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Cattle farm's typology of Nikki's and Péhunco's district in the north of Benin

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ABSTRACT

In the goal to characterize cattle farming and milk production in the north of Benin a typology of herd installed around Péhunco's and Nikki's creamery was made. Data were collected from a random sample farmers based on extension services' lists. The survey was done with 146 cattle-breeders at Nikki and 139 at Péhunco which were in the official extension group. The principal composant analysis have identified four types of cattle-breeders called CB1 , CB2 , CB3 and CB4, differentiated by ethnicity, farming – cattle breeding integration, family's skilled labor level, breeders' training level, cattle phenotype, endogenous health knowledge, prophylaxis practice and food supplementation with crop residues. CB1,CB3 and CB4 were breeders who gave more importance to farming depend on cattle breeding. In return their small ruminants' population increased. Typology allows to better understand the breeding systeme around creamery in Nikki and Péhunco.

1. Introduction

Livestock production is important in Benin Republic's economy. In Benin, livestock production represents 25% of the GDP of the primary sector (MAEP, 2011). Benin's cattle herd is estimated at 2,058,000 heads in 2011 (FAO, 2013) with 90% concentrated in the northern districts of the country and composed of trypanotolerant bullfighting such as Borgou Somba and Lagunaire, zebu such as M'bororo, Djelli, Goudali and White Fulani, and Métis from their crosses (Djenontin et al. 2004). Nikki and Péhunco districts are located in Borgou and Atacora respectively. Nikki has 114,000 heads and Péhunco 62, 300. This totalizes 9.02% of national herd (MAEP, 2014). In the two districts it has been installed diaries in the goal to build industrial milk chain. In the purpose to analyze the changes occurs in the breeding system of those two districts, we must make a diagnosis which starts with the typology of cattle farms. Typologies of farms used to compare groups of farms, to analyze their dynamism, to identify possible solutions to problems and develop appropriate recommendations (Djenontin et al. 2004). The objective of typologies is to provide the use of an image – makers of the local farming to guide development actions (Roybin , 1987). Typologies have the ambition to simplify reality while respecting the main features (Alkoiret et al. 2009). This study aims to establish through surveys in cattle farms a typology of cattle breeding systems of two districts. This typology will highlight the farmers' breeding methods, their evolutionary trajectories, their main production and their limiting factors.

2. Materials and methods

2.1. Study area

The study was conducted in Nikki's and Péhunco's cattle farms. Nikki was located in the Departments of Borgou in the north – east of Benin Republic. Péhunco was located in the department of Atacora in the north – west of Benin Republic.

The city of Péhunco is located between 10°13'42" north latitude and 2°0'7" east longitude Its total area is 1,900 km² (INSAE, 2003). The city of Nikki is located between meridians 9°56'00" north latitude and 3°12'30" east longitude. The two districts climate is Sudano -Guinean marked by a rainy season from May to October and a dry season from November to April. The average annual rainfall over a period of ten years is 1051 ± 212 mm. The annual average temperature and relative humidity during the same period were respectively 28.2 ± 0.6°C and 56.4 ± 1.9% (Soulé, 2009).

2.2. Survey methodology

The semi -structured and structured interviews with farmers individually or in the same group was adapted from August to December 2011. The family is seen as a group of individuals who live together and eat together (Jouve, 1986; Sraïri, 2004). The method of livestock productivity survey developed by IEMVT and CIRAD, adapted to the realities and constraints of our work was used for this study. It has been used for the typology of cattle farms in many countries including Guinea (Lhoste et al. 1993) and Benin (Alkoiret et al. 2009).

The questions concerned the breeder (location, lumber used socio-cultural group, age, level of education and literacy, family size, area planted, hand, point of sale of fresh milk), animals (number of cattle, sheep, goats and poultry, phenotype and origin of animals) and farming practices (type of farming and breeding, health monitoring and food and mineral supplementation). A random sample of 146 breeders at Nikki totalizing 9,306 cattle head (16.7 % of Nikki's cattle herd) was made in the base extension services list. At Péhunco too, a random sample of 139 breeders with 10,431 cattle head (8.2% of Péhunco's cattle herd) was made.

2.3. Data analysis

Multivariate analysis was performed using SAS software (SAS, 2009). The principal component analysis (PCA) has highlighted the types of operations, and hierarchical clustering (AHC) has allowed the determination of their practices and strategies of farms' types (SAS, 2009). The meaning of the variables subject to the typology by principal component analysis and dynamic clustering classification was notified in Table 1.

3. Results

3.1. Sample characteristics

The general characteristics of cattle farms surveyed are shown in Table 1. The study of correlations between the variables allowed us to retain a set of 9 active variables giving 27 terms that are presented in Table 1.
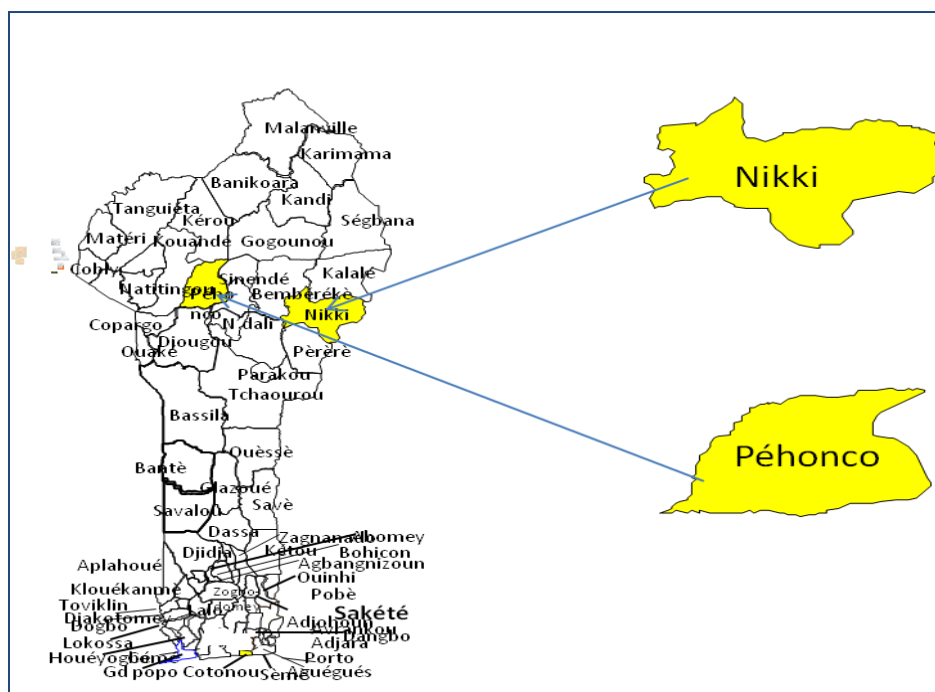

Fig. 1. Districts covered by the survey on cattle farms in the study area in northern Benin.

3.2. Size reduction of the structural variables

The PCA's results showed a total explained variance of 60.0% (p <0.0001) and expressed by the axes 1, 2 and 3 respectively for 30.2% , 16.9% and 12.9 %. The variables which represented the best the structural characteristics of farms were ethnicity (EE), the total area planted (ETS), household size (TME), the number of small ruminants (ECAP and EOVI), supplementary feeding of animals (ACALB), the cattle's phenotype (RAC), the farmers' educational level (NIF) and the monitoring animal health (SSA).

Classification in dynamic clusters of structural variables shows that the variability is more apparent concerned ethnicity, herd and area sow with food or cash crops. The classification of structural variables allowed to establish four types of livestock farm called Agro -pastoralists with large herds (CB1), Great breeders (CB2) , Small Agro - pastoralists (CB3) middle Agro -pastoralists (AE4). The characteristics of these types were as follows :

CB1 (13%) : These are agro -pastoralists who have large cattle herds between 75 and 150 heads, snow with average areas of 3.5 to 7 ha and showing a strong integration of farming with high use of family skilled labor and a large population of small ruminants from 30 to 80 head. They were illiterate cattle-breeders but their Borgou cattle received crop residues and veterinary or endogenous care.

CB 2 (1%): These are Great Agro -pastoralists who have both wholes beef cattle (over 500 head) and small ruminants (over 150 head) that snow with crop large areas more than 10 ha and showed strong integration of faring with breedin, with low use of family skilled labor. They were illiterate farmers with crossbreed cattle Borgou X Somba, and Borgou X Zebu receiving crop residues and combined endogenous and veterinary care treatments.

CB 3 (71%) : These are Small Agro – pastoralists who have a minimum beef cattle (20 to 100 heads) and small ruminants population (10-20 heads) with minimum area snow with crop of 0.5 to 2,50 ha. This indicates a very weak integration of farming and cattle breeding. They were literate breeders and trained in production techniques with Goudali cattle which received crop residues and combined endogenous and veterinary treatments.

Table 1
Different types of cattle – breeders by structural variables (285 farmers).

Variables	Cattle – farms			
	CB 1 (13 %)	CB 2 (1%)	CB 3 (71 %)	CB 4 (16 %)
Ethnic group of cattle breeder (EE)	Peul	Lokpa	Gando	Gando
total area sow with (STE)	3 – 5 ha	5 ha and more	0 – 1 ha 1 – 3 ha	3 – 5 ha
Caprine population (ECAP)	31 – 60 heads	100 heads and more	0 – 10 heads	0 – 10 heads
effectif des Ovine population (EOV)	(0 – 20 heads	150 heads and more	0 – 20 heads	21 – 50 heads
household size (TME)	31 – 40 persons ou 40 persons and more	0 – 10 persons	11 – 20 persons	21 – 30 persons or 40 persons and more
dietary supplementation of cattle (ACALB)	Crop residues	Crop residues	Crop residues	Crop residues
Cattle Phenotype (RAC)	Borgou	Métis BorgouX Somba XZébu	Gudali	Borgou
Educational level	Illiterate	Illiterate	Illiterate + formed	literate + provided with schooling

CB 4 (15%): These are Middle Agro -pastoralists who have medium cattle herds (75 to 150 heads) and small ruminants population (20-50 heads) and snow with crops small areas (2 to 3 ha) which showed farming and breeding integration with a strong use of family skilled labor. These breeders are provided with schooling, literate and trained in livestock production techniques. They had Borgou cattle which received crop residues and endogenous and veterinary treatments.

This typology highlights a gradual diversity of cattle – breeders with a greater or lesser integration of farming and cattle breeding. It notes in particular that the number of cattle decreases gradually as the increase of agricultural activities on farms (Table 2).

Table 2: Average number of cattle and small ruminant livestock and the area planted to different types of livestock operations.

Table 2
Average number of cattle and small ruminant livestock and the area planted to different types of livestock operations.

Types	Beef Cattle (herds)	Small ruminants population (herds)	Total area sown (ha)
CB1	75 - 150	30 à 80	3,5 à 7
CB2	≥ 500	≥ 150	≥ 10ha
CB3	20 - 100	10 à 20	0,50 à 2,5
CB4	75 - 150	20 à 50	2,0 à 3,0 ha

CB1 : Agro-pastoralists with large herds; CB2:   Major agro –pastoralists; CB3:   Small Agro –pastoralists; CB4: Middle breeders

4. Discussion

Our study highlight four types of breeders whose production system is changing by the integration of farming in breeding method. Other studies in the neighboring districts of the study area (Alkoiret et al. 2009; Soulé, 2009) also reported the existence of these types of breeders. But none of these authors have done a structural typology of cattle breeders. in northern Benin. All these studies have rather shown the existence of three types that are related to three types of breeders encountered in our study CB1, CB3 and CB4.

The development of agriculture in the two towns has generated new occupational groups in northern Benin in favor of an increase in the area sown to the detriment of grazing areas. Cattle were gradually converted to agriculture because of the population explosion that causes the scarcity of natural pasture from the point of view of its quantity and its quality and especially in the dry season between November and March (Djenontin et al. 2004; Sinsin and Heymans, 1998). This situation highlighted by the types obtained in northern Benin with use of crop residues is consistent with previous work in the study area and in Niger and Burkina Faso (Cervantes et al. 1986; Alkoiret et al. 2009; Hamadou et al. 2002; Morin et al. 2007). Thus, farming in addition to the assurance of food production, also provides valued crop residues as fodder during dry seasons periods (Djenontin et al. 2004).

Borgou cattle are the common cattle of the study areas because of its good resistance to some diseases such as trypanosomiasis (Azando, 2005; Tache, 2001). But the lack of food and water, health monitoring resources and genetic erosion due to zebu blood are obstacles to the development of Borgou cattle in northern Benin (Bonfoh et al. 2005).

Cattle – breeders used four techniques in the goal to make crop residues more palatable and digestible for ruminants. This suggests cattle – breeders' gradual transformation with a greater farming – breeding integration. In addition, this situation requires a progress settling process of cattle – breeders (Lau et al. 2001).

5. Conclusion

There are 4 groups of cattle – breeders at Nikki and Péhunco. All the cattle – breeders are taking more importance to farming in their production system. These will limited fresh milk supplying for diaries. Only the sensitive group would be targeted for development milk production activities.

Acknowledgements

References

Alkoiret, T.I., Awououedji, D.Y.G., Akossou, A.Y.J., Bosma, R.H., 2009. Typologie des systèmes d'élevage bovin de la commune de Gogounou au nord-est du Bénin. Annal. Sci. Agr. Bénin., 12, 77-98.

Azando, E.V.B., 2005. Problématique de la gestion des conflits de transhumance dans le département du Zou. Mémoire de maîtrise de Sociologie-Anthropologie, FLASH, Université d'Abomey-Calavi.

Bonfoh, B., Ankers, P., Sall, A., Diabaté, M., Tembely, S., Farah, Z., 2005. Schéma fonctionnel de services aux petits producteurs laitiers périurbains de Bamako (Mali). Etud. Rech. Sahél., 12, 1- 25.

Cervantes, N., Choisis, J.P., Bouchier, A., Lhoste, P., 1986. Une typologie des élevages bovins de l'état de Colina au Mexique : première étape du diagnostic. Revue d'Elevage et de Médecine Vétérinaire des Pays Tropicaux.39 :21-28. www.remvt.cirad.fr/revue/notice_fr.php?dk=431150 (26/02/2013).

Djenontin, J.A., Amidou, M., Baco, N.M., 2004. Diagnostic gestion du troupeau : gestion des ressources pastorales dans les départements de l'Alibori et du Borgou au nord-Bénin. Bullet. Rech. Agr. Bénin.43 :30-47.

FAO., 2013. Données statistiques de la FAO (FAO-STAT), 25 février 2013, 52.

Hamadou, S., Kamuanga, M., Marichatou, H., Kanwe, A., Sidibe, G.A., Pare, J., 2002. Diagnostic des élevages périurbains de production laitière : typologie des exploitations de la périphérie de Bobo-Dioulasso. PROCORDEL, Etudes socio-économiques-Document de travail n°1. CIRDES, INERA, DRRA, Bobo-Dioulasso, 72.

INSAE., 2003. Recensement Général de la Population et de l'Habitat (RGPH 3). Ministère du développement de l'analyse économique et du plan (MDAEP)., Bénin, 235.

Jouve, P., 1986. Quelques principes de construction de typologies d'exploitations agricoles suivant différentes situations agraires. Les cah. rech. dév., CIRAD 11, 48-56.

Làu, H.D., Tourrand, J.F., Faye, B., Da Veiga, J.B., 2001. Typologie des systèmes d'élevage de l'agriculture familiale amazonienne : le cas du municipe d'Uruara, Brésil. Revue Ele. Méd. Vèt. Pays Trop., 54, 239-246.doi : www.remvt.cirad.fr/revue/notice_fr.php / (26/02/2013).

Lhoste, P., Dollé, V., Rousseau, J., Soltner, D., 1993. Manuel de zootechnie des régions chaudes : les systèmes d'élevage, Collection Précis d'élevage, Ministère de la Coopération, France. 281 p.

MAEP (Ministère d'Agriculture de l'Elevage et de la Pêche)., 2011. Plan Stratégique De Relance Du Secteur Agricole (PSRSA), Cotonou, République du Bénin, 112 p.MAEP, 2014).

Morin, G., Coulibaly, D., Corniaux, C., Poccard-Chappuis, R., Sidibé, S.I., Molin, C.H., 2007. Dynamiques des unites de production laitières dans le bassin d'approvisionnement de la ville de Ségou au Mali. Revue Ele. Méd. Vèt. Pays Trop., 60 (1 – 4), 89-101.

Perrot, C., Landais, E., 1993. Comment modéliser la diversité des exploitations agricoles ? Dossier : méthodes d'étude en milieu paysan. Cah. Rech. Dév., 33, 24-40

SAS., 2009. SASSTAT : user's guide (ressource électronique) version 6, 4e édition. New York : Cary, SAS inst.

Sinsin, B., Heymans, J.C., 1998. Problèmes liés à la transhumance des animaux domestiques à travers les parcs nationaux. Nature et Faune., FAO. Accra 4, 27-31.

Soulé, A.H., 2009. Système d'élevage bovin et d'approvisionnement en matières premières des unités de transformation laitière dans les communes de Gogounou et de Parakou. Mémoire de Diplôme d'Etudes Approfondies, Faculté des Sci. Agr., Université d'Abomey-Calavi, Bénin.

Sraïri, M.T., 2004. Typologie des systèmes d'élevage bovin laitier au Maroc en vue d'une analyse de leurs performances. Thèse de doctorat, Faculté Univ. Sci. Agr., Gembloux, Belgique.

Tache, C., 2001. Analyse typologique des exploitations laitières à La Réunion. Mémoire fin d'étude ISTOM.