Scholars Journal of Agriculture and Veterinary Sciences OPEN ACCESS
Abbreviated Key Title: Sch J Agric Vet Sci
ISSN 2348–8883 (Print) | ISSN 2348–1854 (Online)
Journal homepage: www.saspublishers.com

Characterization of Swine Holes in Korhogo Department

G. K. G Brou[1*], C.F.D. Adou[2], M. Meniga[3], R. Y. Soro[4]

[1]BROU Gboko Gatien Konan, Enseignant-Chercheur, Laboratoire de biologie, de production et de santé animale, Institut de Gestion Agropastorale (IGA), Université Péléforo Gon Coulibaly (UPGC) de Korhogo, BP 1223 Korhogo, République de Côte d'Ivoire
[2]ADOU Coffi Franck Didier, Enseignant-Chercheur, Laboratoire de Biologie et Cytologie Animale, Ecole Normale Supérieure, Université de Cocody, 08 BP 10 Abidjan 08 Côte d'Ivoire
[3]COULIBALY Fatoumata, Chercheur, Laboratoire de biologie, de production et de santé animale, Université Péléforo Gon Coulibaly de Korhogo, BP 1223 Korhogo, République de Côte d'Ivoire
[4]Enseignant-Chercheur Laboratoire de Biochimie, Institut de Gestion Agropastorale (IGA), Université Peleforo Gon Coulibaly de Korhogo

DOI: 10.36347/sjavs.2019.v06i11.003 | **Received:** 01.12.2019 | **Accepted:** 08.12.2019 | **Published:** 15.12.2019

***Corresponding author:** Brou G. K. G

Abstract **Original Research Article**

The development of pig farms requires a better knowledge of these different components. Thus a study was conducted in the Korhogo department to characterize pig farms. To do this, a survey was conducted using a questionnaire to interview pig farmers. A total of 68 pig farms were visited. The results showed that pig farming is practiced by men (86.8%) and is intended for sale (97%) with a strong exploitation of improved breeds (92.6%) acquired per purchase (86.8%). The average herd size is 16.16 heads, with a predominance of fattening pigs (55.3%). This breeding is practiced for most breeders with a system and traditional buildings (63.2%). Food is mainly based on the use of a mixture of two to three raw materials representing the components of the feed manufactured by the farmer (80.5%) and distributed once (72.1%). Management is carried out by the breeder himself and / or his family (94.1%). Reproduction is done in a natural way (94.1%). The main diseases encountered are African swine fever, scabies and diarrhea and no prophylaxis plan is respected. Many constraints exist and are linked to livestock management.

Keywords: Characterization, Pig farming, Food, Pathologies, Constraints.

INTRODUCTION

Worldwide, meat production doubled between 1964 and 1994, from 2.9 million to 6.1 million tonnes [1]. Despite this increase, it is unable to meet the needs of the population, which has tripled during the same period.

In Côte d'Ivoire, the number of livestock farms in Abidjan increased from 423 farms in 1991 totaling 50,000 pigs to nearly 1,500 farms with 100,000 pigs, or 80% of the country's modern farms in 1996 [2]. Pig farming is dominated by the traditional system which exploits 75% of the national workforce. Despite this proportion, this system produces the same quantity of pork as that of the modern system which has only 25% of the workforce [3]. A better knowledge of the different aspects of pig production, as well as the related social dynamics, will make it possible to develop appropriate strategies for the implementation of a socio-economic development strategy. It will also allow the development of the sector, leading to sustainable production [4].

Ivoiry Cost has undertaken many initiatives to overcome the deficit and achieve targets by intensifying local pig production and encouraging modern pig farming. However, despite the efforts made, it faces different types of problems for its development, including lack of technical data on pig farming, lack of food security, poor sanitary conditions, poor hygiene practices pig breeding, as well as the lack of veterinary services. These problems lead to real public, animal and environmental health problems [5]. In northern Ivoiry cost, the Korhogo department has an important reputation in the production and consumption of pig.

His production is mainly carried out by small family units in which animals are very poorly monitored at the health, medical and zootechnical levels.

Given this, it is necessary to conduct a study to make a diagnosis highlighting the positive and negative aspects of pig farming in the Korhogo department. The general objective of this work is to characterize pig farms in the Korhogo department.

MATERIAL AND METHODS

Study Zone

Located north of Ivoiry cost, more than 600 km from the economic capital, Korhogo is the regional capital of Poro and Savannah district.

The department has sixteen sub-prefectures. It is limited to the north, by the department of M'Bengué, to the north-east by the department of Sinématiali, to the south-east by the department of Niakaramadougou, to the south by the department of Dikodougou and to the west by the department of Boundiali (Figure-1).

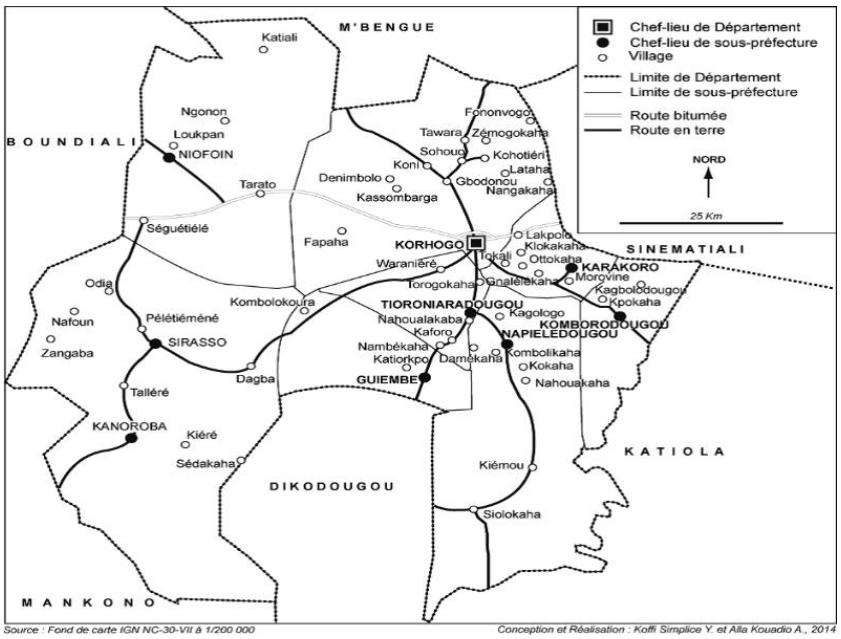

Fig-1: Map of Korhogo Department (Koffi *et al.*, 2014)

Biological Material

The biological material consisted of several porcine breeds identified in the Korhogo Department namely, the local breed Korhogo breed (Figure-2), the Large White (Figure-3), the Landrace and the mixed race.

Fig-2: Presentation of the Korhogo breed

Fig-3: Presentation of a large White breed suckling sow

Sampling

A sample of 68 farms at 11 localities was selected from the lists of pig farms received from different associations of pig farmers in the Korhogo Department out of a total of 203 breeders. This represents a sample of 33.50% of active breeders. The choices were made according to the availability of the breeders to receive us. The distribution of pig farms surveyed by locality is reported in Table-1.

Table-1: Distribution of pig farmers surveyed by locality

Localité	Number of breeding	Frequency (%)
Moroviné	5	7,4
Sinistré	2	2,9
Torgokaha	6	8,8
Tioro	3	4,4
Lakpolo	5	7,4
Waraniéré	8	11,8
Dokaha	15	22,1
Nangoukaha	5	7,4
Teguere	6	8,8
Kassirimé	5	7,4
Karakoro	8	11,8
Total	68	100

Survey Technique

It took place over a period of about 3 weeks. It took the form of visits to pig farms, direct observations on farms, interviews with the various actors involved in the work. The goal is to collect targeted information, structured according to a predetermined questionnaire. On some farms, the interview took place immediately at the first visit, while in others, it took place a few days later depending on the respondent's availability.

Data Processing

Statistical data processing was conducted using computer tools with the Sphinx Plus 2 software for entering data collected from pig farmers. This software also made descriptive statistical analyzes (frequency, average, standard deviation, etc.).

Socio-professional characteristics of pig farmers

The socio-professional characteristics of the farmers are presented in Table-2. It appears that pig farming is practiced mainly by men (86.8%). The pork breeders we met are mostly Christians (51.5%). They are mostly raised for sale (97%). The majority of the breeders surveyed took care of doing this activity on their own initiative (72.1%). The farms are 100% private.

Table-2: Socioprofessional characteristics of Korhogo pig farmers.

Variables	Terms	Numbers	Percentage (%)
Sex	Femal	9	13,2
	Male	59	86,8
Religion	Christian	35	51,5
	Animist	33	48,5
goal	Internal consumption	1	1,5
	Sale	66	97
	Leisure	1	1,5
Motivation	Consul of others	19	27,9
	Own initiative	49	72,1
Statut breeding	Private	68	100
	Public	0	0

Herd structure Races exploited The study showed that 92.6% of breeds exploited on farms are improved, compared to 7.4% of local breeds. Frequencies of exploited porcine breeds are shown in Table-3.

Table-3: Races exploited

Races exploited	Animals numbers	Percentage (%)
Locale	5	7,4
Improved	63	92,6
Total	68	100

Method of Acquisition

Figure-4 shows the different methods of animal acquisition. Thus 86.8% are acquired by purchase, 11.8% in donation and only 1.5% were received in confiage.

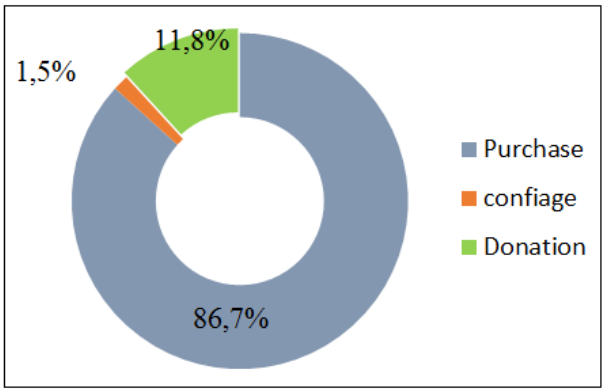

Fig-4: How to acquire animals

Herd size and Composition

The average size of hog farms is 16.16 ± 22.73 heads. The minimum size is 02 hogs and the maximum size is 164 hogs. As for the overall composition of pig farms, pigs in predominant engraving with 55.3%, then piglets come with 24.8%, breeding females with 8.9% and then gilts. Boars represent only 4.2% (Table-4).

Table-4: Overall composition of pig farms

Category animals	Total animals numbers	Effective Medium by breeding	Standard Deviation	Minimum	Maximum	Percentage %
Board	45	0,66	0,75	0	3	4,2
Pig	98	1,44	2,51	0	7	8,9
Piglet	75	1,10	1,81	0	20	6,8
Piglets	273	4,02	6,47	0	44	24,8
sows in fattening	608	8,94	14,63	0	95	55,3
Total	1099	16,16	22,73	2	164	100

Associated Breeding

The proportion of pig farms associated with other types of livestock is relatively low (23.5%). Thus the association between pork and broiler or local is 17.6%, pork and duck 1.5%, pork and sheep or goat 4.4%. On the other hand, farms where only pork is present is 76.5%, as shown in Figure-5.

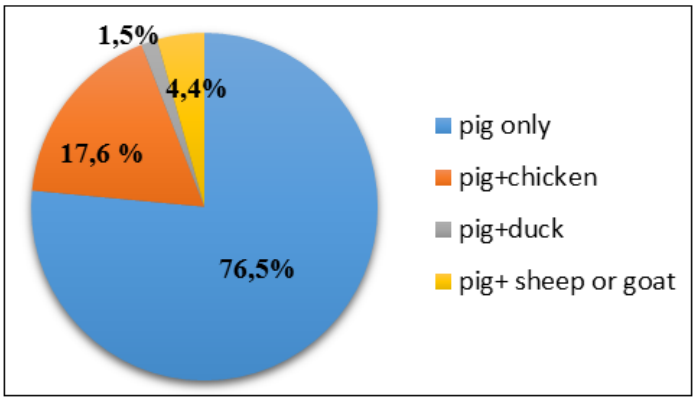

Fig-5: Types of association with pig farming in Korhogo

Types of Production

Figure-6 shows that the type of pig farming in Korhogo is essentially mixed type, that is to say, fattener-fattener (98.5%). Farming fattening types represent only 1.5%. There is no breeder type breeding.

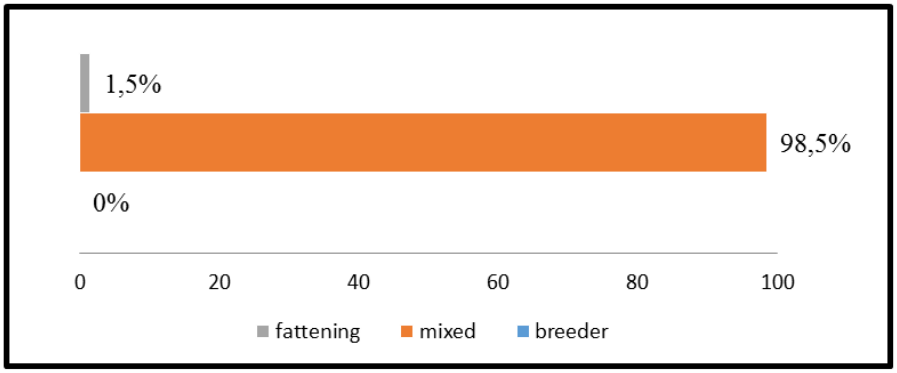

Fig-6: Type of livestock production

Production System

Depending on the feeding system and the size of the farms, Table-5 shows the three production systems including the traditional system where the food is made up of agricultural by-products and kitchen residues. Often one without the other. The flock is usually small. The animals are often wandering. They represent 63.2% of the farms visited. The semi-intensive system represents 27.9% of farms. It is characterized by a herd of medium size (20 to 50) with a diet based on more or less balanced agro-food by-products and agro-industrial by-products. Finally, the intensive system is characterized by herds of large sizes. Pigs are reared with agrifood by-products and complete (industrial) feeds. The intensive production system represents about 8.8% of the farms visited.

Table-5: Pig farming system in Korhogo Department.

Bruiding system	Animals numbers	Percentage (%)
Traditionnal	43	63,3
Semi-intensive	19	27,9
Intensive	6	8,8
Total	68	100

Type of Pigsty

Breeding or pig farming premises exist for all the breeders surveyed. Depending on the nature of the roof (straw, sheet, etc.), sidewalls (banco, cement, etc.), the floor (concrete or not, etc.) and others, the pigsty has been classified into three categories. presented in Table-6. Traditional hog houses are characterized by straw or old sheets as roofing or often non-existent. Feeders do not exist in most cases. The food is distributed on cemented soil. Sometimes they are old cans cut in half, basins and trunks of wood dug that serve as feeders. They are found in 63.2% of the farms visited. Semi-modern hog houses are built with recovery materials from destroyed homes. They are sometimes compartmentalized in several boxes with lateral walls in banco or in cement. The roof is made of sheet metal and the floor is cemented. They are observed in 29.4% of farms. As for modern piggery, they are built with definitive materials and well compartmentalized. The side walls are cemented and well plastered with a well concrete floor. The roof is made of sheet metal and the buildings are electrified. Pigs are fed in feeders and have modern concrete waterers. They represent 7.4% of the farms.

Table-6: Type of building

Type of building	Animals numbers	Percentage (%)
Traditionnal	43	63,2
Semi-modern	20	29,4
Modern	5	7,4
Total	68	100

Feeding System

In most of the breeders surveyed, the feeding systems used are variable. Data analysis revealed that 4.9% of farmers use industrial feeds often with a mixture of some feedstock, 80.5% self-produce their feed with agricultural and agro-industrial by-products and often associated 14.6% of kitchen scraps use leftovers (Figure-7).

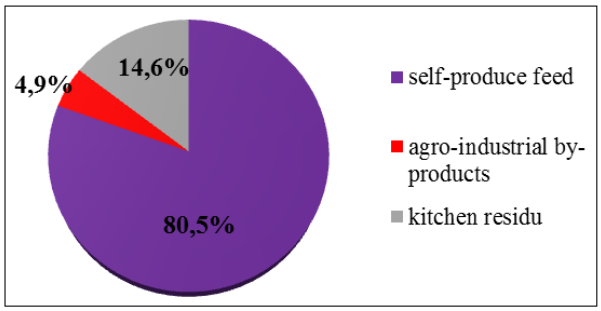

Fig-7: Power System

Frequency of Food Distribution

Figure-8 shows that the frequency of daily distribution of the food ration is usually once a day (72.1% of farms).

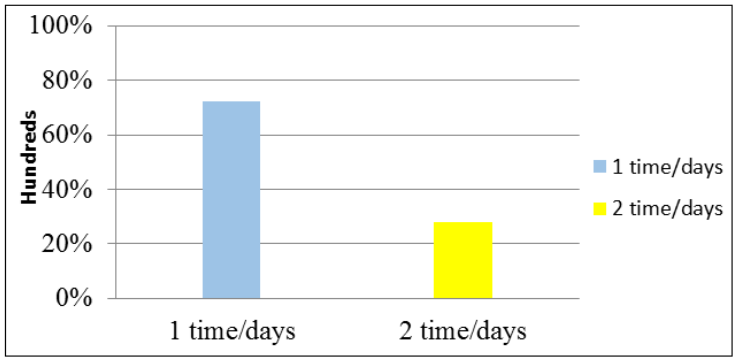

Fig-8: Frequency of distribution of the pig food

Pig Feed

The raw materials used are mostly agricultural materials and agro-food by-products among which there is: the corn brand (58.9%) and rice (37.5%) which are the most used; there is also millet (25.0%), fish meal is also used with other raw materials as shown in Figure-9.

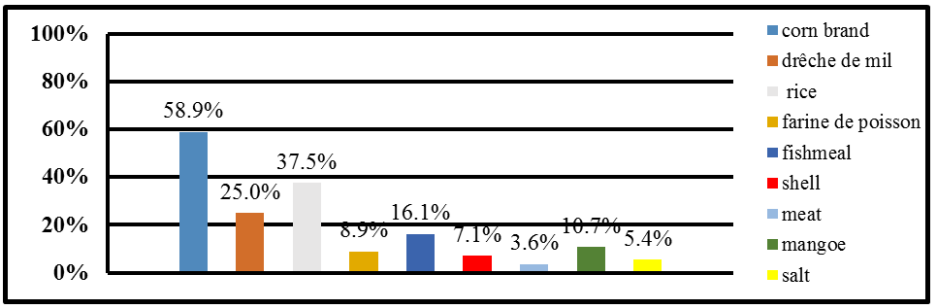

Fig-9: Different raw materials used by breeders

Management of Pig Farms

Livestock management is generally carried out by farmers who have no training (92.6%). Livestock activities are mostly carried out by the breeders themselves and / or their families (94.1%). As for the farming method, 91.2% of the breeders surveyed practice permanent confinement, compared to 5.9% who practice both, as shown in Table-7.

Table-7: Breeding method, qualification of pig farmers and animal monitoring

Variables	Terms	Numbers	Percentage (%)
Breeder qualification	Breeder form	5	7,4
	No training	63	92,6
Breeding manarger	breeder + Family	64	94,1
	Worker only	4	5,9
Breeding mode	Divagation	2	2,9
	Permanente confinment	62	91,2
	Mixed	4	5,9

Age at Weaning and Castration

The age at castration varies from one farm to another. It is done in most cases by the breeder itself (51.5%), only 19.1% of breeders use a veterinary agent for castration. For cultural reasons, 27.9% of breeders prefer not to castrate their animals. Depending on the competence of the practitioner, castration can occur very early (15 days), but also later (180 days). The average age at castration is 62.65 days. As for the age at weaning, it is mainly a function of the growth of piglets. Weaning can be natural. In cases where weaning is provoked, it may occur earlier (28 days) or beyond 150 days of age in some farms. With an average of 64.14 days as shown in Table-8.

Table-8: Age at weaning and castration

Age	Average (days)	Standard deviation	Minimum	Maximum
Castration	62,65	38,63	15	180
weaning	64,14	29,34	28	150

Coupling Mode

The survey shows that 94.1% of breeders control the breeding of animals, and this is done naturally (Figure-10).

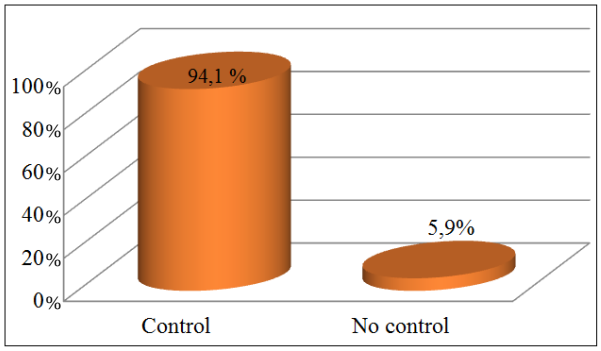

Fig-10: Coupling mode

Management of Livestock Waste

As for waste management, 100% of farmers use pig manure for field application. Breeders wait until it is dry to collect (Figure-11).

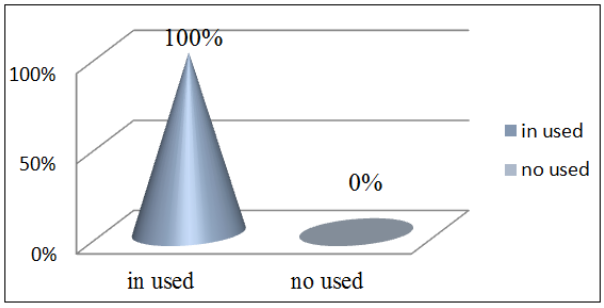

Fig-11: Farm waste management

Dominant Pathology

In the department, the do%minant pathologies in pig farms are internal parasites (scabies) 68.1% and digestive diseases at the origin of diarrhea with a proportion of 17.6%. Other diseases such as respiratory diseases, hernia have been cited. However, African swine fever (PPA) is currently very endemic in the department, with high mortality among some breeders.

Health Prophylaxis

The sanitary prophylaxis in the pig farms of the department comes down to the disinfection of the premises (85.3%) for the most part with a solution of cresyl or bleach. Cleaning is done in 88.2% of farms and once a day. It is limited to simple scanning and waste collection. Only 1.5% of farms visited had a footbath at the entrance to the barn as shown in Table-9.

Table-9: Presentation of the different measures of sanitary prophylaxis

Variables	Terms	Numbers	Percentage (%)
Disinfect your building?	No	10	14,7
	Yes	58	85,3
Regulary clean your buiding?	Yes	60	88,2
	No	8	11,8
Do you have pediluve?	Yes	1	1,5
	No	67	98,5

Medical Prophylaxis

At the medical level, 97.1% of the prophylactic measures are undertaken by the breeders according to the disease encountered as, vaccination and antibiotic use only 2.9% use a prophylactic schedule (Figure-12).

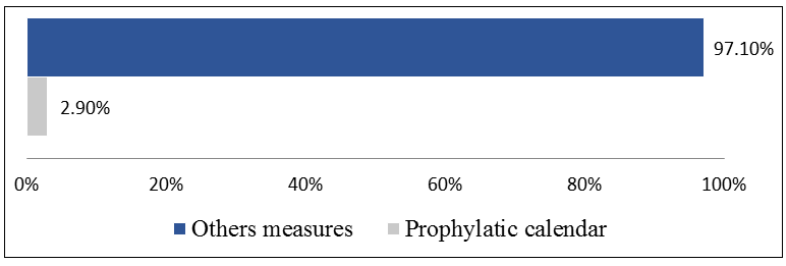

Fig-12: Types of Prophylaxis

People Treating Animals

Regarding the treatment of animals, nearly 52.9% of breeders use a breeding agent (technician or veterinarian) in case of illness, other breeders do self-medication (Figure-13).

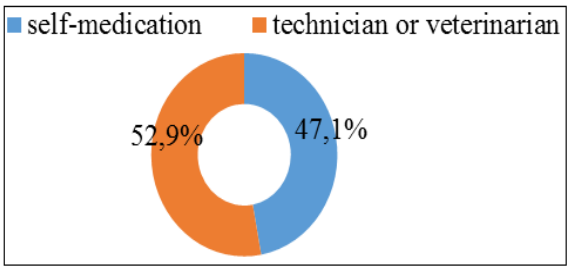

Fig-13: People treating animals

Food Constraints

The survey revealed that most farmers prefer to make their own food on the farm (80.5%) without having previously trained in food formulation technique. The high cost of raw materials for food has been reported by 73.5% of breeders. This remains the main constraints related to food as shown in Figure-14.

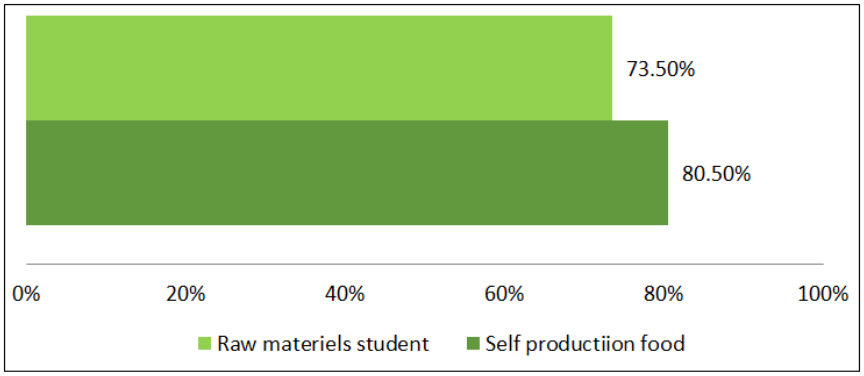

Fig-14: Main constraints related to food

Constraints Related to Breeding Technique

In the farms visited 92.6% of the farmers have received no training and only 7.6% of the farms have a register to record births and other livestock activities. This remains the major constraints related to the breeding technique (Table-10).

Table-10: Main Constraints Related to Livestock Technology

Variable	Terms	Number	Percentage (%)
Did you received a form?	No	63	92,6
	Yes	5	7,4
Do you have a register?	Yes	6	8,8
	No	62	91,2

Health Constraints

Figure-15 shows that one of the health constraints is African swine fever. Indeed, 80.9% of the farms in the department recognize their current endemic state. The irregularity of prophylactic measures (97.1%) also remains one of the main health constraints.

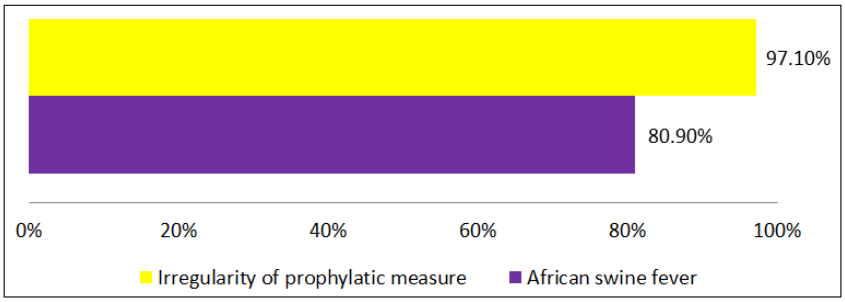

Fig-15: Main constraints related to breeding technique

DISCUSSION

The conduct of breeding remains the privileged domain of Christian men. These results are consistent with those obtained by [4] in Burkina Faso, but they are different from those of [6] in the groundnut basin in Senegal, [7] in rural areas in Casamance and [8] in Dakar, on the of the woman in the conduct of the breeding. According to these authors, the maintenance and surveillance of animals are entrusted to women. The strong dominance of men is explained by the fact that most of the funding comes from them. Pig farms are 100% private. This result is consistent with those obtained by [9] in Côte d'Ivoire and [10] in Benin. This is explained by the lack of involvement of the state in the pork industry.

The main exploited breeds are of the improved type (92.6%) and are mostly purchased (86.8%). The local breed is found only in very few farms. This could be explained by the fact that breeding is practiced for commercial purposes. This motivates breeders to exploit the improved breeds. This is also due to the strong exploitation of an improved breed from the department, notably Korhogo pork. A study by [9] in Côte d'Ivoire revealed the same results. However, these results differ from those obtained by [11, 12], respectively, in the Central African Republic and Madagascar, according to which the local breed was clearly predominant. In addition, the results concerning the acquisition procedures are consistent with those [10] in Benin.

The overall average size of the hog farms visited is 16.16 ± 22.73 head. It is lower than those obtained by other authors: 324.54 pigs per farm in the urban and peri-urban area of Abidjan [9] and 86 in Burkina Faso [4]. This difference can be explained by the fact that these two authors worked under the conditions where the breeding is practiced with a very lucrative goal with high rates of semi-intensive and intensive breeding. On the other hand, this same size agrees with other authors: 11 pigs per farm in Senegal in Lower Casamance [7], 20.8 pigs in Senegal [8]. This is explained by the fact that these two authors worked under the conditions where the breeding is practiced for the purpose of self-sufficiency and family-type farming. The overall composition of pig farms, where pigs predominate, is explained by the fact that the farms visited are mostly mixed (98.5%) with a low rate of breeding. These results are consistent with those of [7] in Senegal [13], in Benin and [9] in Côte d'Ivoire. Only 76.5% of breeders practice only pig farming against 23.5% which associates the breeding of pigs to other species. This can be explained by the fact that the farms visited are small. These results are different from those obtained in the Central African Republic by Abdallah, Senegal by [7] and Benin by [13]. On the other hand, they agree with those obtained by [9].

The pig farming in Korhogo is mainly of mixed type, that is to say, breeder-fattener (98.5%); fattening farms represent only 1.5%. If these results are consistent with those of [7], [10] and [9], they are different from those [11] according to which mixed-type breeding is in a relatively small proportion (10%). This absence is the lack of specialized structure in breeder breeding. In the farms visited, there were three types of livestock buildings, with a strong dominance of traditional-type buildings (63.2%), mostly built with local materials. The high rate of traditional buildings differs with those obtained by [9]. This can be explained by the fact that the type of building used depends on the means of the farmer, his objectives and the farming system. Most farmers (80.5%) prefer to make their own food with 2 or 3 raw materials versus 4.9% who use industrial feed. This has been reported in [15], which indicates that farmers, thinking of saving money, often use raw materials alone or mixed without applying the basics of equilibrium of food rations distributed to animals.

The frequency of distribution of the ration is usually once a day (72.1% of the farms) often in wet form or soup after soaking in water. This frequency is different from that reported by [16] where the majority of farmers distributed the ration twice a day. This is explained by the fact that pig farming is considered as a secondary activity and before going to their occupation the farmers distribute the food for the whole day. The raw materials used by most farmers are mainly composed of corn bran (58.9%), rice bran, millet and fish meal. They do not differ much from those reported by [16, 4]. The high rate of corn and rice bran is explained by its availability in the department. Farming is generally carried out by breeders who have no qualifications (92.3%). Most hog farms do not hire workers (76.9%). This result is explained by the fact that most of the farms visited are small and the breeders themselves take care of their breeding with their family or not. This result is consistent with that [10]. As for the rearing method, only 2.9% of the breeders surveyed practice breeding in rambling. This result does not agree with those [11], from [7], respectively, in the Central African Republic and in Senegal according to which straying was the most popular method of breeding. It is explained by the presence of building at the majority of the breeders. The average age at weaning is 64.14 days. It corresponds to the recommendations of [5], agrees with that found by [10] and [4] and differs from [9] where the average age is 33 days.

This can be explained by the use of the traditional system. Age at castration varies by farm with an average of 62.25 days. It is lower compared to that of [8] which is 102.3 days and higher than that of [9] which is 33 days. This can be explained by the use of the traditional system.

External parasitosis and diarrhea remain the two main pathologies encountered in Korhogo farms. This can be explained by animal deworming programs that are done at irregular intervals, but also by the poor hygiene often found in piggery resulting in obtaining very wet litter. It turns out that sometimes the litter is muddy and thus constitutes a real culture medium for parasites and microbes in hog barns. The same pathologies were observed in Benin and in the farms of Côte d'Ivoire, respectively by [16, 9]. The case of African swine fever reported by [12] was also observed in a few farms. This is explained by its recent declaration in one of the neighboring departments, by the insalubrity observed and the lack of sanitary prophylaxis in some farms visited.

CONCLUSION

L'enquête sur la caractérisation des élevages porcins dans le département de Korhogo a révélé que l'élevage porcin est pratiqué par les hommes en majorité. Il s'agit d'une activité destinée à la vente avec une forte exploitation des races améliorées qui sont acquises par achat. La taille moyenne des exploitations porcines visitées est de 16,16 têtes avec une prédominance de porcs charcutiers et des porcelets. L'élevage porcin est rarement associé à d'autres types d'élevages. Les élevages visités sont essentiellement de type mixte (naisseur-engraisseur) et sont pratiqués pour la plupart dans le système traditionnel. L'aliment est surtout fabriqué par l'éleveur même, avec un mélange de deux à trois matières premières dont principalement le son de maïs ou de riz, souvent associés à d'autres résidus de récupération. Il est distribué une seule fois par jour au niveau de la plupart des éleveurs. Il faut souligner que la gestion des fermes porcines est effectuée par l'éleveur même et/ou leur famille. Il se trouve que la majorité des éleveurs n'a reçu aucune formation. La stabulation permanente reste le mode d'élevage dominant. Mais, la reproduction peu suivie se fait de façon naturelle. Quant aux lisiers du porc, ils sont utilisés comme engrais organique et l'épandage se réalise dans les champs. Les principales pathologies rencontrées sont la peste porcine Africaine, la gale et la diarrhée. Sur le plan prophylactique, malheureusement, aucun plan de prophylaxie n'est respecté. Cette situation favorise la présence de plusieurs pathologies. Les actions sanitaires ne se résument qu'à la désinfection des locaux et aux nettoyages réguliers des porcheries. Il existe des contraintes liées à la conduite (alimentation, prophylaxie) et aux techniques d'élevages. Cependant, des études devront être menées sur l'aspect économique pour mieux apprécier la rentabilité de l'élevage dans le département. Ces résultats constitueront des données nouvelles exploitables pour des programmes d'intervention.

REFERENCES

1. Tacher G, Letenneur L. Le secteur des productions animales en Afrique des indépendances à 2020, Prospectives de la demande et de l'offre pour 2020 et les voies de réponse au nécessaire développement de l'élevage, Revue Elev. Méd.vét. Pays trop, 2000, 53(4):365-375.
2. Verhulst A. Renforcement des capacités de prévention et d'intervention d'urgence contre la peste porcine africaine, Rapport de mission, Rome, FAO, 1998, 28.
3. Anonyme. Ministère des Productions Animales et Ressources Halieutiques (MIRAH). Annuaire Statistiques. Abidjan, 2010, 68.
4. Umutoni, C. Evaluation technico- économique des élevages de porc à Bobo-Dioulasso (Burkina Faso). Thèse master II, E.I.S.M.V., Dakar, 2012, 45.
5. Muys D, Westenbrink G, Meinderts J. L'élevage des porcs dans les zones tropicales.- Wageningen : Fondation Agromisa, 2003, 67.
6. Bulgen A, Piraux M, Dieng A, Schmit G. Comperer, Les élevages de porcs traditionnels du bassin arachidier sénégalais. Rev. Mond. Zootech, 1994, 81: 63-70.
7. Missohou A, Niang M, Foucher H, Dieye PN. Les systèmes d'élevage porcin en Basse Casamance (Sénégal). Note de Recherche. Cahiers d'Agricultures, 2001, 10: 405- 408,.
8. Sambou G. Analyse des impacts de la décharge de MBEUBEUSS (Dakar) sur les élevages porcins environnants .Thèse Médecine Vétérinaire, E.I.S.M.V., Dakar, 2008, 138.
9. Tra Bi TC. Filière porcine en côte d'ivoire : production, propositions d'amélioration et perspectives de développement. Thèse Médecine Vétérinaire, E.I.S.M.V., Dakar, 2009; 146.
10. Ayssiwede SB. La filière porcine au Benin : Production, commercialisation, propositions d'amélioration et perspectives de développement. Thèse de Médecine Vétérinaire, E.I.S.M.V., Dakar, 2009, 161.
11. Abdallah NE. Elevage porcin en région-périurbaine de Bangui (Centre Afrique). Thèse de Médecine Vétérinaire, Ecole Inter-Etats des Sciences et de médecine vétérinaire (E.I.S.M.V.), Dakar, 1997, 111.
12. Humbert C. Etude épidémiologique de la Peste Porcine Africaine dans la région de Marovoay (Madagascar). Mémoire : Etude approfondie vétérinaire/ Pathologies animales en région chaude : ENV – Toulouse, 2006, 61.
13. Ayssiwede SB. La filière porcine au Benin : Production, commercialisation, propositions d'amélioration et perspectives de développement. Thèse de Médecine Vétérinaire, E.I.S.M.V., Dakar, 2004, 161.
14. Sambou G. Analyse des impacts de la décharge de MBEUBEUSS (Dakar) sur les élevages porcins environnants .Thèse Médecine Vétérinaire, E.I.S.M.V., Dakar, 2008, 138.
15. FAO. Secteur Porcin Burkina Faso. Revues nationales de l'élevage de la division de la production et de la santé animales de la FAO. No. 1. Rome: FAO, 2012, 93.
16. Aloeyi K. Performance de reproduction de porc large –white a la ferme BENA- Développement au Togo. Thèse Médecine Vétérinaire, E.I.S.M.V., Dakar, 1997, 85.