

Original Research Article

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## Characteristics and Constraints of Pigs Breeding in Sub-Humid Zone of Benin

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### Abstract

The purpose of this study was to determine the characteristics and constraints of pig breeding in Benin. Transversal and retrospective survey was used to collect the data on 210 pig farms in seven departments. Breeding was chosen according to the access to the pigsty and availability of breeder to collaborate at the time of data collection. A structured questionnaire was used. The results showed that the average of area at soil of livestock building was higher (117 m<sup>2</sup>) in Zou. The density of animals was higher in Mono, Ouémé and Atlantique with one animal/m<sup>2</sup>. Local materials were widely used in infrastructures of pig breeding. Total cloistering (49.43%), seasonal cloistering (41.86%) and total divagation (8.71%) were the breeding methods used. Feeding is based on the use of food residues and domestic processing (52.82%), agricultural by-products (40.78%), agro-industrial by-products (27.14%), provender (10.57%) and fodders. The pigs were exploited primarily for sale but also for ceremonies (28.43%), parties (15.14%) and the gift (7.71%). The constraints to pig's production were lack of capital, sanitary pressure, food deficit, inappropriate housing, slack, theft and absence of appropriate supervisory structures. Implementation of palliative measures against these constraints is essential for the development of pig production in Benin.

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### Introduction

In order to fight against poverty and food insecurity, the medium- and long-term development priorities are aimed at improving household incomes, animal proteins availability and a reduction in import of human base

products (Mopaté, 2008). However, with a high demographic increase in poor countries, the productivity of agricultural sector, particularly that of the livestock sub-sector, is relatively insufficient (FAO, 2012). In this context, it is a priority to improve the capacity of breeder and economic operators in management of

livestock farming, to provide them with effective management tools, so that they become professionals to contribute better to local production of animal products (Djimènou et al., 2017).

Short-cycle animal species such as pig and poultry had an important role in the quick increase in animal protein production, according to their high productivity potential. However, the supply of pigs destined to supply large consumer region comes mainly from a multitude of small-scale breeding scattered almost all over the Beninese territory and whose management behavior are still little known. Consequently, pigs breeding as well as that of other animal species faces to many difficulties ranging from production to marketing and of which only control can lead to a sustainable development of the sector. However, as far as researches were concerned, most on the problem of pig breeding in Benin has focused on experimentation in a controlled environment on improvement of local pigs productivity (Nonfon et al., 2000), feeding influence on growth performance (Youssao et al., 2004) and improvement of local pigs' productivity by crossing with exotic race (Youssao et al., 2009). Only two studies have concerned pig breeding system in peasant environment but have been focused to restricted geographical areas (Youssao et al., 2008a; Houndonougbo et al., 2012). The first was

limited to the communes of Cotonou and Abomey-Calavi and the second focused on the municipality of Adjara. It is therefore necessary to extend these studies to all areas of southern Benin where there is renewed interest in pig breeding and consumption because of the organoleptic quality of its meat (Deka, 2008; Youssao et al., 2008b). It will be necessary to explore all the different parameters of pig production, such as livestock management, housing, feeding, pathologies, access to credit, marketing, etc., in order to identify the strengths and weaknesses linked to a porcine sector. A good control of the obstacles and the implementation of the palliative measures will enable the development of this sector in Benin.

## Materials and methods

### Study area and sampling

This study was carried out in a rural environment in southern Benin from June to October 2015. A total of 210 pigs' farms in seven departments with 30 farms per department were used for data collection. The most productive district of pigs was selected in each department as illustrated in Fig. 1, according to statistics basis published by the Livestock Department of Benin (CountryStat, 2013).

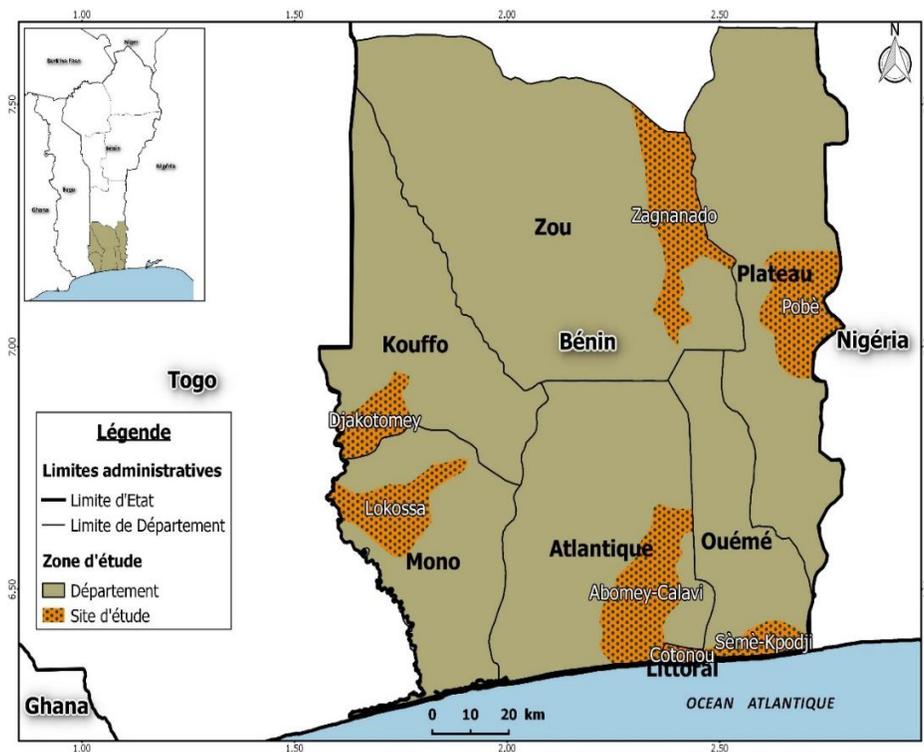


Fig. 1: Study area.

A transversal and retrospective survey coupled with direct observations and measurements of farm dimensions using a decameter were realized. Farms were chosen according to the criterion of access to the pigsty and the complete availability of the breeder to collaborate for data collection by using a structured questionnaire. The variables studied were quantitative (area of the farm, height under the roof of the building and number of livestock) and qualitative (experience of the breeder, method of breeding, animal service manager, building materials of the wall or the side wall, the roof and floor of the livestock building, animal husbandry, animal feeding, sanitary and disease control and other constraints, envisaged solutions, prospects and wishes of the breeders).

### Statistical analysis

The collected data were encoded and directly recorded in the Sphinx version 4.5 software where they were analyzed. The descriptive statistics were used to calculate the relative frequencies of the qualitative variables. The Chi<sup>2</sup> test was performed for the variability analysis of frequencies using a significant threshold of 5%. Then, the

Student test was used to compare averages two by two. An analysis of variance was carried out with the quantitative data (soil surface of livestock building, height under roof, livestock population) to assess the influence of departments on their variation using the Minitab 16 software. The multiple comparisons of means were performed with the Turkey test with a significant threshold of 5%. The density within the herd was deduced by the ratio of soil surface of building and the average of livestock size (number of animals).

## Results

### Characteristics of livestock buildings and animal density

The soil surface of livestock buildings (Table 1) varied significantly between  $23.33 \pm 11.93 \text{ m}^2$  in department of Mono and  $117 \pm 141.56 \text{ m}^2$  in department of Zou ( $p < 0.001$ ). The other departments had intermediate averages of surfaces. The height under the roof of buildings also varied between  $1.35 \pm 0.22 \text{ m}$  in Plateau and Couffo and  $1.95 \pm 0.65 \text{ m}$  in Littoral without presenting any significant difference.

**Table 1.** Ground surface, pork height and animal density.

Department	Soil surface of livestock (m <sup>2</sup> )	Height under roof (m)	Size of livestock (heads)	Density (Area /Number of animals)
Atlantique	30.74±11.49 <sup>a</sup>	1.774±0.41 <sup>a</sup>	20.64±08.23 <sup>a</sup>	1.29 m <sup>2</sup> /animal
Littoral	39.09±24.37 <sup>a</sup>	1.954±0.65 <sup>a</sup>	17.24±05.51 <sup>ab</sup>	2.27 m <sup>2</sup> /animal
Ouémé	26.25±5.59 <sup>a</sup>	1.484±0.22 <sup>a</sup>	20.28±11.70 <sup>a</sup>	1.29 m <sup>2</sup> /animal
Plateau	26.05±9.06 <sup>a</sup>	1.354±0.22 <sup>a</sup>	10.50±03.81 <sup>b</sup>	1.48 m <sup>2</sup> /animal.
Zou	117±41.56 <sup>b</sup>	1.524±0.06 <sup>a</sup>	25.80±09.83 <sup>a</sup>	4.53 m <sup>2</sup> /animal
Mono	25.96±12.17 <sup>a</sup>	1.364±0.26 <sup>a</sup>	23.72±06.71 <sup>a</sup>	1.09 m <sup>2</sup> /animal
Couffo	23.33±11.93 <sup>a</sup>	1.740±0.67 <sup>a</sup>	9.20±03.45 <sup>bc</sup>	2.54 m <sup>2</sup> /animal
p-value	***	ns	***	-

Results assigned to the same letter on the same column do not differ significantly. \*\*\*: Significant difference at the threshold of 0.1%, ns: Difference not significant.

Livestock building were covered with straw or sheet-metal (Fig. 2). The sheet-metal roof was widely adopted in Littoral, Ouémé and Atlantique, while in the other departments there was almost as much a straw roof as a sheet-metal roof. However, straw was not used in livestock buildings in Littoral and Ouémé. Concerning the design of the wall of pig farm buildings (Fig. 3), different types of materials were used, namely bricks made with cement, bar land, wood and bamboo ( $p < 0.001$ ). The floor of the buildings (Fig. 4) was made with various materials including gilded laterite, cement, stones and sometimes the floor was without any layout. The average size of herd ranged from 9.20 heads in

Couffo and 25.80 heads in Zou. The density of the herds evaluated without distinction of age varied from 1 animal per 1.09 m<sup>2</sup> in Mono to 1 animal for 4.53 m<sup>2</sup> in Zou.

### Farms age and breeding methods

Couffo farms were the youngest (93%), while Zou and Littoral were the oldest (Table 2). Most of the farms have been set up during the last decade, notably in Couffo, Mono, Atlantique, Plateau and Ouémé regions.

Total divagation, permanent cloistering and seasonal

cloistering were the breeding mode used by pig's breeders (Table 2). The breeding mode in total divagation was less practiced (8.71%). However, it was more frequent (47%) in Littoral than in other departments. Seasonal cloistering was prevailing in

Couffo (80%), Mono (67%) and Plateau (60%). During drought, only 7% and 20% of pig breeders opted for cloistering at day and night respectively in Mono and Couffo. During a cultivation period, all pigs are kept in cloistering in all departments except Littoral.

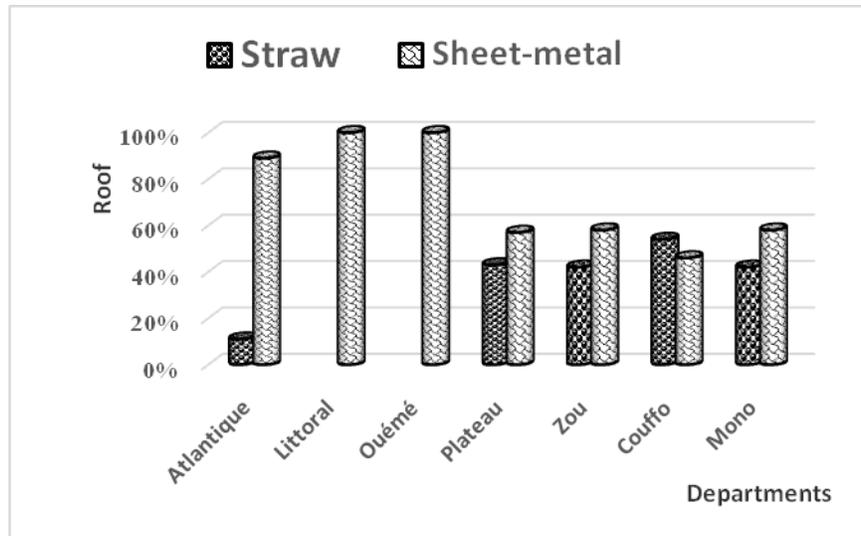


Fig. 2: Materials used for pigsty's roof.

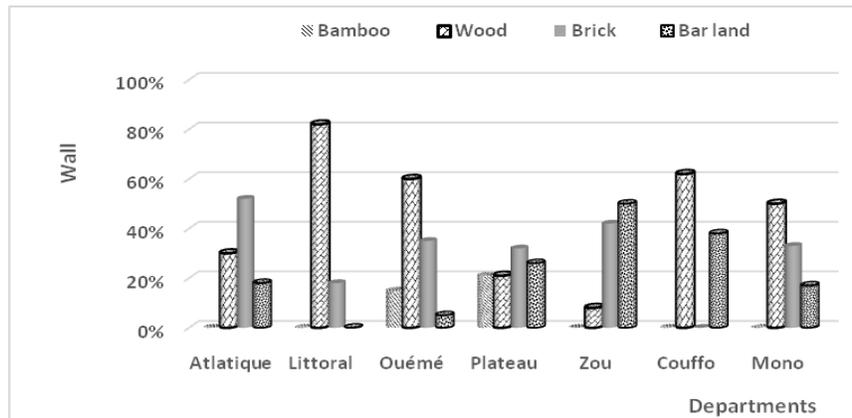


Fig. 3: Materials used for husbandry walls building.

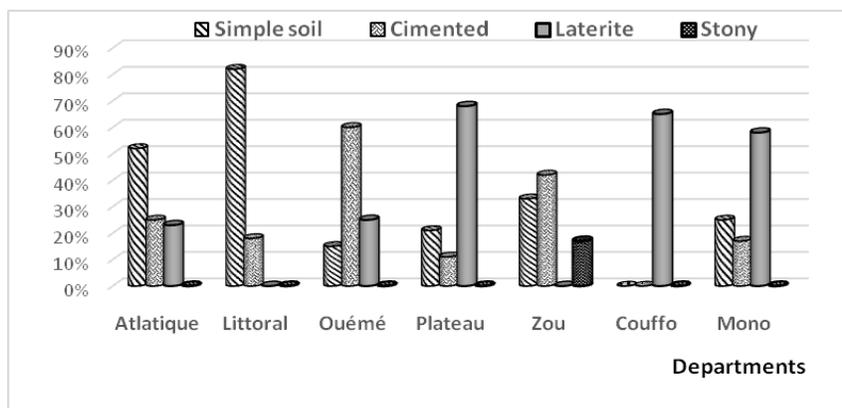


Fig. 4: Nature of livestock building soil.

**Table 2.** Age of farms and methods of rearing.

Variables		Atlantique	Littoral	Ouémé	Plateau	Zou	Couffo	Mono	Chi <sup>2</sup> test
Age of farms (%)	<10 years	73a	47b	53bc	67d	33e	93f	73a	***
	>10 years	27a	53b	47bc	33d	67e	7f	27a	***
Breeding methods (%)	Divagation	7	47	0	0	0	0	7	NS
	Cloistering	53a	40b	80c	40b	87c	20e	26ef	***
	Seasonal cloistering	40a	13b	20bc	60d	13b	80e	67f	***
Housing during drought (%)	Day enclosure	93a	67b	100ac	60d	73be	20f	7g	***
	Night enclosure	93a	67b	100c	60d	73be	20f	7g	***
Housing during crops (%)	Day enclosure	100	87	100	100	100	100	100	NS
	Night enclosure	100	87	100	100	100	100	100	NS
Persons providing food supply (%)	Housekeeper	60	60	33	60	87	20	40	NS
	Wives	27a	40b	73c	27a	73c	27a	53d	*
	Children	33a	33a	0	7b	87c	53d	0	***
	Worker	13	7	7	7	0	7	7	NS

Results assigned to the same letter on the same line do not differ significantly. \*\*\*: Significant difference at the threshold of 0.1%, \*: Significant difference, NS: Difference not significant.

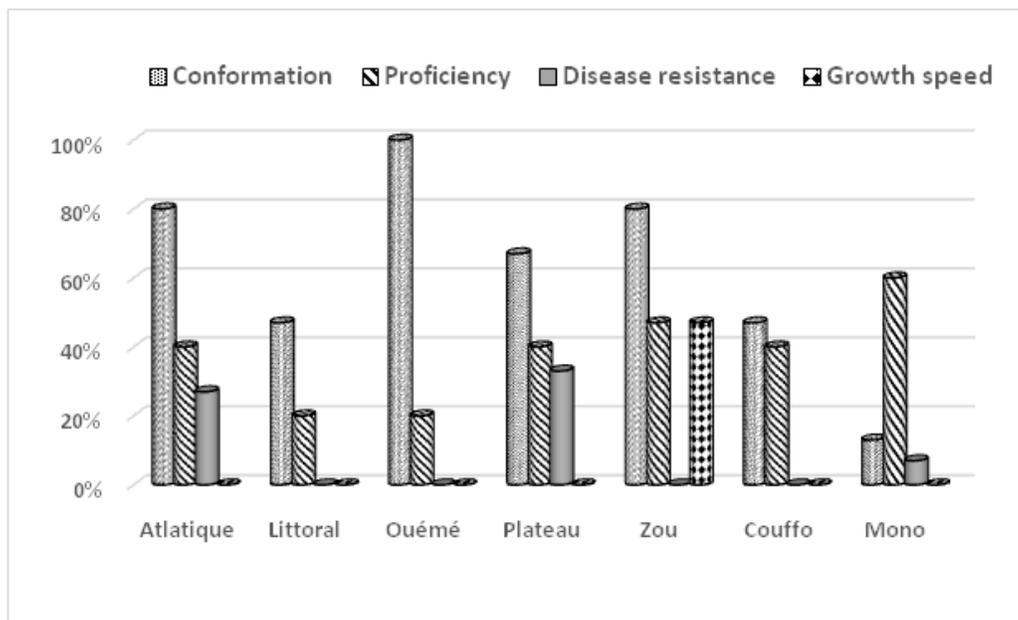
In cloistering system, food and water were essentially served to pigs by the head of the household (60%) in Atlantique, Littoral and Plateau respectively, then wives in Ouémé (73%), Zou (73%) and Mono (53%) and children in Couffo. Very few breeders recruit workers for service in pig farms.

**Criteria of begetter’s selection**

The selection criteria considered by pig breeders were

animal conformation, growth speed, disease resistance and prolificacy (Fig. 5). The conformation of the animal was the most determinant selection criterion for breeders in Ouémé, Zou, Atlantique, Plateau, Littoral and Couffo.

In Mono, prolificacy was the prevailing criterion of sow’s selection, while in Plateau and Atlantic, resistance to disease was also a priority of begetter’s selection. The growth speed was also a favored criterion in the choice of begetter in Zou.



**Fig. 5:** Criteria of pig’s begetter selection.

## Animals feeding

Four major food groups such as agricultural by-products, domestic processing by-products, agro-industrial by-products and provender were used to nourish the pigs in Southern Benin (Table 3). The use frequency of different types of food varied according to departments. However, provender has been used very little in pigs feeding in southern Benin. Among the agricultural by-products, cassava chips were widely used in Zou, while cassava and

potato peelings were widely used in Mono, Couffo, Zou, Ouémé and Plateau. Domestic processing by-products used by farmers were: maize bran, recycled flour of the mill and bakery, soya bran, peanut residues and cooking residues. Among the latter, maize bran and recycled flour of mills and bakeries, cassava peelings and cooking residues were the most widely used in pig farms in southern Benin. The soya bran was mostly used in Zou and Plateau. Cassava chips and peanut residues were only used in Zou.

**Table 3.** Different types of food served to animals.

Variables		Atlantique	Littoral	Ouémé	Plateau	Zou	Couffo	Mono	Chi <sup>2</sup> test
Types of food served (%)	Provender	7	7	7	13	13	20	7	NS
	Agricultural by-products	47a	53ab	80c	100d	0	87ce	100d	***
	Transformation by-products	100	100	100	100	100	93	100	NS
	Agro-industrial by-product	47a	53ab	93c	60d	87ce	7f	0	***
Agricultural by-products (%)	Cassava chips	0	0	0	0	93a	20b	0	*
	Cassava/potato peelings	7a	7a	87b	73c	87b	87b	100d	**
By-products processing (%)	Soya bran	7a	40b	0	53c	67d	0	7a	***
	Recycled flour	100a	93ab	100a	93ab	93ab	73c	100a	**
	Cooking residues	73a	87b	73a	67c	100d	93e	87b	***
	Peanut residue	0	0	0	0	73	0	0	NS
Agro-industrial by-products (%)	Bran/granulated wheat	33a	7b	73c	60d	0	0	0	***
	Brewery malt	13a	33b	67c	20ad	0	0	0	**
	Palm oil of cake	27a	53b	87c	67d	93ce	7f	0	***
	Rice bran	27a	0	7b	0	73c	0	0	**

Results assigned to the same letter on the same line do not differ significantly at the 5% threshold. \*\*\*: Significant difference at the 0.1% threshold, \*\*: Significant difference at the 1% threshold, \*: Significant difference, NS: Difference not significant.

Agro-industrial by-products have also been widely used in pig's feeding in southern Benin. Thus, granulated wheat bran has been used more in Ouémé, Plateau and Atlantique. The palm oil cake has been widely used in Zou, Ouémé, Plateau and in Littoral. The brewery malt and the rice bran were more served to pigs in Ouémé and Zou respectively than in other departments. Agro-industrial by-products have been less used by pigs' breeders of Mono and Couffo. Farmers used also local fodders resources to feed pigs (Fig. 6).

The plant species most commonly used in southern Benin were: *Amaranthus* spp. (Handukpo or Hanman in

local language Fon), *Manihot esculenta* (fënyénman in Fon), *Carica papaya* (Kpènman in Fon), *Talinum triangulare* (Aglaweman in Fon), *Moringa oleifera* (Kpanouyéde-man or kpatinman in Fon), *Ipomea repens* and *Ipomea batatas* (Dokwinman or Wèliman in Fon), *Elaeis guineensis* (Déman in Fon), *Boerhavia erecta*, *Boerhavia diffusa*, *Boerhavia repens* (Gbagbadaman in Fon) and *Musa* spp. (Kwékwe-man in Fon). More than 55% of breeders of Ouémé, Plateau and Couffo used *Manihot esculenta* while those of Littoral used mostly *Ipomea batatas* (67%) and *Ipomea repens* (33%). *Amarantus* spp. were most commonly used in Mono (53%), Atlantique (33%) and Zou (31%).

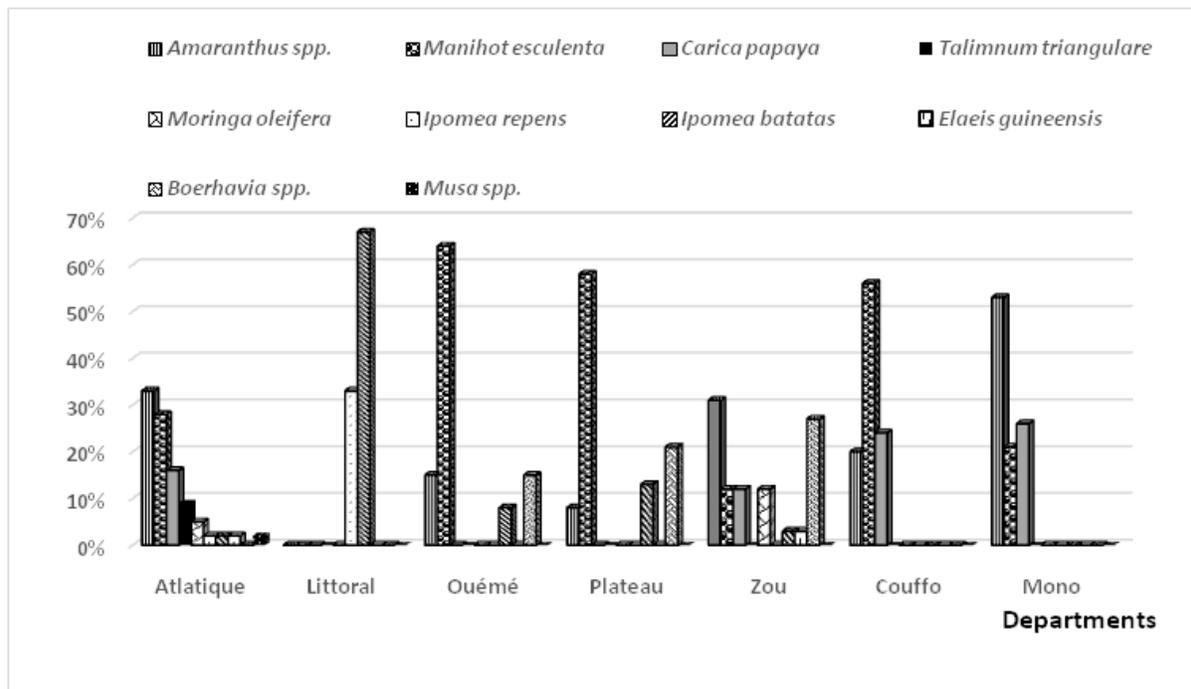


Fig. 6: Local fodders valorized in feeding of pigs in Southern Benin.

### Animal's exploitation

Pigs bred were used for sale, donations, festive and funerary events (Table 4). The sale was the priority of the reasons for destocking of animals from the livestock for all the breeders. Funeral ceremonies, baptism and libation ceremonies were not neglected

reasons for exploitation of pigs in livestock, especially in Couffo and Mono departments (53% and 40%, respectively). As for festivities, donations and marriages, the removing frequencies of pigs were more dominant in Zou than in other departments. The animals taken were mainly boars, growing young and reformed sows.

Table 4. Reason of removing animals and categories.

Variables		Atlantique	Littoral	Ouémé	Plateau	Zou	Couffo	Mono	Chi <sup>2</sup> test
Reasons for destocking of animals (%)	Sale	100	100	100	100	100	100	100	ns
	Donation	0	7	0	0	47	0	0	ns
	Festivity	20a	20a	13ab	0	53c	0	0	**
	Marriage Ceremony	0	0	0	0	40	0	0	ns
Animals categories removed (%)	Boars	100	100	100	100	100	100	100	ns
	Growing yong	100	100	100	100	93	100	100	ns
	Reformed sows	100	93	100	100	100	100	100	Ns

Results assigned to the same letter on the same line do not differ significantly. \*\*: Significant difference at the 1% threshold, ns: Difference not significant.

### Health management and animals' mortality

The health constraints faced by pig breeders included scabies, helminthiasis, diarrhea and African swine fever (Table 5). African swine fever (ASF) continued to be prevalent in all departments in Southern Benin and was most common in Zou (67%), Mono (60%)

and Ouémé (53%). The categories of pigs most affected by the pathologies were piglets and fattening pigs. However, frequent mortality of adult pigs had also been reported in Zou, Mono and Ouémé. The therapeutics opposed to these various pathologies were a combination of traditional and veterinary medications. However, some breeders had not used

any treatment for pathologies. These were more numerous in Mono and Couffo. Few breeders had used traditional therapy and this as a disposable means. On the other hand, according the majority of breeders, veterinary treatment, applied by them, was the most effective therapeutic against disease.

Parasites drugs, antibiotics and vitamins were the most widely used in pigs' pathologies except in Mono, where 60% of breeders did not use any treatment. Drugs were generally administered to sick animals by most breeders themselves under veterinary prescription and to a lesser extent by self-medication.

**Table 5. Sanitary constraints and treatments applied against diseases.**

Variables		Atlantique	Littoral	Ouémé	Plateau	Zou	Couffo	Mono	Chi <sup>2</sup> test
Diseases (%)	Scabies	80a	67b	100c	67b	53d	73be	93cf	***
	Helminthiasis	93a	87ab	100ac	87ab	80bd	93a	100ac	**
	Diarrhea	20a	40b	60c	67d	27e	7f	0	***
	ASF	27a	40b	53c	33ad	67e	27a	60cf	***
	None	0	7	0	7	0	7	0	ns
Animals categories affected (%)	Piglet	93a	100ab	67c	93a	100ab	87ad	100ab	**
	Growing pigs	93a	100ab	80c	87ad	80c	87ad	47e	*
	Adult	33a	47b	53bc	27ad	73e	33a	53bc	**
	None	0	0	0	7	0	0	0	ns
Type of treatment (%)	Traditional	0	13	0	0	20	13	20	ns
	Modern	93a	53b	100ac	73d	60be	53b	20f	***
	None	7a	40b	0	27c	0	33cd	60e	***
Cause of traditional treatment (%)	Disposable means	0	13	0	0	20	13	20	ns
	No idea	100	87	100	100	80	87	80	ns
Cause of modern treatment (%)	Efficiency	93a	53b	100ac	87ad	87ad	53b	20e	***
	No idea	7a	47b	0	13ac	13ac	47b	80d	***
Cause of no treatment (%)	Lack means	0	20a	0	20a	0	33b	60c	***
	Negligence	7	20	0	7	0	0	0	ns
Type of de products used (%)	Parasites drugs	93a	53b	100ac	73d	80e	53b	20f	***
	Antibiotics	67a	40b	93c	73d	87ce	53f	13g	***
	Vitamins	53a	33b	93c	67d	80e	27bf	13g	***
	None	7a	47b	0	27c	13ad	47b	80e	***
Drogs origine (%)	Self-medication	33a	20b	0	0	40ac	7d	0	**
	Veterinary	60a	33b	100c	73d	53ae	47ef	20g	***

ASF: African swine fever. Results assigned to the same letter on the same line do not differ significantly. \*\*\*: Significant difference at the 0.1% threshold, \*\*: Significant difference at the 1% threshold, \*: Significant difference, NS: Difference not significant.

Mortality affected all categories of animals within the herd but with varied degrees (Table 6). Thus, piglets were more affected (more than 80%) by mortality than growing pigs and adult pigs. Diseases were the main causes of mortality (over 60%) of animals without distinction of age. Other major causes of piglet mortality, particularly in Zou, were traffic accidents (80%) caused by motorcycles and drowning. In Mono and Couffo, conflicts between breeders and farmers were mortality cause of the piglets respectively at 40 and 33%. Choking at birth and during lactation by the sow and rainy weather were also significant causes of mortality of piglets. In growing pigs and adult pigs, diseases were the main

causes of mortality, but the conflict between farmers and breeders was reported.

### Breeders' difficulties, planned solutions and prospects

Other constraints faced by pigs' breeders in the farming were lack of means for adequate feeding, inadequate habitats, animal theft, slump in sales and indebtedness (Table 7). Constraints related to the theft of animals were much more expressed in Littoral, Zou, Couffo, Mono and Plateau. The slump was mainly expressed in Ouémé and Littoral. The constraint related to pig's habitat was one of major worries of Zou breeders.

Different planned solutions were proposed by pig's breeders to palliate the various constraints. Thus, Zou breeders have planned as a solution to build livestock buildings according to standards in an adequate environment. In terms of feeding difficulties, most breeders have considered the provision of raw material stock and the improvement of food quality. As for pathologies, hygiene, prevention and treatment of

diseases was proposed just as confinement practice. Despite the many constraints, breeders except some of Atlantique, have not expressed the desire to give up pig farming. On the contrary, they had the prospect of extending livestock by increasing the size of their livestock. The wishes of the breeders to achieve this perspective were, in priority, financial support and training on breeding techniques.

**Table 6.** Mortality and mortality causes of pigs.

Variables		Atlantique	Littoral	Ouémé	Plateau	Zou	Couffo	Mono	Chi <sup>2</sup> test
Mortality (%)	Piglet	100	100	73	80	100	80	80	ns
	Fattening pigs	27	40	0	20	20	13	27	ns
	Adult pig	13a	20ab	0	13a	7c	13a	47d	*
Causes of piglets mortality (%)	Accident	0	0	0	7	80	0	0	ns
	Choking	13	27	27	20	0	27	0	ns
	Drowning	7a	33b	0	0	80c	0	0	*
	Conflict	20a	13ab	0	33c	13ab	53d	60de	**
	Diseases	93a	67b	47c	60bd	53de	47c	80f	*
Causes of fattening pigs mortality (%)	Rainy season	7	47	0	0	0	7	0	ns
	Accident	0	0	0	0	7	7	0	ns
	Conflict	13a	7b	0	20ac	7b	33d	40de	**
	Diseases	27a	40b	7c	33ad	20ae	60f	27a	**
Causes of adult pigs mortality (%)	Accident	0	0	0	0	7	0	0	ns
	Conflict	0	0	0	13a	0	33b	40bc	*
	Diseases	13a	20ab	0	13a	7c	20ab	47d	*

Results assigned to the same letter on the same line do not differ significantly. \*\*: Significant difference at the 1% threshold, \*: Significant difference, NS: Difference not significant.

**Table 7.** Other constraints, solutions considered and prospects.

Variables		Atlantique	Littoral	Ouémé	Plateau	Zou	Couffo	Mono	Chi <sup>2</sup> test
Constraints (%)	Theft	0	53a	0	7b	40c	27d	13e	***
	Habitat	0	7a	0	0	80b	33c	0	***
	Food	40a	93b	93b	100bc	100bc	67d	100bc	**
	Slump	33a	80b	93c	33a	27ad	7e	13f	***
	Debt	20a	33b	45c	13ad	25ab	7e	0	**
Solutions proposed (%)	Good habitat	0	13a	0	0	80b	33c	0	**
	Quality Food	40a	93b	100bc	100bc	100bc	67d	100bc	*
	Veterinary therapy	100a	87b	100a	87b	100a	67c	93bd	*
	Cloistering	0	33a	0	13b	20bc	13b	13b	*
	Hygiene	20a	13ab	33c	0	67d	20a	7e	**
To abandon breeding (%)	Yes	7	0	0	0	0	0	0	ns
	Lack means	7	0	0	0	0	0	0	ns
	No	93	100	100	100	100	100	100	ns
Wishes of the breeder (%)	Increase number	100	100	100	100	100	100	100	ns
	Financing	87	100	100	100	100	100	93	ns
	Training	100	100	45	100	100	100	100	Ns

The results assigned to the same letter on the same line do not differ significantly. \*\*\*: Significant difference at the 0.1% threshold, \*\*: Significant difference at the 1% threshold, \*: Significant difference, ns: Not significant difference.

## Discussion

The preservation and development of the pig sector in Benin requires a diagnostic study of the different breeding systems in order to investigate the possibilities of improvement through the implementation of the techniques applicable in a farming environment and compatible with the objectives of the breeders. This study makes it possible to control the contours of pig production, an activity generating income widely practiced by rural populations, urban and sub-urban in Benin.

The study showed that the building materials used in pig breeding buildings are essentially local materials. These results are in agreement with those reported in Burkina Faso and in the tropical zone (Umutoni, 2012; Delate, 1994) and explain the less exigency of pig breeding, which motivates its practice by all socio-professional classes.

The method of breeding pigs included breeding in divagation, permanent cloistering and seasonal cloistering. The choice of breeding mode depended of production objective and financial capacity of breeders. However, each of methods of breeding has certain advantages but also disadvantages. Indeed, in divagation breeding, a farmer is exempt from all expenses related to animal feeding. Animals cover their food needs by gleaning everything all products they can meet and consume. But this practice exposes animals to all kinds of bad weather as rain, wind, sun, cold, predation, envenomation and diseases. Contrary, the breeding mode in cloistering renders possible the control of these risks and to avoid them. The disadvantage here is that the farmer is obliged not only to take in hand all the needs of animals kept in cloistering, but also to make himself available or to hire workers for their service. The predominance of seasonal cloistering in this study differs from the predominance of open-air breeding in Italy, in Sweden, in France and Denmark (Prunier et al., 2012). In seasonal cloistering mode, most breeders are regulated by a cultivation period. Thus, from the first plantings, pigs are kept in confinement and regain their freedom only at the end of harvests (Ayssiwèdé, 2004; Mopaté, 2000 and 2002). But in case of off-season cultivation, the animals cloistering can be prolonged even after harvests.

The involvement of different members of the household in the service of confined animals is similar to the

results observed in urban and peri-urban areas of Cotonou and Abomey-Calavi in Benin (Youssao et al., 2008a) and those obtained through studies on pig sector in Benin (Ayssiwèdé, 2004). This involvement of all household members in animal husbandry revealed that pig farming in South of Benin is a family enterprise. The different types of feed used to nourish pigs are by-products of domestic processing, agricultural by-products, agro-industrial by-products, provender and fodders. This variety of feed is due to the fact that the pig is omnivorous and is able to value a whole range of food products and even those of less nutritive value (Youssao et al., 2008a). This specificity of the digestive physiology of pig gives it an ability to adapt to all kinds of breeding conditions, be it traditional, modern or semi-modern. Very few breeders use provender in pigs feeding. Previous studies reported most pig's producers used green fodders associated with domestic residues and palm oil wastewater to limit spending related to feeding (Nonfon et al., 1994; Tchoumboué, 1983).

Mono, Couffo, Ouémé and Zou are farming areas where cassava cultivation is highly developed, the breeders valorized better their derived products in pigs feeding. The kitchen residues and the mill's recycled flours were also widely valorized in pigs feeding in these areas. The recycling of these wastes in animals feeding contributes to the fight against environmental pollution (Houndonougbo et al., 2012). The main reasons for animal's exploitation were sale, gift, party, marriage, libation and funeral ceremonies, and baptism. Thus, pigs were not only saving easily mobilizable in case of necessity but also fully integrated into the socio-cultural life of the populations in southern Benin.

Pig farming in South of Benin is facing enormous problems related to pathologies, feeding, slack, housing, theft and indebtedness. The most common diseases faced by porcine herds in Southern Benin are internal and external parasites, African swine fever (ASF) and diarrhea. These diseases which were recurrent with higher frequencies in Ouémé, Mono and Atlantique were due to the high density of animals within livestock in these areas, i.e. animal number per square meter. A plethoric number of animals in a small space is a potential factor of stress, rapid proliferation of germs and horizontal transmission of diseases. African swine fever, which remained current throughout the area studied, exposes the pig production to a permanent risk of the emergence of this disease. A new approach of fight cutter this disease must be the emergency object in

enzootic control program in Benin. The frequent mortality of piglets was a consequence of the fragility of their immune system against diseases. This of adult pigs in Ouémé, Zou and Mono was due to the frequency of African swine fever, which in these areas devastated the pig population without animal's age distinction.

The lack of financial resources is one of major constraints to the development of pig's production. However, even if insufficient financial resources constituted a handicap for breeders, good management can allow rational and profitable management of a farm by giving the farmer, from the sales of first generation pigs, means of investing in feeding, health and maintenance necessary for the growth of the following generations, and this in a progressive manner. This strategy would enable producers to avoid not only their dependence on credit institutions but also unproductive expenditure (Ndébi et al., 2009). The constraints encountered during this study, such as lack of capital, sanitary pressure, difficulties in feeding and marketing animals, theft as well as the absence of the appropriate supervisory structures were similar to those reported previously by several authors (Ndébi et al., 2009; Ndébi and Ongla, 2006; Serres, 1989). The improvement in take care of animal health is due to the fact that pig farming is increasingly becoming a production-sales enterprise, the profitability of which depends on the quality of the investments.

## Conclusion

The study on management of pig breeding and its constraints in southern Benin showed that the pig breeding has a great importance in a rural economy in Benin. Its practice requires little investment in term of infrastructure and animals feeding. The construction materials of pigs building are generally local materials and the feeding based on using of by-products of domestic, agricultural and agro-industrial transformation accompanied by several fodder species. This sector is confronted with many difficulties in particular compared to the breeding control, the formation, the access to the credit and the organization of the sector. The implementation of palliative ways against these constraints will be a large asset for the development of porcine sector in Benin.

## Conflict of interest statement

Authors declare that they have no conflict of interest.

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