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Characterization of fattening places and estimation of the importance of feeds in the peri-urban area of Tahoua (Niger).

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Abstract

In the Sahel, sheep fattening contributes to the growth and food security of rural households. However, the practice of fattening is subject to constraints including the optimal use of feed. The objective of this study was to know the preferences of foods used and fattening practices in the urban commune of Tahoua. A survey was conducted among 163 bottle fillers chosen using snowball sampling. The results show three groups of fatters. The Balami (63.46%) and Oudah (68.57%) breeds are fattened in groups 1 and 2 respectively. However, group 3 has a preference for crossbreeds (73%). The white two-tone dress is preferred in group 1 (61.54%). Group 2 has a preference for two-tone dark (34.29%) and two-tone black (45.71%) dresses. Aged fattening sheep are preferred in groups 1 (82.69%) and 2 (70.73%). Producer preferences show that cowpea tops (weight = 0.09) and peanut (weight = 0.09), gao pods (weight = 0.08) and local bran (weight = 0.07) are the most important in the diet of fattened sheep. The less preferred foods in fattening are Piliostigma reticulatum pods (weight = -0.06), cotton grains (weight = -0.05), millet stalks (weight = -0.05) and cowpea hulls (weight = -0.04). These results help guide interventions in the choice of animals and fattening foods in order to improve production while promoting agriculture-livestock integration.

Introduction

Livestock breeding is considered one of the pillars of the Nigerien economy. Thus, the export of live animals represents the 2nd source of income for the State after mining resources with a contribution of 22% of the value of exports. Livestock contributes 11% and 35% respectively to the constitution of Niger's national and agricultural GDP (FAO/SFW, 2010) and more than 25% of the farm budget (INS, 2012). Animal resources play a vital role in food security and the fight against poverty, especially among rural populations. As a result, it is practiced by 87% of the population throughout Niger either as a main activity or as a secondary activity (FAO/SFW, 2010). The Nigerien herd is made up of more than 20 million TLU in 2020, or around 52 million heads of all species combined (Ministry of Livestock, 2020). Sheep and goats represent more than 2/3 of the Nigerien livestock population. Sheep constitute 28.4% of Niger's livestock and are distributed throughout all the agro-ecological zones of the country. They are divided into two large groups including that of hair sheep (Bali-Bali, Oudah, Ara-Ara and Balami) and wool sheep (koundoum, Hadine and Daine Zaila) (Yaye et al., 2019; Hamadou et al ., 2015).

Sheep fattening is the form of intensive exploitation of sheep for meat production in Niger. It represents the main Income Generating Activity linked to livestock for the majority of rural households. It is a practice that promotes sheep on the occasion of religious festivals thanks to the demand from urban centers for very fat animals (Nantoumé et al., 2006). Despite the socioeconomic and cultural importance of this activity, it encounters problems related to the supply and quality of food and technical inadequacies (Sanon and Traoré, 2014; Dan Gomma et al., 2017). Thus, the pastures constituting the basis of the diet of fattened animals are characterized by a double fluctuation in terms of quality and quantity depending on the seasons. Agro-industrial by-products which are used to supplement the nutritional value of fodder are also characterized by their unavailability and their high costs in areas far from urban centers representing suitable areas for conducting fattening operations. This is a limiting factor in their use to meet the nutritional production needs of animals for fattening. These technical and dietary constraints are often the basis of the poor performances recorded by fatteners, which many observers exploit to convey messages about the economic unprofitability of fattening (Gnanda et al., 2015; Prodex, 2011). . To meet this challenge, research has popularized several technologies to contribute to improving the meat productivity of livestock but their use is very limited due to many factors linked to their poor popularization and adaptation to the local context. These technologies contain rations that allow high meat production. However, the ingredients included in the composition of these rations are not within the reach of small farmers, particularly women with generally low purchasing power. The use of resources available on farms, in particular traditional herbaceous fodder, woody fodder and crop co-products and domestic residues, the acquisition cost of which is relatively low compared to agro-industrial co-products, could help to avoid this problem. Therefore, studies on the sustainable management of feeding systems in traditional livestock farming must focus on the adaptation of feeding systems for fattening animals to the fodder resources of interest including those produced locally. The use of these plant resources in rations, however, requires a deeper understanding of their interest and level of use, which must be analyzed with regard to their diversity on farms. However, there is little work carried out in Niger on the perception of the importance of fodder resources potentially

usable in sheep fattening. Thus, the objective of this study is to determine the perception and preferences of fatteners on the food resources used in sheep fattening. In doing so, the study will be able to contribute to a good understanding of the perception of the relative importance that fatteners place on food resources with a view to ensuring competitive, profitable and ecologically sustainable animal production in fattening workshops.

Material and methods

Presentation of the study area

The study was carried out in the town of Tahoua (14°53 north and 5°15 east). The main socio-economic activities of the inhabitants of the town of Tahoua are agriculture and livestock breeding. Agriculture is considered the main economic activity of urban households because it provides the essentials for food consumption and partly the financial needs of households. The town of Tahoua is located around the 300 mm isohyet with a semi-arid climate comprising two very contrasting seasons: a rainy season which only lasts from June to September and a long dry season occupying the rest of the year. The cumulative rainfall is between 200 and 500 mm with an average number of rainy days of 35 days. Precipitation is characterized by a high intensity of torrential rain. This means that they run off quickly and are less beneficial to vegetation. The rainfall regime is also characterized by strong variability in space and time. Most of the total annual rainfall regime is recorded during the months of July and August. Temperatures vary between 13°C (January) and 45°C (April-May) with extreme daily averages of 22 to 39°C (Amadou, 2011). The relief of the town of Tahoua is characterized by dune soils, fertile valleys and plateaus with bare soils including watersheds leading to the formation of numerous koris threatening riverside homes. The composite vegetation is an association of woody species including Acacias nilotica, Acacia radiana, Acacia seyal, Balanites aegytiaca and numerous annual species such as Cenchrus biflorus, Artida mutabilis, Pennisetum pediculatum (Garraud et al., 2012).

Data collection methodology

The methodological approach consisted of conducting a pre-survey in 5 focus groups composed of 5 to 6 bottlers in the peri-urban area of the town of Tahoua (Niger). This made it possible to draw up a list of foods used in fattening operations. Thus, 21 types of foods were inventoried on the basis of focus group interviews and included in the study. These 21 foods are arranged in table form with two options “most important” and “least important”. The “most important” and “least important” scale method was applied to collect data from the respondents. Thus, each bottle filler was asked to choose the seven (7) “most important” foods and the seven (7) “less important” foods out of the 21 foods presented in the form of choice tasks. The second part of the survey questionnaire is devoted to the socio-economic characteristics of fatteners, the practice of fattening activity (animals, health, market), the characteristics of fattening workshops and food resources. Sampling of respondents was carried out using the “snowball” method. The first respondents who are the bottlers met during the focus group interviews were asked to indicate the next bottlers to be investigated. The questionnaire was administered to 163 bottle fillers at their homes in the three (3) communes of the city of Tahoua.

Statistical analyzes

Analysis of socio-economic data

The data collected on the socioeconomic characteristics of fatteners and fattening practices were subjected to multiple correspondence analysis (MCA). An ascending hierarchical classification was subsequently applied to the ACM results to discern the groups of fatters. The frequencies of the different modalities of the qualitative variables were calculated for each class. The chi2 test made it possible to determine the links between variables of the different groups of fatteners with a threshold of 5%.

Econometric Data Analysis: Counting Method

The so-called Maximum Difference (Max Diff) method or choice of extremes “Best Worst scaling” (Finn and Louvière, 1992) is a classic method of measuring the importance of attributes which has been widely used to study consumer behavior because it is consistent with the theory of random utility.

The underlying assumption is that when presented with a set of choices, the "Best-Worst" pair chosen by a respondent is equal to the difference between the largest preference and the smallest preference on an importance scale (Flynn et al., 2014; Louvière et al., 2015, Jin et al., 2019). The level of importance of each item is thus estimated by the difference between the number of times the item was chosen as “more important” and the number of times it was considered to be “less important”. The standardized scores (std.BWi) indicate the importance of each food in the fattening ration on a scale from -1 to +1 among all respondents. Scores close to +1 indicate that the food has a great influence or a significant weight in the ration, scores close to -1 indicate that the food has a weak influence in the ration, and a score of 0 indicates that 'there is no relevance of this food in the ration:

BWi = Bi-Wi

std.BWi = BWi/n*r

Where Bi: the number of times the item was chosen as the “most important” (Best) among all respondents (n); Wi: the number of times the item was chosen as the “least important” (Worst) among all respondents (n); r = frequency of appearance of each item in the choice sets (here: r = 4); n = number of respondents; BWi: difference between Bi frequency and Wi frequency; std.BWi: standardized score per item indicating the level of importance of the item (weight).

Results

Characteristics of bottle fillers

Table 1 presents the characteristics of the bottle fillers. In groups 1 and 2, men are the majority in the practice of fattening with 92.31 and 94.29% respectively. However, in group 3, women (51.22%) slightly outnumber men (48.78%). The participation of men and women in fattening operations presents a significant difference at the 5% threshold. The age of the bottlers varies significantly. In groups 1 and 2, there are more young people than old people. But, in group 3, elderly bottlers constitute 78.05% compared to 21.95% of young people. In all groups, there is a strong involvement of agropastoralists in fattening activities. Concerning education, the educated are only the majority in group 1 with a rate of 78.85% compared to 55.71 and 73.17% of uneducated people respectively in groups 2 and 3. The bottlers also participate in training sessions. training on good fattening practices. Thus, in group 1, 63.46% of respondents attended two training courses compared to 64.29 and 43.90% participated in a

training workshop respectively in groups 2 and 3. The income level of the bottlers presents a significant difference at the 5% threshold. Low-income bottlers are in the majority in group 1 (61.54%) and group 2 (74.29%). However, in group 3, middle-income respondents are in the majority and represent 58.54%.

Table 1: characteristics of bottle fillers

characteristics		Group 1		Group 2		Group 3	
		n	%	n	%	n	%
Sex	Feminin	4	7,69	4	5,71	21	51,22
	Male	48	92,31	66	94,29	20	48,78
Age	young	30	57,69	41	58,57	9	21,95
	old	22	42,31	29	41,43	32	78,05
Instruction	educated	41	78,85	31	44,29	11	26,83
	uneducated	11	21,15	39	55,71	30	73,17
Activity	agropastoralist	35	67,31	61	87,14	31	75,61
	pastor	17	32,69	9	12,86	10	24,39
Annual revenue	weak	32	61,54	52	74,29	17	41,46
	AVERAGE	20	38,46	18	25,71	24	58,54
Training received	once	10	19,23	45	64,29	18	43,9
	2 times	33	63,46	7	10	13	31,71
	more 2 times	9	17,31	18	25,71	10	24,39

Fattening practices

Table 2 presents fattening practices. The fattening duration presents a significant difference at the 5% threshold in all groups. Group 1 presents 53.85% of fattening workshops whose rotation cycle is three months compared to a cycle of more than three months with 55.71 and 80.49% of respondents respectively for groups 2 and 3. practice of fattening activities is occasional as part of the preparations for the tabaski festival among 67.31 and 70.00% of respondents in groups 1 and 2 respectively. However, the presence of fattening workshops is permanent among 56 .10% of respondents from group 3. The use of fattening sheep breeds presents a significant difference at 5%. Each group of respondents differs in the breeding of a breed or mongrel. Thus, the Balami breed (63.46%) and the Oudah breed (68.57%) are fattened among the respondents of groups 1 and 2 respectively. However, for the respondents of group 3, they have a preference for the mixed sheep (73%). The coat of animals for fattening is also a significant criterion in the characterization of breeding practices. In group 1, the white two-tone dress is preferred by 61.54% compared to 23.08% for the black two-tone dress and 7.09% for the dark two-tone dress. Among the respondents in group 2, two-tone dark (34.29%) and black (45.71%) dresses are preferred over the two-tone white dress (18.57%). On the other hand, in group 3, 58.54% of respondents have no preference for the coat of the animals to be fed. The age of the fattening sheep is similar in groups 1 (82.69%) and 3 (70.73%), which show a preference for older sheep. However, for group 3, young sheep are preferred by 54.29% of respondents compared to 45.71% for older ones. Concerning prophylaxis practices, for all groups, 60 to 90.38% of respondents carry out vaccination and deworming at the start of the fattening cycle. The preferred sales markets for fattened sheep are local markets for 61.65 to 88.57% of respondents.

Table 2: characteristics of fattening practices

Characteristics of fattening practices		Group 1		Group 2		Group 3	
		n	%	n	%	n	%
Cycle duration	3 months	28	53,85	31	44,29	8	19,51
	More than 3 months	24	46,15	39	55,71	33	80,49
Workshop	permanent	17	32,69	21	30	23	56,1
	temporary	35	67,31	49	70	18	43,9
Breeds	Ara-ara	10	19,23	8	11,43	2	4,88
	Balami	33	63,46	7	10	2	4,88
	Metis	4	7,69	7	10	30	73,17
	Oudah	5	9,62	48	68,57	7	17,07
Dresses	two-tone white	32	61,54	13	18,57	6	14,63
	dark two-tone	4	7,69	24	34,29	1	2,44
	two-tone black	12	23,08	32	45,71	10	24,39
	Without opinions	4	7,69	1	1,43	24	58,54
Markets	local	32	61,54	62	88,57	33	80,49
	Neighboring countries	20	38,46	8	11,43	8	19,51
Health	Not vaccinated	5	9,62	28	40	8	19,51
	vaccinated	47	90,38	42	60	33	80,49
Ages of sheep	aged	43	82,69	32	45,71	29	70,73
	youth	9	17,31	38	54,29	12	29,27

Importance of the different foods used for sheep fattening

Table 3 presents the results of the analysis of the accounting approach for fattening food preferences. Foods with positive values are more preferred than those with negative values. Thus, the producers' preference indicates that cowpea tops (weight = 0.09) and peanut (weight = 0.09), gao pods (weight = 0.08), local bran (weight = 0 .07) and wheat bran (weight = 0.06) are the most important in the diet of fattened sheep. Concerning the less important foods in the conduct of sheep fattening, the choices of the fatters indicate that the pods of Piliostigma reticulatum (weight = -0.06), the grains of cotton (weight = -0.05), the stems of millet (weight = -0.05), cowpea hulls (weight = -0.04) and leaves of Ziziphus Mauritiana (weight = -0.04). Bush straw is considered a neutral food in fattening foods (weight = 0.00).

Table 3: importance of foods in the fattening ration (weight)

Fattening foods	**More important (b)**	**Less important (w)**	**b-w**	**Weight (importance)**
Peanut top	121	13	108	0,09
Cowpea tops	122	18	104	0,09
Gao pods	113	20	93	0,08
Its local	100	21	79	0,07
Bran	92	29	63	0,06
Cowpea hulls	72	30	42	0,04
Cowpea top	48	39	9	0,01
Bush straw	69	67	2	0
Pods of Accacia Radiana	50	58	-8	-0,01
Gao leaves	41	63	-22	-0,02
Sorghum glumes	39	71	-32	-0,03

Peanut shell	40	73	-33	-0,03
Sorghum stalks	43	79	-36	-0,03
Cottonseed meal	33	65	-32	-0,03
Cowpea seeds	27	55	-28	-0,02
Leaves of Ziziphus Mauritiana	29	69	-40	-0,04
Sorghum panicles	24	58	-34	-0,03
Millet stalks	37	92	-55	-0,05
Cowpea hulls	16	59	-43	-0,04
Pods of Piliostigma reticulatum	18	88	-70	-0,06
Cotton grains	15	76	-61	-0,05

Discussion

Characteristics of bottle fillers

Fattening is an activity which is part of the fight against poverty in the Sahel countries. It is practiced by all socio-professional strata in rural areas. The male sex is the majority in fattening practice (48.78 to 92.31%). In a study conducted in Niger in the regions of Tahoua, Tillabéry, Maradi and Dosso, Yaye et al. (2019) found a similar result. They explained this high frequency of men in fattening activities by their responsibility in the management of the farm. However, the participation of women is not negligible in this activity. Sanon et al. (2020) showed that women participate in both the feeding and maintenance of their fattening workshops. In group 3 of this study, women represent 51.22%. This would indicate that women are also interested in running fattening operations. Numerous studies have demonstrated that fattening is considered an Income Generating Activity in which women are very active (Ayantunde et al., 2008). According to these authors, this craze for fattening is due to the low initial investment, the rapid turnover cycle and its social acceptance by women. The results of the study demonstrated that fattening is practiced by both young people and older people. In groups 1 and 2, the rate of young people practicing fattening is 58%. The strong involvement of young people from two age groups shows that fattening tends to become a socio-professional activity in rural areas (Sanon et al., 2020). The proportion of uneducated people practicing fattening is slightly lower than that of the educated. This is explained by the fact that the study was conducted in peri-urban areas. However, we see that in groups 2 and 3, the uneducated are in the majority. This high rate of illiteracy is linked to the fact that in these groups, elderly people are in the majority. This high rate of illiterates in fattening activities is a serious handicap for the economic evaluation of the activity but also for the adoption of technologies for its improvement (Sanon et al., 2014; Sanon et al., 2020). The study showed that there is a strong participation of agropastoralists and low-income farms in the practice of fattening. Thus, fattening activities allow them to use agricultural residues in animal feed to generate additional income (Sanon et al., 2020).

Conduct of the sheep fattening activity

The criteria for choosing animals are significant parameters in the management of a fattening workshop. Thus, the study showed that there is a preference for the Balami and Oudah race, and the mixed race. This choice seems linked to their large size. This observation is similar to that of Hamadou et al. (2019) who obtained a low willingness to pay for the Koundoum breed because of its small size compared to other large breeds. In addition to the size, the bottlers also have a clear choice for the dress, particularly the white dress. This may be linked to

socio-cultural considerations because the white coat is in high demand during the Tabaski festivals which is the main time of high demand for fattened sheep. Thus, Sanon et al. (2020) observed that white sheep are dominant in fattening plants in the semi-arid zone of Burkina Faso. In a study on the conservation of Koundoum sheep in Niger, low willingness to pay was attributed to black-coated sheep. In this study in Niger, respondents affirmed that the black coat of the Koundoum sheep is one of the limiting factors for its in situ conservation. They explained that it is difficult to find buyers for animals of this type of format but also their market value is very low (Hamadou et al., 2019). The age of the animals to be fed is also an important management criterion. Thus, in this study older animals are preferred in groups 1 and 3. The use of older animals makes it possible to shorten the duration of the fattening cycle. Several studies have shown that old animals have a short fattening cycle compared to young animals (Somda, 2001; Sangaré et al., 2005; Alkoiret et al., 2007). Young sheep certainly have better ADGs but have the disadvantage of extending the time of the fattening cycle and therefore increasing the cost of feed unlike older sheep (INERA, 2003). This observation is consistent with group 3 of this study where respondents have a preference for young animals with fattening cycles of more than four months.

Importance of feed in sheep fattening

Fatters use different plant resources and agro-industrial concentrates to feed animals in tropical areas. These include herbaceous, woody, cereal and agro-industrial by-product fodder. Numerous studies have characterized these foods, particularly the nutritional value, but few studies have concerned the interest and importance of these foods for fatters. Thus, this study showed that agricultural residues (cowpea and peanut tops) and gao pods are the most important fodder in the diet of fattened animals in the urban commune of Tahoua. These legumes are used as ingredients to facilitate the ingestion of roughage from stuffy animals. Many authors have testified to the good nutritional quality of these foods. They have good biomass quality, good digestibility and an excellent supply of nutrients allowing good digestibility of cellulosic biomass from roughage. They are also a good source of vitamins and minerals for animals (Leng, 1997; Sanon et al., 2020). In a study conducted in Niger, Dangomma et al. (2017) confirmed this peasant perception of the importance of these foods. These authors showed that ration formulas containing cowpea tops, peanuts and gao pods had the best GMQ in a 75-day trial on Ara-ara sheep aged 18 to 24 months. This observation is similar to that of Nantoumé et al. (2018) in Mali on Djallonke sheep aged 12 to 18 months with rations containing cowpea tops which allowed for ADG of 114 g. In addition to their good nutritional value, local fodder is less expensive and helps reduce the cost of feeding fattened animals. This allows bottle fillers to increase their profit margin in fattening. To this end, several studies recommend that fatters use local fodder in a farming environment instead of agro-industrial by-products, notably cotton grains and oilcake (Kiema et al., 2008; Fall-touré et al., 1997).). Certainly these agro-industrial by-products allow good zoo-economic performance of animals but their availability and accessibility (price, transport, distance from places of sale, etc.) can be limiting for their use in farming environments (Sanon and al., 2014). This peasant perception of the zoo-economic performance of fodder over agro-industrial foods is confirmed by the results of a study in Niger which showed that straw rations supplemented with millet tops and bran provide better benefit than agro-industrial foods in fattening operations (Ayantude et al.,2008).

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