

Original Paper

Use of Agro-Industrial By-Products in Animal Feed at Modern and Semi-Modern Farms of Urban Community of Niamey (UCN): State Places

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Abstract

The study was conducted in Urban Community of Niamey at modern and semi-modern farms provided an overview use of agro-industrial by-products in animal feed. Among 57 farms only 17 farms, including 10 beef farms, 2 sheep farms and 5 poultry farms were systematically surveyed. All farm managers are men. 60 and 33% are respectively officials at the level of poultry farms and ruminant farms. Farmers make up 25%, all of which own beef farms. There is also a predominance of adults, 60% at poultry level and 58.33% at ruminant farms. We note the use of a variety of agro-industrial by-products in animal feeds, in this case by-products derived from vegetable processing (wheat bran, exfoliated cotton cake) and animal processing (fish and fish meal ...). There are also some concentrates for poultry feed. Agribusiness by-products are increasingly used in urban livestock production but their valorization needs to be improved.

Keywords

farms, food, agro-industrial by-products, niamey

1. Introduction

In intensive systems, concentrated foods and precisely agro-industrial by-products cover almost all energy and protein needs. Animal nutrition is one of the major challenges to livestock development in Niger. This problem is acute in large urban areas such as Niamey, where urban and peri-urban livestock production is flourishing, with intensive use of crop residues and agro-industrial by-products (Maman Lawal, 2014). Studies on diversity and use of agro-industrial by-products in animal feed have been conducted since 1976 in Togo by Iréné, in Rwanda by Nubaha (1986) in Senegal, Mali and Niger (Lambaré, 2015). In Niger, one of scientific studies on that subject was conducted by Harouna (1993), Chaibou et al. (2012) in Maradi and recently by soulé (2014) and Ousseini et al. (2017) in Urban Community of Niamey. Use of agro-industrial by-products in animal feed suggests a prosperous urban and peri-urban livestock production in Niamey. Faced with this situation, it is again necessary to investigate such use at level of breeding where complementation is more practiced. From where the state of play on use of agro-industrial by-products at level specifically modern and semi-modern farms in Urban Community of Niamey.

2. Material and Methods

2.1 Area of Study

The study took place in Urban Community of Niamey (UCN). It is located on borders of Niger River, in extreme west of country, between 13°33' North and 13°24' South and meridians 2° and 29°15' East (Beidari, 1999). Administratively, Niamey is divided into five communes spread over 58 neighborhoods and 44 attached villages located in its immediate periphery (Figure 1).

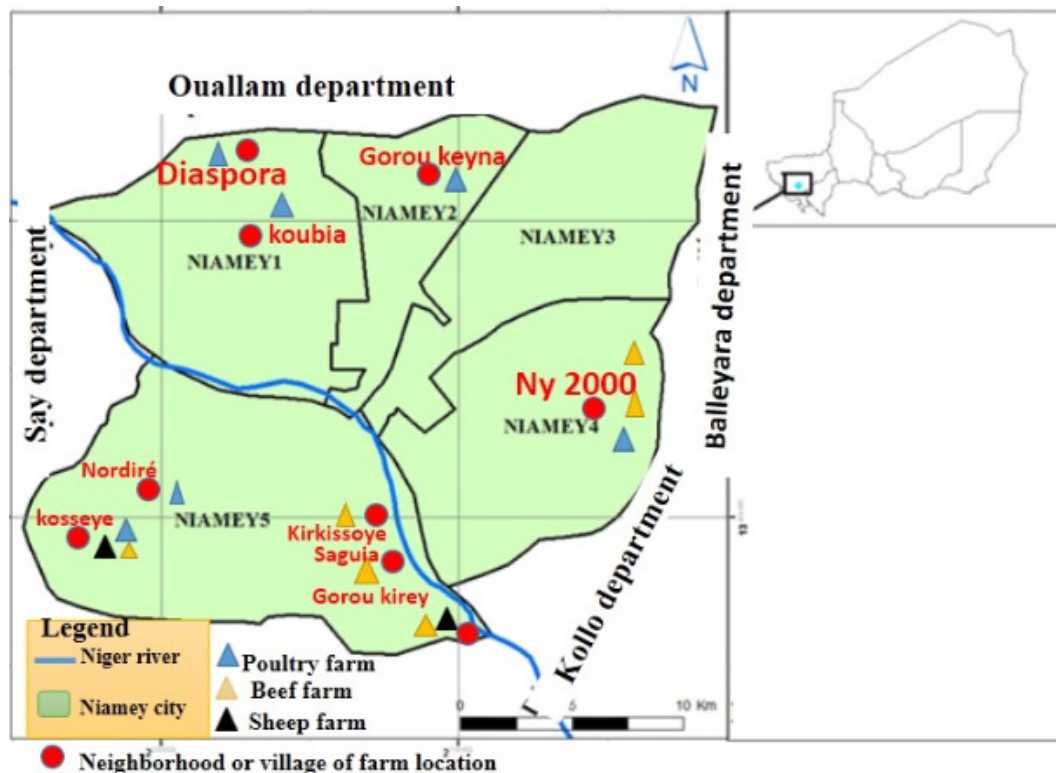


Figure 1. Map of Niamey City

The climate is characterized by a maximum temperature of about 36.06°C, and a minimum of 23.09°C. The rainfall is 574.4 mm and rainy season lasts three to four months (June to September) (ASR/INS, 2015).

River network of CUN is marked mainly by Niger River which crosses the city at about 15 km and which are added some permanent ponds and many temporary ponds. On morpho pedagogical level, CUN is made up of battleships cut into valley of river with basins temporarily waterlogged and presenting hydromorphic soils, sandy or lateritic soils in places and tropical ferruginous soils covering most of the agricultural zone (Chaibou et al., 2011). In general, there is sparse shrub vegetation and seasonal herbs. In the shallows nature of soil and proximity of water are conducive to development of fairly dense natural vegetation (ASR/INS, 2016). Main crops grown in irrigation are: rice (630 ha), market gardening (400 ha) and arboriculture (450 ha). Livestock farming is characterized by a large number of modern and semi-modern farms in which all species of domestic animals are found (Rhissa 2010; MEIA, 2008).

2.2 Methodology

It is a systematic sampling which was conducted in this study with regard to diversity of farms and constraints of environment (accessibility, availability of breeders, etc.). This is how, out of twenty-three (23) poultry farms and thirty-four (34) ruminant farms, seventeen (17) farms were surveyed in five (5) communes with exception of commune III:

- ✓ Ten (10) beef farms (Nine (9) dairy farms and one (1) fattening farm). Of these ten (10) farms, two (2) are modern and eight (8) semi-modern farms;
- ✓ Five (5) poultry farms including three (3) layers and two (2) flesh; among which two (2) modern and (3) semi-modern;
- ✓ Two (2) sheep farms (fattening and breed selection); all are semi-modern.

The characteristics of farms surveyed are presented in Table 1.

Table 1. Characteristics of Farms Surveyed

N° farm	Option/Speculation	Localization	Start of Operation	Type
Poultry farms				
1	Eggs	Diaspora/T1	2007	SM
2	Eggs	Koubia/T1	2009	SM
3	Eggs	Nordiré/T5	2011	M
4	Flesh and Guinea fowl	Kosseye/T5	2013	M
5	Flesh and eggs	Niamey 2000/T4	2018	SM
Cattle farms				
6	Milk	Sagua/T5	2004	SM
7	Milk	Saga gorou2/T4	2009	M
8	Milk	Saga gorou2/T4	2014	SM
9	Milk	Gorou keyna/T2	2011	M
10	Milk	Kosseye/T5	2013	SM
11	Milk	Gorou kirey/T5	2010	SM
12	Fattening	Sagua/T5	2017	SM
13	Milk	Kirkissoye/T5	1977	SM
14	Milk	Kirkissoye/T5	2014	SM
15	Milk	Kirkissoye/T5	2013	SM
Sheep Farms				
16	Selection of breeds and Fattening	Gorou kirey/T5	2010	SM
17	Fattening	Kosseye/T5	2013	SM

Note. M: modern; SM: semi-modern; T: town.

Questionnaires developed according to farm type were sent to farm managers. This information covers, among other things, vital statistics, type of exploitation, types of agro-industrial by-products used in animal feed and supply of agro-industrial by-products.

2.3 Data Analysis

Data processing and presentation were done on Excel spreadsheet. MINITAB 14 software, correlations were established by principal component analysis between farm types and variables characterizing the herd management mode.

3. Results

3.1 Social Situation of the Respondents

Socio-demographic characteristics of respondents were diagnosed in order to better assess their socio-economic situation. The most important of these characteristics are: sex, age, marital status, occupation, ethnicity, type of education, number of persons in charge, and religion. Men are 100% responsible for the farms surveyed. With regard to ethnic groups, individuals constituting the sample belong to 5 out of 8 ethnolinguistic groups of Niger: Hausa, Zarma/Sonrhai and Dendi, Fulani, Tuareg, Kanuri with a predominance of Zarma (29.41%) and Fulani (29.41%) followed by Haoussa 17.64% and Kanuri and Tuareg (11.76%). All respondents are Muslims, 94.11 and 5.88% are respectively sedentary and transhumant.

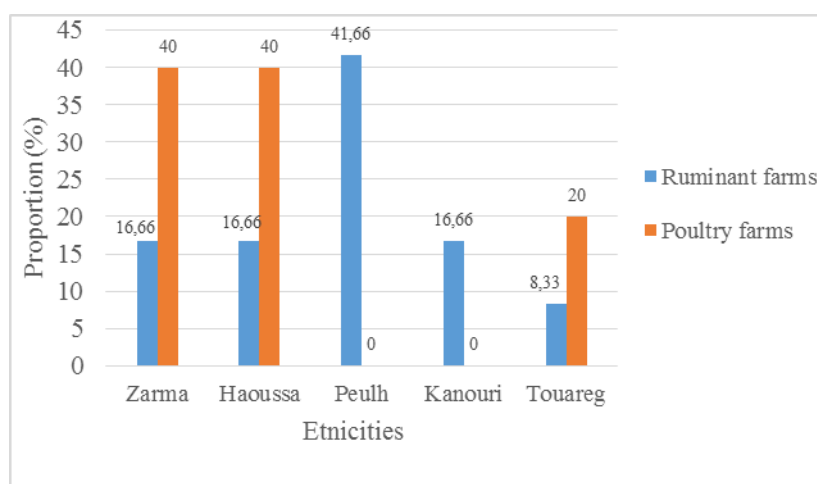


Figure 2. Ethnicity of Respondents

Information on age has also been sought, as shown in Figure 2. Figure shows that adults (60% at poultry level and 58.33% at ruminant farms) predominate between 31 to 50 years old. Age group of 18 to 31 year olds is 20% in poultry farms and 16.66% in ruminants.

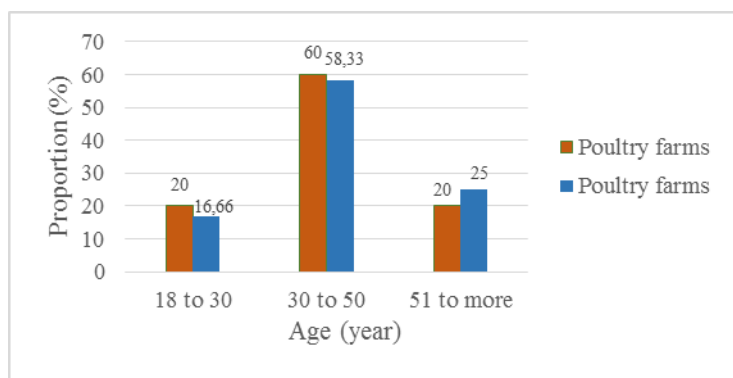


Figure 3. Age of Respondents

Civil servants represent (60%) and have all reached the top level at the level of poultry farms and traders make 20%. These officials also have a high percentage (33.33%) and farmers represent 25% at ruminant farm level. However, we note presence of retirees at level of cattle farms (33.3%) and poultry (20%) (Table 3).

Table 2. Occupation of Respondents (%)

Occupation	Ruminant farms	Poultry farms
Officials	33,33	60
Trades people	-	20
Farmers	25	-
Breeders	8,33	-
Retirees	33,33	20

All farms surveyed are 100% acquired by purchase. With regard to breeds reared at poultry farms, animals are breeds imported from Europe; RIR (Rhode Island Red), New Hampshire. ... On cattle farms there is a breed diversity, so all races of Niger are bred with a predominance of Azawak breed. Azawak is found in all farms followed by Goudali. There are also mixed breeds from local breeds and other exotic breeds such as European Holstein and Brown Alpine breeds. As for sheep farms, breeds encountered are Balami which is the most represented breed followed by Fulani two-colored sheep.

3.2 Relationship between Farms and Herd Management

This relationship is determined through Principal Component Analysis (PCA), which highlights the correlations between farm types and way in which animals are grouped, housed and housed (Figure 4). Correlations shows that first two axes F1 and F2 of PCA are only ones whose eigenvalues are greater than 1 (Kaiser, 1960). These axes summarize 100% of information. The first factorial plane F1 and F2 is then retained to interpret results. In fact, cattle farm is characterized by animals that are housed in habitats made of permanent materials. In cattle farm, animals are grouped by species, by category and

even together and in both loose and shackled stabling. Poultry farm is characterized by enclosure with wire fence in which animals are grouped by age and category then in stabling hampered. The sheep farm is characterized only by housing with thorny enclosures and free stabling.

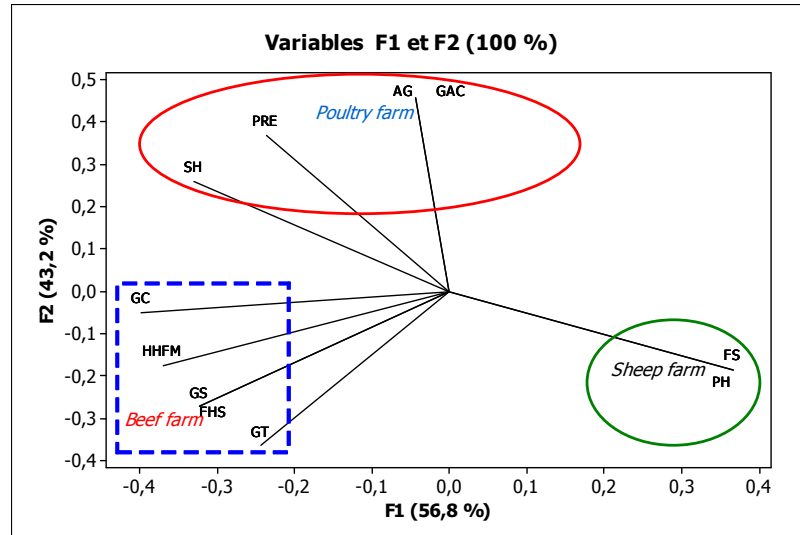


Figure 4. PCA Correlation between Farms and Herd Management

Note. GT: Grouping together, GS: Grouping by species, AG: Age grouping, GC: Grouping by category, GAC: Grouping by age and category, HHFM: Housing habitat in final materials, PH: Penitentiary housing, PRE: Pens roosting enclosure, FS: Free stabling, SH: Stabulation hampered and FHS: Free and hampered stabling.

A positive correlation is found between variables as final material housing, grouping by species, by category, and all together, as well as free and hampered stabling. Similarly, there is a positive correlation between age grouping, age and category grouping, gridlock housing, and tied up stabling. Spiny-pen housing and free stabling are positively correlated.

3.3 Animal Feed: Agri-Industrial By-Products

In all poultry farms, the agro-industrial by-products used are wheat bran, concentrates which are compound feeds consisting of various products (cotton and peanut cake, bone meal, blood meal and fishmeal, soy, etc.). Fishmeal is only used in 40% of farms. Wheat bran and cotton cake are used in 100% of beef farms. In the latter, the cotton grain and the brewer's grain are respectively used at 25% and 40%. Wheat bran and cotton cake are also used on sheep farms. The survey showed that dietary formulas are seasonal functions. The presentation frequencies of SPAI to animals are diverse. The quantities of SPAI in the ration depend on the number of animals on the poultry farms and the availability of coarse feeds, particularly feed which is the staple food of ruminant farms. Wheat bran is the most used by-product, indeed it is offered to animals on all farms. In poultry farms, SPAI account for more than 50% of daily rations with a predominance of wheat bran and concentrates. In 100% of

ruminant farms where wheat bran is used, the quantities vary from 50 to 75 kg/day. For dredging the approximate quantity is 100 kg/day. As for peanut bran which is only used in 10% of these farms the quantities are from 20 to 30 kg/day and the cotton cake from 25 to 50 kg/day. The frequency of use of the SPAI varies according to the food, so the waste is given alone until the stock is exhausted. Wheat bran is given once or twice and once a day, at the level of the cattle and sheep farms respectively. These SPAIs are often associated with each other or mixed with other coarse foods to increase the quantities offered. The different types of SPAI used in poultry farms are shown in Figure 5.

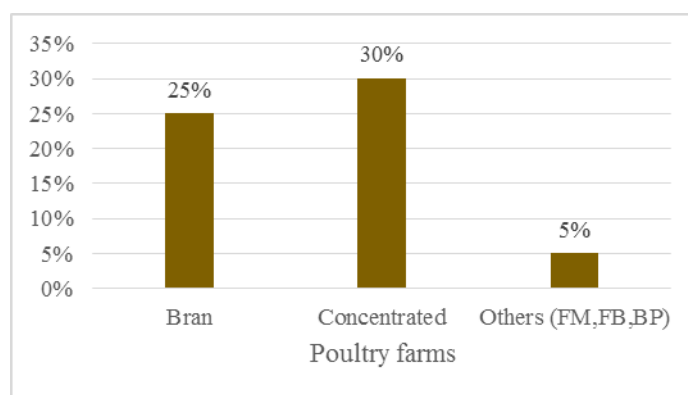


Figure 5. Agro-Industrial By-Products in Poultry Feed (%)

Note. FM: Fish meal; FB: Flour of blood; BP: Bone powder.

In all cattle farms, there is forage used throughout the year. This is rice straw, followed by bourgou (*Echinocloa Stagnina*) used in 30% of the farms in the rainy season and other green fodder, found on the natural routes for the 20% of the farms where the animals are driven. In the rainy season. As for cereals, they are used in all poultry farms (100%). In fact, all the farms surveyed largely use yellow maize, otherwise white. This constitutes 45% of the rations given to poultry. Other residues and by-products of culture are used in the diet. These are peanut and cowpea vines used in 100% of sheep farms. Cowpea pods are used in 10% of cattle farms. It is also in only 10% of beef farms that cowpea haul is used. Note that legume leaves are used primarily to feed small ruminants. Multi-nutritional blocks, salts, lick prayer and malbaza limestone are used in poultry farms. Also in the latter we also note the use of some vitamin foods that are mostly introduced during watering (premix, stimosol ...).

3.4 Supply of Agro-Industrial By-Products

All poultry farms obtain bulk supplies ranging from one (1) to five (5) tons per supply at costs ranging from CFAF 75,000 to CFAF 1,500,000. Given the variety of agro-industrial by-products available for ruminant farms, the supply is based on the need of the food but also on the farmers' stock market. The brewery is wholesaled in the 40% of farms that use it but the sounds and cakes in 70% of the sample. Of the agro-industrial by-products alone, rice bran, brewer's dough, wheat bran, peanut bran, blood meal and bone meal are produced in Niger. The others come from the countries of the subregion but are

available at the level of the livestock feeders. The development of the livestock feed trade in the city of Niamey makes concentrates available all year round. However, there is variation in the quantities of certain products at certain times. Thus, the grains and cotton cakes are more available after the harvests.

4. Discussion

4.1 Social Situation of the Respondents

All farms surveyed belong to men, this is explained by the fact that livestock is practiced mostly by men in Urban Community of Niamey. These results are similar to those obtained by Garba in 2009 and Djibji in 2015. These authors found that 100% of men practice modern cattle breeding. Oumarou (2011) in Maradi and Tou (2006) in Bobo-Dioulasso (96%) also found the same trends. The predominance of men may be due to their ability to invest in this sector but especially to their ability to manage the tasks that make up this activity (Djibji, 2015). At ethnic level, Zarma and Peulh (29.41%) predominate followed by Haoussa (17.64%), which reflects ethnolinguistic composition of Niamey city (Maman Lawal, 2014; Marichatou et al., 2005). These results corroborate those of Djibji (2015) (23% of Zarma) and Boukary et al. (2007). The same observation was made at the level of peri-urban farms in Bobo-Dioulasso, where Peuhl ethnic group represents about 85% of sample (Tou, 2006). As for breakdown by category of farm, Fulani ethnicity is still the majority in cattle farms (41.66%) followed by Zarma and Hausa (16.66%). These results are similar to those found by Marichatou et al. (2005) (89%); Maman Lawal (2014) (69.1%) and Garba (2009). This activity is traditionally the livelihood of Fulani, which is why breeding is the first choice for this ethnic group, while Zarma and Hausa ethnic groups are more numerous at poultry farm level (40%). The predominance of adults (60% at poultry level and 58.33% at ruminant farms) aged between 31 and 50 years in the sample was observed. Similar results were obtained by Moustapha (2016) (69% of adults) and by Ousseini et al. (2017) (48%) at the level of raising small ruminants. The high percentages of officials and traders respectively 60% and 20% at the level of poultry farms against 33.33% of officials on the side of ruminant farms, testify that the ownership of animals has shifted from traditional breeders to officials and traders (Moustapha, 2016; Rhissa, 2010). Other similar results were obtained by Djibji (2015) where 69% of the officials practice modern breeding. It is the same in Burkina Faso, with 100% of veterinarians in commercial farms (Tou, 2006). With respect to farm-to-herd relations, farm animals that have spiny pad housing are not grouped by category or species. These animals are also not housed in permanent materials and are not stall locked or even loose housing and hampered. Farm animals that are grouped together are not in a grid enclosure and are not grouped by age, age, and category.

4.2 Breeds Raised on Farms

At level of all poultry farms in the sample, animals are breeds imported from Europe, proof of modernization of this breeding. On cattle farms, there is a diversity of breeds. Thus all races of Niger are elevated; Azawak race is dominant followed by Goudali. There are also mixed breeds from local

breeds and other exotic breeds such as European Holstein and Brown Alpine breeds in 10% of the beef farms. These results corroborate those of Marichatou et al. (2005). The strong representation of Azawak zebu is due to its milk performance. This explains why the Azawak breed is still the best dairy cow in West Africa (Rhissa, 2010). Métis from cross between azawak and other breeds are signs of the modernization of livestock through introduction of animal biotechnology including artificial insemination. From where establishment by Nigerian State of National Program for Genetic Improvement of Local Cattle (PNAG/BL).

4.3 Animal Feed

In SPAI categories used in animal feed, wheat bran is by far the most commonly used by-product, which corroborates the findings of Maman Lawal (2014) who claims that the most commonly used feed concentrate is the sound. This high use is due to its availability on the market but also for its nutritional values superior to that of other sounds produced such as rice. These results confirm that of Lambaré (2015), which states that wheat bran is one of the most available SPAI for animal feed in West Africa. It has been used mainly in poultry farming since 1995, with a supply of about 80 tons per year in Niger (Creunet, 1997; quoted by Hamadou, 1999). Regular use of SPAI in the diet allows these farms to make their own food. This leads to saving time and saving money, so these foods are well conditioned according to their users. Cotton cottonseed is increasingly replacing cottonseed in animal feed on beef farms. This same crab is used and then considered concentrated in poultry farms. Cotton grains are still used but it is observed that supplies are becoming weaker. Thus, there is a significant drop in the production of this by-product in relation to that of cotton production in West Africa. This fall has occurred since 2004 to become important in 2007 and seems to continue (FAO, 2014). As for the brewing spat, despite its availability and its nutritional values, its use (40%) on cattle farms is not easy because of the high cost of transport, by its non-palatability by animals in 10% of cattle farms but especially that their palatability decreases with the duration of storage (Marthe et al., 2017). The quantities of SPAI in the ration of animals vary according to the farms and the period. This same observation was made in the study by Djibji (2015) and RBM (2012). Nutritional qualities, availability throughout the year, ease use and affordable prices, among others are the benefits reported by the managers of the farms surveyed. Majority (88, 23%) of respondents do not have any problems with using agro-industrial by-products, however 5.88% complain about high cost and problem of storing these by-products. The sources of supply of SPAI are mainly the markets but also the private sellers for some of these by-products such as rice bran and bone powder. Similar results were found by Mama Lawal in 2014. These private sellers are indeed actors who have fixed places and who not only sell the SPAI in detail but also supply retailers or street vendors. Similar results were found by Habou in 2013 where he showed that the supply of livestock feed is at the various outlets located in the different neighborhoods and markets of the Urban Community of Tahoua from wholesalers and semi-wholesalers. The convincing results obtained in this work give hope and open up good prospects for the valorization of agro-industrial by-products in livestock feed. For this, it is proposed a long-term

monitoring and especially to evaluate the effect of the valorization of these by-products in animal experimentation.

5. Conclusion

The study carried out in modern and semi-modern farms of urban community of Niamey made it possible to identify two categories of SPAI that are used in food: These are by-products of plant and animal processing. For vegetable industry there are by-products of the milling, textile and brewery. At level of by-products of animal industry, there are by-products of slaughterhouse and fish industry. Despite the diversity of by-products used, we note their insufficiency, and even absence of some SPAI used in the West African subregion. The use of SPAI at level of CUN modern breeding is increasing every year thanks to the creation of more and more poultry farms, favored by the growing demand for animal protein.

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