



Innovation Opportunities in the Small Ruminants livestock sector in Benin

GUIDE
BOOK

Serge E. P. Mensah
Patrice Y. Adégbola
Aimé K. Edénakpo
Nestor Adjovi Ahoyo
Isidore Gbégo Tossa
Fatunbi A. Oluwole
2017



Innovation Opportunities in the **Small Ruminants** livestock sector in Benin



**GUIDE
BOOK**

Serge E. P. Mensah
Patrice Y. Adégbola
Aimé K. Edénakpo
Nestor Adjovi Ahoyo
Isidore Gbégo Tossa
Fatunbi A. Oluwole

2017



Citation:

Serge E. P. Mensah, Patrice Y. Adégbola, Aimé K. Edénakpo, Nestor Adjovi Ahoyo, Isidore Gbégo Tossa and Fatunbi AO (2017). Innovation Opportunities in Small Ruminants Livestock Sector in Benin. Guide book 2, Forum for Agricultural research in Africa.

FARA encourages fair use of this material. Proper citation is requested.

Forum for Agricultural Research in Africa

12 Anmeda Street, Roman Ridge
PMB CT 173, Accra, Ghana
Tel: +233 302 772823 / 302 779421
Fax: +233 302 773676
Email: info@faraafrica.org
Website: www.faraafrica.org

ISBN: 978-9988-8776-0-6

Contents

PAGE

Foreword	4
Acknowledgements	5
<hr/>	
Introduction	6
Livestock production and small ruminants breeding in West Africa	6
Some characteristics of small ruminants in West Africa	8
Situation of sheep and goat production in Benin	11
Area of ruminant production in Benin	11
Small ruminant production systems in Benin	12
Role of small livestock among rural household in Benin	13
Contribution of small ruminant to food and nutrition in Benin	14
<hr/>	
Production Constraints	15
Health constraints	16
Nutrition	18
Management	19
Research constraints	19
Marketing of small ruminants in Benin	19
<hr/>	
Innovations Opportunities	20
Introduction	20
Policy Innovation	20
Production Innovation	21
Marketing Innovation	23
Financing Innovation	24
Endogenous innovation	25
Technological innovation	26
<hr/>	
Value Chain Analysis	27
Introduction	27
Actors in the sector and transactions between them	28
Sheep/goat meat value chain	30
Product Flow	30
Analysis of governance in Value Chain	33
Constraints and opportunities in Value Chain	33
Strategies for the development of different value chains	34
Solutions sought and suggestions made by the actors	34
Cost analysis and cost structure analysis in the value chain	37
Performance financial indicators of Value Chain	39
Conclusion	40
<hr/>	
References	41

FOREWORD

Livestock plays a key role in the different facet of societal life in Africa. It principally serves as source of animal protein in the diet of the populace as well as source of materials for body wears such as waist belt, shoes, blanket etc. Livestock also plays a key role in the religious life of certain sects as object for sacrifice and worship. The small ruminant constitutes a major category of the livestock that are kept by many household and it serves as source of income for the household as well as occasional source of food. In West Africa, many households takes the husbandry of small ruminant as source of livelihood, in some instances this could be the main commodity of the business and in other cases it co-exists with cropping to form a farming livelihood.

Research efforts to improve the productivity of the small ruminant has attracted some attention in recent past with active contributions from specialized livestock research institute in Africa. The adoption, and use of the ensuing technologies is not widespread for issues of technology transfer, appropriateness of the technologies for the smallholders, the cost and other soft issues around access, communications etc. Thus, deriving the desired economic benefits from the sector is limited and its broad potentials to generate jobs for the youth, raw materials for the industry and contribution to nation economy is widely affected.

This book attempt to analyses the small ruminant livestock production and marketing systems in Benin Republic, to identify the constraints, source solutions and explicate the innovation opportunities within the industry. The book explicated both the technological, institutional or infrastructural modification including market, policies, social interactions that could be manipulated to yield improved productivity and profitability. It further explored both qualitative and quantitative value chain analysis of gains from the adjustments of the interventions of different actors. This is expected to provide the needed knowledge material that could be used by the different actors around the small ruminant's value chain actors to foster productivity and profitability.

ACKNOWLEDGEMENTS

This work was carried out within the Program of Accompanying Research for Agricultural Innovation (PARI). The PARI project is coordinated at the global level by the Center for Development Studies (ZEF), University of Bonn in Germany and the Forum for Agricultural Research in Africa (FARA) is coordinating the action in 12 Africa countries. The funding for this work was provided by the German Federal Ministry of Economic Cooperation and Development (BMZ).

The authors wish to acknowledge the contributions of the different individuals in ZEF and FARA to the reviews of the proposals and the final outputs of the research endeavor's. The contributions of the FARA team, as well as Dr. Heike Baumüller and her team at ZEF are well acknowledged.

We would also like to express our gratitude to the management of the National Institute of Agricultural Research of Benin (INRAB) for their scientific and administrative supports. We also appreciate the efforts of the enumerators who contributed to this study.

Introduction

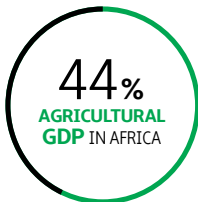


LIVESTOCK IN SUB-SAHARA

MORE
THAN **250%**

ANTICIPATED
GROWTH BY 2020

(Club du Sahel/OECD, 1998; Delgado et al., 2001)



60 million
HEAD OF CATTLE



160 million
SMALL RUMINANTS



400 million
POULTRY

Livestock production and small ruminants breeding in West Africa

With an estimated annual growth of 4 percent, the demand for animal products is expected to increase in sub-Saharan Africa, especially in West Africa, by more than 250 percent by 2020 (Club du Sahel/OECD, 1998; Delgado et al., 2001). This increased demand will result from population growth, accelerated urbanisation, growing incomes and consequently increased purchasing power of the populations. There was a temporary decrease in meat imports from outside Africa as a result of changes in trade policies over the past 10 years at the international, regional, and national levels. This temporary situation created real opportunities to satisfy the region's demand with local animal products at favourable prices. Livestock rearing plays a major role in household incomes and a key role in the

economies of West African countries, providing up to 44 percent of agricultural GDP. With 60 million head of cattle, 160 million of small ruminants, and 400 million of poultry, the Sahel and West Africa is an exceptional region for livestock rearing. These figures represent respectively 25 percent of the total African cattle populations, 33 percent of that of sheep, and 40 percent of that of goats (Swac-Oecd/Ecowas, 2008).



INCREASE IN

**IMPORTS FROM
OUTSIDE AFRICA**



**UEMOA
IMPORTED**
IN 2002

24000



**TONS OF
POULTRY**

@ US\$ **58.8 million**

With regard to poverty reduction, statistics (FAO, 2006) indicate that about 675 million of the world's rural poor, including nearly 170 million in sub-Saharan Africa, are entirely or partially dependent on livestock production to feed themselves and generate income. Although there are opportunities for the development of regional trade in meat, there is still the paradox of the ever-increasing imports of animal products from outside Africa, even if imports of meat from the European Union tend to decline. For example, the proportion of imports of meat from outside Africa rose from 3 to 19 percent in Côte d'Ivoire between 1970 and 1999 and from 4 to 17 percent in Togo (Balami, 2003). In 2002, the Member States of the West African Economic and Monetary Union (UEMOA) imported 24000 tons of poultry meat at a cost of USD 58.8 million (Faire Dupaigre et al., 2006).

Besides improving productivity, livestock rearing in West Africa shall increasingly face policy and technical challenges. It is therefore essential to support national and regional trade and agricultural policies that encourage the production and promotion of animal products.

Some characteristics of small ruminants in West Africa

Small ruminants are composed of two species: sheep and goats, divided into two main types/breeds each and several varieties. Table 1 shows the sheep and goat breeds and their weight.

Table 1: Average weight of adult small ruminant (kg)

Species	type/ breed	Varieties	Adult weight (kg)	
			Male	Female
Sheep	Djallonke:	Mossi, West African dwarf, Guinean dwarf, Cameroonian dwarf, Blackbelly, Kirdi, Kirdimi, Massa, Poulfouli, Mayo-Kebbi	25	18
	Sahelian	Touareg, Grand targui, Small targui, Ara-Ara, Argooradji, Foulbé, Waila, Futake, Banamba, Fulani, Oudah bicolore, Bouli, Bali-Bali, Balami, Yankasa, Landoum, White Maure, White Arabe, Koundoum, Goundou, Oudah, Touabire, Macina, Sahel, Toronké	40	30
Goats	Djallonke	Goat of Fouta Djallon, Guinean dwarf, Guinean dwarf, West African dwarf, African pygmy, African dwarf, Cameroonian dwarf, Nigerian dwarf, Ghanaian dwarf, Hausa, Hausa, Kosi, Mossi, Kirdi, Kirdimi	17	21
	Sahelian	Goat of the Sahel, long legs West African, Desert, Sudan, Fulani Peul, Peulh, Voltaic, Goran, Moor, Touareg, Niorp, Niafounke	32	25

Source: FAO, 2012

The Sahelian type

the sheep and goats of this type have long legs (70 to 90 cm), with a Roman nose and long floppy ears.



Sheep

The male has horizontally large spiral horns; adults can reach 45 kg live weight. In females, the horns are rudimentary or reduced to stumps. The ears are almost always drooping.



Figure 1 Sahelian sheep



Goats

The Sahel goats are found north of the 11th parallel and are generally recognised by their tall and slender look. However, it is noted that some variation in size in relation to the environment and the degree of mixing exists.



Figure 2 Sahelian goat

Source: Photo Investigation INRAB / FARA 2017

The dwarf or Djallonke type

The sheep and goats of this type are found in the Guinean zone. Both are small (50 to 65 cm) with several varieties of coat colours. The Guinean sheep, Black-belly variety, is distinguished by the black belly. It is a great meat producer, and a very prolific animal. Yields are high among goats and sheep in the south, lower in sheep and goats in the north.



Figure 3 Djallonke Sheeps

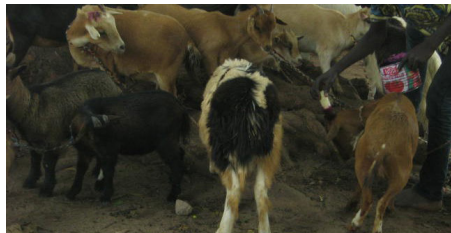
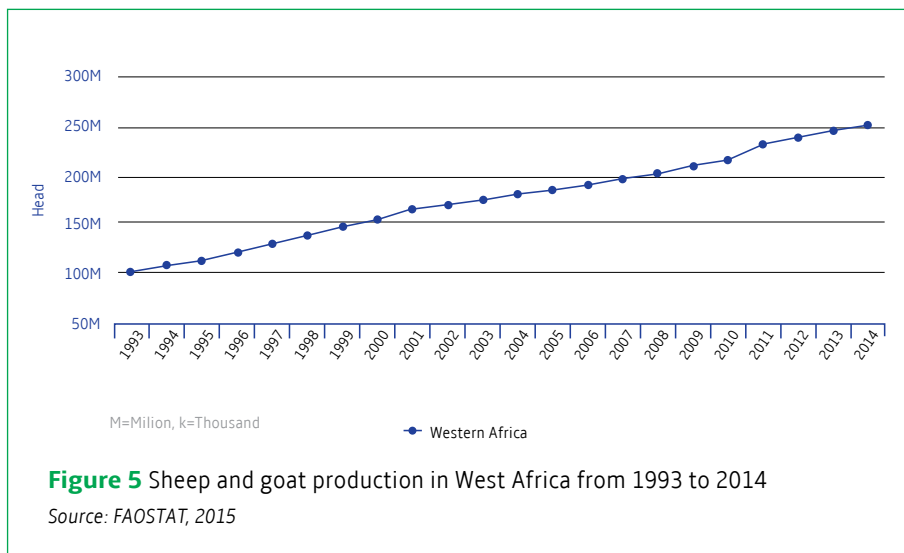
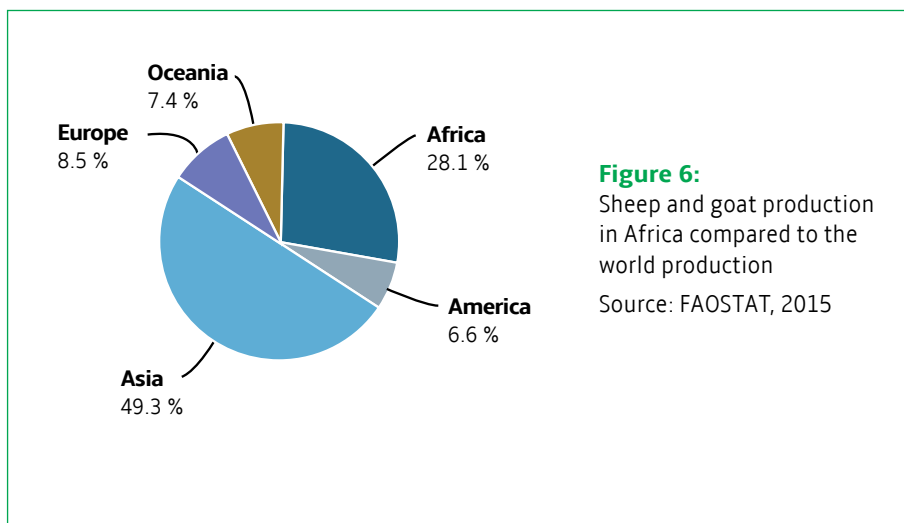


Figure 4 Djallonke Goats

Source: Photo Investigation INRAB / FARA 2017



According to statistics from the Food and Agriculture organisation (FAOSTAT, 2015), the number of sheep and goats in West Africa is considerably higher than that of cattle. It rose from 100 million head in 1993 to 250 million in 2013 (Figure 5).



Situation of sheep and goat production in Benin

13%

CONTRIBUTION TO MEAT PRODUCTION IN 2013

about **2,576,000** HERD OF **GOATS & SHEEP**



In Benin, small ruminants are kept by the vast majority of the population. Apart from the prestige and saving functions, they contribute to farmers' income through the sale of animals and their by-products (skin, milk); they also provide manure for use as organic fertiliser (Savi et al., 2004). The national herd of goats and sheep was estimated in 2013 to be about 2 576 000 head and contributed to approximately 13 percent (8 243,10 tons) of the total meat production (64 968,55 tons). Two main breeds are found: the Djallonke and Sahelian. There is a predominance of goats in the southern area whereas sheep predominate in the north.. The small ruminants are kept in rural, peri-urban and urban areas where they form part of family breeding enterprise. The annual average weighted productivity is 3.2 kg. The types of farming vary according to agro-ecological zone, ethnic and social behaviour as well as the technical level of farmers.

Area of ruminant production in Benin

Generally, ruminant livestock farming is practised throughout the country. But three main production zones are defined as shown in Figure 7.

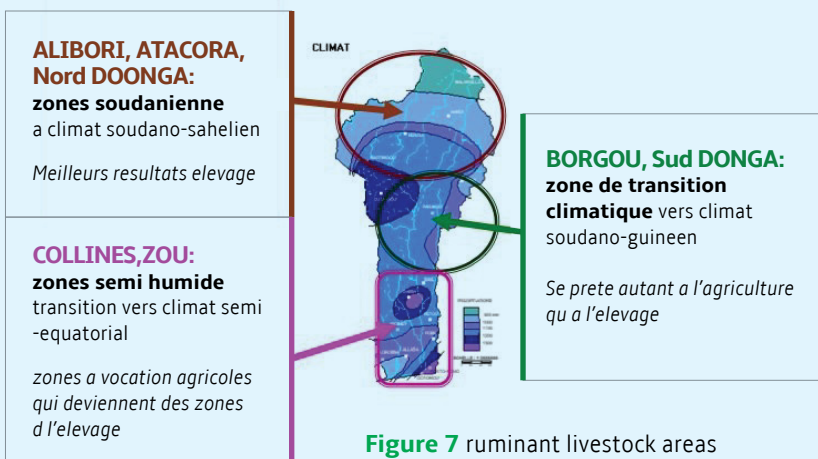


Figure 7 ruminant livestock areas

Source: ANOPER, 2014

In the north, *Alibori*, *Atacora*, *North Borgou* and *Donga* are Sudanese areas very favourable for breeding.

More to the *south*, *central*, and *South Borgou Donga*, the Northern Hills is a climatic transition zone that is suitable for crop as well as livestock farming.

At the centre of Benin, *Collines* and *Zou* are agricultural zones that have become breeding areas. They are unfavourable for ruminant livestock production.

Small ruminant production systems in Benin

Apart from some state-owned farms, where sheep is kept in a relative semi-intensive system, most of the small ruminants are kept by smallholders under the traditional extensive production systems, which include;

- Urban and peri-urban systems
- Agro-pastoral farming
- Pastoral farming; this mode of farming is practised mainly among the Fulani, who move cattle together with small ruminants.

Small ruminants livestock systems in Benin



Figure 8 Sheep at Bétécoucou state-owned farm



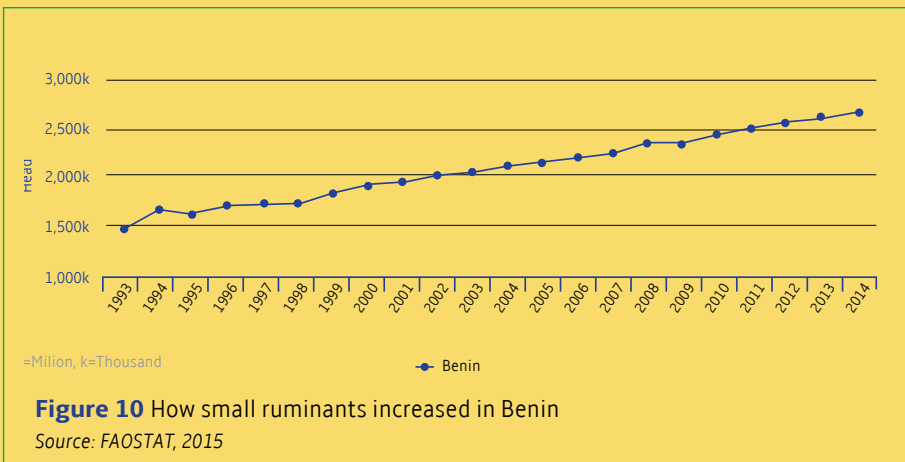
Figure 9 Sheep in urban breeding (Benin)

Source: Investigation INRAB / FARA 2017

Role of small livestock among rural household in Benin

) Dossa,(2007) reported income as the principal reason why the rural household in Southern Benin keeps small ruminants. Goats are sold mainly when money is needed, for instance when there is an emergency (insurance function) or to cover expected expenses (buffering function). Household meat consumption was ranked lowest as a reason for keeping goat.

At the same times, Sanon, (2003) stated that when a family member was sick, a sheep or goat was sold to cater for hospital and related expenses. School-related expenses too were met through sale of a goat or sheep. Thus, livestock rearing, especially that of the barnyard type, which has not been researched much, plays a major role in bringing people out of poverty.






67%
INCREASE IN
PRODUCTION
IN 20 YEARS

From 1993 to 2014, the number of small ruminants in Benin increased considerably. In 1993, 1.5 million head of small ruminants were produced. 20 years later, this number exceeded 2.5 million head of sheep and goats.

Contribution of small ruminant to food and nutrition in Benin




Animal products play a direct and indirect role in reducing food insecurity. According to FAO standards, minimum meat requirement is 21 kg/inhabitant/year while minimum egg requirements are 1 kg/inhabitant/year. In 2012 meat production levels averaged only 6.80 kg/inhabitant/year. Cattle accounted for 56.7 percent while sheep/goats and pigs accounted for 12.75 and 7.55 percent respectively. This level of meat production matches that of countries south of the Sahara, which produce 12.5 kg/inhabitant/year. Thus, Benin produces only 45.75 percent of beef and veal, 56.65 percent of sheep, and 87.2 percent of goat meat relative to meat production in countries south of the Sahara.

According to DE (2012) statistics, the importance of the production of ruminants in general and small ruminants in particular by department is as follows:

Cattle 	Sheep 	Goat 
Alibori 33.50 %	Alibori 45.81%	Alibori 21.12 %
Borgou 29.86 %	Borgou 21.27%	Atacora 13.25%
Atacora 17.4 %	Atacora 17.27%	Atlantic 10.50 %
Hills 6.11 %	Atlantic 7.70%	Borgou 9.20 %.

Alibori is therefore the leading producer of cattle, sheep and goats.

The Department of the Atlantic is also a major producer of small ruminants. In terms of meat production, the patterns are different and are as follows:

Cattle 	Sheep 	Goat 
Borgou 29.3%	Borgou 18.6%	Littoral 49.6 %
Littoral 19.7%	Atacora 7.3%	Borgou 16.7 %
Atacora 9.7%	Ouémé 5.9%	Ouémé 8.8 %
Alibori 9.3%	Alibori 5.7	Alibori 5.3 %
Zou 9.3%		

This means that meat production is higher in large agglomerations.

Production Constraints

Small ruminant farmers in Benin share the same constraints with their south African counterparts. In Benin, the main constraints faced by breeders are: rudimentary and archaic materials and infrastructure for breeding--breeders breeding by intermediaries, poor quality of broodstock used, and poor quality of food. Table 2 summarises the production constraints.



Table 2 Ranking of Small ruminant production constraints in Benin.

Constraints	Average Rank	Rank
Rudimentary and archaic breeding materials and infrastructure	3.71	1
Grass-raising of breeders through intermediaries	3,51	2
Poor quality of brood stock used	3,07	3
Professional organisation of butchers not sufficiently active	2.55	4
Low sale price	2.36	5
Reduction of pasture especially during the dry season	2.27	6
Low availability and high cost of livestock inputs	2.1	7
Qualitative and quantitative insufficiency of management staff	2.01	8
Insecurity of land	2.01	7
Existence of livestock diseases	2.001	8
Inexistence of MFIs	1.89	9
Low Investment Capacity	1.80	10

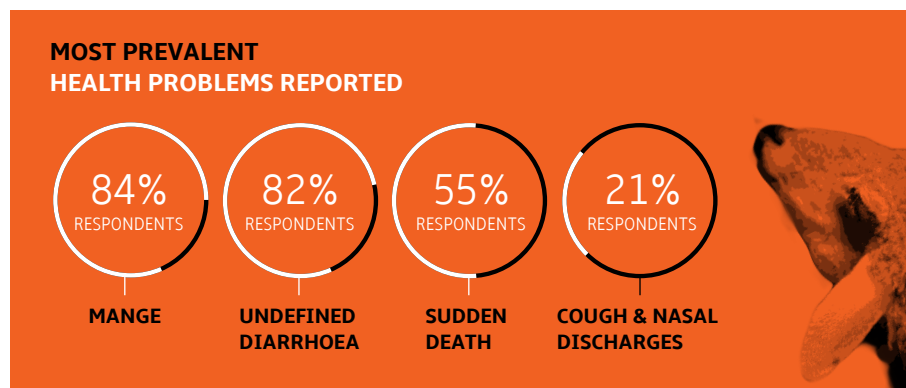
Source: Investigation INRAB / FARA 2017

Health constraints

A serious constraint in small ruminant production in Africa has been the high prevalence of diseases and parasites, particularly in the more humid areas. This causes high mortality amongst kids and lambs, diminishing the benefits of their high reproductive performance.



One of the most important diseases is the plague of small ruminants, which was first recognised as a contagious **“rinderpest-like”** condition in goats in Nigeria in 1930. It was first described in Côte d’Ivoire in 1942 and later in the Benin Republic in 1944. To date it remains the most destructive viral disease in small ruminants. Goats are more susceptible to plague of small ruminants than sheep; young animals are more susceptible than adult ones. The use of tissue-culture rinderpest vaccine (TCRV) is effective in the control of plague of small ruminants.



Dossa et al. (2007) reported in his study in Southern Benin that the average pre-weaning mortality was estimated by respondents to be about 20 percent in Toffo and 25 percent in Ouedeme-Pedah. The most prevalent health problems reported were mange (84 percent of respondents), ‘undefined diarrhoea’ (82 percent of respondents), ‘sudden death’ (55 percent of respondents) and ‘cough and nasal discharges’ (21 percent of respondents). Only 8 percent mentioned plague of small ruminants directly. On the other hand, in Mono, Koudande (1991) reported that the complex diarrhoea-stomatitis-mortality (related to plague of small ruminants) was reported simultaneously in the sites surveyed. It



constitutes the main concern of the breeders (75 to 80 percent) and occupies the first place in the pathologies quoted. Scabies come in second, followed by tetanic seizures and food poisoning. In 1993, a serological and parasitological investigation conducted by the same author revealed that plague of small ruminants, bluetongue sheep and pasteurellosis are the most prevalent diseases in the southern zone of Benin.

Ademosun et al. (1985) reported that the pre-weaning mortality of up to 40 percent has been recorded with kids and lambs in Nigeria.

Parasitism ranks high among the factors that limit the productivity of small ruminants although its effect is often underestimated.

Gbaguidi (1995), in a study conducted in the Atlantic, showed that helminth infection is more pronounced in goats than in sheep with the difference that sheep contain more cestodes than goats. Houssa (2001) found no significant difference between the overall rate of goat infestation and that of sheep in labour in the Ouémé-Plateau departments, but noted that the prevalence of the nematodes is higher than that generated by the cestodes.

External parasites cause extensive losses among small ruminants, especially in humid areas. The two most serious vectors are ticks and mites. The irritation and dermatitis that accompany mange infestation can reduce the value of the skins for sale to the leather industry and the meat with skin for consumption as food.

Pneumonia, coccidiosis, contagious caprine pleuropneumonia, ecthyma, caseous lymphadenitis and brucellosis are other diseases that have limited the productivity of small ruminants in tropical Africa. Individually, these diseases might not constitute serious problems, but their combinations or their occurrence under marginal conditions could result in serious losses.



increasing reduction of pasture space and the degradation of fodder resources through the disappearance of certain forage species from natural grazing a major problem

Nutrition

The major difficulties of the ruminant sector in general evoked by ANOPER relate to the increasing reduction of pasture space and the degradation of fodder resources through the disappearance of certain forage species from natural grazing (FAO 2016). This can be summarised as a general problem of access to quality fodder by large and small ruminants. Some of the causes of the reduction of grazing areas are the uncontrolled urbanisation of areas predisposed to agricultural activities, the increase in food crop areas, and the continuous exposure of cultivable and grazing land to bush fires and overgrazing in places. To feed small ruminants, livestock producers face problems in accessing inputs, high raw material costs, low valorisation of crop residues and agro-industrial by-products (FARA Survey, 2017). In livestock-based or paddock systems encountered in areas of high population density in the south and Zou, the forage supply from pastoralists during a food crop is insufficient (Bankolé et al., 2007). There is also evidence of poor utilisation of forage available in this area. For example, the abundant local maximum *Panicum* near the rural tracks during the rainy seasons is abandoned in favour of the leaves of Palm tree. Also, areas around the fields and palisades in the village are not exploited for the production of forage legumes. There is also a low protein and mineral content of rations available to animals (Gbego et al., 2015). In extensive livestock systems in areas of low population density where small ruminants are left at large year round, forage is almost non-existent at all times of the year. Rare corn bran supplements are offered to the animals.

Management

Small ruminants in tropical Africa are kept under traditional extensive systems. In the arid and sub-humid zones, cattle are reared with sheep and/or goats. In the humid zone, animals generally graze freely, with access to household and kitchen waste when available. These are supplemented with bush grazing on low-quality forages or browses. In some places, animals are tethered and fed kitchen waste supplemented with zero-grazing.

The marketing of small ruminants and their products is more or less organised by livestock traders and not by farmers, leading to the exploitation of primary producers. In his study, Dossa et al., (2007) reported that 65 percent of the respondents in Toffo and 45 percent in Ouedeme-Pedah declared that they had never sold their animals at market. They usually sell them to middlemen who go from village to village to purchase animals for resale at market and/or to butchers and caterers.

Research constraints

Institutional support for livestock development programmes is generally weak. Many African governments make minimal budgetary allocations to livestock development. Existing government agencies may need to be reorganised to operate more effectively. Routine vaccination against PPR is cheap. Control of tsetse flies and other disease vectors should have a high priority in small ruminant development programmes. Lack of credit has hampered small ruminant production in many places. Organising farmers into cooperatives and establishing fattening schemes run by smallholders will enhance productivity. Research innovations and extension services have little impact on the production systems, and the benefits of an integrated crop/livestock production system are lost.

Marketing of small ruminants in Benin

In terms of marketing, the major constraints of breeders are the lack of organisation or non-functional existing organisations, absence of a sales contract between producers and traders, difficult access to consumer markets, non-standardisation of prices by weighing, and selling live weight animals. The production cost fits the livestock traders who are organised.

Innovations Opportunities



Introduction

An innovation can be defined as an idea, practice or object perceived as new by an individual or other adoption unit (Toborn, 2011). Conventionally, an innovation is associated with a new product and a service that customers value and pay for (Bessant and Tidd 2007). Today, however, innovation permeates all spheres of life. In the livestock sector, new practices are being introduced to improve productivity. The practices, generated mainly by livestock organisations, are in various fields, notably animal health, feeding, genetic improvement, management, and advocacy for self-managed livestock markets without intermediaries.

Policy Innovation

The State, through its decentralised structures, facilitates the organisation of the actors. Professional organisations on ruminants (small and large) have a role to defend the interests of breeders and to represent them at the level of decision-making bodies at various levels (communal, regional, and national). Currently, unions operating in the sheep and goat sectors are



include **ANOPER**, **UDOPER** and **UCOPER**. These organisations work to improve the living and working conditions of the member breeders by making livestock farming a sustainable and professional activity. They contribute to improving animal productivity by placing particular emphasis on animal health and reproduction through training of members. They are therefore interested in research and innovations in the field of animal husbandry with the aim of exploiting the products and by-products of ruminant farming through processing. The breeders also provide consulting services in livestock to member breeders. They are in charge of organising marketing of livestock by creating self-managed cattle markets free of intermediaries and resolving conflicts among farmers.

Production Innovation

The majority of members of UCOPER, UDOPER, and ANOPER are direct breeders of large and small ruminants. The interventions of livestock organisations are more focused on large ruminants as the solutions to the problems of large ruminants are adapted to small ruminants. Thus, ANOPER engages in advocacy with the authorities for the improvement of the living conditions of the breeders. For instance, it intervenes with the political-administrative authorities when they demand that breeders leave a place. The association ensures that there is no discrimination against breeders by also engaging with the judicial authorities. It supports UDOPER and UCOPER in training regional and local members on health, nutrition, breed improvement and herd management.

Animal health



In terms of health, the breeders' capacity has been reinforced on: the timing of prophylaxis, knowledge of possible livestock diseases, hygiene and quarantine practices for sick or newly acquired subjects. ANOPER, through its regional and communal divisions, supports veterinary services in the organisation of vaccination campaigns by raising the awareness of breeders and ensures proper follow-up of the animals by the veterinary agents.

Feeding livestock

The capacity of member farmers has been strengthened on: livestock feeding techniques based on harvest by-products (groundnut and cowpea, rice straw) and agro-food processing by-products (cassava peels, yams, corn sap, millet, and soybean), feeding techniques for small ruminants, hay and silage manufacturing and conservation techniques, and fodder field installation techniques.

Breed improvement

Existing breeds are the Djallonke (Guinean breed), the Sahelian breed and their mixed breed for sheep and goats as well as the Niger Balami sheep breed, which was introduced among the farmers. Ten pairs were given to ten breeders in the form of share cropping and after one year the brood stock would be given back to other breeders. Ten pairs of goats of the very prolific and very early Maradi goat breed have been established among breeders following the same pattern as in the case of sheep. For the welfare of animals, breeders have been trained on the types of habitats that are likely to be reproduced by themselves.

Management

The breeders' capacities were strengthened on the technical and financial management of the herd. The factional structures, in collaboration with the political and administrative authorities, participate in the tracing of transhumance corridors, the delimitation of pasture areas and the organisation of peaceful transhumance. They also organise visits to exchange experiences with the members to see how the breeding activities are conducted elsewhere.

Evolution of small ruminant production from 2007 to 2016

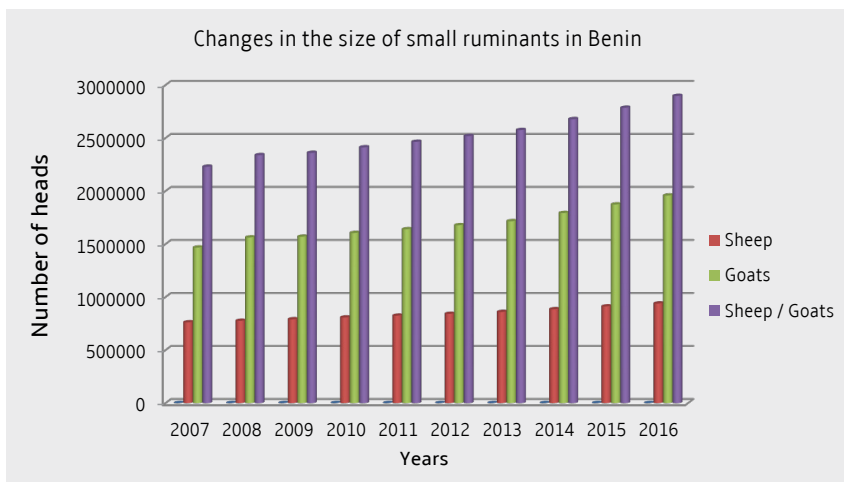
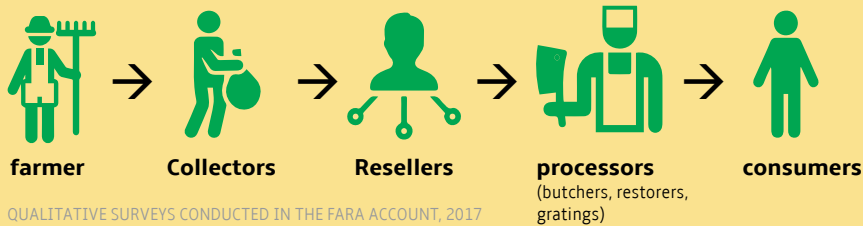


Figure 11 Evolution of small ruminant production in Benin

Source: Données DE, 2007-2016



Marketing Innovation

The breeder produces and sells animals to buyers who may be collectors, dealers, processors, or consumers. The qualitative surveys conducted in 2017 showed that:

The collectors come to the farmer to buy the animals at home, or the breeder takes the animal to the market at the dealers who buy it. These two actors are therefore the first customers of the breeders. Next come the butchers, those who want to do ceremonies, and consumers.

Collectors bring the livestock to the market where they increase their stock if they have a place of reseller in the market. Alternatively, they may resell the animals to the resellers of the market and return to the farmer for new animals.

Resellers are in the market and have as their main customers the processors (butchers, restorers, gratings). Cattle traders come from other departments to animate the market and finally consumers who have ceremonies or simply want to consume some meat.

Processors in turn sell processed, fresh or cooked meat to consumers. Wholesalers are importers and exporters of small ruminants. One category imports from Burkina Faso and Niger and another exports from Benin to Nigeria. In the cattle markets of the South and in some of the North, there are intermediaries who are “dilali” directors. They are at the level of the cattle markets and do not allow the buyer and the seller to discuss the price of transfer of the animal. They discuss one price with the buyer and another with the seller. This way, they benefit from a big financial margin. On the other hand, in certain northern markets called new self-managed markets, this practice of intermediaries is banned.

The farmers’ structures where intermediaries persist endeavour to discourage them. Where possible, the market management committee buys the animals if funds are available. This helps to avoid the selling-off that these intermediaries impose on them when they need money urgently.

Financing Innovation

To carry out the activities, professional organisations rely on various sources of funding, namely internal sources and external sources. Internal sources consist of annual membership dues and membership fees. External sources consist of financial support from Technical and Financial Partners (PTFs). Annual contributions are made at the level of the members of the village groups during the vaccination campaigns. The members' contribution is 2000 per year and is distributed as follows: grouping at village level 400 FCFA, structure at district level 200 F, structure at communal level (UCOPER) 350 FCFA, UDOPER 350 F, ANOPER 700 FCFA. Each group or member shall pay a fee of not more than 500 FCFA, which represents membership fee. The membership fee is no longer returned to the member even if he leaves the professional organisation. Membership fees and dues are annual and are used for administrative expenses of the cooperative or association. The social part, on the other hand, allows the cooperative or association to carry out activities during the term of office of the executive board. The shares are used to create income-generating activities to replenish the funds of professional organisations at the municipal, departmental, and national levels in order to ensure their financial autonomy. Depending on the shares paid up by a member, the cooperative or the association pays dividends to the shares issued. The value of a share in the case of ANOPER is 300,000 FCFA, refundable to a member of the cooperative or the association that leaves the organisation. The revenues from the economic infrastructure installed by the UDOPER are also used to finance the activities. The UDOPER struggled to have delegated management of cattle markets. Thus the cooperative manages the markets and reports to the City Council. On each animal sold, the seller and the buyer pay taxes of which the 50 percent goes to the UDOPER and the remaining 50 percent to the Town Hall.

ANNUAL MEMBERSHIP

DUES AS INTERNAL FUNDING

500 FCFA

MEMBERSHIP FEE

1 MEMBER → **2000** PER YEAR



group at village level	400 FCFA
structure at district level	200 FCFA
structure at communal level (UCOPER)	350 FCFA
UDOPER	350 FCFA
ANOPER	700 FCFA

Endogenous innovation

To maintain good practice and overcome feeding problems, breeders have endogenous practices of herbal treatment. However, several attempts to obtain the names of the plants from which the herbs are prepared were unsuccessful. These breeders were asked to search for the names of the plants and, if possible, samples to be collected during the quantitative phase of the survey.

Animal Health

- For diarrhea and high mortality (PPR) in small ruminants, breeders use the tablet “Cipro” (Ciprofloxacin). Two tablets at the start of treatment and one tablet daily for 3 days;
- For ordinary diarrhea, give the solution of the “Kpassama” leaf dried and powdered to the animals;
- The bark of a tree prepared and given to drink stops diarrhea in small ruminants. Breeders use dried papaya seeds, crushed and mixed with corn bran to control parasites in the animals;
- There are anti-venom plants that breeders use where an animal is attacked by a venomous creature.
- “Modern medicine itself has not yet found effective anti-venom to fight against the envenomation of our animals, but our plants do it very well,” he added;
- There are trees whose barks, crushed and dried with salts, are given to the animals in case of suspicion of disease. That is, as a preventive and curative measure;
- Calcédra bark (*Khaya senegalensis*) crushed + salt, regulates the problems of anorexia and weight loss in animals

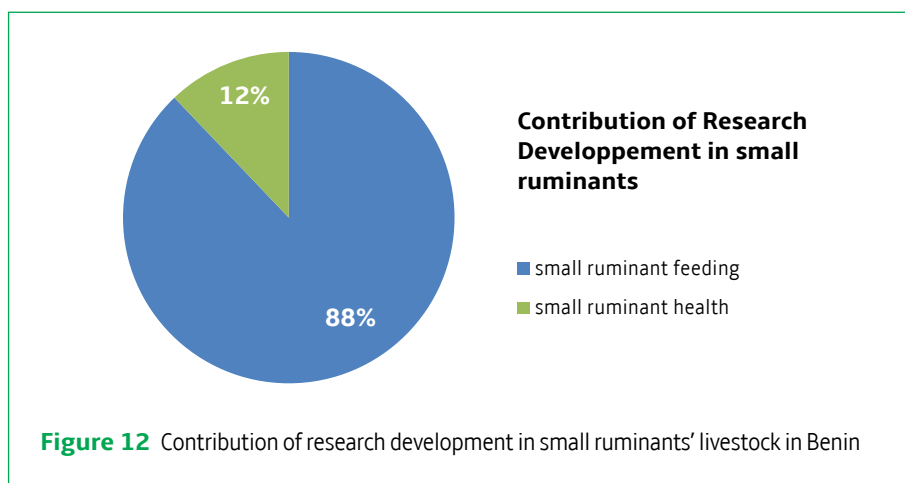
Food

- Some dried herbs are very good for animals; wet herbs give them diarrhea;
- Farmers use certain plants rich in nutrients to fatten animals.
- Groundnut, cowpea, cassava peel, yam, rice straw, corn stalks, corn sap, millet and soybean are also used.
- Storage techniques exist for harvested by-products (peanut, cowpea, cassava peel, yam, rice straw, corn stalks).



Technological innovation

The list of technological innovations in small ruminant farming from 1996 to 2016 has been updated and the promising innovations developed during the period have been highlighted. Thus, in the field of feeding of sheep and goats, 29 promising technologies were identified. In the field of animal health, four promising technologies were noted.



Value Chain Analysis







Introduction

A chain of values can be defined as the set of activities that are required to bring a product or service from the design site to the final consumers through the various phases of production (involving a combination of physical transformation, delivery of services to individual producers) and delivery to end-users (Kaplinsky and Morris, 2003). The value chain approach presents a good picture of the process of creating value. Value chain analysis helps in understanding the connection among actors in the chain and the way trade takes place (Adeoye et al.,2013).

Actors in the sector and transactions between them

Direct actors

At the national level, the actors can be grouped into four categories:

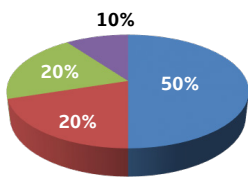
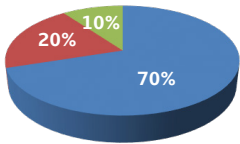
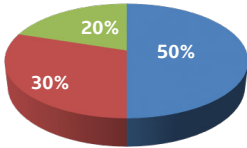

-  **The primary actors of the sector:** breeders or agro-pastoralists who breed in divagation, semi-divagation or claustration (fattening of huts) especially for Tabaski. The farmer uses crop residues, agro-food by-products, pre-fabricated livestock feed, salt or lickstones to feed the animals in the case of confined animals or to complement them in the case of semi-wandering or rambling animals. The farmer delivers animals to groups of livestock traders or processors.
-  **Collectors and resellers** can be grouped into livestock traders (wholesalers or retailers). Retailers are local collectors and dealers in each municipality. But wholesalers are importers and exporters of small ruminants; they operate at national level and depend more on the carriers than collectors and resellers.
-  **Transformers:** they are butchers, grills or restorers; they are the main customers of traders and are mainly and secondarily breeders.
-  **Consumers:** they are the last links in the chain and are customers of breeders, livestock traders and processors.

Indirect actors

However, there are other actors, such as service providers (veterinarians, food vendors, and transporters), support structures (INRAB CARDER, OP, Financial partners, and NGO) and facilitation indirect actors.

The flow of trade among stakeholders in the small ruminant value chain is shown in Table 3

Table 3 Flow of livestock from breeders to collectors, and to others

<p>Breeders</p>	<p>Flow of the product from the breeders to the other actors</p>  <ul style="list-style-type: none"> ■ Collectors ■ Retailers ■ Transformers ■ Donation / self-consumption
<p>Collectors</p>	<p>Flow of product from collectors to other actors</p>  <ul style="list-style-type: none"> ■ Retailers ■ Transformers ■ Consumers
<p>Retailers</p>	<p>Reseller product flow to other players</p>  <ul style="list-style-type: none"> ■ Transformers ■ National Traders ■ Consumers
<p>Transformer:</p>	<p>Product flow from processors to consumers</p> 

Sheep/goat meat value chain

Generally in Benin, the animals are produced at the level of the breeder according to two systems of breeding: the intensive breeding by box fattening and the semi-intensive breeding with food supplement in the evenings on return of the animals. The breeder produces and markets then sells animals. The breeders in Djougou are specialists at fattening of the hut that they make in the approach of the tabaski and sell the animals in the cattle market. For fattening, the farmer buys young animals in cattle markets in addition to own stock. There are merchants/collectors who come to the breeder to buy the animals at home, or the breeder takes the animal to the market. Collectors/traders bring animals back to the markets where they add to their stock if they have a place for reselling in the market. Alternatively, they resell purely and simply to the resellers at the market and return to the farmer for new collections. The dealers are in the market and have as their main customers the processors (butchers, restorers, grills), cattle traders from the southern departments, consumers for ceremonies or simple consumption. Processors in turn sell processed meat to consumers. Butchers sell fresh meat to conservators, grills or consumers. Restorers, especially those who make “gbo kpètè” and the grills sell the meat cooked to the consumers. At the level of butchers, “it is a cultural occupation,” affirms a butcher “you are born a butcher, you do not become a butcher.” It is therefore a caste of natives of the middle who make the butchery and are very related to the breeders. Racks sell cooked meat to consumers. The grills are in the same way as the butchers except that the gratings are more than 95 percent of the Nigerians and the butchers are natives, nationals. Before selling the meat, an inspection is made by a public veterinarian.

Product Flow

In all villages surveyed, about 90 percent of production is sold. The remainder represents the production consumed by self, given away, and lost. The share sold varies from one actor to another along the chain. Figure 3 shows that 60 percent is delivered to the collectors/traders of animals on foot (40 percent to footwear traders, 10 percent to butchers, and 10 percent to traders from neighbouring countries). It should be noted that traders from neighbouring countries market the product to Niger, Burkina Faso, and Mali. Then, 20 percent of the quantity produced is sold directly to the traders /retailers of animals on foot by the breeders themselves. And finally, 10 percent is delivered directly to butchers. These actors in turn deliver the product to restorers, grills, and consumers.

Mapping value chain small ruminant meat in Benin

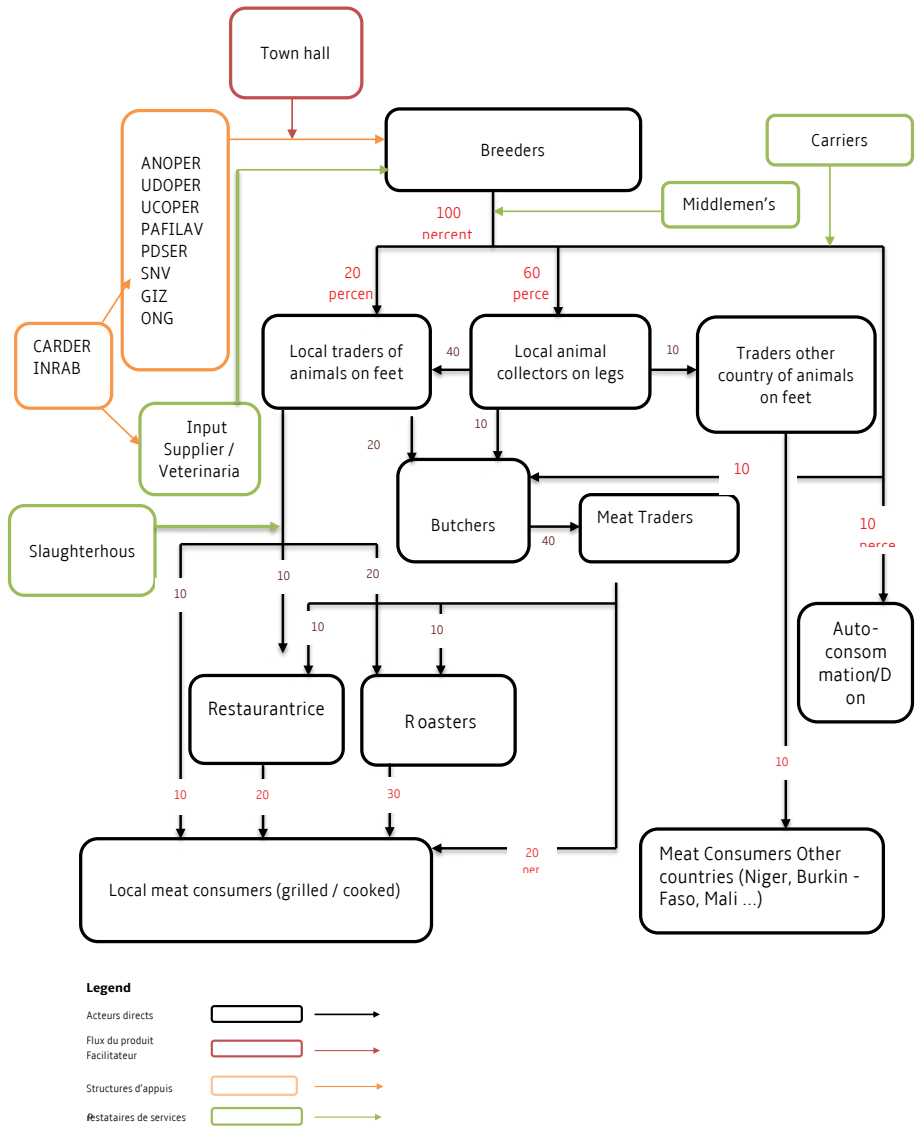


Figure 13: Mapping value chain small ruminant meat in Benin
Source: Investigation INRAB / FARA 2017

Figures of possible value chains of the small ruminants sector



Figure 14 Reseller of small ruminants



Figure 15 Slaughter of small ruminants



Figure 16 Roaster of small ruminants



Figure 17 Sale of skin of small ruminants

Source: Investigation INRAB / FARA 2017

Analysis of governance in Value Chain

The selling price of the small ruminants is proposed by the merchant. However, the product is delivered to the customer after haggling. In general, the selling price varies according to the time of year. It is high especially at the approach of the tabaki and Ramadan festivals and the end-of-year celebrations. There are forms of informal contracts between certain actors. In fact, when the breeder needs money and for reasons of maintaining a breed of animals or spawners in his zone so that in his time he has the possibility of resuming the breed of the animal, he gives another breeder of his environment for money. Another form (under analysis) is the practice of some kind of warrantage; That is, if the market management committee had money in its caisse (an available fund), it could buy back the animals from the breeders to avoid the sell-off that middlemen impose on breeders. As far as power relations are concerned, it is held by intermediaries who are "dilali" directors. These intermediaries are at the level of the cattle markets and do not allow the buyer and the seller to discuss the price of transfer of the animal. They discuss another price to the buyer and another price to the seller, for this fact they benefit from a large financial margin without being breeder of the animal.

Constraints and opportunities in Value Chain

The constraints and opportunities in CVAs are identical to those described in the chain in general in Chapters 2 and 3

Strategies for the development of different value chains

Assets and Opportunities of Livestock

The actors of the small ruminant Value Chain in Benin have and benefit from certain assets and potentialities that allow them to continue the activities despite the constraints to which they are subjected. Among others we distinguish:

- Significant source of income
- Improvement of living conditions
- Use of animal manure to fertilise agricultural land
- Existence of demand
- Proficiency in breeding techniques
- Existence of structures that provide support
- Existence of professional organisation
- Environmental conditions favourable to livestock and fattening
- Existence of livestock markets
- Project implementation and existence of state and private structures that support the chain

Solutions sought and suggestions made by the actors

-Solutions to constraints

The paragraph above presents a list of the different constraints to which the actors of the chain are subjected. The solutions to the main constraints (the first five per actor) are presented in Tables 4, 5 and 6

Table 4: Applied solutions and solutions desired by breeders

Constraints	Applied Solutions	Desired Solutions
Rudimentary and archaic breeding equipment and infrastructure	Renovation with makeshift tools	-Training on the advantages of using modern equipment and infrastructure
- Granting of these modern materials		
Grounding of actors through intermediaries	Overpressure of these players in certain markets	-Organisation of marketing by PO
Poor quality of broodstock used	Purchase of sire on the external market	- Development of new breeds of broodstock adapted to the realities of the country
Professional organisation not very active (not totally autonomous)		-Training the POs on good management of the actors;
-Reinforcing POs by inputting subsidies to make financial means available to POs through loans		
Non-incentive sale price	Sale of product after negotiation	Set price per kilogramme

Source: Investigation INRAB / FARA 2017

Table 5 Applied solutions and solutions desired by traders

Constraints	Applied Solutions	Desired Solutions
Poor organisation of traders	Grouping of small groups of traders	Train traders on the advantage of being in a cooperative
Grounding of traders through intermediaries	Too much pressure on these players in certain markets	-Organisation of marketing by the PO
Not satisfying demand in quantity	Importation of animals from neighbouring countries (Niger, Burkina ...)	-Organise training on modern breeding techniques
Lack of incentive prices	Sale of product after negotiation	Set price per kilogramme
Inadequacy of means of transportation	Without solution	Repair/construction of roads

Source: Investigation INRAB / FARA 2017

Table 6 Solutions applied and solutions desired by butchers

Constraints	Applied solutions	Desired solutions
Professional organisation of butchers not sufficiently active on the ground		Strengthen and support the POs
Insufficiency of qualified agent for meat control		Provide a qualified veterinarian to each butcher's shop
Inexistence of training on the quality of the product	Use of the results obtained from the experiments	Organise training on the tests of qualities
Increase in taxes on the slaughter of animals		- Decrease or elimination of certain taxes
- Regulate taxes		
Absence of a modern slaughterhouse meeting quality standards	Construction of slaughterhouses of fortune	-Build in each commune a modern slaughterhouse that meets the standards of quality

Source: Investigation INRAB / FARA 2017



Cost analysis and cost structure analysis in the value chain

Two types of costs are analysed in this section: production costs and total costs of the value chain. The Table 7 presents the cost of raising goats/sheep. From the analysis in this table it appears that for the annual production of goat or sheep, the farmer spends on average 271.205,37 FCFA. The purchase of small animals is the item that consumes the most financial resources. Then comes the food supplements. The animals are fed largely by the fodder and kitchen left-overs. Nevertheless, some breeders add supplements to accelerate the growth of their animals. The lowest cost is recorded in the labour force. Little wage labour is used for maintenance of animals. However, the costs of veterinary care and grazing are borne by the farmer.

Table 7: Cost of raising goats/sheep

Item	Cost in FCFA / year
Small animals	150 212,36
Food supplements	33 722,33
Vaccine (FCFA / year)	31 813,78
Manpower (FCFA / year)	26 907,54
Amortization (FCFA / year)	28 549,36
Total	27 1205,37

Source: Investigation INRAB / FARA 2017

The cost analysis (Table 8) indicates that goat meat/sheep value chain in Benin generates a total cost of 3045.57 CFFA / kg and a consumption of 2030.56 CFFA / kg of goat meat/sheep. Consumption is lower at the level of breeders. The same applies to the level of total consumption. This situation is due to the fact that breeders do not use means for the construction or purchase of equipment for breeding. The animals spend most of their time wandering. At the level of the other actors, reliance on intermediaries and more adequate equipment are essential. They purchase scales, stock the butchery, and pay taxes and other costs.

Table 8: Intermediate consumption and total costs in goat meat/sheep meat in Benin

	Item	Cost in FCFA / kg
Intermediate Consumption (IC)	Breeder	296,13
	Trader	500,69
	Butcher	432,74
	Roaster	801,00
	Total	2 030,56
Total Consumption (TC)	Breeder	322,40
	Trader	843,10
	Butcher	555,07
	Roaster	1 325,00
	Total	3 045,57

Source: Investigation INRAB / FARA 2017

Performance financial indicators of Value Chain

Table 9 shows that the goat meat value chain in Benin is financially profitable regardless of the actor concerned, with the best creation of wealth realised by the gratings. However, the best profits are realised respectively by the gratings and the butchers, up to 651 FCFA /kg and 604, 93 FCFA/kg. Racks add the most value to the product while producers add the least.

Table 9: Indicators of the financial performance of the goat/sheep meat Value Chain in Benin

Rubrique	Acteurs	Coût en FCFA/kg
Add Value (AV)	Breeder	496,94
	Trader	809,31
	Butcher	727,26
	Roaster	1175
	Total	3 208,51
Profit in FCFA/Kg	Breeder	456,99
	Trader	466,9
	Butcher	604,93
	Roaster	651
	Total	2 179,82
Ratio VA/CI	Breeder	1,67811434
	Trader	1,61638938
	Butcher	1,680593428
	Roaster	1,466916355
	Total	6,442013507
Ratio profit/CT	Breeder	1,41746278
	Trader	0,553789586
	Butcher	1,089826508
	Roaster	0,491320755
	Total	3,552399628

Source: Investigation INRAB / FARA 2017

Conclusion

In summary, the small ruminant sector study shows that the livestock sector has major strengths. It also shows that good organisation of the actors can allow development of the sector by focusing on the value chains with timely links for each of the players as in the goat/sheep farming in Benin, which is profitable. The best financial performance is achieved by the roaster. It can be seen, however, that traders are among the actors achieving the best value added and come in third place after the roaster and butchers at the level of realisation and profit. However, the sector is experiencing difficulties and local production does not yet fully cover the needs of the population. It is therefore important that the State through its policy:

- provide livestock producers with support to ensure high growth rates;
- introduce new food rations adapted to each species by age category;
- train breeders on modern breeding techniques;
- provide technological and material support to actors; and
- support Producers Organizations in their missions. At the Farmers Organization level, they have to rigorously carry out the tasks assigned to them.

REFERENCES

- Adeoye I. B., Omobowale A. Oni, Salaiman A. Yusuf and Kemisola O. Adenegan, 2013. Plantain Value Chain Mappin in Southwestern Nigeria, *Journal of Economics and Sustainable Development*, ISSN 2222-1700(Paper) ISSN 2222-2855 (Online), Vol 4, N° 16, 2013.
- ANOPER, 2014. La situation actuelle de l'élevage et des éleveurs de ruminants au Bénin. Analyse et perspectives. 68 p.
- Direction de l'Élevage. *Annuaire Statistiques* 2012; 2013.
- INRAB/FARA, 2017. Analyse de la performance de la chaîne de valeurs petites ruminantes au Bénin. 30 p.
- Gbaguidi, B.F. Mémoire DIT, UNB/CPU, 1995, 137 p.
- Houssa, S. E. Mémoire DIT, CPU/UNB, 2001, 44 p.
- Kaplinsky, R., Morris, M., 2001. A Handbook for Value Chain Research. Working Paper Prepared for the IDRC. Institute for Development Studies, Brighton, UK. 113p.
- Kit, Faïda MaLi et IIRR 2006. Chain empowerment: supporting African farmers to develop markets. Royal Tropical Institute, Amsterdam, Faïda Market Link, and International Institute of Rural Reconstruction, Nairobi, 201p
- Koudande, O.D. Rapport RAMR/DRA/MDRAC, 1991, 17 p.
- Pnud, B. "Rapport OMD: Évaluation des progrès accomplis en Afrique dans la réalisation des objectifs du Millénaire pour le développement." MDG Report: Assessment of the progresses accomplished in Africa for the Millenium Development Goals (2012)
- PRePAH 2010. Programme de Recherché en Production Animale et Halieutique. Institut National des Recherches Agricoles du Bénin. 115 p

About FARA

The Forum for Agricultural Research in Africa (FARA) is the apex continental organization responsible for coordinating agricultural research for development (AR4D) in Africa so as to increase its efficiency and effectiveness. It serves as the entry point for agricultural research initiatives designed to have a continental reach or a sub-continental reach spanning more than one sub-region.

FARA serves as the technical arm of the African Union Commission (AUC) on matters concerning agricultural science, technology and innovation. It provides a continental forum for stakeholders in AR4D to shape the vision and agenda for the sector and to mobilize them to respond to key continent-wide development frameworks, notably the Comprehensive Africa Agriculture Development Program (CAADP) of the African Union (AU) and the New Partnership for Africa's Development (NEPAD).

FARA's vision:

Reduced poverty in Africa as a result of sustainable broad-based agricultural growth and improved livelihoods, particularly of smallholder and pastoral enterprises

FARA's mission:

Creation of broad-based improvements in agricultural productivity, competitiveness and markets through strengthening of the capacity for agricultural innovation across the continent

FARA's value proposition:

Strengthening Africa's capacity for innovation and transformation by visioning its strategic direction, integrating its capacities for change and creating an enabling policy environment

FARA's strategic direction is derived from and aligned with the Science Agenda for Agriculture in Africa (S3A), which is, in turn, designed to support the realization of the CAADP vision of shared prosperity and improved livelihoods.

FARA's programme is organized around three strategic priorities (SPs), namely:

Visioning Africa's agricultural transformation through foresight, strategic analysis and partnerships to enable Africa to determine the future of its agriculture, using proactive approaches to exploit opportunities in agribusiness, trade and markets, taking the best advantage of emerging sciences, technologies and risk mitigation practices and approaches, and harnessing the combined strengths of public and private stakeholders.

Integrating capacities for change by making different actors aware of each other's capacities and contributions, connecting institutions and matching capacity supply to

demand, so as to create consolidated, high-capacity and effective African agricultural innovation systems that can use institutional comparative advantages to mutual benefit while strengthening individual and institutional capacities.

Enabling environment for implementation, initially through evidence-based advocacy, communication and widespread stakeholder awareness and engagement to generate enabling policies and institutions, then by ensuring the stakeholder support required for the sustainable implementation of program for African agricultural innovation.

Key to these outcomes is the delivery of three important results, which respond to the strategic priorities expressed by FARA's clients. These are:

Key Result 1: Stakeholders empowered to determine how the sector should be transformed and to undertake collective actions in a gender-sensitive manner

Key Result 2: Strengthened and integrated continental capacity that responds to stakeholder demands in a gender-sensitive manner

Key Result 3: Enabling environment for increased AR4D investment and implementation of agricultural innovation systems in a gender-sensitive manner.

FARA's development partners are the African Development Bank (AfDB), the Canadian Department of Foreign Affairs, Trade and Development (DFATD), CGIAR, the Danish International Development Agency (DANIDA), the UK's Department for International Development (DFID), the European Commission (EC), the governments of the Netherlands and Italy, the Norwegian Agency for Development Cooperation (NORAD), the Australian Agency for International Development (AusAid) and the World Bank.



Innovating for Africa's Wellbeing

Forum for Agricultural Research in Africa

12 Anmeda Street, Roman Ridge, PMB CT 173, Accra, Ghana

Telephone: +233 302 772823 / 302 779421; Fax: +233 302 773676 / Email:

info@fara-africa.org

www.fara-africa.org

About PARI



The Program of Accompanying Research for Innovation (PARI) brings together partners from Africa, India and Germany to contribute to sustainable agricultural growth and food and nutrition security in Africa and India. PARI offers independent scientific advice to the special initiative of the German Government “One world without hunger” (SEWOH) which, among other activities, supports the improvement of food and nutrition security and sustainable agricultural value chains by setting up Green Innovation Centers (GICs) in 12 African countries and India.

Specific goals of PARI are to promote and support the scaling of proven innovations in the agri-food sector in collaboration and partnership with all relevant actors; to support and enhance investments in the GICs through research; and thereby to contribute to the development of the agri-food sector in Africa and India through the identification, assessment and up-scaling of innovations. The core topics and thematic research priorities of the Program have been identified in accordance with the African Union’s CAADP as part of the New Partnership for Africa’s Development (NEPAD).

PARI’s collaborative work includes:

- 1** Innovation research with future-oriented impact analyses, such as:
 - modelling and mapping direct and indirect impacts of potentially promising innovations
 - developing methodologies and concepts for strategic analysis of potentials and prospects
 - institutional analysis of the GICs in the context of their national agricultural innovation systems

- 2** Identifying and stimulating technological and institutional innovations, such as:
 - screening for promising innovations from research and innovation systems (“top-down” approach)
 - soliciting innovations generated by farmers and other actors in the value chains (“bottom-up” approach)
 - scaling of innovations

- 3** Engaging with food and agriculture policy making to enhance approaches for innovation that improve food and nutrition security.

The Program is being implemented by an international, interdisciplinary consortium of three universities (ZEF / University of Bonn, University of Hohenheim, Technical University Munich), the Forum for Agricultural Research in Africa (FARA) and its network of national and regional partners in Africa, and the African Growth and Development Policy Modeling Consortium (AGRODEP) facilitated by the International Food Policy Research Institute (IFPRI, Africa Office) and research collaborators in India.



Forum For Agricultural Research In Africa

Headquarters 12 Anmeda Street, Roman Ridge

PMB CT 173, Accra, Ghana

Tel +233 (0) 302 772823 / 779421

Fax +233 (0) 302 773676

Email info@faraafrica.org

ISBN:978-9988-8776-0-6

