

Contribution of Multi-Nutritional Blocks and Treatment of Roughage for the Resilience of Beneficiary of Rural Households in Niger

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The present study was conducted to assess the contribution of Multi Nutritional Blocks and that of the processing of roughage in the resilience of households. The study was carried out in the rural communes of Sakoiria and Kourtheye (department of Tillabéri) through a survey of 32 producers of multi-nutritional blocks and treated straw. The structure by age class reveals, among the Peulh ethnic group, that 50% of the people surveyed are between 30 and 49 years old while half of remaining at an age between 50 and 69 years old. It appeared that more than half (55%) of the sample of people surveyed were uneducated. Multi-nutritional blocks are appreciated by 90% of the respondents against 10% who did not give their point of view. The treatment of the straw aroused the admiration of the majority (80%) of the respondents. For the strategies adopted by the peasants, one can retain the destocking which is practiced by 86.6% of the respondents against 6.6% who prefer the sale of animals. A profit of 42,500 FCFA was obtained for a production of 100 kg of mixture of multi-nutritional blocks and an average of 121,000 FCFA by giving the treated straw to an ox for two months. This made it was possible to meet certain needs, thus leading to household resilience.

Key words: Household resilience, Multi nutritional block, Roughage.

INTRODUCTION

Biomass is the most economical fodder resource for ruminants (Houmani and Tisserand, 1999). Moreover, it is easily accessible to farmers who are very vulnerable to climate change (Sansoucy, 1996). Unfortunately, these forage resources available in the tropics are unbalanced in terms of their feed value (they are rich in fibre and poor in nitrogen, minerals

and vitamins). They require appropriate supplementation to provide sufficient nitrogen for rumen microflora development and 'real' proteins that can feed the animal and ensure sufficient production (Abecha and Mangaa, 2007). Although it still plays an important role in the national economy as the main supplier of meat, ruminant livestock in Niger in

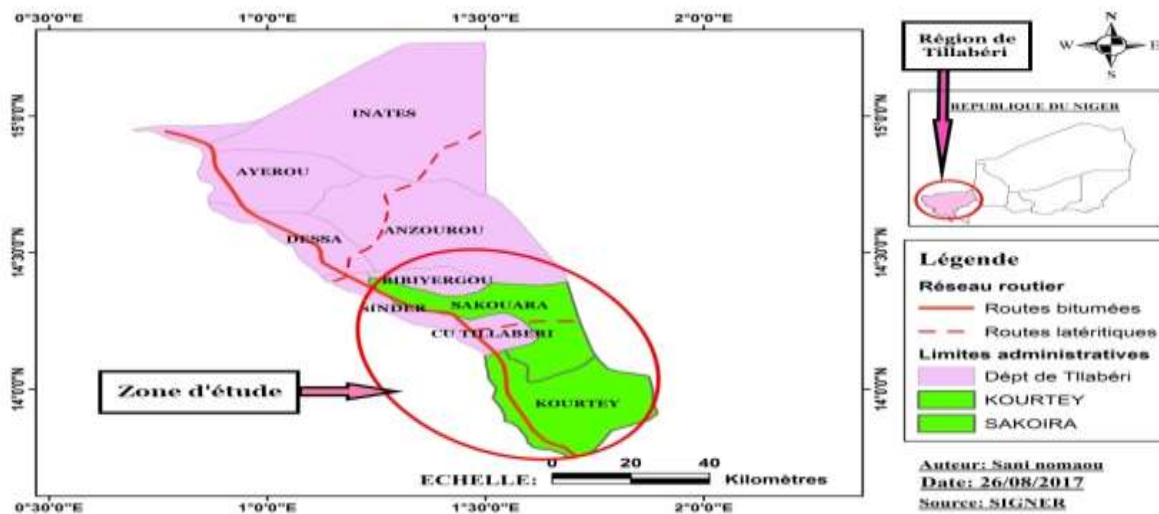


Figure 1. Location of the study area.

general and in the department of Tillabéri in particular in the rural communes of Sakoirra and Kourtheye is subject to strong uncertainties linked to climatic hazards and variations in animal prices (Issoufou, 2016). The problem of agro-pastoral livestock development is not only present in Niger and the Sahel, but in many developing countries, according to a study by CIRAD-EMVT (2006). The lack of grazing areas and the low nutritional value of available agricultural residues, which characterize the pastoral zone, do not allow the livestock living there to fully express their genetic potential (Kayouli et al., 1994). The dominant characteristic of these roughages is their low ingestibility, low digestibility and low nutritional value, particularly in nitrogenous matter. The result is chronic undernourishment, which leads to growth difficulties in young animals; weight loss in adults; reduced meat and milk production; reduced working capacity (stamina and strength) in draught animals; and susceptibility to disease (Kayouli et al., 1994; Moussa, 2011; Soumana et al., 2016). It should be noted that livestock production is an important source of household income (Rhissa, 2010). However, the country's natural constraints seriously handicap ruminant breeding. The food and nutritional situation of humans and animals, threatened by recurrent and multi-faceted crises, is a major concern in Tillabéri department, the study area and its surroundings. In this context, building the resilience of vulnerable households is an imperative, which is reflected in the

strategic frameworks of CILSS, IGAD and FAO (FAO, 2016). Building resilience therefore requires support to individuals, households, communities and governments (MEIA-Niger, to help them put in place concrete policies and measures that anticipate and manage shocks (FAO, 2016). The food insecurity of livestock linked to the chronic fodder deficit requires us to look for alternative solutions to mitigate the adverse effects of insufficient livestock feed resources on the productivity and income of livestock farmers and agro-pastoralists (Abdou et al., 2011). The treatment of roughage is a possible alternative that not only enhances its nutritional value, but also improves its digestibility and increases its ingestion by animals (Kayouli et al., 1994). The use of multi-nutrient blocks (MNB) based on local forages in animal feed is another possibility (Mohamed-Brahmi et al., 2010; Abdou et al., 2011). The main objective of this study is to assess the effect of using MNBs and roughage processing as alternatives in household resilience.

MATERIALS AND METHODS

Presentation of the Study Area

This study was conducted in the rural communes of Kourtheye and Sakoirra (Figure 1). The rural commune of Kourtheye is located in the south-western band of the Department of Tillabéri (Niger)

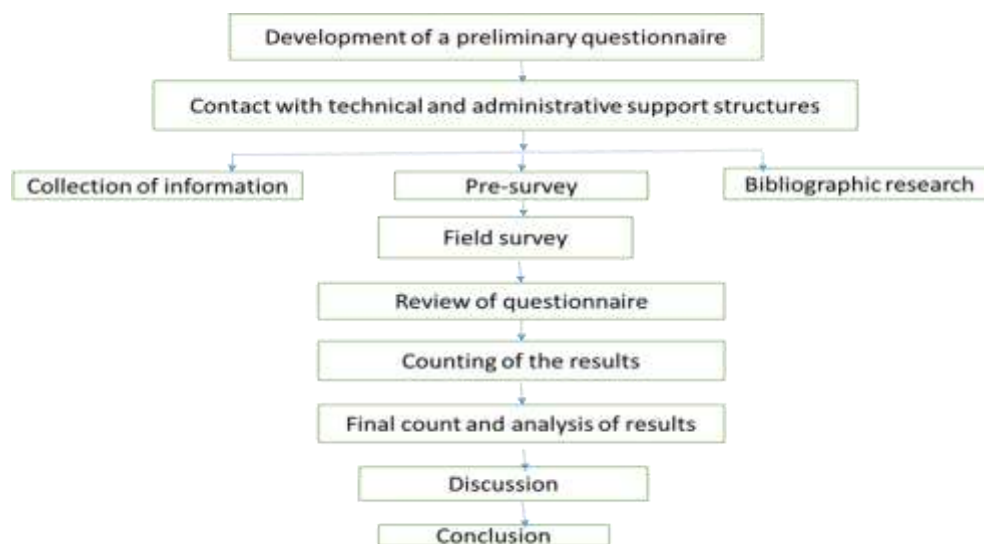


Figure 2. Farm study guide for agronomists (Capillon and Manichon, 1991).

Agriculture is the main economic activity of the area's populations, occupying more than 80% of the active population, both women and men (RDA/Tillabéri, 2019). Livestock breeding is the second most important economic activity in the area.

Materials

The following equipment was used for collection and processing: (1) a camera for the illustration photos; (2) a survey form to list the data; (3) Arcgis and SPSS software for the creation of maps, image processing and coding of data; (4) use of Paint Net for image modification.

Methods

The working methodology adopted is deduced from the Farm Study Guide for Agronomists (Figure 2).

Sampling

The choice of villages and respondents was made in a reasoned manner, based on the REGIS-ER/Tillabéri principle of choosing the most vulnerable layer. The sample of respondents was carefully selected and varied from 3 to 4 individuals per village. This choice is explained by the fact that the basic study of the project carried out by REGIS-ER brought out the portraits of the target populations and those who had received training in their structure. In

addition, an awareness-raising session was held in two (2) villages of Sakoirra, followed by a training session in the Kourtheye town hall which brought together all the farmers concerned in the two communes. Thus, based on the inclusion criteria described above, the survey was conducted among a sample of 32 producers of BMN and treated straw.

Canvassing or Pre-Survey

The first stage is a pre-survey. It is a preliminary stage that consists of testing the administration of the questionnaires to the target populations, in order to make possible corrections and to carry out preliminary observations in the field.

Survey

During this stage, a total of 32 questionnaires were administered in the two communes (Sakoirra and Kourtheye). The method used to collect information consisted of a series of interviews with the target households (agro-pastoralists), either directly or indirectly, depending on the case (absence of the owner, mistrust of the agro-pastoralist, etc.), and by direct observation without asking questions. The main questions concerned: (1) the socio-professional characteristics of the respondents (2) livestock feeding practices (3) major constraints on livestock rearing; (4) farmers' strategies for ensuring the survival of the herd; (5) general observations on the

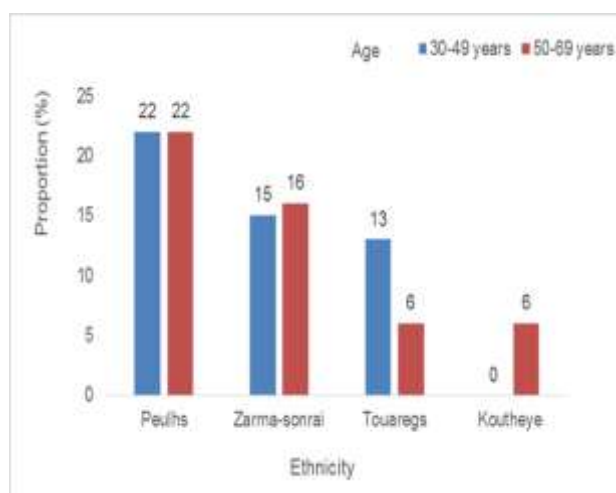


Figure 3. Distribution of respondents by ethnicity and age.

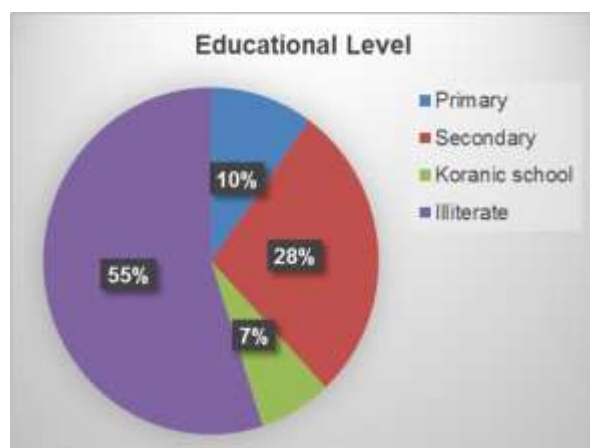


Figure 4. Educational level of respondents.

multi-nutritional blocks.

A focus group was organised in two (2) villages of the Sakoira commune, with an estimated size of more than 20 people, made up of men and women. A socio-professional diversification was also sought (farmers, stockbreeders and agro-breeders etc.) during this awareness-raising phase. This meeting was organised with the aim of motivating, proposing and encouraging these populations to start treating their straw and making BMN for their livestock. Finally, they were made aware of the advantages of these two activities for the valorisation of fodder for animal production.

Statistical Analysis of Data

Within the framework of this study, SPSS 20 software was used to analyse and process the data from the surveys. It was used to determine the number and proportion of responses for each question, and to calculate the averages of certain results.

RESULTS

Socio-Professional Characteristics of the Survey

Structure by social group and age group

The sample of thirty-two (32) farmers surveyed individually is made up of 44% Peulh, 31% Zarma-sonrai, 19% Touareg and 6% Kurtheye. The age structure of the Fulani ethnic group shows that 50% of the people surveyed are between 30 and 49 years old, while the remaining half are between 50 and 69 years old. However, among the other ethnic groups, there is a slight disparity among the Zarma-sonrai, and a significant difference among the other ethnic groups (Figure 3).

Marital status and family type of respondents

Analysis of the data showed that 86% of the sample are married and 14% are single and head of household. It should also be noted that more than two-thirds of the married respondents (72%) are polygamous, as opposed to 28% who are monogamous.

Level of education

After analysis of the data, it was found that more than half (55%) of the sample of people surveyed are not educated. The study also revealed that 7% had attended Koranic school, and 38% had attended modern school, of which 28% had secondary education and 10% had primary education (Figure 4).

Socio-economic activities

The main activities of the people surveyed were agriculture, animal husbandry, small-scale trade and handicrafts. Figure 5 shows that the majority of the sample is made up of livestock farmers (50%); farmers and small-scale traders are equally represented (21%), while craftsmen are less

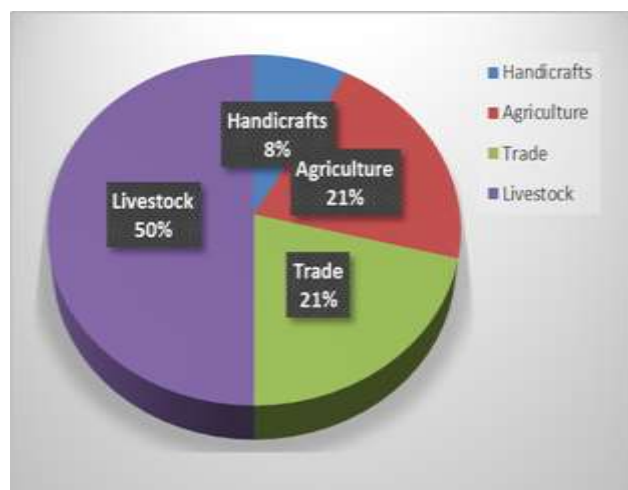


Figure 5. Socio-economic activity of respondents.

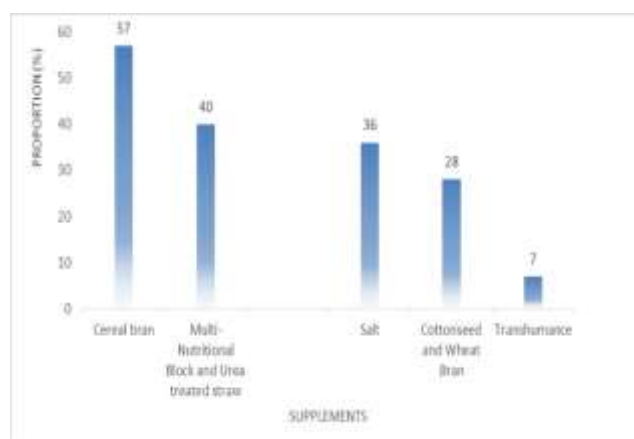


Figure 6. Different types of livestock feed in the study area.

represented (8%).

Livestock Feeding Practices

Analysis of the data (Figure 6) shows that, in the dry season, 100% of respondents take their animals to pasture during the day and distribute rice straw or other crop residues in the evening when they return from grazing. Fifty-seven percent (57%) of respondents supplement the basic ration (natural pasture) with cereal bran and 40% use BMN and processed straw as supplements to the basic diet. In addition, the survey revealed that 36% of the agro-pastoralists give water and salt, 28% distribute cotton

grains and wheat bran, and 7% practice transhumance.

Major Constraints on Livestock Farming

The survey revealed that 100% of the people surveyed have difficulty feeding their animals. Poor grazing in the dry season and insufficient grazing during the winter months were highlighted. The level of health coverage for animals is low in these areas, as 57% of respondents do not have veterinary products. Concerning watering of animals, 29% of respondents are confronted with a problem of watering, especially during the dry season. Farmers in the rural communes of Sakoiria and Kourtheye (36%) also lack the means to purchase agro-industrial by-products. Among the constraints mentioned, 14% mention overcrowding of animals as an obstacle and finally 7% see inter-community conflicts as a major constraint to the development of their livestock activities.

Farmers' Strategies for Ensuring the Survival of the Herd

Concerning the strategies adopted to ensure the survival of the animals, the analysis of the data revealed that 86.6% of the sample fed their animals with crop residues, 93.3% used BMN and treated straw to ensure the survival of their herd. As for destocking, 86.6% of the respondents opted for this practice against 6.6% who preferred to sell their animals. In addition, the animals in the rural communes of Sakoiria and Kourtheye receive supplementary feed when they return from grazing, in addition to the basic feed provided by natural pastures. In this regard, the study found that 6.7% cut green fodder that is wilted after cutting (hay) while 93.3% used straw to ensure the survival of their herd. It was also noted that 93.3% had purchased bran and cotton grain, while 35% practiced transhumance. Finally, 20% used other strategies.

GENERAL OBSERVATION ON THE MULTI-NUTRITIONAL BLOCKS IN LECHER

Farmers' Observations on BMN and on the Animals Receiving these Blocks

The BMN is a food resource that is highly valued by 90% of the respondents, compared to 10% who did

Table 1. Summary of ingredients for the manufacture of BMNs and income from its activities.

Formula	Quantity		Unit price (FCFA)		Total price (FCFA)	
Millet bran	6,5 kg		307		2000	
Cement	1,5 kg		500		750	
Salt	1 kg		500		500	
Urea	1 kg		500		500	
Water	6 litres		//		//	
Total cost of production of 10kg of mix					3 750	
Production	Unit weight	Cost price/unit	Selling price/unit	Total revenue	Net Profit	
16 medium blocks	588g	230 FCFA	500 FCFA	8 000F	270F/bloc	4 250F/10 kg
32 small blocks	294g	115 FCFA	250 FCFA	8 000F	135F/bloc	4 250F/10 kg

not give their opinion. Regarding the condition of the animals, 90% of the respondents noted an increase in the weight of the animals, a change in their coat, an increase in milk production and an increase in the market value of the animals that had benefited from the BMNs. Some respondents (10%) did not respond to this question.

Farmers' Observations on the Technique of Making BMNs and its Possible Constraints

The results of the survey showed that 90 to 10% of the farmers surveyed agreed that making BMNs is a simple technique to implement and allows better management of straw stocks. In addition, 50% reported constraints such as purchasing power which reduces the accessibility of inputs against 50% of the farmers surveyed who did not suggest any constraints.

OBSERVATION ON ROUGHAGE PROCESSING AT UREA

Farmers' Observations on Treated Straw and on Animals Receiving this Straw

The majority of respondents (80%) treat their straw. According to these same respondents, the animals that received the treated fodder showed a weight gain. On the other hand, the 20% of the population surveyed did not observe any change either in the treated straw or in the condition of the animals that consumed the treated fodder.

Farmers' Perception of the Treatment Technique and its Possible Constraints

Like the BMN, 80% of the sample stated that the treatment technique is simple to implement and allows for better management of straw stocks, compared to 20% who had no opinion. For constraints, the situation is similar to that of the BMN. Purchasing power (SPA) is always cited as the main constraint.

Different Types of Straw Preferred by Farmers for Processing

The analysis of the data showed that 82.2% of the respondents preferred rice straw for processing, while 17.8% preferred the stalks of other cereals such as millet and sorghum.

CALCULATION OF ECONOMIC PROFITABILITY

Calculation of the Economic Profitability of BMN

Table 1 summarizes the ingredients for BMN production and the income derived from its activities. The result of the table obtained by applying the formula for 10kg of BMN mix, shows a profit of 4,250 FCFA without taking into account labour, i.e. a profit of 4,500F for a production of 100kg of mix.

The production of BMNs is an income-generating activity that enables the household to meet some of its daily needs. The profitability of BMN sales depends on the availability of inputs and labour if

Table 2. Calculation of the economic profitability of treating rice straw with urea.

Formula	Quantity		Unit price (FCFA)		Prix Total price (FCFA)	
Straw Labour	1000kg		//		//	
Urea	50kg		250F		12500	
Water	1000L		//		//	
Rice	10kg		500F		5000F	
Small expenses	Condiments ; candy		Varies by type of unit		3500F	
Labour	12 people		Inter aide		Inter aide	
Loan of materials	3 barrels		//		//	
Production cost of 1000 kg of treated straw					21000F	
Production	Consumers (5 oxen)	Duration of fattening	Purchase price of 2 oxen	Total revenue	Total profit	Net Profit
50 treated bales or 1000kg of treated straw	2 steers for sale	2 mois	450000F	700000F	250000F	242000F
	3 oxen for field work	Not specified	Not specified	Not specified	Not specified	Not specified

necessary.

Calculation of Economic Profitability for Straw Treatment with Urea

The results on the economic profitability of using treated straw are presented in **Table 2**. Five average oxen were fed with the 1000 kg treated straw for two (2) months, three of which were kept for field work and the other two were raised for sale. After the consumption of the treated straw, the selling price of these two oxen is 700,000 CFA francs, whereas these animals were bought at 450,000 CFA francs, i.e. a net profit of 121,000 CFA francs per ox and 242,000 CFA francs for the two (2) oxen.

Use of Income from the Manufacture of BMN and Processed Straw

The surveys conducted among farmers revealed the following headings for the use of income. These are the purchase of cereals and children's clothing, baptisms and weddings of children, etc. **Figure 7** shows the distribution of income use and production from the manufacture of BMNs and processed straw. The analysis of the data showed that 82.2% of the respondents preferred rice straw for processing, while 17.8% preferred the stalks of other cereals such as millet and sorghum.

DISCUSSION

Socio-Professional Characteristics of the Surveys

The strong involvement of the Fulani ethnic group in cattle rearing has already been described in other studies which have shown, as in the present work that more than 40% of the cattle breeders in Niger are Fulani (Chaibou et al., 2011). In the same vein, of course, it is known in Niger that the Fulani are the biggest actors in this activity. In the course of this study, it is also noted that a large proportion of the animal keepers are relatively young (30 and 49 years) in these rural communes. These results are similar to those reported by Assani (2013) in a study on the productivity of Goudali zebu in the far north of Benin, where the age of the herders varies from 25 to 60 years. The high involvement of the uneducated in cattle breeding was also noted by Meyer and Denis (1999).

Livestock Feeding Practices

It was found that most farmers graze their cattle during the dry season. Crop residues are generally of better quality (Molid, 2010), which may justify the

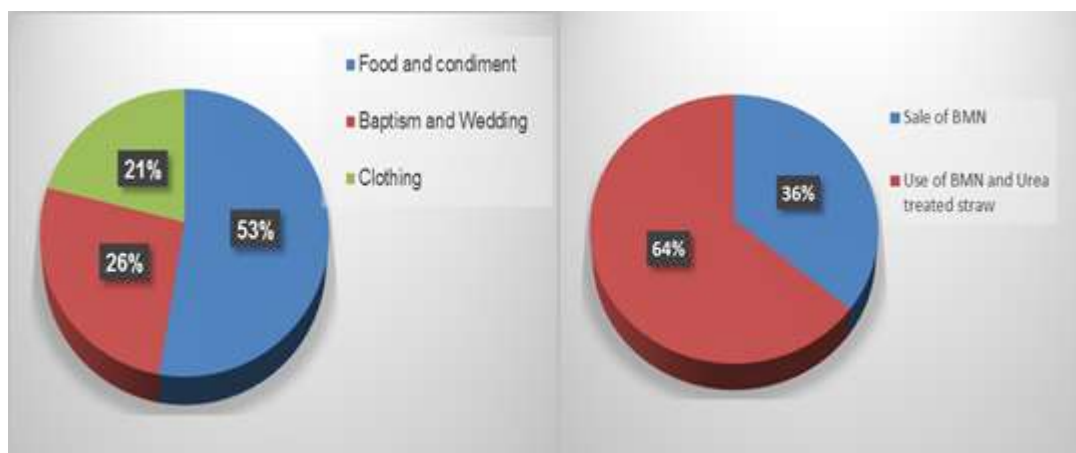


Figure 7. Distribution of income and production of BMN and processed straw.

grazing practice chosen by all (100%) of the respondents. It is reported in the literature (Richard et al., 1990) that hay, millet and sorghum straw, and natural Sahelian fodder in the dry season have a gross energy content of 14 kcal/kg DM and a digestibility of 6 kcal/kg DM. Thus, Molid (2016) tested the effect of five (5) feed formulas based on local feed resources (millet stalk, rice straw, groundnut and cowpea stover) combined with agro-industrial by-products (cotton cake and wheat bran) on the performance of sheep in fattening. The results obtained during this study ranged from 59 to 118 g/d for various treatments. These results demonstrate the nutritional qualities of BMNs. The use of BMNs by more than 93% of the farmers surveyed could be attributed to these encouraging results as reported by Molid (2016).

One of the reasons for the particular importance of fodder crops in the world is the enormous amount of land devoted to livestock production. Three to four billion hectares, or nearly 80% of all land used for agricultural production, is used to feed livestock. Livestock production is growing significantly in developing countries and demand for livestock products has grown dramatically over the past two decades and is expected to continue to grow. This is referred to as the "livestock revolution". This growing demand can only be met by increased livestock production. However, ethical considerations lead to feeding ruminants with forages rather than cereal-based feeds for human consumption (Klein et al., 2014). Since the 1960, research in tropical countries has made substantial progress in pasture and forage production and productivity. The IEMVT (Institut

d'élevage de médecine vétérinaire tropicale) and later the CIRAD have largely contributed to this, particularly in French-speaking countries, but also in Latin America, through research projects in partnership with local stakeholders (Klein et al., 2014).

Constraints and Farmers' Strategies to Ensure Herd Survival

In summary, to ensure the survival of livestock in the face of the adverse effects of climate change, the use of BMNs, processed straw, crop residues, destocking and the sale of animals are the recourse routes (strategies) favoured by farmers in the rural communes of Sakoiria and Kourtheye. It is widely reported in the literature (FAO, 2011) that the above-mentioned food resources are the usual recourse for livestock survival. The staple diet of ruminants in the different agro-ecological zones consists mainly of roughage from pasture, often of poor quality due to the cyclicity of drought, and crop residues, generally cereal straws. These feeds are nutritionally deficient in terms of energy, proteins, minerals and vitamins, and consequently the quantities ingested by the animals are limited and only allow a low level of production (Abecha and Mangaa 2007). Faced with this situation, farmers resort to abusive use of concentrates, the raw materials of which are generally imported (especially oil cakes). The high currency price of these materials requires their replacement by local resources (Abecha and Mangaa 2007). The use of agricultural and agro-industrial by-products as a complement to poor

fodder and pastures allows the basic ration to be better valorised at an acceptable cost (Boulberhane, 2002). Under these conditions, the use of supplements is inevitable. This consists in providing rumen microorganisms with the nutrients necessary for their growth, thus ensuring favourable conditions for cellulose in the rumen (Moujahed et al., 2000; Moujahed et al., 2003). Supplementation is recommended in several forms, such as barley or urea and the formulation of a mixture of urea, molasses and minerals in order to optimize the use of urea by rumen microorganisms. Several methods have been applied in many countries. These methods can ensure a slow consumption of urea with the simultaneous supply of a fermentable energy source, using a suitable delivery system such as lick balls (Kakkar and Sukhvire, 1993).

However, this alternative has practical disadvantages, including the difficulty of transporting the mixture and the risk of urea toxicity from excessive consumption of the liquid if there is no functional delivery system (Kunju, 1986), especially in grazing animals (Kakkar and Sukhvire, 1993). Thus, the process of providing molasses-urea mixture in a solid carrier in the form of BMN has been developed, and subsequently new blocks are made without molasses by integrating other locally available by-products (olive pomace, poultry droppings, date waste, etc.). However, in some countries, such as those in arid and semi-arid areas and in the Sahel zone, access to protein supplements is difficult or impossible.

In Australia and South Africa, liquid molasses-urea mixtures have been used for many years to supplement nitrogen, minerals and energy (Beames, 1963). However, the major constraint of this system is the transport and handling of molasses, especially for small-scale farmers, over long distances or to areas with difficult access. Another solution was therefore considered, which consisted in bringing the molasses-urea mixture in solid form. This method of making molasses-urea blocks was developed in Australia (Beames, 1963). It was subsequently developed in several other countries (Egypt, India, Pakistan, etc.) thanks to the work of Professor Leng at the University of Armidale (Leng, 1984). The FAO's Animal Production and Health Division has also developed this method (Sansoucy, 1986) through projects in various other countries (Senegal, Mali, Burkina Faso, Cameroon, Sudan, Somalia, Bhutan, etc.), which has enabled the survival of animals in periods of drought, and even a low level of production

In some cases. Unfortunately, many countries (Tunisia, Algeria, Niger, Chad, etc.) do not have molasses or have it in quantities too small to be used in the manufacture of blocks. It was therefore essential to find a solution for these countries by developing a method of making blocks that took this constraint into account (Sansoucy, 1986). To this end, the Animal Production and Health Division of FAO conducted a study in Niger with the cooperation of the Institut National de Recherche Agronomique du Niger (INRAN) to mitigate this challenge (Abdou et al., 2011). This practice is the subject of numerous development projects launched by FAO.

General Observation on Multi-Nutritional Leaching Blocks

The analysis of the farmers' observations on BMNs in relation to the improvement of the animals' body weight shows that BMNs are a very nutritious feed. These very remarkable positive effects of BMN on zootechnical performance (milk production and average daily gain) have already been demonstrated and described in experimental animals (Abecha and Mangaa, 2007; Molid, 2016). The recognition by farmers of these benefits of this technology is already an important pledge to the prospects of large-scale valorization of local products from BMN manufacture, which has a definite future in reducing the costs of imported feed (Abecha and Mangaa, 2007). The advantage given to goats for BMN distribution could be explained by the rapid adaptation of goats to the diet (Abecha and Mangaa, 2007).

Observation on Roughage Treatments at Urea

The use of urea treated straw is an alternative that could considerably improve the zootechnical performance of any animal that has been fed it. Indeed, the majority of farmers in the rural communes of Sakoiria and Kourtheye initially appreciated the quality of this roughage, which had undergone a technique to increase its nutritional value. These same farmers also attest to the fact that straw treated with urea considerably improves the body weight of the animals that benefit from it. It is true that the treatment technique is simple to implement and allows for better management of straw stocks. However, the lack of means (financial, material, manpower) hinders its development. The introduction of the technique of treating roughage with urea in Niger dates back to the early 1980s as part of a

fattening project in the district of Kollo, implemented by Euro Action Accord. This introduction was not successful. In 1987, the Government of Niger requested FAO's assistance in implementing a programme to test the effectiveness of urea treatment of roughage in the farming environment for feeding ruminants. Farmers welcomed this very simple and easily controllable technique. In view of these results, the government submitted a new funding request to the UNDP, which resulted in 1991 in the project "Extension of the urea treatment method for roughage in the departments of Tillabéry, Dosso and Maradi", which lasted four years and was entrusted to the FAO for implementation (FAO, 1991). In the first year, more than 500 agro-pastoralists volunteered to carry out the treatment and the results were very encouraging. During the course of the project, the farmers gave priority to draught animals.

In 1994, draught animals made up 76% of the animals fed with roughage, compared to 13% for fattening animals and 11% for dairy cows. With regard to the time of straw processing, the cold dry season seems to be the most favourable period for straw processing and allows animals to be put to fattening. Moreover, Abdou and Rupol (2000) noted that crop residue prices can increase by 300-500% on the eve of the Tabaski festival and during the lean season, which justifies the result of the present study, where a minority of farmers (20%) prefer the lean season for processing. However, most farmers give the treated straw to sheep, followed by goats and cattle. Finally, farmers proposed to carry out an awareness and motivation campaign on the benefits of the technique, to those farmers who have not started treating straw and making BMNs. According to Richard et al. (1990), the highest values of organic matter are found in the dry season Sahelian pasture group, while the lowest are found in rice straw, which is very rich in mineral matter. This confirms the choice of 82.2% of the farmers to use rice straw for the treatment.

Calculating the Economic Profitability of Income-Generating Activities for Household Resilience

The processing of fodder is a real economic activity that is profitable insofar as it generates income. Indeed, a farmer could earn 121,000 FCFA in two (2) months by feeding the processed straw to an ox. However, it should be noted that this result depends on the duration of the fattening and the type of

animals to be fed. The activity of processing rice stalk fodder provides more income than natural fodder. It was found during the study that the price of any fodder processing production is variable depending on the type of straw to be processed and the time of year. Thus, the selling price of the bale is variable for groundnut stover, cowpea stover and bush straw. According to Soulé (2014), the selling price per kg is 207, 167 and 250 FCFA respectively for groundnut stover, cowpea stover and bush straw (zornia). This confirms the variability of fodder prices according to the quantities produced, in space and time. The 2003 and 2012 seasons were in surplus while the 2011 season was in deficit (Ministry of Livestock-Niger, 2012) and the law of supply and demand, "a product is expensive when it is scarce" explains the high prices in 2011 compared to the other two years.

CONCLUSION

This work has highlighted that the contribution of the multi-nutritional blocks and the treatment of roughage in the study area have led to convincing results. Indeed, this study showed that BMN is a very nutritious feed insofar as the condition of the animals that received this feed improved considerably. For the contribution of BMN to animal production, the results obtained show an increase in milk production. A positive change in the coat of the animals was also observed. This has resulted in the added value of this product (coat) on the market. Constraints were noted such as purchasing power which reduces the accessibility of inputs. Thus, the cold dry season is the preferred period for the manufacture of BMN, due to the availability and accessibility of local products for the manufacture of BMN. For the treated straw, which is brown in colour, pungent smelling and soft, a remarkable change was observed in the animals that received this treated fodder. Indicators of this change include increased milk production and improved coat texture. In view of these results, it can be said that the production of BMNs is an income-generating activity that helps to meet some of the daily needs of the household. It was also found that fodder processing is a profitable activity.

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