RESEARCH PROGRAM ON Dryland Systems

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INTERNATIONAL LIVESTOCK RESEARCH INSTITUTE

Sheep fattening with locally available feed resources in Fakara, Niger

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1. Introduction

In West African Sahel, livestock form one of the main livelihood strategies of the rural population playing a cardinal role in food security and income generation (Hiernaux and Ayantunde, 2004). In 2014, the livestock population in Niger was estimated at 41 million heads including all species (cattle, sheep, goat and camel). Livestock is Niger's second source of revenue after mining resources contributing to 11% of national GDP and involving 87% of the rural population in the country.

Despite its socio-economic and cultural importance, livestock production in the Sahel is largely characterized by low external inputs and heavily dependent on rainfall which varies markedly from year to year. Feed scarcity, particularly in the dry season and low nutritional quality are the main causes of low livestock productivity in the region. Sheep fattening based on locally available feed resources has been promoted in the Sahel as a way to improve income of rural households and food security. Based on previous studies by ILRI in Niger, this activity was conducted under CRP Dryland Systems for Kano-Katsina-Maradi action transect in West African Sahel and Dryland Savanna. The sheep fattening scheme was designed for youth and women in Fakara, Niger towards the Tabaski of September 2015. The objectives of the study were: (i) To improve income of rural households through least cost rations for sheep fattening in the late dry season. (ii) To promote better use of locally available feed resources for livestock productivity.

2. Materials and methods

2.1 Materials

2.1.1 Animals

Young male sheep of local breed (Oudah) from the experiment farmers' flock were used for the fattening scheme. The average initial weight of the animals was 35 ± 8.00 kg (mean ± standard deviation) with age ranging from 8 to 24 months. Each experimental farmer selected 3 young male sheep from their flock with 1 male sheep fed according to the farmer's practice

while 2 animals were allotted to 2 treatments. The 3 animals of each farmer were randomly allotted to the 3 treatments.

2.1.2 Feed rations

The feed rations used for fattening consisted of natural fodder (bush hay) as basal feed, crop residues (groundnut haulms) and traditional agricultural by-products (pure millet bran, a mixture of millet and maize bran) and cotton seedcake.

The rations used for the fattening were:

- Treatment 1 (control or farmer's traditional fattening practice): Bush hay + mixture of millet and maize bran (2/3 millet bran+ 1/3 maize bran)
- Treatment 2: 1.4 kg of bush hay + 600 g millet bran + 400 g groundnut haulm
- Treatment 3: 1.4 kg bush straw + 600 g millet bran + 400 g cotton seedcake

2.2 Methods

2.2.1 Study sites

This study was conducted in the following 4 villages: Yelloua (2 39 52^{o} and 13 32 16^{o}); Tigo Tegui (2 46 58^{o} and 13 30 68^{o}); Katanga (2 48 85^{o} and 13 32 11^{o}) and Bankadey (2 36 20^{o} and 13 31 81^{o}) in the Fakara area, southwestern part of Niger. The 4 villages are located in the commune rurale (local government area) of Dantchiandou in Tillaberi Region of Niger.

2.2.2 Selection of experimental farmers

In each village, 7 farmers (4 young men and 3 women) were selected during a village meeting based on the following criteria: willingness to participate in the study, having sufficient feed resources that could cover the duration of the fattening and ownership of at least 3 young male sheep of the same breed and in the same age bracket for the 3 treatments and willingness to follow guidelines for the fattening. The study was conducted by 28 crop-livestock farmers including 16 young men and 12 women.

2.2.3 Duration of the experiment

The duration of the fattening was 48 days in the late dry season between June and July 2015.

2.2.4 Feeding procedure

The experimental farmers provided bush hay (basal feed) for all sheep and local bran for the control. In addition to veterinary products (vaccines, drug for ecto-parasite treatments and antibiotic), the farmers were supported with groundnut haulm, millet bran and cotton seedcake for the fattening in view of the acute feed scarcity in the late dry season when the fattening was conducted.

Each farmer confined the sheep being fattened around the homestead under a shed. Each animal was offered its ration twice per day (morning and evening). The rations were weighed into polyethylene bags marked with the same color as the sheep to be offered. The leftovers from the bush hay and supplements were collected separately in bags and weighed weekly. Feed offered, leftovers and faecal output were weighed using a hand-held 10 kg weighing scale.

2.2.5 Health treatments

All experimental animals were vaccinated against PPR and pasteurelosis, and dewormed at the beginning of the fattening and any sick animal was treated during the fattening period. Throughout the fattening, 5 cases of diarrhea were observed, 3 of which were reported in Yelloua and 2 in Bankadey. Sick animals were treated immediately. A case of mortality was recorded in Bankadey due to injuries and the animal was replaced.

2.2.6 Data collection

Samples of the feed and faeces were collected and taken to laboratory for analysis. Sheep were weighed every two weeks before watering and feeding using a hand-held 100 kg weighing scale. Data on feed prices were collected in the four villages and at Dantchiandou market from June to August 2015. The project technician in each village monitored the price and weight of the various feeds at Dantchiandou market and in the villages where they monitored the study on sheep fattening. The purchase and sale prices of sheep were collected in the 4 villages and at Dantchiandou market.

2.2.7 Data Analysis

Statistical analysis of the data (intake, weight gain, manure, purchase and sale price of sheep, gross profit and net profit) was done with SAS following the General Linear Model (GLM) procedure and comparison between the means of the different dependent variables was made

using contrast statement. The data analyzed are those collected in three villages (Tigo Tegui, Bankadey and Yelloua) where all the selected farmers participated in the study. Data from the fourth village Katanga were excluded from the statistical analysis as only two farmers with all the 3 treatments remained at the end of the study.

For data on prices of various feed recorded in the villages and at Dantchiandou market during the study, Microsoft EXCEL was used to compute the averages and standard deviations.

3. Results

Feed prices collected in the 4 villages and at Dantchiandou market are presented in Table 1.

Table 1. Mean price per kg feed (dry weight) used for sheep fattening in Fakara, Niger

Feed	**Price per kg of feed (FCFA*)**	**Price per kg of dry matter (FCFA*)**
Bush hay	94±40	101
Groundnut haulm	138±9	158
Cowpea hay	144±61	157
Cotton seedcake	184±6	200
Pure millet bran	139±48	153
Mixed millet and maize bran	130±24	144
Andropogon gayanus (hay)	125±18	133
Eragrostis tremula (hay)	72±30	78

*As at the time of this study 1 USD = 600 FCFA

Of all feeds used (Table 1), groundnut haulm is the most expensive (138 FCFA / kg) which was about the same price as pure millet bran which was 9 FCFA higher than mixed millet and maize bran commonly used in the villages. The hay of *Eragrostis tremula* hay was cheaper than bush hay used as basal feed in the study. The cotton seedcake which is imported cost 45 FCFA more than the pure millet bran.

3.1 Animal performance and economic evaluation per treatment

Mean intake for different feed rations (treatments), weight gains and economic evaluation are shown in Table 2. The treatments had a significant effect on total and partial intake of the dry matter ($p<0.05$). The farmer's traditional fattening practice (control) has the highest mean intake (1995 g/day). Dry matter intake per $kg^{0.75}$ of treatment 3 was lower (119 g/day/ $kg^{0.75}$) than that of 2 others though the mean values were not significantly different (Table 2). Dry matter intake of bush hay for the control was significantly higher than those of the other treatments.

The treatment had no significant effect on average daily gain (ADG) or on the feed conversion ratio ($p > 0.05$). The treatment had significant effect on total feed cost ($p <0.001$) but had no significant effect ($p> 0.05$) on net benefit from fattening. In the 3 villages (Bankadey, Yelloua and Tigo Tegui) average purchase and sale prices of sheep were not significantly different (Table 2).

Table 2. Animal performance and economic evaluation of sheep fattening per treatment

Parameter	Treatment		
	1. Farmer's traditional practice	2. Groundnut haulm + Millet bran	3. Cotton seedcake + Millet bran
Total dry matter intake (TDMI) (g/day)	1995±37[a]	1862±38[b]	1718±39[c]
Total dry matter intake (g/$kg^{0.75}$/day)	135.51±5.50[a]	128.12±5.67[a]	119.98±15.91[b]
Bush hay dry matter intake (g/$kg^{0.75}$/day)	84.18±3.70[a]	69.69±3.82[b]	59.78±3.98[b]
Groundnut haulm dry matter intake (g/$kg^{0.75}$/day)	0±0.0[a]	23.35±1.30[b]	0±0.0[a]
Bran dry matter intake (g/$kg^{0.75}$/day)	48.45±1.93[a]	36.43±1.99[b]	35.67±2.08[b]
Cotton seedcake dry matter intake (g/$kg^{0.75}$/day)	0±0.0[a]	0±0.0[a]	25.55±2.08[b]
Average daily gain (g/day)	65.89±10.99[a]	72.49±11.34[a]	81.03±11.81[a]
Feed conversion ratio (kg TDMI / kg gain)	52.15±15.19[a]	57.39±15.67[a]	42.96±16.32[a]

Total feed cost (FCFA)	14892±289[a]	12894±298[c]	13654±311[b]
Average purchase price of sheep (FCFA)	58704±2386[a]	56176±2462[a]	54356±2565[a]
Average sale price of sheep (FCFA)	84522±1308[a]	81675±1391[a]	80825±3634[a]
Gross benefit (FCFA)	25819±1309[a]	25499±1351[a]	26469±1407[a]
Net benefit (FCFA)	10626±1324[a]	12305±1305[a]	12515±1422[a]

Treatment means with the same superscript are not significantly different at the 5% level of significance.

The highest total feed cost was observed for the traditional fattening practice (Treatment 1) followed by treatment 3 with cotton seedcake. The average net benefit was not significantly different between the 3 treatments with a difference from the control of 1679 and 1889 FCFA for treatments 2 and 3, respectively.

3.2 Intake, weight gain and economic evaluation by village

The different means for intake, weight gain and economic evaluation by village are shown in in Table 3.

Table 3. Mean dry matter intake, weight gain and economic evaluation of sheep fattening by village

Parameters	**Bankadey**	**Tigo Tégui**	**Yelloua**
Total dry matter intake (TDMI) (g/day)	1988±42[a]	1929±30[b]	1757±40[c]
Total dry matter intake $kg^{0.75}$ (g/day)	129.52±6.31[b]	141.57±4.52[a]	112.74±6.09[c]
Bush hay dry matter intake $kg^{0.75}$ (g/day)	68.63±4.25[b]	80.76±3.04[a]	63.75±4.09[b]
Haulm dry matter intake $kg^{0.75}$(g/day)	9.27±1.45[a]	9.71±1.04[a]	7.99±1.40[a]
Bran dry matter intake $kg^{0.75}$(g/day)	43.62±2.2[a]	43.82±1.62[a]	33.01±2.14[b]
Cottonseed cake dry matter intake $kg^{0.75}$ (g/day)	8.26±0.53[a]	9.45±0.38[a]	8.34±0.51[a]
Average daily gain (g/day)	77.21±12.6[a]	73.84±4.52[b]	67.86±6.09[c]
Feed conversion ratio (TDMI kg/kg gain)	68.87±17.43[a]	47.29±12.50[b]	37±16.82[c]
Total feed cost (FCFA)	13747±332[ab]	14276±238[a]	13417±320[b]

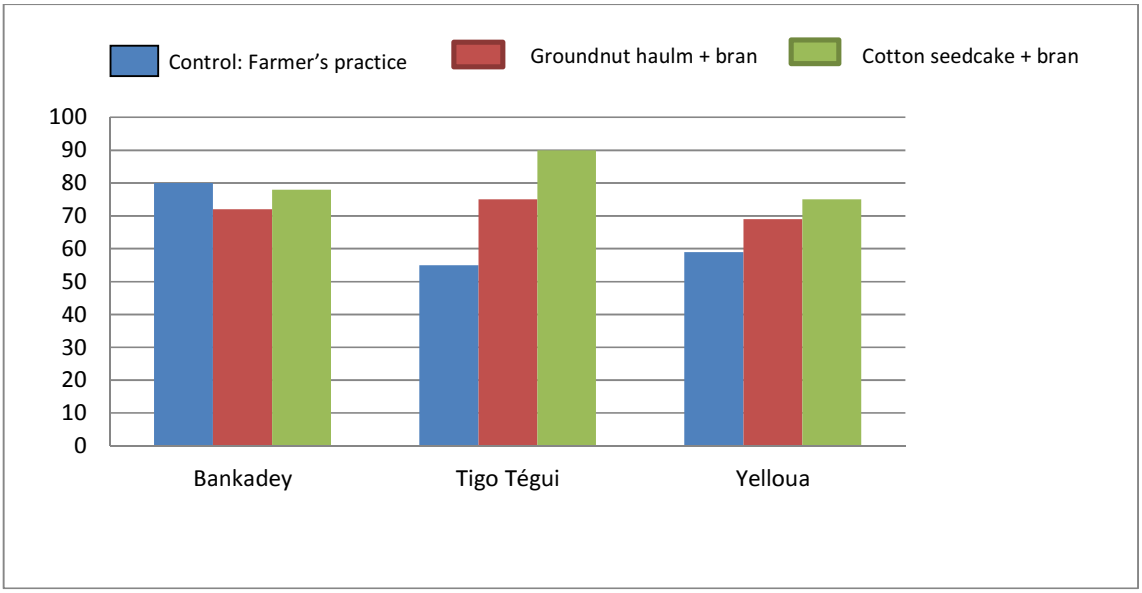
Sheep average purchase price (FCFA)	51966±2766[b]	48053±1964[b]	69216±2642[a]
Sheep average sale price (FCFA)	81120±3880[b]	75974±2783[b]	89927±3744[a]
Gross benefit (FCFA)	29153±1502[a]	27922±1077[ab]	20711±1449[b]
Net benefit (FCFA)	15106±1519[a]	13346±1089[a]	6994±1466[b]

Treatment means with the same superscript are not significantly different at the 5% level of significance.

Location (village) had a significant effect on the total dry matter intake and intake of bush hay and bran ($p < 0.01$) and also on net benefit. However, the interaction between village and treatment only had a significant effect on the total dry matter intake ($p < 0.001$). The highest mean of total dry matter intake was recorded in Bankadey (1988 g/day) while the lowest (1757g / d) was recorded in Yelloua (Table 3).

The lowest feed conversion ratio or highest feed efficiency was observed in Yelloua compared to the other 2 villages. The lowest feed efficiency was recorded in Bankadey. Average purchase and sale prices of sheep were higher in Yelloua than in the 2 other villages where the prices were not significantly different. The highest net benefits were observed in Bankadey (15106 FCFA) and Tigo Tegui (13346 FCFA), which are twice higher than that of Yelloua (6994 FCFA).

The interaction between treatment and village had no significant effect on sheep growth performance ($p > 0.05$). Figure 1 shows average daily gain realized with the interaction between feed rations and village. This figure shows that in all the villages, rations containing cotton seedcake had the best average daily gain (ADG) followed by those with groundnut haulm.



4. Discussion

The different rations tested positively influenced total dry matter intake. The higher total intake of bush hay under traditional fattening practice (84 g / day / kg 0.75) can be explained by the its high consumption compared to the experimental treatments, with daily bush hay intakes of 69 and 59 g / day / kg 0.75 for treatments 2 and 3, respectively.

The average daily gains of the 3 treatments were similar with slight advantage for the experimental rations with values 72 and 81g / day for treatments 2 and 3, respectively. The low growth performances of the sheep in all treatments can be explained partly by the short duration (48 days) of the fattening and secondly, by the loss of energy caused by exposure to weather conditions due to unsuitable habitat. These results are inferior to those obtained by Ayantunde et al. (2008) with a ration containing 400g of millet bran and 600g of groundnut haulm.

The total feed cost of the farmer's practice ration (control) is higher than the cost for treatment 2 and 3 by 1990 and 1238 FCFA, respectively. This higher cost could be attributed

to the fact that farmers often use large quantity of feed in sheep fattening, therefore leading to waste in the traditional fattening scheme. The high feed cost in traditional fattening is largely responsible for low net benefit as demonstrated by this study. The net profit of the traditional fattening practice in our study was lower than the benefits from improved rations by by1679 and 1889 FCFA for treatments 2 and 3, respectively. These results show that improved rations are more economically profitable than the control (farmer's practice) ration.

Dry matter intake varies by location with a high mean value (1988 g / animal / day) in Bankadey. Sheep weight gain also varies from one village to another with the highest growth obtained (77g / d) in Bankadey against 67g / day for Yelloua. Comparing purchase and sale prices in Yelloua shows that these values are higher than in the other 2 villages where mean prices are not significantly different. The mean net profits are similar for Bankadey and Tigo Tegui and are twice higher than the net profit in Yelloua. The low net profit obtained (6994 F) in Yelloua is explained by the high purchase price of sheep (69,216 FCFA) compared to 48,053 FCFA in Tigo Tegui and 51,966 FCFA in Bankadey.

In all villages, the best weight gain was realized for the animals receiving cottonseed cake, which can be explained by its high nitrogen content. These results are consistent with those obtained by Dan-Goma et al. (2004) and Ayantunde et al. (2007; 2008) with increasing levels of nitrogen source (groundnut haulm).

Conclusion

The study demonstrated that improved feed rations, particularly those containing high nitrogen content (cottonseed cake, haulm) are more efficient and more cost-effective for sheep fattening than the traditional practices which are associated with high feed cost as a result of unregulated feeding of the animals.

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