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Introduction of breeds (Local, Mixed, Large white) and valorization of nutrition (Local, Balanced Local Ration,Balanced) for an increase in pig production (Sus domesticus Erxleben, 1777) in Kindu and its surroundings, Province of Maniema, DRC.

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ABSTRACT

Feeding piglets in the maternity ward is essential for late weaning at 45 days. The objective of this study was to verify the hypothesis according to which the ration and the breed can improve the zootechnical performances on the increase of the breeds of piglets at weaning. A sample of 45 piglets (15 piglets of the local breed, 15 crossbreeds and 15 Large white) were distributed between three batches: piglets fed only the local ration (lot 1, control), piglets having consumed an unbalanced local ration (lot 2), piglets receiving a balanced ration (lot 3). Individual weighings were carried out upon entry to the piglets to know the live weights and finally to find their growth weights. Piglets receiving the types of food gave better performances ($p < 0.05$) on live weight at 45 days of age (±8 kg to select a piglet) the daily feed consumption was (1.5 kg/d) and the average weight gain was (2.592 kg). In conclusion, the distribution of solid foods significantly ($p < 0.05$) improves feed intake and growth rate of piglets on the 45th day at 9 weeks. This study showed the need to distribute 1st and 2nd age foods in farms practicing late weaning. This practice opens up prospects for improving zootechnical performance on increasing weight in pig farming in the City of Kindu.

1. CONTEXT AND JUSTIFICATION.

The pig (Sus domesticus) enjoying enormous potential (short very early reproduction cycle, prolific 4 to 12, even 18 to 20 piglets per birth and productive, high food conversion and good adaptation to different ecosystems) has made it possible in certain countries of Africa and even the cities of the DRC to meet the needs for meat and relieve the vicissitudes of poverty (Bondombe, 2018). The pig is resolutely positioned as an animal of choice in the livestock development policy in the town of Kindu and its hinterlands (Edoukou, 2012).

However, feed representing 60% and the production cost in pig farming ranging around 70% certainly constitute an important economic lever, quickly mobilized and reversible (Monziols, 2014).

Furthermore, food is a key element in limiting the competition for resources that exists between human food and animal food.

The feed efficiency of pigs is therefore at the heart of the sector's concerns. Today, the breeder is paid proportionally according to the weight of the carcasses produced (Pomar, 2011).

On the other hand, the study of the dynamics of ingestion and well-being of the animal is a prerequisite to the search for new solutions, on the one hand and on the other hand, the control and maintenance of production costs relatively low levels make pig farming profitable (Sauvant, 2014). In the Democratic Republic of Congo in general and in particular in the town of Kindu, most pig farmers are concerned.

It is in this perspective that this work aims to contribute to the application of strategies to increase pig production in Kindu to serve one of the basic models of sustainable and socio-economic development of households.

2. PROBLEM

In developing countries, the occupation of land for agriculture or urbanization considerably reduces grazing areas for ruminants. These limits highlight the place of Sus domesticus, often neglected even though it is the most consumed animal in the world (Anonymous, 2016).

Pig farming, through the multiple advantages it offers compared to other livestock, is ideal for helping to fight poverty and improve the meat supply in most African countries (Doutoum, 2014).

Pig farming is a real social shock absorber, first of all thanks to the numerous job opportunities generated by the sector, but also thanks to the constant flow of income from sales. This allows breeder households to meet their vital needs and thus improve their daily lives (Mormede, 2018).

Mopaté and Koussou (2013) state that the establishment to carry out a project and adopt a production diversification strategy to fight against poverty.

Over the last two decades, the deep socio-economic crisis experienced by the DRC in general and Maniema in particular, associated with repeated wars, looting, epidemics and other disasters have reduced the Congolese agropastoral sector and consequently caused the fall in livestock production (Nsimba, 2017).

According to Fabre (2018), to meet the needs for proteins of animal origin of the Congolese population in general and that of Maniema in particular, it is necessary to take advantage of zootechnical aspects that can influence animal welfare from the start of the meal which is triggered by the feeling of hunger.

In Maniema and more precisely in Kindu, the pork meat trade is an activity carried out by women who, for the most part, force themselves to control household food security through the sale of poultry, for example, which constitutes one strategic pillars of food security (Nsimba and Jelu, 2015). Currently, the advantages that pig farming presents (fertility, prolificacy, rapid fertility, growth and development) we are seeing an enthusiasm for women in this commercial activity (Sheria, 2013). Unfortunately, the lack of mastery of appropriate, better-planned techniques that could allow them to make this breeding more profitable and sustainable, which dampens the enthusiasm of these actors.

This is indeed the concern of this study which aims to implement strategies to increase pig production in the town of Kindu.

3. RESEARCH QUESTIONS

As part of this study, we address the general question of: what are the efficient strategies that would allow the increase in pig production in Kindu?

From this general question, four specific questions were formulated:

1. What are the negative factors that prevent an increase in pig production in Kindu?
2. What are the limiting threats in the pig farming management system?
3. What are the positive factors on the economic impact of pig farming in the pork sector?
4. What opportunities are envisaged to improve the zootechnical performance of this pig culture in Kindu?

4. ASSUMPTIONS

The hypothesis put forward is based on the fact that: the strategies for increasing pig production in Kindu in the near future are related to genetic improvement and the preservation of pig germplasm, food, animal health and animal behavior of said culture.

The specific hypotheses assigned to this study are as follows:

1. The negative factors which do not allow an increase in pig production in these regions are endemicity, various pathologies, qualitatively and quantitatively deficient rations, ineffective monitoring, degeneration and the low volume of pig herd;
2. The limiting threats in the management systems in pig farming are the ephemeral destruction of the pig farm infrastructure, episodes of theft cases, pollution, zoonoses, deficiency of feed ingredients covering the year, overtaxation by state services and natural disasters;
3. The positive factors on the economic impact of pig farming and the pig industry are characterized by thrift, omnivorous character, growth and rapid development of very interesting of a pig farm is most often motivated by the producer's desire zootechnical performances of the animal, easy flow of the meat in the middle;
4. The opportunities envisaged to improve the pig activity are diverse: job creation, the use of open-air breeding, which would make it possible to provide healthier and more environmentally friendly products, the granting of micro credits and provision of a school pigsty to pig farmers in the town of Kindu.

5. OBJECTIVES OF THE STUDY

5.1.1. Overall objective

The main objective of this investigation is to contribute to the study of the application of strategies to increase production in the number of pigs in Kindu to be able to promote pig farming and make it sustainably profitable.

5.1.2. Specific objectives

Given the particularity of this study, we have set ourselves the objectives specifically, it will be a question of:

1. Correct the negative factors which do not allow the increase in pig production in these regions which are the endemicity of various pathologies, qualitatively and quantitatively deficient rations, ineffective monitoring, degeneration and low volume of livestock pig in Kindu;
2. Face the limiting threats in pig farming management systems which are often the ephemeral destruction of the pig farm infrastructure, episodes of theft cases especially during the night, pollution, zoonoses, deficiency of feed ingredients covering the year, overtaxation by state services and natural disasters;
3. Maximize the positive factors on the economic impact of pig farming and the pig industry which are characterized by thrift, with an omnivorous character, growth and the rapid development of very interesting zootechnical performances of the animal by its easy flow of meat into the media;
4. Exploit the opportunities envisaged to improve the pig activity with various job creations, using open-air breeding, which would make it possible to provide healthier and more environmentally friendly products, but also by granting micro credits to pig farmers in the town of Kindu.

6. INTEREST OF WORK

This study is of triple interest, namely: scientific, socio - economic and environmental.

a) Scientifically:

The results obtained in this research will constitute a data base for other researchers in multidisciplinary fields who will address similar concerns, allowing them to take measures for the improvement of pig farming and its sector.

b) On the socio-economic level:

This work aims to develop strategies that can better contribute to increasing the availability of animal proteins among consumers through high production from this breeding.

Finally, the study will strengthen the place of animal products in the fight against food insecurity and will constitute a source of income for some farming households and those in the pork sector marketing circuit.

c) Environmentally:

The effectiveness of this investigation will contribute to the sanitation of the environment through the waste from rice husks generated by rice mills and household waste supplied daily will constitute a serious environmental problem in these environments.

7. SPATIO-TEMPORAL DELIMITATION

The data collection for this study took place in the town of Kindu, province of Maniema in the DRC, from June 15, 2022 to July 22, 2024, i.e. two years.

8. PRESENTATION OF THE CITY OF KINDU

8.1 GEOGRAPHICAL FRAMEWORK

The town of Kindu is bounded:

- in the North, a vertical straight line going from the Misubu river on the right bank, passing through Keka village downstream of the Congo river, towards the left bank of the Congo river in the North – left of the Kindu airport runway up to its intersection with the Kindu – Lokando road near the Lwama cemeteries;
- to the South, a straight line starting from the source of the Mikonde River to its mouth upstream of the Congo River, going from the right bank to the left bank at the mouth of the Mukolochi River passing by Rail road until at the Kibombo road crossing;
- to the East, a straight line starting from the source of the Mikonde River to its intersection going to the right of the Misubu River bridge;
- to the West, by a straight line which starts from the Lokando crossing, only from Lwama passing by the Mikelenge river bridge on the Katako – Kombe road to the Kibombo road.

The town of Kindu is made up of three communes, one of which is on the right bank, that of Alunguli, and two others on the left bank. These are Mikelenge and Kasuku. It extends over an area of 101,259 km² and with an altitude of 487 m, i.e. 25°47' East longitude and 2°47' South latitude. (Morel, 2007).

- Municipality of Kasuku

Entirely located on the left bank of the Congo River, Kasuku is an urban commune. It is limited to the north by the Bangengele chiefdom in Kailo territory, to the west and south by the Kapondjo and Mikelenge rivers which separate it from the commune of Mikelenge, to the east by the Congo river formerly (Lualaba) which separates it from the commune of Alunguli. It is the main commune of the town of Kindu, due to its central geographical position and especially the concentration of socio-professional activities and public infrastructures. The governorate offices, the provincial government as well as the City Hall are located in this commune. (Figure 1)

Municipality of Mikelenge

Entirely located on the left bank of the Congo River, Mikelenge is an urban-rural commune. It is limited to the north by the Lwama road; to the east by the Kapondjo, Mikelenge and Lualaba rivers; to the South by the village Libenga; to the west by kilometer point 10, Mikelenge houses the headquarters of the Provincial Assembly of Maniema. (Figure 1)

c) Municipality of Alunguli

Entirely located on the right bank of the Congo River, Alunguli is an urban-rural commune (figure 1). It opens the city to the mining sites in the east (Kaïlo, Kalima, etc.) and the Kasongo Territory to the south. Its population is made up of more than three quarters by the Lega, the rest being made up of the Genya (falsely called here Lokele), followed by the Songola (N'sanda, 2011).

Table 1: Structure and area of the town of Kindu

Municipalities	Neighborhoods	Blocks	Avenues
Alunguli(25km²)	**Kama II**	**6**	**35**
	Kabondo	**3**	**6**
	Mangobo	**9**	**56**
Subtotal	6	8	94
Kasuku (30 km²)	**Basoko**	**7**	**48**
	Kasuku	**6**	**130**
	Lwama	**7**	**34**
Subtotal	3	20	212
Mikelenge (46,297 km²)	**Lukunda**	**7**	**20**
	Mikelenge	**8**	**27**
	Tokolote	**8**	**69**
Subtotal	3	23	116
Grand Total	9	61	422

8.2 BIOPHYSICAL FRAMEWORK

a) Soil and relief

The relief is that which characterizes the end of the central Congolese basin, very uneven with the soil which varies between the clay-sandy and sandy-clay type. This region has agricultural soil which allows the cultivation of all kinds of crops, both food and cash (Yuma, 2016).

b) Climate and vegetation

According to the meteorological service and according to the KÖPPEN classification, the city of Kindu is characterized by a hot and humid climate which evolves from the equatorial type to the North. The average temperature is around 25 to 27°C and precipitation amounts to 1650 mm.

The climate is characterized by:

- A rainy season which occurs twice a year: from August to December and from January to mid-May.
- A dry season which does not exceed 4 months, which goes from mid-May to mid-August, accompanied by fog during the morning and disparate fine rains.
- Season A normally begins in mid-September until January and season B begins in February until May. Thus, the climatic data from our work are presented in the table below:

The primary vegetation of this city having been destroyed for a long time, it contained valuable species in particular: Chlorophoraexcelsa, Entadrophragmaborea, and others which have now given way to grasses and legumes, shrubs and shrubs. Among them, we cite Musangacecropioides, Eupatoriumodoratum, Hyparrheniasp, Puerariajavanica, Elaeis sp, etc. (Yuma, 2016).

c) Hydrography

It is essentially composed of the Congo River and its tributaries located on either side of the said river. On the right bank, there are the following tributaries: Kindu, Kange, Mikonde, Luambondo, Muchondo, Mangobo, Kamikunga and Musubu. On the left bank we have: Mikelenge, Luandoko, Makopo, Canals, (Yuma, Op cit).

8.3 POPULATION

The estimated size of the population is 453,9411 inhabitants, according to demographic forecasts established with reference to data provided by the three municipalities of the city and on the basis of an average rate of change in the population observed during the period. of 2018.

As for religion, 4 large groups dominate the city: Catholics, Muslims, Protestants and those from revival churches. Believers in revival churches are growing sharply in the city. (City Hall, 2019)

8.4 SOCIO-ECONOMIC SITUATION

According to (Yuma, 2016), the town of Kindu is essentially agricultural. Some Kindu residents farm on the outskirts of the town to meet their needs. The food crops generally grown are: Rice, Corn, Cassava, Banana, etc. It is also grown in a small proportion of perennial crops (robusta coffee and oil palm).

Regarding livestock, the population of Kindu traditionally practices the breeding of small livestock (pig, goat, rabbit, sheep, guinea pig) and the breeding of poultry (chicken, duck, pigeon, didon, guinea fowl,). Fish farming is also practiced there.

Generally, the city's state-owned enterprises are old; this is particularly the case of: REGIDESO (Water Distribution Authority); SNEL (National Electricity Company); the SNCC (National Railway Company of Congo); O.R (Road Office) etc. (Onadambo, 2015).

9. STUDY MATERIAL

As part of this study, two types of materials were used, namely: biotic material and abiotic material.

This material consisted of pigs of the large white breeds; hybrids and local purchased from certain pig farmers in Kindu.

The technical equipment includes a motorcycle, the notebook, the pen, the ballpoint GPS, the modem, the computer and its peripheral, the digital camera, a scale, sprayer etc.

10. METHODS AND TECHNIQUES USED

10.1. Methods.

Any research or application of a scientific nature in general must include the use of rigorous, defined, transmissible processes, capable of being applied again under the same conditions, adapted to the type of problems and phenomena in question (Pinto and Grawitz, 1971).

The method adopted will be an approach characterizing the pork sector in order to study the application of upstream and downstream strategies. It is essential to have a clear picture of increasing pig production. This approach includes zootechnical and economic aspects while taking into account our objectives. The use of descriptive and analytical methods, which will be supported by participatory, empirical and documentary techniques, then the collection of data in the field.

10.2. PARTICIPATORY OBSERVATION

For this technique, data were collected from the different supervisory offices in relation to the field of this porcine activity, such as the Provincial Inspectorate of Agriculture, Fisheries and Livestock and the Provincial Division of the Environment.

The participatory method allowed us to obtain their points of view on pig farming from state (IPAPEL/Maniema) and private services.

10.3. EMPIRICAL METHODS

The moments of observation were used for the benefit of the researcher to verify the statements of the respondents. This offered the possibility of describing certain salient facts, also, we formulated criticisms with regard to the information obtained and we had matured reflections (Pinto and Grawitz, op.cit).

10.4. TECHNIQUES

To carry out this work, free interview techniques supported by documentary technique, direct observations were used (Bondombe 2018)

10.4.1. Documentation

We have consulted certain works, reports from services and scientific work quadrant with pig farming to amend this work.

10.4.2. Direct observation

Also called ad hoc investigation, it consists of personally receiving research realities in different corners of the study environment (Onadambo, 2015).

Direct observation or ethnography is a qualitative method consisting of directly observing in the field the social situation that we seek to study.

That is to say the implementation of a public policy, which implies that the researcher is physically present in the field.

Ethnography implies a field investigation consisting of methods of information collection, transcription and writing monitoring.

To collect data, this method allowed us to observe the state of health of the animals, the type of housing where they are raised, and the utensils used for feeding. The breed raised and counting the number of animals in the herd, etc.

Figure 2. Data collection at the Pig Farm of the Faculty of Agricultural Sciences / Department of Animal Science at the University of Kindu.

10.5. DATA COLLECTION

Field data collection was carried out from June 15, 2022 to July 22, 2024. Data was collected for each socio-professional category of pig farmers to identify problems based on the CAME matrix (Correct negative factors; Face threats); Maximize strengths and exploit opportunities).

The latter provides solutions by finding strategies to increase production with the determination of the sample in the pigsty school.

10.5.1. Determination of the sample in the pig school

The sample consists of fourteen (14) piglets aged three months, with an average weight of twenty (20) kg, including 12 females of the improved Large white breed; mixed race and local race. From this we have two (2) males (Large white).

The information collected concerns: zootechnical parameters (the observed parameters) and economic components (economic variables).

10.5.2 Zootechnical parameters

- Boar production cost;
- Production cost of the sow;
- Profitability of pig farming.

- Genetic improvement;
- Power management;
- Health management;
- Breeding conduit;
- Marketing.

10.5.3 Parameters observed

- Number of males and females in the pigsty;
- Sex ratio;
- Replacement rate;
- Reform rate;
- The size of breastfeeding babies;
- Number of young for distribution of the starter ration;
- Period/month of the sow's first farrowing;
- Fertility rate (year): (How many farrows/year of the sow);
- Birth mortality rate: (Number of piglet mortality during birth);
- Litter size at birth: (Number of piglets farrowed by the sow);
- Live weight at birth;
- Veterinary data.

10.5.4. Economic components

- Production cost of piglets;

10.5.5 Economic variables:

1. Profit ($) = production value ($) - overall cost of production

Production value = Number of piglets x Sales or unit price;

Production cost= (Feeding of broodstock ($/year), Ration transport cost ($/year); Veterinary costs ($/year), labor ($/year), purchase of breeding stock, depreciation.

$$2.\ \text{Financial profitability}\,(\$)\ \frac{\text{profit}}{\text{Total or overall cost}}\text{X100}$$

$$3.\ \text{Commercial profitability}(\%) = \frac{\text{profit}}{\text{turnover}}\text{X100}$$

10.6. Data processing and statistical analyzes

1) Data processing: Depending on the variables below, data is collected, manually processed, entered, processed with Microsoft software, Excel (scatter chart, tables, figures, diagrams and histograms) was used to determine certain parameters of position (mean), dispersion (variance, standard deviation, coefficient of variation) and will be grouped and compiled to have the results of each observed parameter.

2) Statistical analyses: application of pig increase strategies in Kindu.

Factorial and Cluster Analyzes were used for the spatial application and classification of pigsties by the software "STATGRAPHICS Plus – untitled statFolio and ArcGis version 10.8" the latest software was based on the processing of geographical coordinates in the different environments. study in order to produce maps of the study areas.

Figure 3. below illustrates the location of study environments within the University of Kindu and its territories.

11. PRESENTATION OF RESULTS

This chapter essentially focuses on the results found within the framework of the present study in order to answer the questions formulated and/or verify the hypotheses. The data collected in the field were analyzed, processed, analyzed and statistically analyzed.

To facilitate its understanding, this chapter is structured around improving pig zootechnical performance in Kindu in the pigsty – school as a reference within the framework of our experimental site within the University of Kindu, Faculty of Agronomic Sciences.

11.1 Technical data on zootechnical parameters

The strategies for increasing pig production will be implemented through its five zootechnical components retained.

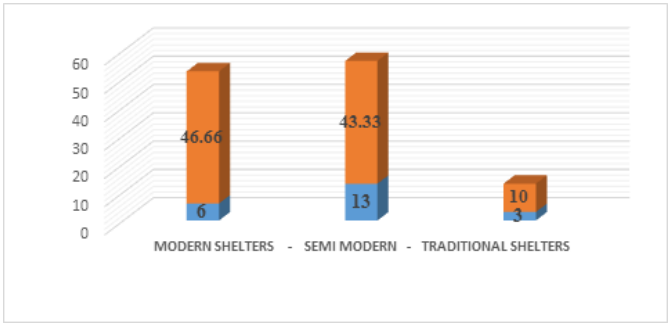


Figure 4. Types of pigsties encountered in Kindu

Among the farms surveyed, the majority had the same type of habitat for pigs. The different types of pigsties encountered were semi-modern shelters (43.3%), traditional shelters (30.7%) and modern shelters (26.66%).

11.2 Breeding management

11.2.1 Type of accommodation (Pigsty)

The figure below shows the semi-modern pigsties were compartmentalized according to the physiological stage of the animals, with a roof made of metal sheets or tiles, and side walls made of well-cemented bricks.

11.2.2. Livestock equipment

The figure below illustrates the types of feeders and drinkers as well as other technical equipment.

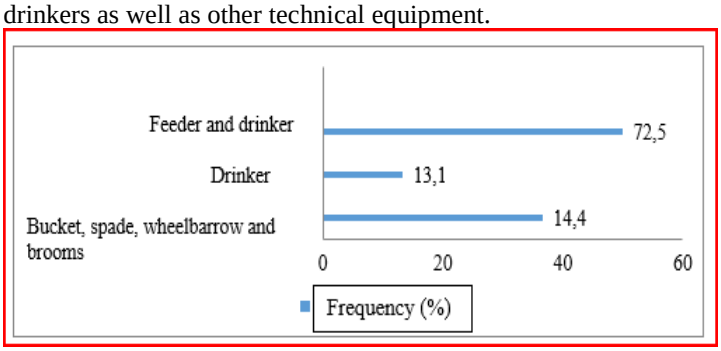


Figure 5. Pigsty breeding equipment.

These pigsties were equipped with very diverse feeders and water troughs (wooden; cut cans; kitchen utensils (72.5%), then bucket, spade, wheelbarrows and brooms (14.4%) and finally with other materials built in the cage with cement (13.1%).

11.2.3. Types of breeders and breeding systems

The figure below elucidates the type of pig farming practiced.

The analysis of the figure above sufficiently shows that 60% of the selected pig farmers operate the farrowing type and while the remaining 40% practice the farrowing and fattening type in the figure above.

II.2.4. Breeding systems

The following figure presents the pig farming system according to the three categories classified below in Figure 7.

The traditional production system (47%) while the semi-intensive system accounted for (27%), and the mixed or open-air system were identified in (26%). These three systems were defined according to criteria such as the type of habitat, feeding, breeding management and the zootechnical characterization of the activities.

11.3. Management and productivity of pig farms

11.3.1. Exploited breeds

The figure 8 shows the different pig breeds.The main breed exploited is the mixed race which is present in pigsties

with (36.66%) of the farms followed by the Large white breed (26.6%), which is more exploited. Then the Duroc breed (16.6%) and finally, the local breed which is very poorly bred and exploited loosely (23.33%).

11.3.2. Morphological characteristics of pigs

Figure 9 below shows the different coats of raised pigs.The pig resources in Kindu and its surroundings are distinguished by different coat colors (Figures 9), the most common of which are white (43.4%), and ash (30%). Dresses such as black were respectively in equal proportions of (20%), finally red (6.6%). Other dresses such as ash, piebald ash, ash with white sash on the shoulders, white with black plate on the side and red are very rare. Concerning other morphological traits such as size (small or large), shape and position of the ears, shape and position of the tail, profile of the head, shape of the face and snout, no difference was observed among pigs in Kindu town. All pigs, regardless of agroecological zone and coat color, presented small, oval, erect ears, a thin, straight tail with a straight head profile, an elongated face and a cylindrical-conical snout.

11.3.3. Age at weaning and castration

Table 2. Age at weaning and castration

Age (Days)	*Average*	*Standard Deviation*	*Minimum*	*Maximum*
Weaning	*45*	*16,75*	*24,1*	*60*
Castration	66,5	13,95	45	90

We note in the table above that the age at weaning is 45 days on average ± 16.75 and at castration is 66.5 days on average ± 13.95 of the piglets. On farms, sows are bred by natural mating. As shown in Figure 10.

11.3.4. Animal reproduction parameters

The figure 10 above shows that the age of the first birth per female is on average (12.6 months) with a minimum of 11 months and a maximum of 14 months. The number of births / female / years is (2 times) as on average, at the minimum and at the maximum. The average litter size at birth of (10 pigs, 8 pigs, and 12 pigs) and the mortality rate from birth to weaning are respectively (16%, 10% and 40%) with an average age of (12.6 months) at first birth.

11.4 Power management

11.4.1. Type of foods rationed

Two types of food have been listed according to their nature: complete food (or feed) used alone or mixed with other raw materials: Corn bran (30%), oilcake, palm kernel (10%), Flour fry (5%), shellfish with (3%), and salt (2%). Foraged foods are rationed at will in the evening so as to combine to alleviate hunger and characteristic for type 2.

Type 1: The total absence of rationing and characteristic for free-range breeding;

Type 2: Exclusive rationing of rice bran and characteristics for pig farms;

Type 3: Rationing of rice bran and palm kernel cakes and fodder concerning stable breeding;

Type 4: Rationing foods including rice bran, palm kernel cake, corn flour + soy flour + mineral foods (snail shell, oyster, or cow bone flour) + fodder: balanced mixture and rationing entered cut by the moment of shedding and reduction of food compounds;

Type 5: Rationing through more or less balanced rations for short-lived periods (fattening + sale);

At this stage, animals become undemanding about their diet, especially since they have already built up stocks of nutrients in their bodies, which allows them to resist sometimes inadequate nutrition.

The basic mixture at this level consists essentially of rice bran, palm kernel cake, calcined oyster shell flour as well as fresh greens.

11.4.2 Health management

11.4.2.1. Health management and common pathologies

The supply of veterinary services is weak and the health care of pig farms remained largely traditional with sometimes questionable medical practices.

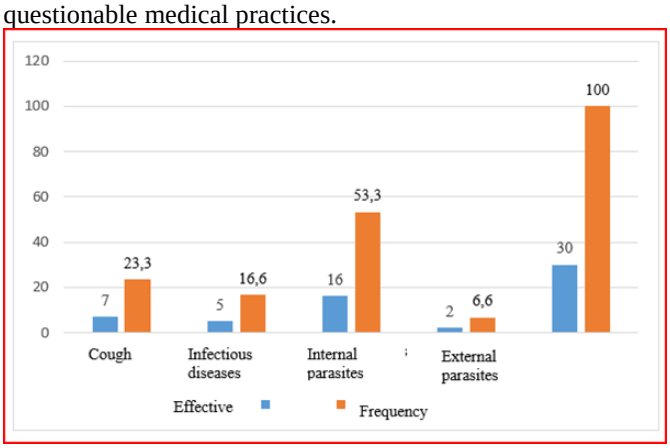


Figure 11: Cases of conditions encountered in the school pigsty (%)

The most common pathologies in pig farms are internal parasites (53.33%) followed by cough (23.3%); but also infectious diseases (16.66%). For external parasites (6.6%), pathologies are present in all the farms visited. Cases of internal parasitosis are more common except that many breeders carry out regular deworming.

11.4.2.2. Prophylaxis in pig farming

The following figure categorizes the different prophylaxes to finally protect animals against diseases.

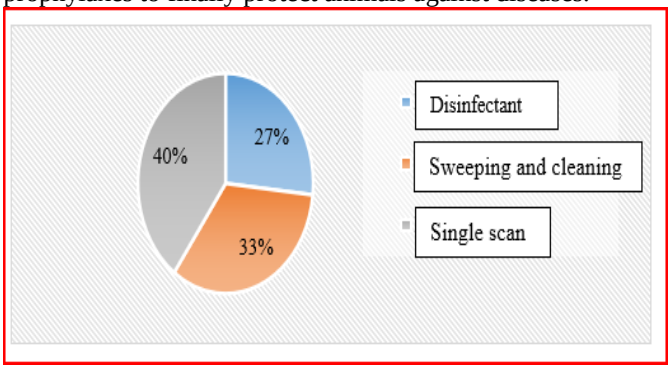


Figure 12: Prophylaxis in pig farming (%)

Simple sweeping of pigsties was carried out in (40%) farms with disinfectant (26.66%). On the other hand, sweeping with cleaning was (33.33%).

11.4.2.3. Pig care

The figure below illustrates the veterinary + human products used

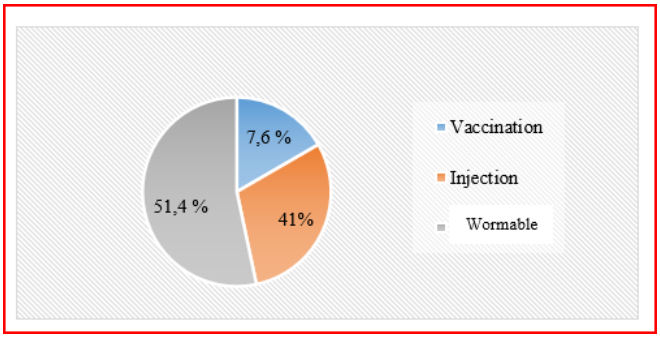


Figure 13: Care given to pigs (%)

Vaccination is practiced at (7.66%) and breeders are unaware of the diseases against which they are victims (41%) of injectable products (51.4%) of breeders claimed to practice simple deworming.

The Pigsty School.

The Faculty of Agricultural Sciences of the University of Kindu built a pigsty for scientific research in 2016. Following this, our Doctoral research focuses on this pigsty, where we call "Pigsty-school" in the context of increase of pig production in the town of Kindu.

Definition of the MOFF technique

MOFF analysis: is a method of analyzing the strategic context. It makes it possible to identify the internal strengths and weaknesses of an entity, its opportunities for development as well as the threats likely to affect its reason for being or compromise the achievement of its objectives (Mukandama et al., 2020 ; Myonge et al., 2020)

Use: The MOFF analysis is used to build a project while the CAME matrix revises the strategy of an entity.

The primary objective is to identify the problems of pig farming according to the MOFF matrix, from this matrix, we have developed a strategy called CAME, which will be able to find the solutions to follow in the environment of Kindu and its surroundings.

This strategy should be applied as follows:

- Operating system;
- Component (must resolve zootechnical and economic problems) with
- Zootechnical factors (we thought about breeding management) and
- Economic factors (to see trends in economic variables) (Myonge, op cit)

The table above shows the average total growth at birth is 1.395 kg, the weekly weight gain is (1.576 kg) in the first week while it becomes (1.272 kg) at weaning. The same applies to the daily weight gain, which is (0.2251 kg) in the first week, then (0.181 kg) at weaning. So these gains will increase, then they decrease with age.

Table 4 above indicates that at 4 months the morphometric trait was considered in local sows belonging to morphotype (a) presented weak characteristics with (16,122 cm ; 70,14 cm ; 66,687 cm ; 42,735 cm ; 47,455 cm ; 32,342 kg , 25,545 cm and 12 teats) hybrids belonging to morphotype (b) presented an average characteristics with (16,755 cm ; 72,965 cm ; 69,145 cm ; 47,16 cm ; 49,107 cm ; 35,45 kg, 26,255 cm and 14 teats)) while the morphotype (c) brings together the sows which presented the best characteristics, improved breed Large white (19 cm ; 84,807 cm ; 84,305 cm ; 58,735 cm ; 60,772 cm ; 48,21 kg ; 28,717 cm and 14-16 Teats) more than pigs of the morphotype respectively for snout length, body length, thoracic circumference, height at the withers, height at the sacrum, live weight and snout circumference).

At 6 months, high performance trends were observed in boars having formed the morphotype (d) of the improved Large white breed (20.975 cm; 87.395 cm; 88.55 cm; 65.19 cm; 67.16 cm; 56.285 kg and 31,555 cm) and 2 well-developed testicles.

At 8 months, the females having a morphometric trait considered, the sows of the local breed belonging to the morphotype (a) presented weak characteristics with (20,975 cm ; 87,395 cm ; 88,55 cm ; 65,19 cm ; 67,16 cm ; 31,555 kg; and 12 Teats) the crossbreed sows belonging to morphotype (b) presented average characteristics (36,777 cm ; 92,827 cm ; 86,9 cm ; 72,357 cm ; 68,9 cm ; 62,985 kg ; 51,812 cm and 14 Teats) while the morphotype (c) brings together the sows which presented the best characteristics, improved breed Large white (39,06 cm ; 94,885 cm ; 89,75 cm ; 76,347 cm ; 74,834 cm ; 70,75 kg; 58,387 cm and 16 Teats) more than the pigs of the morphotype respectively for the length of the snout, the length of the body, the thoracic circumference, the height at the withers, the height at the sacrum, the live weight and the circumference of the snout).

Performances were observed in boars at 10 months with high tendencies having formed the morphotype (c) of the improved Large white breed (50.865 cm; 97.635 cm; 95.025 cm; 83.995 cm; 85.66 cm; 86.35 kg and 61 .59 cm) and 2 well-developed testicles.

We note that pigs are morphologically structured into three groups (Table 5), namely:

The first group (G1) corresponds to morphotype (a) and the first group (G1) corresponds to morphotype (a) and is composed of female individuals respectively from the local breed.

Pigs assigned to this group presented low morphometric parameters with an average weight of (20.549 kg).

The second group (G 2) corresponding to morphotype (b) is composed of hybrid sows.

This group presents the high format with an average weight of (24.608 kg).

The third group (G 3) corresponding to morphotype (c) is made up of sows of the Large white breed. This group presents the highest format with an average weight of (29.74 kg).

The fourth group (G 4) corresponds to the morphotype (d) and represents the total number of (2) individuals revealed. This group is made up of boars of the breed (Large white) with an efficient morphometric profile (71, 317 kg).

Strategies on zootechnical performance for increasing pig production

Management of pig farming (Infrastructure, breed, feeding, watering and prophylaxis).

Level of knowledge in general pig farming management low by the aforementioned pig breeders as illustrated by the points below.

Table 6. Level of knowledge regarding pig farming.

Settings	Lack of information	Training (Workshops and seminars)	Productions	Breeding management
Pig farmers	+	-	+	+

The table above presents the notion of pig farming management (Weak +), (Average ++), (Strong +++), (Absence -) in the town of Kindu and its surroundings by pig farmers.

Strategy: - Training (workshop, seminar, etc.); - Network of pig farmers in cooperative of pig farmers. Convert Muslims and other non-consuming religions into Christians so that pork is consumed and produced.

Infrastructure: pig construction in the town of Kindu does not meet zootechnical standards. (non-durable; semi-durable and durable).

Table 7. Types of infrastructure operated by pig farmers.

Settings	Unsustainable	Semi durable	Sustainable
Infrastructure	+++	++	+

The table above shows that the majority of pig breeders are in non-durable (+++) and semi-durable (++) shelters while those with durable shelters are in small number (+).

Strategy: - It was necessary to combine the expertise of zootechnicians in the construction of the pigsty; - granting of credit to confirmed operators.

Breed: Large white; mixed race and local: each has its own morphological and environmental aptitudes in order to give good production and reach its normal weight at finishing age after one year, i.e. 300 kg.

Table 8. Exploited pig breeds.

Settings	Large white	Mixed race	Local
Breeds	+	++	+++

The table above presents the different breeds of pigs raised which have good fitness (Strong +++), (Average ++), (Weak +) in the town of Kindu and its surroundings by pig farmers.

Strategy: The pure breed has a very high price and above all very demanding compared to other breeds which have a very low price. We have favored pure breeds and increased the number of market producers, improving the pure breed, obtaining parents or piglets at any time of the year in Kindu and its surroundings.

Nutrition (Food and watering): in the town of Kindu and its surroundings there are two types of food to offer to pigs: balanced and unbalanced food for all ages of pigs, water is drinkable sometimes not drinkable.

Table 9. Types of feeding and watering.

Settings	Balanced	Unbalanced	Local
Food	-	++	+++
Drinking (water)	Drinkable	Not potable	
	+	+++	

The table above indicates the period of abundance and deficiency of food in the town of Kindu and its surroundings, balanced (Absence -), unbalanced (Strong ++) Local (Strong +++), while potable water (Weak +) and non-potable (+++) in the town of Kindu and its surroundings.

Rainy season				Agro-pastoralism / Dry season				Rainy season			
J	F	M	A	M	J	J	A	S	O	N	D
Abundance of food				Food deficiency				Abundance of food			

The table 10 above shows the food competition with humans, hence the importance of maintaining pastures to have good fresh fodder for the animals.

Strategy: During the period of abundance, we store food to be used during the period of scarcity, agro-pastoralism and maintenance of pastures to have good fodder, to be aware and trained in pig feeding, create a managerial spirit, create an efficient and permanent network. It should be noted that, during the dry season, breeders can produce pig breeds. Water should be used from a river source either from a well or tap using the clore product.

Prophylaxis: there is non-compliance with the veterinary calendar and lack of knowledge of swine diseases, screening is absent and if it exists it is generally late,therefore ineffective veterinary pharmacy with oil stain, non-existence of product of choice (vaccine, antibiotic, etc.), lack of specialist advisors among most pig farmers which makes prophylaxis ineffective, absence of visits by State animal health personnel to the various pig farms.

Strategy: to make prophylaxis effective: that the pig farmers' cooperative be installed in all areas well equipped with quality zoo veterinary inputs to meet veterinary and zootechnical requirements, popularization of veterinary care guide and veterinary care monitoring schedule.

Discussion

As part of this work, the zootechnical parameters were analyzed on the basis of the following variables: Infrastructure (type of housing; breeding equipment); feeding of pigs (feed material; feeding behavior); management and reproduction of pig farms (breeds exploited; Types of breeders; breeding systems; management and productivity of pig farms; age at weaning and castration); Possible opportunity to improve zootechnical performance; genetic improvement and morphotype characteristics, the choice of these variables is motivated by the fact that they contribute to the sustainable development of pig farming. These variables are the subject of several studies by other researchers, Koussou and Mopaté, (2017) Lakouéténé et al., (2017); Nguertoum et al., (2018); Ngo Tama and Awa, 2018). They established the situation of pig production in the framework of research applied to pig development in Chad, Cameroon and Bangui.

The habitats were mainly the pigsties of modern seedling shelters (42.3%); traditional (40.7%) and modern with (10%). Livestock system, three categories were classified: the traditional production system (10%) while the characteristics of the breeding equipment in our study were similar to those reported by Abdallah-Nguertoum (1997), and Agbokounou et al. ,(2016b), in the town of Kindu were equipped with very diverse feeders and drinkers (hollowed wood; cut cans; reformed kitchen utensils with (72.5%), and other types of equipment built in the cage with cement (13.1%) bucket and brooms, wheelbarrows (14.4%) and the type of operation in the different pigsties of Kindu and its surroundings, the majority were the breeders with (60%).

The semi-intensive system represented (27%), and the mixed or open-air system were identified in (26%) and traditional with (47%). Our results are similar to those reported in Africa in general by Mopaté Logténé et al. (2010),

Ndebi et al. (2019), Secka (2011), and Agbokounou et al. (2016b).

However, they are different from other work carried out in the DRC (Sambou, 2008; Bassene, 2010; Doumana, 2011), Benin (Ayssiwede et al., 2018) and Burkina Faso (Umutoni, 2012) which note that buildings semi-modern and traditional are in the majority. This difference is explained by the location of the farms surveyed which have access to the financial means allowing them overall to make the necessary investments.

Construction materials are diverse. As found by Traore (2014). These observations agree with those observed during our research which highlights the predominance of materials in the construction of pigsties and that the dominant pigsty in the town of Kindu is mainly semi-modern shelter (42.3%), with roofs in sheet metal, baked brick walls and concrete floor with cement.

Closed type pigsties caught our attention, that is to say the animals are in a room which does not allow them to receive the sun's rays.

Pig breeders gave an estimate of the average age at weaning of 24 days which is encouraging (Table 12), however the age at castration of 66 days far exceeds the average of 24 days meeting the standards and agrees with that found by Muys, (2013) in the Central African Republic, different from those of Abdallah, (1997) demonstrated that the results on age at castration vary depending on the farms. At this stage, castration is delicate for rapid growth, the meat becomes rustic. Hence, the preliminary treatment of preventing iron deficiency is very important in the first week of birth. Weaning occurs three weeks after birth, and the standards of the starter ration are taken into account.

The average litter at birth gives 8 piglets at Kindu and better prolificacy than most pig farms reported in Africa.

However, the production performance is 4-8-10 piglets per litter and the increase in production can be improved from 8-10-12-14 in Kindu. If we manage to respect all the zootechnical conditions, because the environment of Kindu is already favorable for this breeding.

Table 11 below presents the figures given by sows to the litter, some authors in Africa have reported:

Authors	Average	Minimum	Maximum	African countries
Field investigation (2022)	8	4	12	DRC
Missouhou and *al.*,(2011)	8,3	4	12	Togo
Youssao and *al.*,(2016)	7,2	3	10	Central Africa
Mopate and *al.*, 2010)	6,7	3	9	Senegal
Doumana,2011).	5,7	2	7	Benin

Figure Indicates livestock production systems, the mortality rate from birth to weaning is very high with (16%) as an average. This is said by the lack of mineral and vitamin compounds in the acronym CMV or premix are compounds that piglets need in small quantities, consequently their absence leads to serious disturbances for the functioning of animal organisms, mainly the fall in growth and production. dairy for lactating animals which leads to piglet deaths; lack of hygiene; epidemiological period are the basis of this.

This rate is close to that of (14.9%) given by Audeyi (2017) in a pig farm in Togo. Furthermore, the age of the first parturition of females (12.6 months) complies with the recommendations of Missohou et al. (2011)

Knowledge of the breeds and their performance is important before setting up a pig farm, which shows that the breeds exploited mainly are the Métis (36.6%) with ash coat followed by Large white (26.6%). like white coat and some local breed (23.33%) with black coat finally the Duroc (6.66%) with red coat.

Morphologically, a diversity of coats has been observed among pig breeders. The different dresses encountered have been previously reported by different authors with a large dominance of the dress. Furthermore, our study reported more (43.4%) white coats in exotic pigs, more precisely DRC and Europe (Boro et al., 2016; Ritchil and al., 2014; Khargharia and al., 2014; Zaman and al., 2013; The results of the present study showed that the ash (30%) and black (20%) coat generally characterized local pigs in Central Africa, of which the DRC is a part.

Thus, the mixtures of colors observed would be a consequence of mixing between local pigs, generally black in color, and exotic pigs, in particular the Large white in white color.

The majority presence of mongrels testifies that in the urban environment of Kindu the animal would be adapted to the tropical climate and the diet of this region, following its rapid growth which can reach up to 100 kg at 6 months from its birth, adult weight of a boar and a sow is 150 to 250 kg. Its good litter per farrowing is 8 to 10 piglets at birth and 6 to 8 piglets during the weaning period, due to its rustic meat, the crossbred is more appreciated for commercial purposes. The mixed breed is no more sensitive to stress than the Large white, while the local breed has several strains which depend on the regions, small in size, low prolificacy; its litter per farrowing is 4 to 6 piglets; 4 to 5 young during the weaning period, and the adult weight of a boar and a sow gives 40 – 60 kg. The same observation was made by Youssao and Papise (2012), in the peri-urban area of Cotonou and Abomey-Calavi in Benin.

The results showed that the breeders prepared the feed themselves and did not take into account the nutritional balance of the ration.

These results agree with those of Buldgen and al., (1994), and Agbokounou and al., (2016b) who report that leftover meals, kitchen scraps, palm kernel cakes, rice bran, cassava peelings or sweet potato, fish meal and oyster shell serve as a basis in diets. The rational development of local food resources can constitute an alternative way to improve pig nutrition. However, the results obtained in Ivory Coast by Tra Bi Tra (2019) and in Benin by Ayssiwede and al., (2018) differ from ours. These authors state that more than 90% of breeders use feed, especially in urban areas, to feed their pigs.

The level of development of the pig industry in each country would explain this difference. In the DRC, precisely in the town of Kindu, feed for piglets is ordered in rice mills and in local markets (more than 5 kilometers away), which increases their cost and limits their availability and use. Only breeders with financial resources could obtain the ration from the pigsties where the rice mills are located.

These pig feed production units are still few in number compared to other West African countries. Indeed, in Ivory Coast and Benin, categories of feed for pigs have been developed to meet their needs according to the physiological stage. Pig farming in Africa, particularly in the DRC in the town of Kindu, is generally practiced in intensive mode and

the management of pig feeding is regulated by the calendar of agricultural activities (Agbokounou; and al., 2016b).

Thus, several ingredients are available on site as a food source for animals. All these elements are very favorable to the future intensification of pig production in Kindu. Animals become less demanding of their rations, especially since they have already built up stocks of nutrients in their bodies, which makes it possible to resist sometimes inadequate nutrition given that the animal is an omnivore. In Ivory Coast according to (Trabitra, 2019), the nature of the food distributed varies depending on the age of the animal. This agrees with the point of view of Ayssiwede (2004), stating that the traditional system is found mainly in peasant environments.

Furthermore, the parameter observed in pig farms (12 pigs) was close to that reported by Sambou (2018) in Dakar (20.8 pigs), but low compared to that noted by Ayssiwede and al., (2018) in Benin. (40.65 pigs). This difference can be explained by the differential level of development of pig farming practices, socio-cultural constraints and especially the market.

The average total growth at birth is 1.395 kg, the weekly weight gain is (1.576 kg) in the first week while it becomes (1.272 kg) at weaning. The same applies to the daily weight gain, which is (0.2251 kg) in the first week, then (0.181 kg) at weaning. So these gains will increase, then they decrease with age.

This result is higher than that obtained by Le Goulven and al., (1999) in Vietnam (two pigs). Likewise, it is more important than those of Buldgen and al., (1994) and Missohou and al., (2011) who found respectively two pigs per farm in the peanut basin of Senegal and 11 ± 9.1 pigs in low in the town of Kindu. In DR Congo, the evolution of the workforce over time (growth of 3.2%) and the time of year can justify this difference.

Morphometrically, the results from our study justify the low discriminatory power of the types of food used on pigs. The low variability of morphometric characters observed between pigs from different agroecological zones.

Pigs are morphologically structured into three groups.

The first group (G 1) corresponds to morphotype (a) and is composed of female individuals respectively from local breeds, the pigs assigned to this group presented low morphometric parameters with an average weight of (42.374 kg).

The second group (G 2) corresponds to morphotype (b) and is composed of female individuals respectively from mixed breeds, the pigs assigned to this group presented high morphometric parameters with an average weight of (49.617 kg)

The third group (G 3) corresponding to the morphotype (c) is made up of sows of the improved breed (Large white). This group presents the highest format with an average weight of (59.925 kg).

The fourth group (G 4) corresponds to morphotype (d) and represents the total number of (2) individuals revealed. This group is made up of boars of the breed (Large white) with an efficient morphometric profile (71, 317 kg).

According to studies carried out in Benin (Djimènou and al., 2017b, Houndonougbo qnd al., 2012), the same food resources are practically used to feed pigs in most pig production areas in Africa.

These practices are characterized by extensive breeding, with low input, with often precarious housing, without any hygiene measures and not respecting modern zootechnical standards (food of low nutritional quality) (Djimènou and al., 2017b). This explains the fact that the expression of the zootechnical potential of local pigs is limited (Serres, 1989). In view of the results of the present study, in addition to the effects of improving breeding conditions, intra-breed selection and crossing with well-identified high-performance breeds can provide satisfactory results (Youssao and al., 2019a).

CONCLUSION

The present study is carried out with the aim of increasing pig production taking into account breed and nutrition to enhance pig resources for long-term management. To do this, the expectations of the various stakeholders in the pig sector from the point of view of criteria and method to be used for improving zootechnical performance are identified. The National Popularization Service constitutes a basic tool for the conservation and genetic improvement of pure and hybrid breed pigs. The implementation of this program depends on the involvement of political actors including the State since the preservation of animal genetic resources is a national duty which must take into account all the problems and limiting factors available to pig farmers in the town of Kindu.

Table 3. Weight and weight performance of breeding piglets (Kg)

Age (weekdays)	Total growth (Kg) (Average)	Absolute growth rate or weight gain (Average)			
		Observation on daily increase (Kg)		Observation on the half-yearly increase (Kg)	
Birth (12 pigs)	1,395	-	The average weight of the piglets at birth was 1,395 kg out of the 12 piglets.	-	//
1	2,971	1,576	The average weight of the first day.	0,2251	The average weight measured after one week of birth
2	4,706	1,655	The average weight of the second day.	0,2365	The average weight measured at two weeks or 14th day.
3	5,397	1,334	The average weight of the third day.	0,19	The average weight measured at three weeks or 21st day.
4	6,582	1,2967	The average weight of the fourth day.	0,1852	The average weight measured at four weeks or 28 days
5	7,871	1,2952	The average weight of the fifth day.	0,1850	The average weight measured at five weeks or 35 days.
6	9,044	1,274	The average weight of the sixth day.	0,182	The average weight measured at six weeks or 42 days.
7	10,299	1,272	After a week we still measured their weight to be 1,272 kg.	0,181	The average weight measured at six weeks or 49th day from birth.

Table 4. Characteristics of the average morphotypes of the spawners.

Morphotype	Snout length (cm)		Body length (cm)		Chest perimeter (cm)		Height at withers (cm)		Height at sacrum (cm)		Body weight (Kg)		Circumference of snout (cm)		Teats or testicles (Number)
Local sows (a)	**4 months**	**8 months**	**4 months**	**8 months**	**4 months**	**8 months**	**4 months**	**8 months**	**4 months**	**8 months**	**4 months**	**8 months**	**4 months**	**8 months**	**4 -8 months**
1	15,36	35,63	70,67	89,25	64,68	85,24	42,77	70,42	45,93	67,03	33,27	46,12	24,79	47,12	12
2	15,49	36,11	69,85	91,14	62,96	82,99	44,53	69,94	47,94	66,47	31,419	49,41	25,83	45,94	14
3	17,12	34,97	70,61	90,4	67,86	86,12	43,39	72,22	48,32	61,15	30,53	51,02	26,17	50,87	12
4	16,52	35,03	69,43	90,98	71,25	87,01	40,25	70,14	47,63	67,43	34,15	52,87	25,39	49,61	12
5	17,22	33,01	64,93	89,92	76,21	85,91	42,75	60,89	49,21	68,14	36,74	58,22	27,89	49,74	14
Average	**16,122**	**35,435**	**70,14**	**90,442**	**66,687**	**85,34**	**42,735**	**70,68**	**47,455**	**65,52**	**32,342**	**49,855**	**25,545**	**48,385**	**12**
Hybrid sows (b)	**4 months**	**8 months**	**4 months**	**8 months**	**4 months**	**8 months**	**4 months**	**8 months**	**4 months**	**8 months**	**4 months**	**8 months**	**4 months**	**8 months**	**4 -8 months**
1	16,3	36,15	72,6	92,2	68,5	86,62	46,52	71,31	48,5	68,3	34,6	62,11	25,9	50,12	16
2	16,4	36,42	72,8	92,28	68,7	86,73	46,6	71,52	48,8	68,87	34,9	62,43	26,13	50,17	12
3	17,12	37,13	73,16	93,31	69,18	87,1	47,32	73,2	49,27	69,12	35,2	63,23	26,67	53,41	16
4	17,2	37,41	73,3	93,52	70,2	87,15	48,2	73,4	49,86	69,31	37,1	64,17	26,32	53,55	14
5	17,6	37,81	74,6	94,1	73,29	88,21	48,77	73,9	50,6	70,17	38,12	64,31	26,89	53,81	14
Average	**16,755**	**36,777**	**72,965**	**92,827**	**69,145**	**86,9**	**47,16**	**72,357**	**49,107**	**68,9**	**35,45**	**62,985**	**26,255**	**51,812**	**14**
Sows Large white (c)	**4 months**	**8 months**	**4 months**	**8 months**	**4 months**	**8 months**	**4 months**	**8 months**	**4 months**	**8 months**	**4 months**	**8 months**	**4 months**	**8 months**	**4 -8 months**
1	18,6	38,53	84,3	94,2	83,19	89,1	58,15	75,2	60,15	74,18	46,65	70,16	28,34	58,23	16
2	18,85	38,71	84,43	94,32	83,72	89,81	58,25	75,29	60,51	74,71	48,12	70,32	28,6	58,3	14
3	19,23	39,2	85,12	95,19	84,12	89,97	58,94	77,38	61,13	75,12	48,89	71,16	28,83	58,4	16
4	19,32	39,8	85,38	95,83	86,19	90,12	59,6	77,52	61,3	75,33	49,18	71,36	29,1	58,62	14
5	19,78	39,9	85,6	96,27	86,82	90,83	59,63	77,94	61,87	75,91	49,7	73,71	29,38	58,71	16
Average	**19**	**39,06**	**84,807**	**94,885**	**84,305**	**89,75**	**58,735**	**76,347**	**60,772**	**74,835**	**48,21**	**70,75**	**28,717**	**58,387**	**16**
Boars Large white (d)	**6 months**	**10 months**	**6 months**	**10 months**	**6 months**	**10 months**	**6 months**	**10 months**	**6 months**	**10 months**	**6 months**	**10 months**	**6 months**	**10 months**	**6-10 months**
1	20,85	50,61	86,87	97,1	87,5	91,18	64,52	82,81	66,38	85,2	55,17	85,3	31,23	61,27	2
2	21,1	51,12	87,92	98,17	89,6	98,87	65,86	85,18	67,94	86,12	57,4	87,4	31,88	61,91	2
Average	**20,975**	**50,865**	**87,395**	**97,635**	**88,55**	**95,025**	**65,19**	**83,995**	**67,16**	**85,66**	**56,285**	**86,35**	**31,555**	**61,59**	**2**

Table 5. Profile of pig individuals within groups.

Groups	Snout length (cm)	Body length (cm)	Chest perimeter (cm)	Height at withers (cm)	Height at sacrum (cm)	Body weight (Kg)	Circumference of snout (cm)	Teats or testicles (Number)
Sows								
G1 ♀Local (4-8 months) (Average)	**12,889**	**40,145**	**38,006**	**28,353**	**28,243**	**20,549**	**18,482**	**12**
Sows								
G 2 ♀Hybrids (4-8 months) (Average)	**13,383**	**41,448**	**39,011**	**29,879**	**29,501**	**24,608**	**19,516**	**14**
Sows								
G 3 ♀Large white (4-8 months) (Average)	**14,515**	**44,923**	**43,513**	**33,77**	**33,901**	**29,74**	**21,776**	**16**
Boars								
G 4 ♂Large white (6-10 months) (Average)	**35,92**	**92,515**	**91,7875**	**74,592**	**76,41**	**71,317**	**46,572**	**2**

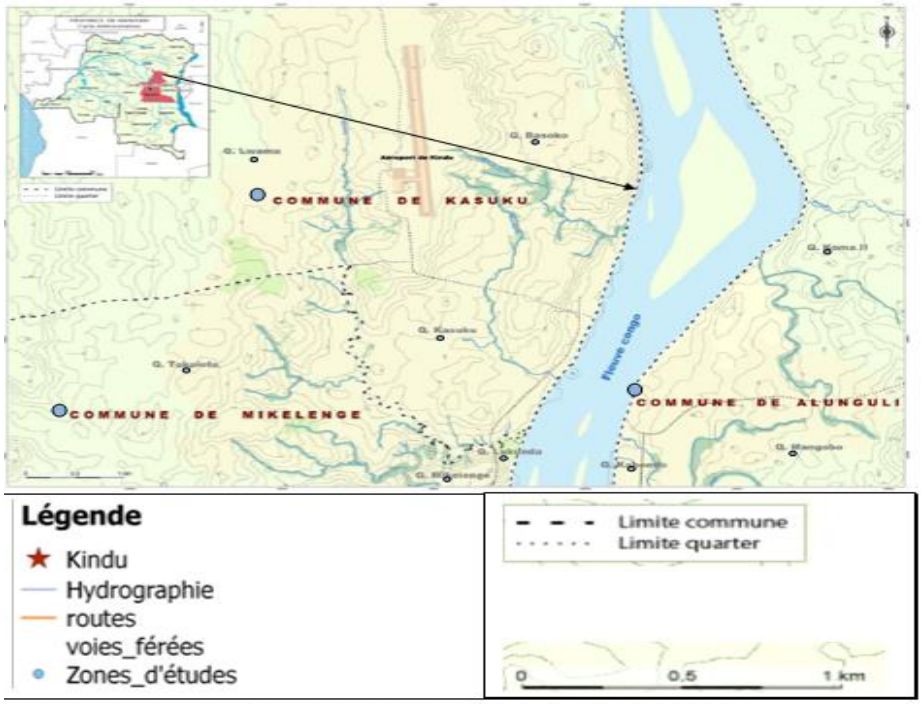
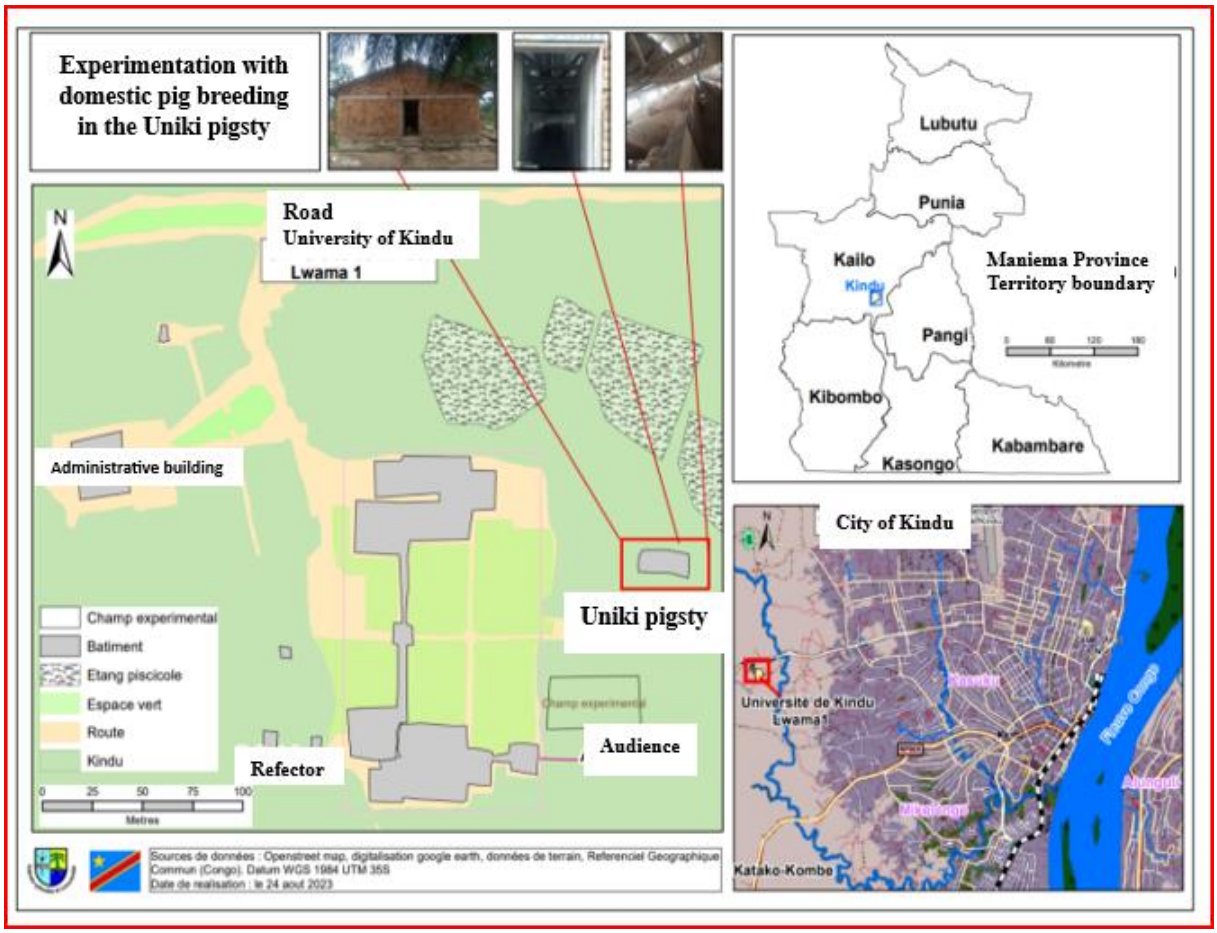


Figure 1. Location of study environments. Source: Personal initiative (ArcGIS)

Area= 101,295 km^2

Anonymous 2018



Data source: RGC, Terrain Data, Opeestreat map, Datum WGS UTM 35S.
Date of completion: September 4, 2023.
Figure 3. Map illustrating the sampling sites of the Pig Farm

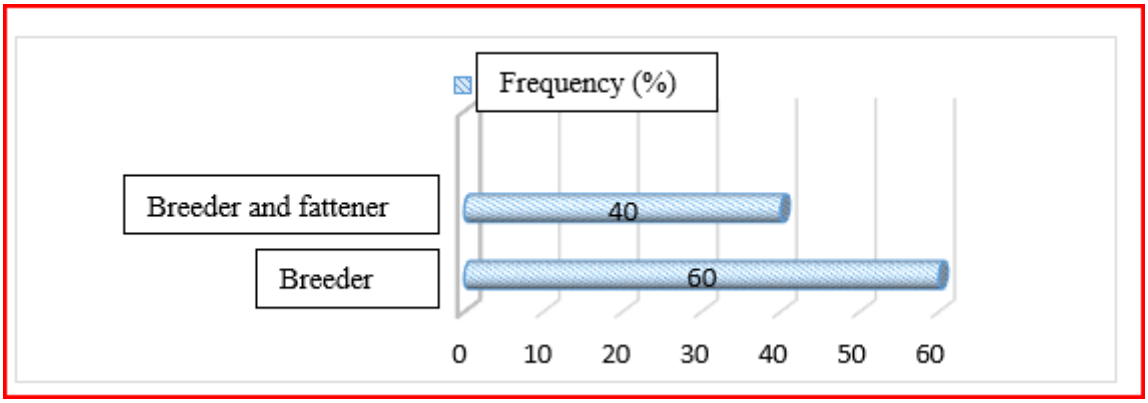


Figure 6. Types of pig exploitation practiced

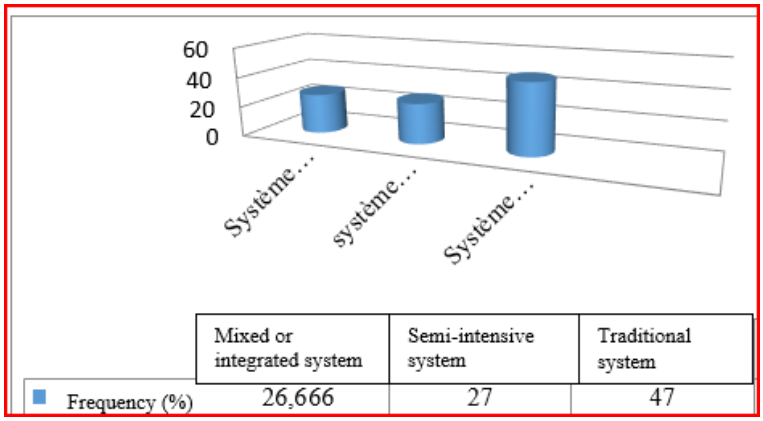


Figure 7. Different pig farming systems practiced (%).

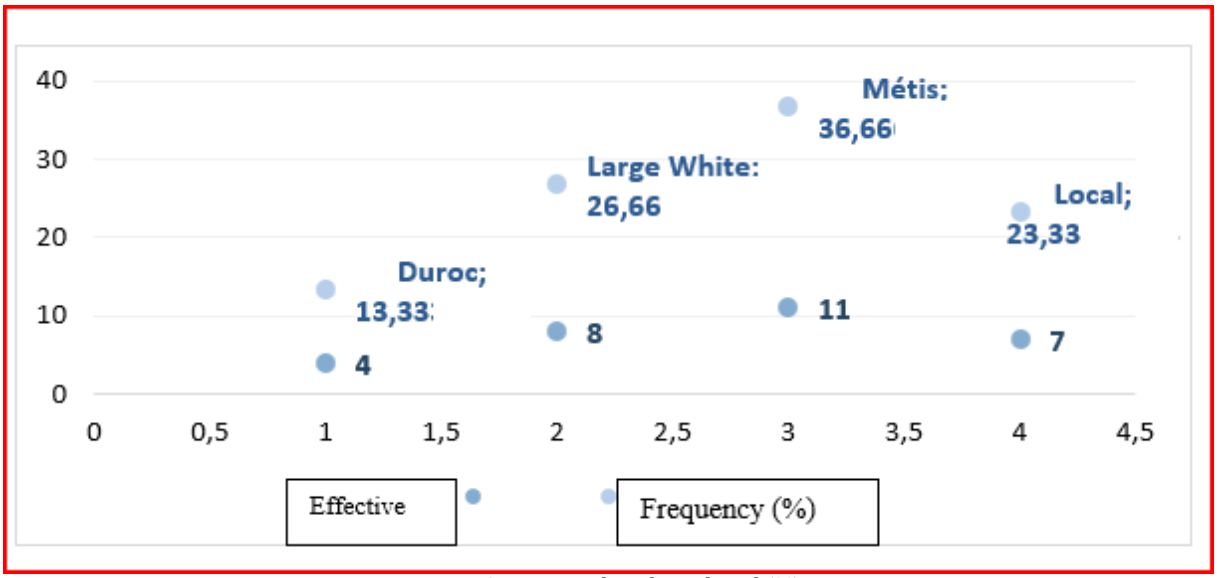


Figure 8. Main pig breeds exploited (%)

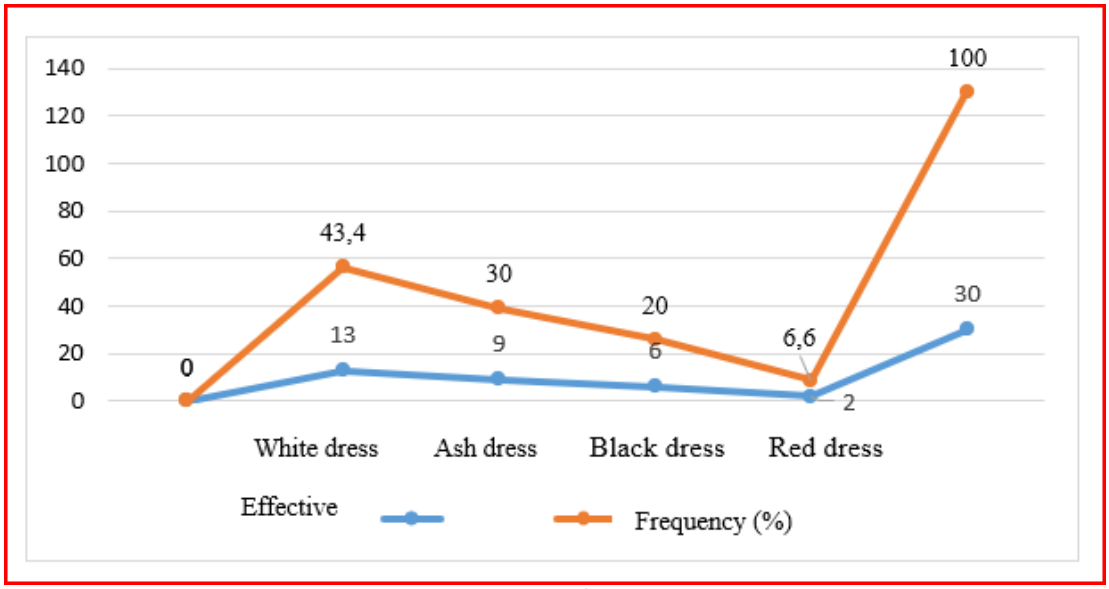


Figure 9.

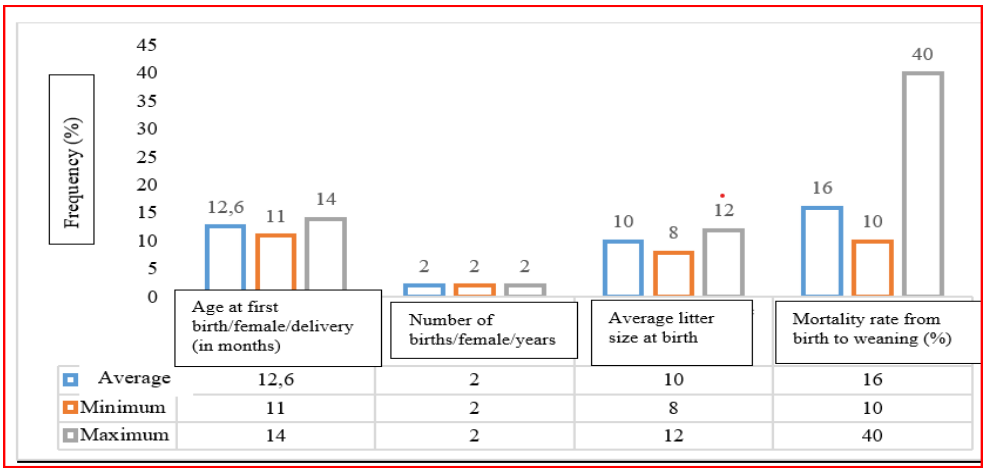


Figure 10. Distribution of sow reproductive systems

REFERENCES

Adamou-N'diaye M., Gbangboche A.B., Adjovi A., Hanzen C.H., 2020. Spermatic characteristics of Borgou breed bulls in Benin. Annal of Agronomic Sciences of Benin, 1 (2): 71-83, 2000.

Adjou-Moumouni P.F.A., 2016. Evaluation of the zootechnical performances of Borgou breed cattle in selection at the Okpara breeding farm (Benin). Inter-State School of Veterinary Sciences and Medicine - Cheikh Anta Diop University - Doctorate in veterinary medicine, 80p. www.memoireonline.com accessed on January 5, 2018 11:53 a.m.

Berrama et al., 2011; Berrama Z., Mefti H., Kaidi R., Souames S., 2011. Zootechnical characterization and genetic parameters of the growth performance of the Japanese quail Coturnix japonica raised in Algeria, Livestock Research for Rural Development, 23 (3). http://www.lrrd.org/lrrd23/1/berr23003.htm 9:08 am.

Darpoux R. and Roussel, M., 1972. "Market and agricultural prices" ed. JB, Ballière, Paris.

Deka E., 2018. 2nd international conference of the "agricultural and rural training" (FAR) network "Role of actors in the orientation and operation of rural training systems for development" TUNIS – May 19 to 23, 2008, 6p.

Djimènou D., Adoukonou-Sagbadja H., Chrysostome C., Koudandé O.D., 2018a Processing and marketing of pork in South Benin: characteristics and economic issues. 4th International Conference of the University of Parakou, from November 28 to 30, 2018. University of Parakou, Benin.

Djimènou D., Adoukonou-Sagbadja H., Chrysostome C., Koudande O.D., 2018b.

Phenotypic characterization of local pigs (Sus scrofa domesticus) in . J.Anim. Plant Sci., 37(1): 5956-5974.

Djimènou D., Adoukonou-Sagbadja H., Chrysostome C., Koudandé O.D., 2018c. Uses of pigs and derived products in human food and socio-culturally in South Benin, XVIIIth edition of the Lomé International Scientific Days (JSIL), from October 8 to 12, 2018, University of Lomé, Togo.

FAO, 2013. Phenotypic characterization of animal genetic resources. FAO Strategies on Animal Production and Health No. 11. Rome. Translation: Vanessa Board Technical revision of the text: Xavier Rognon. French edition, 151p.

Gizaw S., Getachew T., Edea Z., Mirkena T., Duguma G., Tibbo M., Rischkowsky B., Mwai O., Dessie T., Wurzinger M., Solkner J., Haile A., 2013. Characterization of indigenous breeding strategies of the sheep farming communities of Ethiopia: A basis for designing community based breeding programs. ICARDA working paper, Aleppo, Syria. 47pp

Houndonougbo M.F., Adjolohoun S., Aboh B.A., Singbo A., Chrysostome C.A.A.M. 2012. Characteristics of the pig farming system in South-East Benin. Bull. Rec. Agr. Benin (BRAB). Livestock & Wildlife special issue: 15-21.

Mopate L.Y., Kabore-Zoungrana C.Y., Facho B., 2011. Herd structure and performance of pig farms in the N'Djamena zone in Chad. Int. J. Biol. Chem. Sci., 5: 321-330

Mopate L.Y., 2018. Dynamics of pig farms and improvement of production in urban and peri-urban areas of N'Djamena (Chad). Unique Doctorate Thesis in Integrated Natural Resource Management (GIRN), option: Animal production, Polytechnic University of Bobo-Dioulasso (UPB), Burkina Faso, 245 p.

Mopaté L.Y., Koussou M.O., Kabore-Zoungrana C.Y., Gouro A., 2016a. Trade and consumption of pork in the N'Djamena area (Chad). Senegalese journal of agricultural and agri-food research, 1 (02), 39-48.

Mopaté Y.L., Koussou M.O., Kaboré-Zoungrana C.Y., 2016b. Pig farming in Chad: Assessment of the introduction, improvement and diffusion of exotic breeds, AGRI, 38: 87-98. Mukandama, op cit

Naves M., Alexandre G., Mahieu M., Gourdine J.L., Mandonnet N., 2011. Local animal breeds: bases for innovative and sustainable development of livestock breeding in the Antilles. Agronomic Innovations, 16: 193-205.

Nonfon W.R., Deka E., Adegbidji A., Codjo B., Chrysostome C., 2018. Improvement of local pork productivity in South Benin. Final technical report. Cotonou, Benin, National University of Benin/FSA. 174p.

Russo V., Fontanesi L., 2014. Coat color gene analysis breed traceability, Bruna, 3: 95 100.

Tibbo M., 2006. Productivity and Health of Indigenous Sheep Breeds and Crossbreds in the Central Ethiopian Highlands Doctoral thesis Swedish University of Agricultural Sciences Uppsala. ISSN 1652-6880, ISBN 91-576-7100-1. 76p.

Youssao A.K.I., Koutinhouin G.B., Kpodékon T.M., Yacoubou A., Bonou A.G., Adjapka A., Ahounou S., Taiwo R., 2019a. Genetic improvement of the zootechnical performance of local Benin pigs by crossing with Large-White. Int. J. Biol. Chem. Sci., 3: 653-662.

Youssao A.K.I., Koutinhouin G.B., Kpodekon T.M., Bonou A.G, Adjakpa A, Ahounou G.S., Mourot J., 2019b. Zootechnical performances and butchery abilities of local pigs in South Benin. Bull. Anim. Hlth. Prod. Afr., 57: 73-87.

Youssao A.K.I., Koutinhouin G.B., Kpodekon T.M., Bonou A.G., Adjakpa A., Dotcho C.D.G., Atodjinou F.T.R., 2018a. Pig production and local genetic resources in the peri-urban area of Cotonou and Abomey-Calavi in Benin. Animal Resources Breeding Review Med. vet. Country Too., 61(3-4): 235-243.

Youssao A.K.I., Kpodékon T.M., Koutinhouin G.B., Adjapka A., Yacoubou A., Ahounou S., 2018b. Influence of male castration on growth performance, carcass characteristics and meat qualities of local Benin pigs. Bulletin of Agronomic Research of Benin, 61: 1-24.

Youssao A.K.I., Mourot J., Edénakpo A., 2014a. Effect of farming method on the characteristics of the carcass and meat of local pork in Benin. 10th day of Muscle Sciences and Technology (JSMTV), 153-154p.

Youssao I.K.A., Mourot J., Gbangboche A.B., Adehan R., Akoutey A., Edenakpo A., 2014b. Influence of diet on growth performance and carcass characteristics of local breed pigs in Benin. RASPA, 2: 31-36.