



Sustainable Development of Livestock and Meat Production in Republic of Benin: Strategies and Perspectives

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Abstract | This paper aims to update information for a better understanding of the functioning of the sector of animal and meat production in Benin's socio-economic context. It highlights (i) structure of livestock population and production, (ii) competitiveness of meat sector, (iii) identifies constraints and possible prospective solution to increase meat production in Republic of Benin. The traditional animal production systems remain largely widespread. However, industrial and modern livestock farming systems for all species are developing. Cattle (57%), chicken (19%), small ruminants (13%) and pigs (7%) are the main meat producers in the country. Non-conventional species such as rabbit (3%) and grass cutters (1%) contribute also to the national meat production. Despite religious prohibitions, pork consumption increased during the last years notably in southern Benin. The households with a higher monthly income spend more money to purchase meat than poor households. Taste, texture, price, and juiciness are the main criteria of choice. Also, consumers prefer the meat of local breeds to that of exotic breeds. Thus local species and breeds have a great role in the development of this sector. Although policies have been implemented to boost the national meat production, the sector is still undeveloped. That is why, the implementation of new approaches and practices including improvement of animals' genetic resources, housing, health care, and feeding should be developed to intensify production.

Keywords | Benin, Livestock, Farming, Breeds, Meat

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INTRODUCTION

The Republic of Benin is a West African country, bordered by Togo to the west, Nigeria to the east, and Burkina Faso and Niger to the north. The territory of Benin covers an area of 114,763 square kilometres with estimated a population to be approximately 10.08 million in 2013 (NISEA, 2015). Land resources consists of forest (40%), agricultural land (31.3%: arable land 22.9%; permanent crops 3.5%; permanent pasture 4.9%) and other (8.7%) (CIA, 2017). With 32.7%, the agricultural sector is the main contributor to Benin's Gross Domestic Product (GDP) and employed 75% working population of the local population. The subsector of animal production represents nearly 13% of GDP (Sodjinou et al., 2007; MALF, 2013).

In the Republic of Benin, the main product from livestock production is meat. The livestock population comprises conventional species including poultry, pigs, small ruminants, and cattle which are the major source of protein for the local population. It also comprises non conventional species made of grass cutters (Cane rats), snails and rabbits. For most species, animals are reared in traditional production system. However, improved (semi-intensive and intensive) systems are being developed notably in avian sector. Meat production does not meet the expressed needs of consumers and leadsto an increasing meat importation every year (Youssao et al., 2008). According to the National Office for Livestock (NOL) (Direction de l'élevage in French) (2005), the demographic growth in the Republic of Benin leads to a steadily increase of demands in animal

proteins notably meat. The Food and Agriculture Organization (FAO) (2005) and NOL (2014) reported a level of meat consumption estimated at 12 kilograms per capita per year. This level is largely lower than that recommend by FAO (21 Kg/per capita/years). Furthermore, the increasing socio-economic conditions of the consumers in the developing countries can be accessed from changes in their consumption pattern. Therefore information about consumers' meat preference is crucial in developing and implementing appropriate livestock improvement strategies (Ogbeide, 2015). This paper highlights briefly the present situation of livestock and meat production in the Republic of Benin.

METHODOLOGY

We wrote this paper using desk research methodology to compile information from scientific papers various studies reports, strategy documents obtained from the Ministry of Agriculture, Livestock and Fishery of Republic of Benin or from the website of Food and Agriculture Organization of the United Nations (FAO) and statistical data. A total of eight articles searched online using the keywords including Benin, meat, animal, systems of production, and constraints were used when writing this paper. In addition, some website including: Food and Agriculture Organization of the United Nations-Division of Statistics (FAOSTAT), memoire online, FAOSTAT when collecting information and data. We used statistical data related to cattle, small ruminants, pigs and poultry (Chickens broilers and layers) population and meat production from the annual report and statistics of National Office for Livestock (NOL) and Ministry of Agriculture, Livestock and Fishery of Republic of Benin (MALF) (2007-2013) and the FAOSTAT (1990-2006 and 2014). Using these collected data, we performed descriptive statistical (annual growth average (AAGR), Livestock Unit (LU), charts, and percentage) analysis using Microsoft Excel 2007. We calculated AAGR using geometric formula (FAO, 2011) and LU as described by FAO (FAO, 2005).

$$AAGR = 100 \times \left[\left(\frac{X_t}{X_0} \right)^{\frac{1}{t-0}} \right] - 1$$

Where:

X_t is the final value of population; X_0 is the starting value of population; (t-0) is the number of years.

$$\text{Livestock Unit (LU)} = AN \times CF$$

Where:

AN is the number of animals; CF is the conversion factors: Cattle (0.50); small ruminants (0.10), Pigs (0.20) and poultry (0.01).

LIVESTOCK POPULATION

The animals' population trends from 1990 to 2014 are given in the Table 1. The population of cattle estimated at over 2.2 million heads in 2014 is made of 31% trypanotolerant cattle (Borgou, Somba and Lagunaire), 7.7% zebu (M'bororo, Goudali and White Fulani) and 61.3% crossed breeds (Alkoiret, 2011; Hervé, 2017). These local breeds are very well adapted to adverse climate and breeding conditions. They have the ability to walk long distances in search of feed and high resistance to diseases and parasites. However, studies showed that the low genetic potential, resulting in low milk and meat production, required the implementation of appropriate breeding programs (Dehoux and Hounsou-Ve, 1993; Adjou Moumouni, 2006; Alkoiret et al., 2011). Thus, in order to increase national milk production and to meet increasing milk needs of the population, Brazilian Girolando cattle have introduced in November 2004. This exotic breed producing 7.22 ± 0.15 Kg milk per day is kept in some state and private farms (Doko et al., 2012).

Table 1: Trends in animals' population

Species (1000 heads)	Years				Average Annual Growth rate (%)	
	1990	2000	2010	2014	1990-2000	2000-2010
Cattle	1,080	1,541	2,005	2,222	3.62	2.67
Chicken	9,579	11,758	16,550	18,764	2.07	3.48
Pigs	462	255	368	431	-5.76	3.73
Small Ruminants	1,580	1,908	2,413	2,633	1.90	2.38
Livestock Unit	886	1,130	1,483	1,648	2.46	2.76

Source: FAOSTAT (2017a).

The number of small ruminants also increased from 1.58 million heads in 1990 to 2.63 million heads by 2014 with an annual growth rate of 2.16% in 2014. The population of both of two species (goats and sheep) is largely constituted by the West African Dwarf goat and sheep breed (Also known as the Guinean or Djallonké breed) (Aregheore, 2009; Adote et al., 2011; Monkotan, 2011). West African dwarf goat and sheep are kept essentially for meat production. They are well adapted to conditions in humid and sub-humid zones characterized by strong presence of tsetse flies. They are small size animals with a low meat yield and very low lactogenic productive potential (Gbangboché et al., 2002; Monkotan, 2011). Guinean sheep live weight is rarely more than 30 kg with a yield of about 48% but has a high quality of meat (Aregheore, 2009). The second breed raised in the Republic of Benin is Sahelian breed. It is mostly found in the extreme north of Benin. The Sahe-

lian sheep are large and heavy (80 kg) animals. They are meat-purpose animals (40 to 50% of yield) (Aregheore, 2009). Additionally, Alpine goat breeds have been imported in order to diversify milk production, which still comes from cows only. They are currently being kept under an acclimatization research program in some private farm (Monkotan, 2011; Vissoh et al., 2015).

Pig population which was 462 thousand heads in 1993 drastically decreased nearly 255 thousand heads in 2000, and increased more than 431 thousand animals. This decline was due to African swine fever outbreak in 1997. This epizootic decimated more than 70% of national pigs' population causing huge economic losses (Ayssiwede, 2004). Most of the pigs are predominantly local breeds. Despite their low growth and small size, local pigs have a greater ability to withstand disease, hard local breeding, and environmental conditions. Apart from these native breeds, exotic pigs (including Large White, the Landrace and their crossbreeds) are also found. They are large size animals raised in semi-modern or modern systems (Youssao et al., 2008).

Poultry farming is a widespread production activity throughout Benin. It is subdivided into two types: traditional farming in which local breed commonly known as poulet bicyclette (Sahouè, Fulani, Koungbo, etc) are reared. This system largely preponderant aims self-consumption of families and marketing. It is characterized by the use of low inputs. There is also modern poultry farming which exploits improved or imported poultry breeds such as ISA Brown, Warren, Hyline, Lohman, Rhode Island Red and Plymouth Rock (Sodjinou, 2009; FAO, 2015). In 2013 of the estimated 18.2 million heads, only 1.2 million heads are improved or exotic breeds (NOL, 2014).

Most small and large-scale commercial farms are located in southern Benin. As we move northward, poultry farms become scarcer, with priority given to local poultry and to cattle and goat farming (Ogbeide, 2011). The grasslands of the northern Benin are the main hub of ruminants' production in Benin. Indeed, the large population of cattle and small ruminants is kept in Borgou-Alibori with nearly 63% and 29 % of the population respectively. As for chicken and pig, they are mostly found in Zou-Colline and Ouémé-Plateau with 46% and 27% respectively.

This geographical distribution of population may be explained by the variation of climatic factors from one region to another. These climatic conditions influence the availability of food resources and the pressures of tsetse flies vectors of trypanosomiasis (Alkoiret et al., 2011). It can also be due to dietary behaviours of consumers, targeted markets, social and religious factors (Islam) (Ayssiwede, 2004).

ANIMAL PRODUCTION SYSTEMS

Generally, animal production systems are numerous but the main production systems are traditional. This diversity is mainly due to range of agro-ecological zones in Benin, social and ethnic groups and the technical level of keeping. Animals are mostly kept under traditional production system. These systems include transhumant-pastoral, sedentary (free roaming), urban and peri-urban and sometime semi-extensive breeding system.

TRANSHUMANT-PASTORAL SYSTEM

It is the most common system of production in northern and central-northern of Benin where cattle are the main species of breeding. Small ruminant flocks are secondarily annexed to that of cattle. This system is mostly practiced by the Fulani and Gando pastoralists whose livestock keeping is the principal source of income (NOL, 2005). This system is a seasonal and cyclical movement (sometimes cross-border) of keepers and herds according to the rainfall regime (Adjou Moumouni, 2006). It is characterized by the absence of production target, limited food resource, low productivity and high losses due to accidents, diseases, and theft. This system is actually being turned into a mixed farming system in which producers combine animal production with agriculture notably cultivation of cotton and some food crops (NOL, 2005; Ajala et al., 2008; Alkoiret et al., 2011). It generates conflicts between crop farmers and breeders due to non-respect of transhumance corridors causing crop damage.

SEDENTARY SYSTEM

This system is a form of natural pasture, browse, crop residues, and kitchen wastes exploitation. In this system, animals are kept all year round on a fixed area (village) where livestock and crop production are mixed (Adjou Moumouni, 2006). They freely graze on the common village pasture and roam (free roaming) about scavenging for food over the day. At night, they return to their sheds. This system includes crops farmers and non-rural people who entrust their animals to sedentary keepers who and share the offspring. It is the predominant system in central, southern regions and West-Atacora (NOL, 2005). Additionally, family labours play actively an important role in livestock management and animals may not be offered sufficient feed, clean water, and healthcare.

URBAN AND PERI-URBAN SYSTEM

This system is more found in the urban peri-urban areas, where animals are confined in a yard or barn for fattening. The main sources of feed for animals are agro-industrial by-products, kitchen wastes from household food preparation and forages along roadsides and undeveloped plots in the cities (Baah et al., 2012).

NATIONAL MEAT PRODUCTION

Although the increase of animals numbers, research and strategic policy efforts of the government to improve national production, meat production notably remains underdeveloped. Meat is mostly produced from conventional species including bovine, small ruminants, pigs, and poultry. However, the rearing of non-conventional species (snails, grass cutters, and rabbits) contributes also to national meat production. As shown in Figure 1, the indigenous meat production increased from 36,290 tonnes in 1993 to 64,968 tonnes in 2013 with a yearly average of 46,706 tonnes. Cattle are the main contributors to national meat production with 57%. It is followed by chicken (19%), small ruminants (13%) and pigs (7%). As for non-conventional species, rabbit and grass cutters meat represented less than 3% and 1% respectively of total production. In 2013, this production represented 2.25% of West African's indigenous meat production that was over 2.78 million tonnes. Among West African countries, the largest amount of indigenous meat is produced in Nigeria (1.22 million tonnes), Mali (356 thousand tonnes) and Niger (252 thousand tonnes) accounting for 44.11%, 12.83% and 9.06% respectively (FAOSTAT, 2017b).

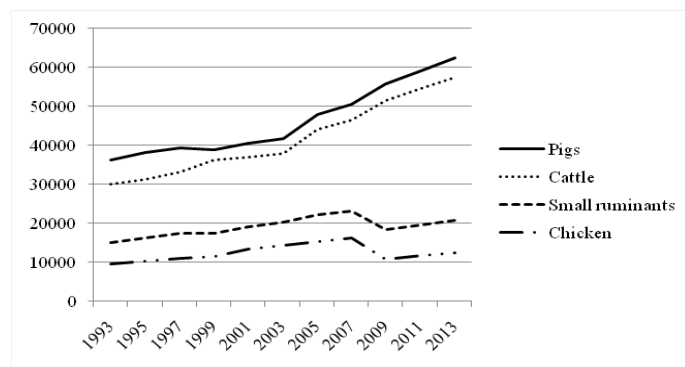


Figure 1: Indigenous meat production (tonnes) (FAOSTAT 2017b)

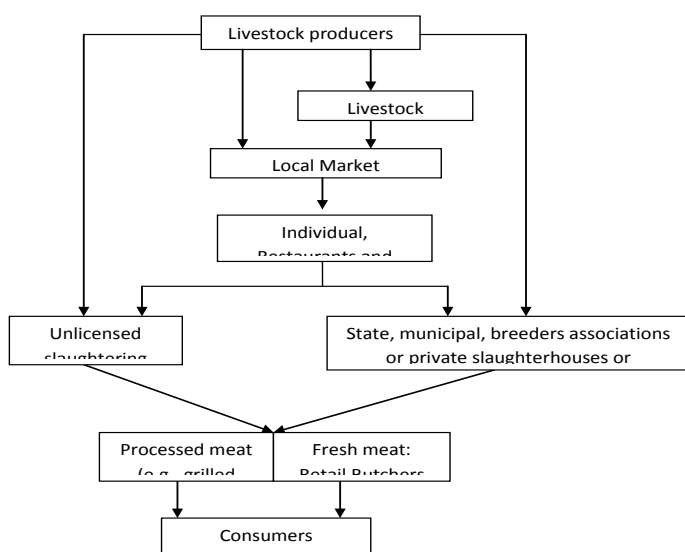


Figure 2: Livestock and meat marketing channels

MEAT IMPORTATION AND EXPORTATION

Republic of Benin has considerable difficulties meeting the needs of its populations in animal protein, especially meat. Thus, to meet this deficit the country imports from neighbouring or European countries animals and frozen meat. Conforming to the statistic of the National Office for Livestock in 2013, more than 177 thousand tonnes of frozen meat has been imported. However, only about 10% of imported frozen meat is consumed by the local population (NOL, 2014). The most important shares are exported neighbouring countries notably Nigeria where high demand is noticed. This may be justified by the local consumers' preferences toward the meat locally produced. Small ruminants are mainly imported from Nigeria and Niger, while Niger and Burkina Faso provide essentially cattle. As for frozen meat imported, it mostly concerns poultry meat and poultry offal. Among countries exporting poultry meat and poultry offal to Republic of Benin, Brazil (15.21%), Spain (13.34%), Poland (12.98%), France (11.78%), and UK (10.31%) are the most important. In 2013, of the total imported over 38.23 thousand tonnes (including meat from imported animals and frozen meat) have locally been consumed. Cattle, small ruminants, pigs with over 17.54, 2.22 and 0.17 thousand tonnes respectively were most important meat from imported animals. While frozen poultry meat represents the most shares of frozen imported meat with nearly 17.65 thousand tonnes accounting for 96.39 % of total frozen meat. The frozen meat of small ruminants was estimated at 0.46 tonne and accounted for a negligible share 0.003 %. Cattle, pigs, and rabbit represent 2.93%, 0.32%, 0.34% respectively of total frozen imported meat (NOL, 2014).

ANIMALS MARKETING, MEAT PROCESSING AND CONSUMPTION

As shown in Figure 2, live animals are marketed on the local market directly by owners or their family members or indirectly by retailers. Studies showed that the main criteria that determine animal prices in these traditional markets are breed, the time of the year, the region, weight, sex, and age (Sodjinou et al., 2007). Indeed, as one draws closer to urban areas, animals' prices rise. Additionally, low prices are mainly observed at the beginning the school year, where the keepers need cash to pay tuition fees of their children and to start crops production activities (Sodjinou et al., 2007). Also, an increase of sheep price is observed during celebrations period such as the Muslim feast also known as Eid-el-Kabir during which, a high demand is noticed. Animals sold are transported and slaughtered by an individual (unlicensed slaughtering) or in the state, municipal, breeder association or private slaughterhouses or slaughtering floors. Then, the cuts of fresh meat are collected and sold by retailer butchers to consumers on the local markets. On another hand, the fresh meat is processed and

Table 2: Major Constraints of Livestock Production and Approaches of Solution

Constraints of Livestock Production	Approaches of Solution
<ul style="list-style-type: none"> • Low productivity of local breeds that constitute the large part of the animal population: although local breeds are very well adapted to environmental and breeding conditions, they have the low genetic potentials and productivity. 	<ul style="list-style-type: none"> • More research should be done to promote the implementation of an effective breeding and genetic improvement program of indigenous breeds through the application of assisted reproductive technologies such as artificial insemination, semen cryopreservation etc.
<ul style="list-style-type: none"> • The lack of fund for research in livestock production and development, and support the cooperation between research institutions (University, research centres etc) and farmers association to promote a great genetic evolution of the herds and animal development. 	<ul style="list-style-type: none"> • The government should provide more funds to support local farmers, researchers and genetic improvement centres which should provide high genetic value reproducer animals to breeders in order to improve the animal productivity in real farm area and ensure a better monitoring of genetic progression.
<ul style="list-style-type: none"> • The inadequacies of animal identification, the system for collecting statistical data and lack of updated official data on livestock population across the country. 	<ul style="list-style-type: none"> • An effective animals' identification system using ear-tags and registration (computer or internet based systems in regional livestock directorate) should be set up to ensure an easier management and availability of updated statistical data.
<ul style="list-style-type: none"> • Poor animal health monitoring due to the insufficient of veterinary services. This is expressed through a high incidence of infectious, parasitic and viral diseases in all species with enormous financial losses for keepers notably in traditional systems. . 	<ul style="list-style-type: none"> • The government should implement an appropriate animal health monitoring (animal health inspection service) with a view to strengthening diseases and epizootics eradication measures.
<ul style="list-style-type: none"> • The absence of long-term development policies and strategies of livestock sector due to lack of governmental funds and awareness for sustainable development of animals farming activities. Difficulty of famers to access banking loans which are at high interest rate. 	<ul style="list-style-type: none"> • The government should implement better animal development assistance policies by providing technical and financial assistance to farmers to improve the production systems. It should reduce the meat importation by increasing the custom taxes and easing the access of farmers to the banking loans at low and effective interest rate.
<ul style="list-style-type: none"> • The lack of training for animal breeders in term of modern technologies of animal reproduction and farm management. 	<ul style="list-style-type: none"> • The regional livestock directorates should regularly set up different training session in order to educate and update the knowledge of breeders about improved techniques of animal production systems and flock management strategies.

sold by restaurants or some individuals as grilled meat directly consumed.

The households with a high monthly income spend more money than poor households to purchase of local chicken (or meat). Taste, texture, price, and juiciness are the main criteria of choice (Sodjinou et al., 2007). Governmental authorities through Ministry of Agriculture, Livestock and Fisheries and the Ministry of Trade and local municipal administrations regulated and controlled the livestock and meat price on the markets. Also, The Ministry of Agriculture, Livestock, and Fishery in collaboration with Ministry Public Health ensure hygienic quality control of meat and population health.

CONSTRAINTS OF LIVESTOCK PRODUCTION AND APPROACH OF SOLUTION TO BOOST THE ANIMAL PRODUCTION AND MEAT SECTOR

Although meat sector is the most exploited way of livestock resource, meat production, and marketing showed some difficulties due to livestock management, lack of structural and institutional organization of the subsector. The major problems associated with livestock production

and some possible solutions to increase the meat production are presented in the Table 2.

CONCLUSION

Livestock production plays an important economic and social role. In Republic of Benin, livestock population and meat production increased over last decades. However, the national needs in meat products did not meet due to many limiting factors including the low genetic value of animals, production systems and lack of governmental policies. This leads to an importation of animals and animal products (cuts of meat, poultry offal) from others countries. Given that the human population and the needs in animal protein are increasing, efforts should be made to improve livestock genetic improvement, production systems in order to significantly increase national production. Also, the quality of meat consumed has to be more controlled to protect consumers against health problems.

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CONFLICT OF INTEREST

The authors declare that they have no conflict of interests.

AUTHORS CONTRIBUTION

Dehouegnon Jerry Agossou: Data acquisition, analysis and interpretation of data. Also the drafting of manuscript.
Youssouf Toukourou and Nazan Koluman: Writing assistance, critical revision and approval of last version of the manuscript.

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