisting grasses mainly. Leguminous are available in small proportions such *Zornia glochidiata*. Remarkable peak of biomass production are raised in the locality of Koundel with 1578.76 kg / ha and about 1566 kg / ha in Lescadié locality. On these pastures, the average of biomass is 1,063.03 kg / ha. Pasture capacity of the sites varies 4ha / UBT more than 10ha / UBT (UBT : Unité bétail tropical (Tropical Livestock Unit), is a theoretical cattle weighing 250 kg) with an average of 6,13ha / UBT. Herbaceous pasture is composed mainly of grasses.

Conclusion:- the pasture deficit noted, leads farmers to prune trees for animals feed; which contributes to the ecosystems degradation. Crop residues exist, but are undervalued. Producers need to be sensitized and trained to better use of crop residues.

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Introduction:-

Ruminant feeding in Senegal, raises a very important issue, especially in extensive systems. Forages which are the main component of animals' diet come from rangeland. Now, these routes are exposed to various pressures, both

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natural (drought) and anthropogenic (bush fires, overexploitation ...). So that rangeland production is affected, because as livestock land resource requirements are enormous (FAO, 2014).

Livestock in north-east part of Senegal is limited by many constraints that are primarily natural or human-induced hindering its development. In those constraints, livestock feed is prominently, especially in the dry season when pastures (main livestock feed sources) are experiencing a drastic decline in their production of forage biomass. This fact induce an animals' feed shortage situation, pushing farmers to increase pressure on natural resources and / or to transhumant in less hostile areas.

This study is a contribution to know livestock feed constraints Eastern Senegal and Upper Senegal River Basin. It has two specific objectives: (i) identify the main constraints that oppose good livestock feeding in eastern Senegal and Upper River Basin Senegal and practices develop by farmers to face and; (ii) assess the amount of biomass produced and opportunities for a best exploitation according the pasture load capacity for ruminants in this specific pasture of Sahel region.

Materials and methods:-

Trials sites:-

The sites are located in the Senegal River top Basin. They are divided between Tambacounda and Matam (see Figure 1). The vegetation a shrub steppetype, with a grass cover dominated by *Aristida funiculata* and *A. mitabilis* with a relatively large presence of ligneous, especially *Combretum* which is the dominant species in Boundou area. Others thornies species like *Acacia seyal* and *Balanites aegyptiaca* are met in the northern part (Bakel and Matam). The hydraulic system, except Faleme and Senegal rivers, is characterized by fossil valleys clogged in the rainy season (July-October) but dry up in the dry season.

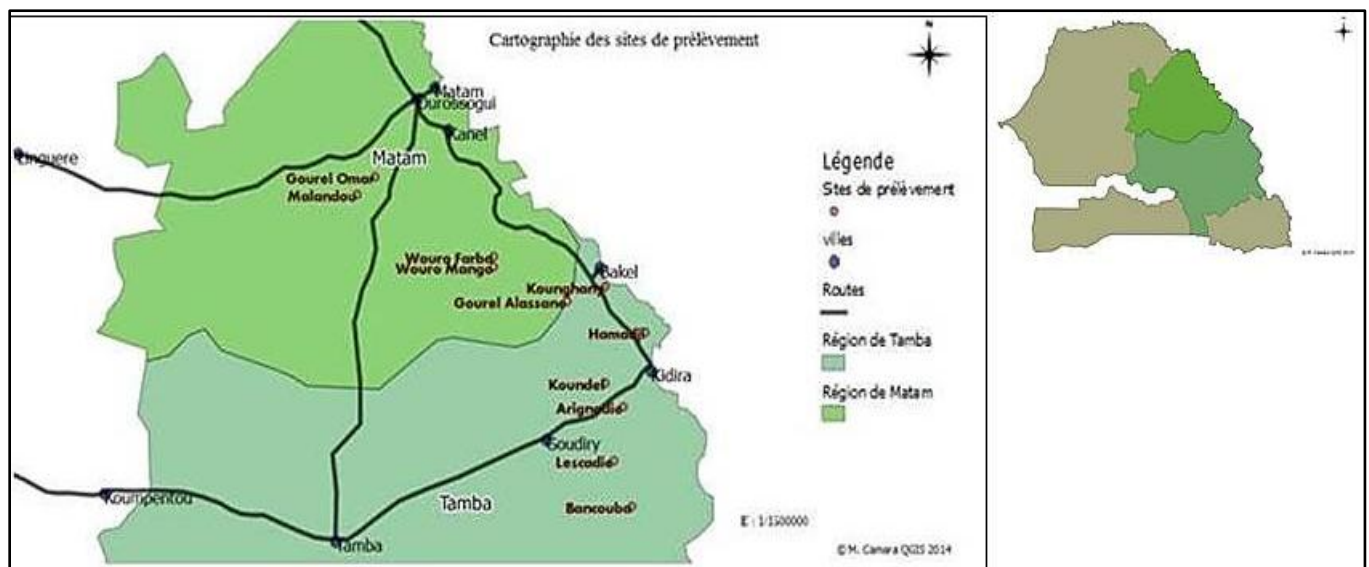


Figure 1:- Study sites localisation.

Equipment:-

The material used is composed of:

- ❖ A plot 1m²: it is a handmade wooden square of 1 meter square,
- ❖ A precision digital scale with a maximum range of 25 kg
- ❖ An oven set at 60 ° C.

Sampling method and sample processing:-

The estimation of biomass production was made by the method of full harvest (AKPO et al. 1993). This method involves cutting the herbaceous close to the ground in the plots located 5 times with 25 m intervals on a representative 1km long of corridor route. The layout of the plots is random, the square is thrown randomly every 25 meters. The length of the corridor does not exceed 1 km, but the sequence of sampling intervals shows the change in

the type of substrate and grass cover on the same site. The number of samples varies from 1 to 5 according to the sites.

Samples are weighed, and then placed in an oven at a temperature of 60 ° C for 72 hours. After obtaining a constant weight due to loss of moisture, they were weighed again to determine the dry matter (DM) content.

Regarding the floristic composition, we relied on a previously formed from herbarium illustrated flora of Senegal (Berhaut, 1988) to identify the species that we have sorted manually. Species that could not be identified were classified by groups "other grasses"; legumes; timber. Finally, crop residues are classified as "straws". The weight of each species or group of species is then assessed in relation to the total weight of the sample. The charge capacity in UBT / ha / year was calculated by the formula:

$$CC(\text{ha/UBT/year}) = \frac{\text{Feed need/UBT/year}}{\text{BM} * \text{CU}}$$

With: BM: maximum biomass; UBT (TLU): Tropical Livestock Unit; CU: coefficient of utilization; CC = pastoral charge capacity.

Recording of sociological data:-

To collect sociological information, a focus groups interviews is conducted in 11 villages that are hosting biomass sampling sites. The questionnaire concerned animals rearing, feed resource use practices, conditions of access on feed. Part of the questionnaire also focused on the most used of ligneous in livestock feed, mode and operating period. In total, thirty people in nine villages were interviewed.

Data processing:-

The data were processed for a statistical processing (classifications, distributions ...) including crosstabs, by *The Sphinx plus* software.

Results and Discussions:-

Pasture use:-

The livestock feeding mode is predominantly extensive type, almost without complementation (less than 18% of the farmers surveyed do complementation). Therefore, animals' feeding is almost exclusively based on rangeland exploitation, already weakened by the lack of rainfall and the adverse effects of bushfires. It follows a shortage of cattle feeding, causing farmers to quite adopt a destructive behavior of their environment. During certain periods, crop residues are available in relatively abundant quantities in the sites. Their support contributes at least, to reduce the impact of feed shortages during a part of the year, but, again, the use of these residues is not rationally (almost feed straw consumed is not properly distributed and is penning by animals during the night). Many breeders are sedentary, they rear animals every day for a pasture and flocks back to the village for night. That's a time where animals drink and stay around the village and use harvested fields where residue can be exploited for feed.

The extensive systems of animals' rearing, exploit an itinerant pasture. According to their definition of extensive systems, SERE and STEINFELD (1995) argue that pastoral areas derive more than 90% of the diet of livestock on natural pastures. Our observations in our study sites confirm this. Regarding ligneous, ICKOWICZ (1995) argues that only a part of the total biomass of leaf assessed is consumed by animals, it is the available volume. However, in case of pronounced deficit, the entire leaf biomass can be made available by the breeders who prune trees, contributing to further degradation of the ecosystem. This demonstrates the importance of ligneous in the diets of animals including small ruminants. Indeed according Traore (1998) ligneous trees participate in 90% goat diet, 70% for sheep and 35% for cattle.

Productivity of herbaceous biomass:-

Due to bush fires occurred during the study, some sites like Bancouba were almost completely destroyed, not allowing any measure. Thus, of the 11 sites chosen initially, only 06 were able to provide enough sufficient biomass production to make significant sampling. Also, the site of Koungny has not been sampled because it is in the bed of the Senegal River, a flood zone of gilgai soil (clay microrelief formed by clay swelling following a hydration period). This kind of terrain does not promote the growth of herbaceous layer even it is characterized by a high density of *Acacia nilotica*.

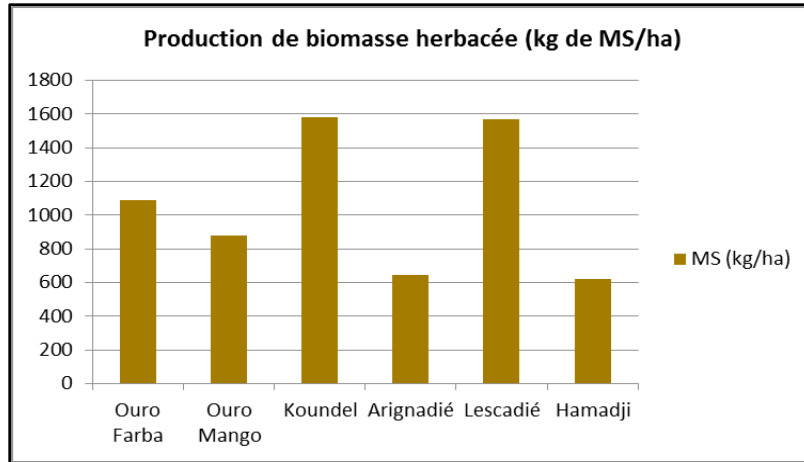


Figure 2:- Average production of biomass routes.

Of all the sites studied, biomass production hardly exceeds one ton per hectare in the dry season (Figure 2); the average being between 600 and 800 kg / ha, withgrasses compound essentially. Samples shows that it is common to find a few amounts of leguminouslike *Zornia glochidiata* in dehydration state. This can be explained by the physiological state of the vegetation at this time of advanced drought. The prominent peaks for biomass production are to 1578.76 kg / ha in the site of Koundel and around 1566 kg / ha in Lescadié site. On these pasture area, the average production of biomass is 1063.03 kg / ha.

The amounts of biomass evaluated on sites are consistent with those found in previous studies. GUERIN (1987) argues that 250 kg / ha of herbaceous biomass are actually consumed by animals on a production of about 900 kg / ha of dry matter for all species in the lower Ferlo, meaning a consumption of 28%. Also, FAO carried out a classification of drylands in which it characterizes the Sahel by plant biomass production of 1,000 kg of dry matter per hectare and a charge capacity of 7 ha / UBT, which is comparable to our study.

Pasture herbaceous charge capacity:-

The estimated production of pasture is used to calculate the charge capacity by using the ratio between the maximum production of biomass corrected by the duty cycle (35%) and the needs of feed for an UBT. The charge capacity of rangeland sites studied (excluding other feed sources) varies from 4ha / UBT to more than 10ha / UBT, with an average of 6,13ha / UBT (Figure 3).

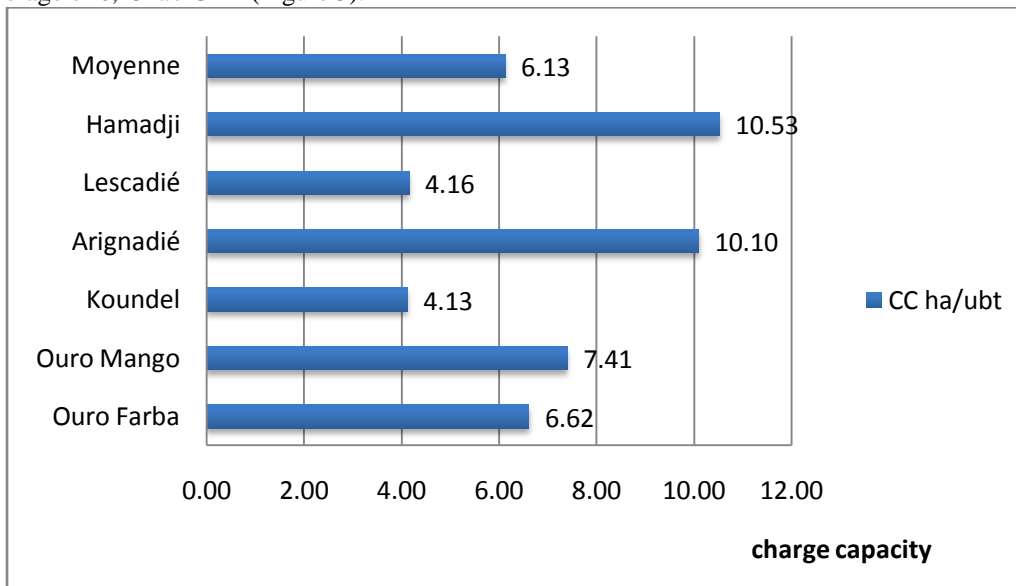


Figure 3:- charge capacity of rangeland ha / UBT.

Herbaceous biomass deficit leads farmers to prune branches of trees to allow livestock to access it like feed, this situation brings all risks that come up (drought, soil vulnerability to erosion and fire, desertification ...). The importance of ligneous as source of nitrogenous and especially as the main animals' feed available in the dry season, make them subjected to unwanted cuts. Species such as *Acacia seyal* and *Balanitesaegyptiaca* (desert date), which are dominant trees in this landscape, are particularly palatable by ruminants. Sheep and goats are better able to eat the small bipinnated leaves protected by thorns. *Bohiniarufescens* species, which maintains its greenery throughout the dry season, provides leaves and pods especially eaten by goats.

Floristic composition of pasture:-

The manual sorting of samples allowed us to identify many species (Table 1), despite the difficulty posed by identification of individual species at this phenological stage. Nevertheless, it is possible to notice the recurrence of *Aristida funiculata* whose dead individuals remain standing until late in the dry season. It represents 41% of species identified at Arignadié site then 11% and 13% respectively at Hamadji and Koundel sites. For sites where the sorting was heavily biased due to the disintegration of the biomass, we were still able to determine a presence of *A. funiculata* up to 2.11% at Lescadié (Kidira area); 1.81% in OuroFarba and less than 1% in Ouro Mango (Matam region). Other species of grasses as *Aristida funiculata*, *Schoenefeldiagracilis* and *Cenchrusbifoliorus* met in low proportions. Finally, in the sorting of samples, leaves of some ligneous as *Bosciasenegalensis* and *Combretummicratum* were identified.

In general, the pasture compounds were essentially herbaceous grasses. However, it is common to find a few amounts of leguminous like *Zornia glochidiata* in a state of dehydration. The dominance of annual grasses in the dry season was mentioned by TOUTAIN and LHOSTE (1978). They argue that the carpet is arranged more or less continuous. "The straws up of these grasses are the main reserve of forage during 9 months of the dry season," they said.

Tableau 1:- répartition des espèces fourragères selon le site.

Site	Species	Frequency	Site	Species	Frequency
OuroFarba	<i>A. funiculata</i>	1,81%	Ouro Mango	<i>A. mitabilmo</i>	0,10%
	<i>Z. glochidiata</i>	0,82%		<i>Z. glochidiata</i>	0,45%
	<i>C. bifoliorus</i>	1,27%		<i>A. funiculata</i>	0,65%
	Ligneux	7,04%		<i>S. gracilis</i>	0,01%
	Autre herbacées	7,34%		Autre herbacées	0,72%
	Autres graminées	40,03%		Ligneux	2,05%
	Pailles	41,69%		Autres graminées	22,60%
			Pailles	73,41%	
Site	Species	Frequency	Site	Species	Frequency
Hamadji	Autre graminées	27,14%	Arignadié	Autres graminées	13,18%
	<i>A. funiculata</i>	11,63%		Pailles	39,20%
	Pailles	59,70%		Autre herbacées	2,60%
	<i>Z. glochidiata</i>	0,08%		Ligneux	3,79%
	Ligneux	0,71%		<i>A. funiculata</i>	41,23%
	<i>S. gracilis</i>	0,22%			
	Autre herbacées	0,53%			

Conclusion:-

Herbaceous biomass production on rangelands upper Senegal basin varies by site, but remains low compared to the needs of the animals. This output is however, relatively stable over time. The degradation is becoming alarming in cases where overgrazing and pressure of human activities disrupt the balance between the environment and the total stocking. Indeed, the double exploitation (grazing and domestic uses) which are subjects' woody regeneration poses a problem.

The only biomass of course not enough to maintain the herd during the lean season. Thus we note long periods of food shortage, pushing farmers to go transhumance over long distances and long term. It also causes food shortages, loss of production and even cases of livestock mortality. It would then resort to other food sources such as crop

residues, or rely on livestock backup operations (distribution of concentrated feed at subsidized prices). Cereal straws are available in relatively abundant but are not valued. This would disseminate improved processing techniques food value of these flaws.

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