GSC Advanced Research and Reviews

eISSN: 2582-4597 CODEN (USA): GARRC2

Cross Ref DOI: 10.30574/gscarr

Journal homepage: https://gsconlinepress.com/journals/gscarr/

(RESEARCH ARTICLE)

Check for updates

Endogenous feeding management practices on small ruminant farms in the Peri-urban areas of kaya city, Burkina Faso

Raogo Sylvain TENSABA *, Somnoma NOUGTARA, André KIEMA and Aliou Kanfido Patoin TIEMA

Department OF Animal Production, Institute of Environment and Agricultural Research (INERA), Animal Nutrition Laboratory, 04 BP 8645 Ouagadougou 04, Burkina Faso.

GSC Advanced Research and Reviews, 2023, 15(01), 103–109

Publication history: Received on 06 March 2023; revised on 15 April 2023; accepted on 18 April 2023

Article DOI: https://doi.org/10.30574/gscarr.2023.15.1.0123

Abstract

The objective of this study was to analyze the endogenous practices of optimization, conditioning and conservation of food resources for small ruminants in the peri-urban areas of Kaya's commune. The surveys were based on 128 rural households. The results showed that the processing/value-adding practices of the fodder produced were chopping (79.7% of producers), tedding (85.9%), grinding (52.3%) and salting (1.6%). The food resources produced were packaged in different ways. The faggots/sheaves were composed of large quantities of cereal stalks and legume tops. Bags were used for the packaging of agro-industrial by-products (AIBP) (88.3%), cowpea pods (99.2%), local concentrates and woody pods (73.5%). Bunching was mainly made by natural straw. Storage facilities were in the majority traditional. The physical form or nature of the packaging of the food resources indicates the most suitable means of storage. Food packaged in bundles and bundles was stored in sheds (72.5% of quantities), on trees (14.83%), on house roofs (2.04%) and in racks (12.63%). The stores were mainly used for bags (96.28%), dishes and drums (100%) and bulk food (89.12%). Stored feeds were used for dry season supplementation when natural pastures are in decline and for fattening animals. The data obtained will facilitate the intervention of technicians in the field.

Keywords: Feed; Practices; Processing; Packaging; Storage; Kaya; Burkina Faso

1. Introduction

Burkina Faso is a country whose agriculture is the main activity. The livestock sub-sector is a source of income for about 80% of the population [1]. Small ruminants have an important economic function through the constitution of savings that can be easily collected to support the purchase of food products in times of food shortage, the purchase of agricultural inputs, the schooling of household members, health care or socio-cultural events such as weddings, baptisms or funerals, etc. [1-3]. Despite its importance, livestock farming is still affected by many constraints that hinder its development. The most important of these constraints is feeding, especially in the dry season when it is based almost exclusively on dry fodder [3]. During the dry season, which extends from October to May, the herbaceous forage is reduced and no longer meets the animals' needs [4; 5]. This is compounded by the decrease in grazing areas in favor of food production plots [5; 6]. In this context, the use of crop residues is remarkable. Indeed, after harvests, herders store residues for gradual use [7]. Despite the progression of such a tradition in the storage of crop residues among herders, the problem of optimizing the use of these food resources remains a challenge [8; 9]. The present study was conducted to analyze the endogenous practices of optimization, conservation and exploitation of small ruminant feed.

* Corresponding author: Raogo Sylvain TENSABA

2. Material and methods

2.1. Study site

The study was carried out in six (06) villages that are Basbériké, Bissiga, Fanka, Goulguin, Kougri and Sian in the commune of Kaya, capital of the Centre-North region, Burkina Faso. This commune is located between 13°5' Latitude North and 1°05' Longitude West, 100 km from Ouagadougou [10]. The climate is the North Sudanese type with a long dry season of eight (08) months from October to May and a short rainy season of four (04) months, which runs from June to September [10]. The average rainfall varies from 414.64 mm to 671.31 mm per year with noticeable variations. The vegetation is composed of dense and degraded shrub savannahs dominated by shrubs under which an herbaceous carpet is scattered.

2.2. Data collection

128 producers owning small ruminants were surveyed in all six (06) villages. The data collected were structured along three (03) main axes:

- Socio-demographic and professional characteristics of the producer;
- Production of food resources for small ruminants. Under this axis, the following elements were addressed:
  - Technologies and local practices for processing/valuing food resources;
  - Packaging methods and feed conservation infrastructures;
- Feeding practices. The producer was surveyed about feeding practices and constraints for small ruminants.

To determine the weight of packaged feed units, samples were weighed using a 10 kg spring scale with an accuracy of 50 g.

2.3. Statistical analysis

The data collected was entered into Excel to form a database. The free software R was used for the analyses. The weight of the feed produced was expressed as mean and standard deviation.

3. Results

3.1. Farmers' strategies for processing/upgrading local food resources

The food produced is often processed or valorized. Farmers in the study area used several techniques to process/upgrade local food resources using various tools. The main processing/value-adding practices for local food resources were:

- Chopping: chopping of cereal stalks is a very well-known practice among farmers in the study area (79.7% of stakeholders). However, only 0.78% of the farmers had received training in this area. The practice remains traditional, using machetes, cutters or picks;
- Wilting: in order to preserve food in the long term, some food is usually wilted in the sun before being packaged and stored. Most of farmers (85.9%) were concerned by this practice but the low level of training of the actors (4.7%) explains why the processes used remained traditional;
- Grinding: Grinding mainly concerned Piliostigma reticulatum pods, which are crushed in mortars and ground into powder. It was practiced by 52.3% of the population but only 2.3% of them were trained;
- Salting: only 1.6% of producers practiced salting. However, none of them had received training in this area.

3.2. Packaging and preservation practices for the food produced

3.2.1. Packaging practices

Different ways were used to package food resources, namely bundles/gerbs, boots, bags and used items (Table 1). Some food was stored in bulk or left in the field due to the lack of packaging tools. Packaging in bags and bundles/gerbs were the most common packaging methods (100% of producers). The bundles/sheaves involved large quantities of cereal stalks and legume tops. Sacks were used for the packaging of AIBP (88.3%), cowpea pods (99.2%), local concentrates and woody pods (73.5%). Most of the natural straw was bundled. Dishes and drums were used to fill the shortage of bags for cowpea pods and woody pods.

Table 1 Summary of local food packaging methods

Types of packaging	Types of food	Average unit weight (kg)	Proportion of producers (%)
bundles/gerbs	Millet or sorghum stalks	4.14±0.83	97.7
	Maize stalks	3.55±1.12	72.7
	Rice straw	6.42±5.12	5.5
	Sesame hulls	2.4±0.87	31.3
	Cowpea hulls	2.6±0.95	99.2
	Groundnut hulls	3.37±1.02	96.9
	Maize stover	2.86±1.64	26.6
	Fresh grass	4.9±3.3	66.5
	White bush straw	8.24±5.52	80.5
	Hay	5.08±2.55	24.2
	Woody leaves	5.09±3.44	8.6
	Watermelon leaves	1	1.6
Boots	White bush straw	8.24±5.52	80.5
	Hay	7.37±1.19	6.3
Bags	Cowpea hulls	7.15	0.8
	Groundnut hulls	8.6	0.8
	Sorghum husks	19.98±7.14	88.3
	Maize stover	11.33±5.87	11,8
	Maize spathe	10.25±2.93	12.5
	Cowpea pods	17.26±5.94	99.2
	Rice husks	7	0.8
	Fresh grass	19.18±7.92	8.6
	White bush straw	25	0.8
	Hay	10.2	0.8
	Local bran	20.46±6.67	75.8
	Woody pods	17.71±5.83	73.5
	Woody leaves	10.38±7.39	14.1
	Millet brew	21.21±7.71	25.8
	Low-grade rice flour	26.5±6.24	3.2
	AIBP	50	88.3
Drums and dishes	Cowpea pods	25	0.8
	Woody pods	07	0.8
	Local bran	2.45 ± 1.05	1.6

3.2.2. Storage and preservation facilities

Various means were used to store food after collection and packaging for medium and long term use, as required. The use of sheds and trees were the most common and concerned 95.31% and 89.4% of producers respectively. Roofs of

dwellings were also used (52.34%). Houses were also used as stores by 35.15% of the producers while only 7.81% of them had built fenced yards.

The physical form or nature of the packaging of the food resources indicates the most suitable means of storage. Food packaged in bundles and bundles was stored in sheds (72.5% of quantities), on trees (14.83%), on the roofs of houses (2.04%) and in racks (12.63%). The stores were mainly used for bags (96.28%), dishes and drums (100%) and bulk food (89.12%).

3.3. Breeding objectives of small ruminants and use of the feed produced

The objectives of raising small ruminants are diverse (Table 2). For the majority (62.18 to 71.85%) of households, there is a strong tendency to use small ruminants as capital. However, keeping animals in parks provides the organic manure needed to fertilize fields for agricultural production. The collection of manure is therefore a main objective according to 27% of farmers. Another objective identified is meat production (fattening). Fattening, especially of sheep, is an income-generating activity in the study area.

Table 2 Small ruminant breeding objectives

Breeding objectives	Proportion of farmers (%)	
	Sheep	**Goats**
Capital/cattle	62.18	71.85
Fodder	10.92	0.97
Manure	26.9	27.18

Feeding patterns depend on the abundance of natural resources and the breeding objectives (Table 3). In general, from July to October, animals with breeding objectives are fed mainly on natural pasture. Supplementation is observed with the gradual removal of natural pasture following the end of the rains in October. Fatting operations are generally carried out in the run-up to the Muslim sheep festival, Tabaski. Males are put in total stalling and feed is brought to the trough.

Table 3 Methods of exploitation of the food produced

Species	Breeding objectives	Seasons	Supply modes (%)		
			PN	**PN+C**	**Stabling**
Sheep	Breeder	SP	69.23	25.64	5.12
		SSF	35.04	61.53	3.41
		SSC	11.11	82.9	5.98
	Feeder	SP	22.78	32.91	44.3
		SSF	10.3	13.4	76.28
		SSC	1.86	20.56	77.57
Goats	Breeder	SP	78.21	19.8	1.98
		SSF	50.5	49.5	-
		SSC	15.8	83.16	0.99

NB: SP= rainy season ; SSF= cold dry season ; SSC= hot dry season ; PN= natural grazing ; PN+C= natural grazing + supplementation

3.4. Strengths, Weaknesses, Opportunities and Threats (SWOT) analysis of farmers' strategies for food production and use

The presence of farmers' organizations and the diversity of feed production techniques and feeding methods are strengths for farmers' strategies. However, the low technical skills of farmers, their high dependence on natural pastures and the reduction in grazing land are weaknesses. The presence of technical agents and NGOs are opportunities for

farmers. But threats such as biodiversity degradation, strong land pressure and the security crisis must also be taken into account (Table 4).

Table 4 SWOT analysis of farmers' strategies

Production, processing and storage of food	
Forces	**Weaknesses**
• Presence of livestock farmers' organizations (FOs) ; • Diversity of food packaging and storage techniques ; • Availability of local materials for food preservation	• Weak capacity of local FOs ; • Insufficient protection against degradation of the quality and quantity of stored food ; • Low technical skills of farmers for the valorization of feed
Opportunities	**Threats**
• Presence of public livestock services ; • Presence of NGOs and projects in the supervision of livestock farmers ; • Existence of manuals on techniques to valorize local food resources ; • Existence of modern equipment suitable for food processing	• Progressive degradation of biodiversity in the face of climate change ; • Security crisis
Conducting the feeding	
Forces	**Weaknesses**
• Diversity of feeding methods (extensive, semi-extensive, intensive) • Diversity of food resources	• High dependence on natural pastures; • Obstruction of livestock tracks ; • Reduction of grazing areas in favour of crop plots ; • High cost of Agro-Industrial By-Products (AIBP).
Opportunities	**Threats**
• Presence of public services ; • Presence of NGOs and projects in the supervision of livestock farmers.	• Strong land pressure linked to the demography and the livestock system practiced (extensive); • Presence on local markets of poor quality AIBP ; • Security crisis.

4. Discussion

Collected feed is often processed or upgraded to improve its quality and optimize its use. Processing/upgrading practices that use physical treatments (chopping, grinding, tedding) were the most widely adopted because they require less modern equipment and skilled labour. Haymaking allows for the conservation of harvested foodstuffs over a longer or shorter period of time. However, tedding in the study area was done in the sun; this contributed to degrading the

nutritional quality of the fodder [11]. Grinding and chopping of feeds reduces wastage as it limits refusal rates [12]. These treatments reduce or change the size and structure of coarse feeds and thus, increase the contact surface with digestive enzymes and microorganisms [13]. However, the type of equipment that was used (machetes, picks, pestles, etc.) in the study area was not well adapted. This contributed to making the tasks arduous and reducing production capacity.

Different modes (bundles, bundles/sacks, etc.) were used to package food. They were adapted to the means of transportation, storage and the nature of the food itself [7]. The food storage facilities inventoried in this study used mainly local means (sheds, trees, house roofs) and less financially constraining means. Similar observations were reported by [11] in the urban and peri-urban areas of Niamey. However, the fodder is exposed to the sun's rays and various weather conditions that contribute to the deterioration of its qualities [11]. The use of shops observed among some producers would be the best way to preserve the feed. However, these were infrastructures built without respecting the recommended standards (ventilation, lighting, watertightness, etc.) and could therefore facilitate the development of moulds.

The results of this study also showed that the main objective in small ruminant breeding is to breed. Because of the practice of breeding, sheep and goats represent a capital (savings) for 57.81% of the respondents. This result is similar with that of several authors, including [2], who showed in a study conducted in Niger that the breeding of small ruminants is a planning strategy and constitutes first and foremost savings that can be mobilised in case of need. Manure production was the second major objective identified in this study. Manure supports crop production in the context of land degradation in the Centre-North region. It concerns sheep for 25% of the respondents and goats for 21.88%. This result is close to that recorded by [3] in the Burkinabe sahel, who found that 26% of respondents had chosen manure as a livestock production objective. But he reported that manure was the third choice after milk (30%). In our study area, the production of milk from small ruminants was not an objective because it was not part of people's dietary habits for cultural reasons. Another objective revealed during the present study was fattening, especially of sheep (10.16%). [3] found a similar result (8% for sheep fattening) while [14] recorded 3.99%. Goat fattening is a marginal activity, rarely practiced due to the poor fattening performance and lower market value of goats.

Three methods of feeding animals coexist and depend on the abundance of natural pastures. In the dry season, particularly in the hot season, the fodder available is generally low and does not cover the maintenance needs of the animals. The distribution of supplementary feeds becomes selective when the number of animals is high. It targets animals according to production objectives. In the case of small ruminant breeding, the feeding pattern is more extensive and semi-intensive. When the aim is to improve fattening performance, a small number of animals, especially males, are kept in stalls. They are fed at the trough with fodder and varying amounts of concentrates. This observation is similar to those made by many authors including [15] and [3]. The use of natural pastures allows animals to be fed at lower cost. However, these extensive practices contribute to a strong pressure on natural resources. The security crisis in Burkina Faso and the Sahel in general has also shown the limits of the use of natural pastures. In addition, population growth is leading to an expansion of the agricultural front at the expense of natural pastures [16].

5. Conclusion

Faced to seasonal variability in the abundance of natural pastures, farmers have adopted strategies for the production and use of food resources. In the rainy season, natural pastures provide almost all the quantitative needs of the animals. However, in the dry season, the decline in the availability of fodder leads farmers to make supplementation according to production objectives. The feeds distributed for supplementation include local concentrates and AIBP, but also crop residues and natural fodder that are collected, packaged and stored on top of roofs, on trees, or in a corner of the field, or even on the ground to protect them from roaming animals or termites.

Compliance with ethical standards

Acknowledgments

The authors are grateful to the leaders of farmers' associations who helped to identify the households to be surveyed. They also thank the herders who were interviewed during the study.

Disclosure of conflict of interest

The authors (Raogo Sylvain TENSABA, Somnoma NOUGTARA, André KIEMA and Aliou Kanfido Patoin TIEMA) declare that they have no conflict of interest.

Statement of ethical approval

The present research work does not contain any studies performed on animals/humans subjects by any of the authors.

Statement of informed consent

Informed consent was obtained from all individual participants included in the study.

References

[1] Sanon HO, Zorma A, Simian A, Obulbiga MF, Compaoré E. Analysis of sheep fattening practices in two semi-arid zones of Burkina Faso. Journal of Applied Bioscienses. 2020; 150: 15390 - 15402.

[2] Gado AB. Climatic variations, food insecurity and peasant strategies. The responses of the Nigerien peasant: historical perspectives. Etudes et recherches scientifiques. 2003 ; 8 (9): 60-72.

[3] Gnanda B. Socio-economic importance of the Burkinabe Sahel goat and improvement of its productivity through feeding [Unique PhD thesis in rural development]. Institute of Rural Development (IDR), Polytechnic University of Bobo-Dioulasso, Burkina Faso; 2008.

[4] Zampaligré N. 2012. The role of ligneous vegetation for livestock nutrition in the sub Sahelian and Sudanian zones of West Africa: Potential effects of climate change [Unique PhD thesis in rural development]. University of Kassel, Germany; 2012.

[5] Obulbiga MF, Bougouma V, Sanon HO. Improving fodder supply through dual-purpose cereal-legume in the northern Sudanian zone of Burkina Faso. International Journal of Biological and Chemical Sciences. 2015 ; 9 (3): 1431 - 143

[6] Kiema A, Sawadogo I, Ouédraogo T, Nianogo AJ. Fodder exploitation strategies by herders in the Sahelian zone of Burkina Faso. International Journal of Biological and Chemical Sciences. 2012; 6(4): 1492-1505

[7] FAO. Agricultural residues and agro-industrial by-products in West Africa: Current status and prospects for livestock. FAO Regional Office for Africa, Accra, 2014

[8] Leng RA. Livestock feeding and limiting factors in tropical developing countries. In: Proceedings of the seminar on the integration of livestock into agriculture in response to increasing population pressure on available resources, held 11-14 July 1989 in Mauritius, Technical Centre for Agricultural and Rural Cooperation (CTA), ACP-EEC Lomé Convention, Wageningen-Ede, The Netherlands; 1992.

[9] Gnanda B, KIEMA A, Ouermi WS, Tensaba R, Kaboré M, Coulibaly D. Training module for technicians. Techniques for the valorisation of local food resources FAO Project TCP/BKF/3605; 2019.

[10] Ministry of Housing and Urban Development. Master plan for the development and urban planning of the city of Kaya. Study report. Ouagadougou, Burkina Faso, 2013.

[11] Lawal A.A, Chaibou M, Garba MM, Mani M et Gouro AS. Management and use of crop residues for animal feed in urban and peri-urban areas: case of the urban community of Niamey. Journal of Applied Biosciences. 2017; 115: 11423-11433.

[12] Sanou S. Farmer practices of adaptation of agro-pastoral production systems to climate change and food security in the northern region of Burkina Faso [Unique PhD thesis in rural development]. Institute of Rural Development (IDR), Polytechnic University of Bobo-Dioulasso, Burkina Faso; 2019.

[13] Chenost M. and Kayouli C. Roughage use in hot regions (FAO Production and Animal Health Study). ISSN 92-5-203981-3, FAO, Rome, Italy, 1997.

[14] Abdoul Aziz ML. Socio-economic aspects of the use of crop residues and agro-industrial by-products in the feeding of domestic ruminants in Niamey (Niger) [Master's thesis in Animal Production and Sustainable Development]. Inter-State School of Veterinary Science and Medicine, Dakar, Senegal; 2014.

[15] Zoundi SJ, Sawadogo L and Nianogo AJ. Farmers' practices and strategies for ruminant supplementation in mixed farming-livestock systems in the central and northern plateau of Burkina Faso. Tropicultura. 2003; 21 (3): 122:128

[16] Ministry of Livestock Resources. Second National Livestock Survey. Projection of results and analysis. Ouagadougou, Burkina Faso, 2011