

Country Gap Report

SENEGAL

Prepared by

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© Pierre William Blanc and Papa Hoyeck, and Advancing women's participation in livestock vaccine value chains in Nepal, Senegal, and Uganda 2019

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Abbreviations

ANABOT	Vaccine against Botulism
ANSD	Agence Nationale de la Statistique et de la Démographie
CAHW	Community Animal Health Workers
CIA	Central Intelligence Agency
CNA	Centre National Avicole
DIREL	Direction de l’Elevage
DINFEL	Directoire National des Femmes en Elevage
DSV	Direction des Services Vétérinaires
FDG	Focus group discussion
GDI	Gender Development Index
GDP	Gross Domestic Product
GII	Gender Inequality Index
HDI	Human Development Index
II	Individual Interview
IDRC	International Development Research Centre
ISRA	Institut Sénégalais de Recherches Agricoles
KII	Key Informant Interview
LNERV	Laboratoire National d’Elevage et de Recherches Vétérinaires
LVVC	Livestock vaccine value chain
MEPA	Ministère de l’Elevage et des Productions Animales
NESS	National System for Epidemiological Surveillance of Animal Diseases
ND	Newcastle Disease
NGO	Non-governmental organization
ODVS	Ordre des Docteurs Vétérinaires du Sénégal
OIE	World Organization for Animal Health
PAFA-E	Projet d’Appui aux Filières Agricoles – Extension
PARC	Pan African Rinderpest Campaign
PASA LouMaKaf	Projet d’Appui de Sécurité Alimentaire Louga, Matam et kaffrine
PASTEURELLAD	Vaccine against Pasteurellosis
PPP	Purchasing Power Parity
PPR	Peste des Petits Ruminants
PRODEC	Projet de Développement des Espèces à Cycle court
PSE	Plan Sénégal Emergent
RGPHAE	Recensement Général de la Population et de l’Habitat, de l’Agriculture et de l’Elevage
SOPRODEL	Société pour la Promotion de l’Élevage
UF	University of Florida
UNDP	United Nations Development Programme
VVC	Vaccine Value Chain

Introduction

This Country Gap Report provides an assessment of the vaccine value chain for livestock diseases, in particular Newcastle disease (ND) for poultry and Peste des Petits Ruminants (PPR) for small ruminants, focusing on the Kaffrine region in Senegal. It identifies and shares what we know about these value chains based on a literature review as well as preliminary information from ongoing fieldwork, as well as identifying knowledge gaps for guiding further research efforts. This report is the first output for Senegal of the IRDC-funded research project “Advancing Women’s Participation in Livestock Vaccine Value Chains (VVC) in Nepal, Senegal, and Uganda”. Besides starting to obtain a more comprehensive mapping of the ND and PPR vaccine value chain, this report contributes to the project goal of identifying the barriers in access to, and participation in, these VVC due to gender and intersectionality factors, as well as the opportunities to increase women’s engagement in VVC in the region of Kaffrine, Senegal.

Both poultry and small ruminants are of high economic and social importance to rural women in Senegal. For instance, women’s livelihoods are more reliant on the poultry sector than those of men, and women are also more likely to own poultry than men (USAID, 2010). Due to the very high prevalence rates of poultry diseases, such as Newcastle disease, which accounts for 80% of poultry deaths (Gning, 2004), poor animal health constitutes one of the biggest threats to the sustainability of women’s livelihoods in this sub-sector. Similarly, women’s reliance on the income and security generated by small ruminants is threatened by high prevalence rates of PPR, for which the number of cases in Senegal has increased considerably since the 1970s (with goats being more sensitive than sheep) and which remains in an enzootic state. In the 0 to 1-year-old age group, the average mortality rate is 27% (Coly, 2002). While vaccination is an effective way to prevent livestock disease and improve poultry and small ruminant health, availability and access are not universal (Alexander, 2009; Marangon & Busani, 2007). Therefore, interventions that increase women’s access to, and use of, vaccines, and promote their participation as providers in the VVC, have the potential to improve women’s economic well-being and status within families and communities.

Research Aims and Methods

The report addresses two interrelated aims: i) contribute to map the VVC in for ND and PPR, identifying the main actors in each VVC, their roles, the connections and nodes between the actors, and any gap in knowledge that further research will have to address; ii) identify the barriers that prevent livestock keepers from accessing and using vaccines, and prevent other actors to enter the value chain and provide services, by focusing on gender and intersectionality factors, such as geographical location, age, social status, ethnicity and form of livelihood, as well as the gaps in knowledge about these barriers and the way they operate.

In order to address the above research aims, the research team, which includes faculty and two graduate students at UF, relied on a literature review of available documents and publications on the livestock VVC in Senegal in general, and on the PPR and ND VVC in particular. Fieldwork was also started in Summer 2019 with the purpose to collect through mixed-methods sex-disaggregated quantitative and qualitative data. The initial research instruments (such as the questionnaires) were created over a period of three months (from March 2019 to May 2019) and the two graduate students were supposed to spend each about 6-8 weeks in the field (both in Dakar and in Kaffrine) during June-August 2019. Unfortunately, the trip had to be significantly delayed and shortened due to the late start of the project. The graduate students worked together with our Senegalese country coordinator (Dr. Alioune Touré) and the help of one research assistant from Senegal. Data collection lasted over a period of about 6 weeks, but the student working on the PPR VC could only be in the field for about 2 ½ weeks. As a result, the information on

the PPR VVC in this report is severely limited, and the field team is working to complete data collection related to the ND VVC.

Methods included the following:

1- *Document review*

Throughout the preparation and implementation of the fieldwork, a number of documents were collected and researched, including peer-reviewed publications, reports on vaccination campaigns from official institutions (such as MEPA, DSV), documents from NGOs and international cooperation development projects in livestock sector in Sub-Saharan Africa in general, and particularly in Senegal. These documents were found through internet searches as well as by asking experts and informants during the fieldwork.

2- *Key informant interviews (KII)* with experts from public and private sector, government, and international donors.

The fieldwork kicked-off with semi-structured interviews with key informants to identify the main actors, entry points and distribution sites for livestock vaccines, as well as poultry vaccination practices. Overall, during July-August 2019, the team conducted a total of 15 key informant interviews, which include five with actors in Dakar, and 10 at the regional and district levels within the region of Kaffrine.

3- *Individual Interviews (IIs)* with key actors in the livestock value chain at the community level

A total of five individual interviews with key local actors were conducted in the region of Kaffrine, and focused on the poultry sector (interview with poultry owners, poultry keepers and community animal health workers, CAHW). Individual interviews with key stakeholders in the poultry production systems aimed to capture their roles at the community level and their decision-making power related to the use of poultry vaccines. Socio-demographic information was also collected to capture barriers and intersectionality in poultry production and poultry vaccine value chain.

4- *Focus group discussions* with poultry owners, and community animal health workers (CAHWs).

Focus group discussions (FGDs) asked participants open-ended questions about livestock keeping, livestock diseases, access to vaccines and acceptance of vaccines. FGDs were organized separately for men (five FGDs in total) and women (six FGDs in total) so that each group could discuss freely about opportunities and constraints specific to each gender. The information collected throughout these discussions contributed to a better understanding and learning about the different roles and responsibilities of men and women in the livestock vaccine value chain, as well as elements of intersectionality (gender, ethnicity, livelihood, socio-economic class, etc.) that mostly affect their participation in the LVVC. During note-taking, particular attention was paid to the interactions between the participants in relation to livestock vaccination practices at the community level.

The breakdown of KIIs, IIs and FGDs by location is indicated in the table below.

Table 1-Breakdown of fieldwork activities by location

Region	Dept.	Period	Focus Group Discussion	Individual Interview	Key Informant Interview	Transect Walk	Grand Total
Dakar					5		5
	Dakar	2 weeks	0	0	5	0	5
Kaffrine			11	5	10	1	27
	Birkelane	4 Weeks	6			1	7
	Kaffrine		3	4	8	0	15
	Malem Hodar		2	1	2	0	5
	Koungheul		0	0	0	0	0
Grand Total			11	5	15	1	32

Source - Fieldwork in Senegal (Summer 2019)

Throughout the data collection period, the research instruments were slightly adapted to the local context in order to make them more comprehensible to the local people. The fieldwork started in Dakar (two weeks), during which period the students conducted key informant interviews to identify key vaccines wholesalers and importers, such as “Global VET Distribution”, and vaccine production laboratories (ISRA). Then, the research team traveled to the region of Kaffrine where they spent 4 weeks conducting focus group discussions and semi-structured interviews (KII & II) in three districts (Kaffrine, Birkelane, and Malem Hodar).

To complete the fieldwork that was started in Summer (e.g. ,visiting more communities in the three cited districts and visiting the more remote district of Koungheul), a new team was identified and formed in Senegal with three graduate students from the University in Dakar and two undergraduate students from the University of Sine Saloum in Kaffrine. This team started fieldwork on September 20 that will continue until mid-October.

Country and Livestock Sector Context

Socio-economic and political context

Senegal is located at the westernmost tip of West Africa on the Atlantic Ocean. Bordered to the north by Mauritania, to the east by Mali, to the south by Guinea and Guinea-Bissau, and to the west by the Atlantic Ocean, the country has a total area of 196,722 sq. km with the Republic of The Gambia enclaved within its south-west part. Dakar (550 km²), the capital, is a peninsula located in the far west. Senegal is a relatively flat country made up of sandy soils not exceeding 130 m in altitude, except on the south-eastern border with Guinea. Three rivers cross the country from east to west: Senegal (1700 km) in the north, The Gambia (750 km) and Casamance (300 km) in the south. Just under one half, 46.8% of land is agricultural

land, and the tropical climate is dominated by a seven-month rainy season (starting in May) and a very hot five-month dry season (starting in December) in most of the country (CIA, 2019).

The Republic of Senegal is a secular and democratic country, which gained its independence from France on April 4, 1960. The constitution ensures equality before the law of all citizens, regardless of origin, race, sex, or religion. The country has a pluralist presidential regime (executive, legislative, and judicial branch). The number of years per term in office is now fixed to five years, after being changed back and forth from seven years to five years (Hesseling, 2010). The current President of the Republic, Macky Sall, has been in power since March 25, 2012, currently serving his second term. The congressional representatives of the Republic of Senegal bear the names of National Assembly and Senate. Their members carry the titles of deputies to the National Assembly and senators. In 2010, then President Abdoulaye Wade signed the law on gender parity in Senegal (Official Journal of the Republic of Senegal, 2010). The law establishes measures to promote greater gender equality in the education sphere, employment sector and several other domains within the Senegalese societies. It also mandates that each political party is to give equal access for both women and men on candidate lists for elections; as a result, Senegal ranks at the 7th position worldwide for highest percentage of women parliamentarians (41.8% in 2016 parliamentary elections).

In francophone West Africa, Senegal is the second largest economy behind Ivory Coast ("France Diplomatie", 2019). In 2017, the estimated gross domestic product (GDP) of Senegal was \$54.8 billion purchasing power parity (PPP) and ranked 107 among 230 countries and territories in all regions (CIA, 2019). The estimated GDP per capita in 2017 was \$3,500 with an annual growth rate of 7.2%. The service sector was the largest driver of Senegal's economy, with an estimated contribution of 58.8% of the GDP, while the industry sector and the agriculture sector accounted for 24.3% and 16.9% respectively. Although agriculture had the smallest contribution to the GDP, this sector accounted for the majority (77.5%) of the total estimated 6.9 million people in the labor force. The primary sources of employment in rural areas are agriculture (comprising farming, livestock and fisheries), mining, construction, and tourism. The rate of official unemployment in Senegal is relatively high, i.e., 48%, which placed the country at the 216 position out of 218; but this figure ignores the large section of the population informally employed or underemployed. The main agricultural products are peanuts, millet, corn, sorghum, rice, cotton, tomatoes, green vegetables, cattle, poultry, pigs, and fish.

The problems of employment, cost of living, quality of public services, and provision and cost of electricity and water supply remain the primary concerns of the Senegalese population. Based on the results of the survey "Listening to Senegal in 2014" by the National Agency of Statistics and Demography in collaboration with the World Bank Group, 56.5% of households live in poverty, among which 45.7% report being very poor (ANSD, 2015). The level of poverty is higher in the rural areas, where 69% of households are considered poor and 53.2% of whom see themselves as very poor (ANSD, 2015). The authorities wish to develop agricultural activity along the Senegal River and intensify market gardening for domestic consumption or export.

The Central Intelligence Agency (CIA) reported in July 2018 that the estimated total population of Senegal was 15 million people with 48% male and 52% female. About 53% of the population is rural, and the capital city of Dakar has around 3 million residents. The age structure is divided as follows: 61% are under 25 years old, 31% are between 25 and 54 years old, and 7% are above 54 years. The majority (96%) of the population is Muslim and 4% are Christian. There are several ethnic groups, however, the predominant ones are Wolof (37%), Pular (26%), and Serer (17%). The population uses French as the official language, along with other non-official languages, including Wolof, which is the most-widely spoken (CIA, 2019).

The Human Development Index (HDI) of Senegal has been progressively increasing since 1990 (HDI: 0.367) and was slightly higher than most of its neighboring countries: Mali (0.427), Guinea-Bissau (0.455), Guinea (0.459) and The Gambia (0.460). In 2017, Senegal's HDI was 0.505 and ranked 164 out of 189 countries (UNDP, 2018). In Senegal, there is a significant level of inequality in terms of the three dimensions of human development, which are: a long and healthy life, access to knowledge, and a decent standard of living.

Historically, society has been organized according to a hierarchy of castes, a rigid structure in which descendants of royal lineages and nobles dominated artisanal castes and servants. After independence, a new set of status criteria appeared that strived to infuse more social mobility and greater equality in front of the law. New ways of attaining wealth, power, and status have been introduced by the market economy and the development of the formal education system. The modern elite includes successful businessmen, managers and professionals from the private sector, as well as influential politicians and highly educated people. The deterioration of living conditions has affected the lives of the masses, many of which live in conditions of poverty and social and economic marginalization that transmit through generations. Lepers, polio victims, and beggars are common in cities, while lack of assets and income generating opportunities exclude families in rural areas from the fruits of development.

Livestock systems

In Senegal, the livestock sector contributes 28.8% of the agricultural GDP. This sector is a good source of nutrition, income, and employment, especially in the rural areas. In fact, livestock-keeping activities contribute to the livelihoods of 28% of Senegalese households (with 20.7% and 7.3% living, respectively, in rural and urban areas). The four main species raised are poultry (27%), sheep (23%), goats (18%), and cattle (12%) (ANSD, 2013). The major constraints to the development of the livestock sector are related to: 1) inadequate pastoral infrastructure, access to water, and feed; 2) inappropriate management of agro-pastoral zones; 3) poor animal health due to the persistence of animal diseases and insufficient health and vaccination coverage; 4) lack of access to markets and poor physical infrastructures, especially for landlocked regions; and 5) limited technology and institutional support for the processing and marketing of livestock products (ANSD, 2017).

There are three livestock systems in Senegal according to the agro-ecological zones and the mode of production (but only the first two are discussed here as most relevant to rural communities): pastoral, agro-pastoral and peri-urban intensive (Paul, 2015). Pastoral livestock systems are more prevalent in the Sahelian zone, notably the Ferlo, which extends to the east of the Peanut Basin, from the Senegal Valley to the Kaolack-Tambacounda-Kayes railway. Pastoral practices are very common among the Fulani ethnic group, whose livelihood relies mainly on livestock. Fulani herds consist of cattle, sheep and goats. Pastoralists live and keep animals in scattered camps and rely on the practice of transhumance to exploit the most remote pastures in search of water points. Agro-pastoral livestock practices consist of a combination of agriculture and livestock (mainly small ruminants). In agro-pastoral households, between 10 and 50% of household income depends on livestock, with crop farming representing the primary source of revenue. Usually agro-pastoralists gradually acquire livestock with the income generated by their farming activities. Sometimes, livestock are entrusted to other shepherds or pastoralists to take them for grazing and away from crop fields. Agro-pastoral farming is more widespread in the peanut basin and mainly practiced by the Serer ethnic groups who master the integration between crop and livestock farming.

The production of poultry farming occupies a different space and is practiced by almost all Senegalese households in the rural areas. However, poultry keeping for commercial purposes is predominant in the Niayes region that extends from Dakar to Saint-Louis (Killebrew et al., 2010). In this region, poultry holders are mostly Fulani or Mandinka (Missohou et al., 2002). The sub sector of poultry is subdivided into traditional poultry farming and modern poultry farming (semi-industrial, industrial). Traditional poultry farming is widespread in many households, and is an important activity for more disadvantaged, vulnerable rural households due to low capital requirements. The traditional systems are based on the natural reproduction of chickens owned by members of the households and raised for self-consumption and sometimes as a source of secondary income. Traditional poultry farming is generally undertaken by women within the household. The number of chickens in a traditional poultry farm is relatively small, about 10 chickens on average. Modern poultry farming (semi-industrial, industrial) is usually practiced by private poultry owners for commercial reasons. Modern poultry farming initially developed from development actions undertaken by the “Centre National Avicole (CNA)” (National Poultry Center) in 1962 and the “Projet de développement des espèces à cycle court (PRODEC)” (Short Cycle Species Development Project) from 1994 to 1998. It is characterized by the production of broilers and layers.

Veterinary services

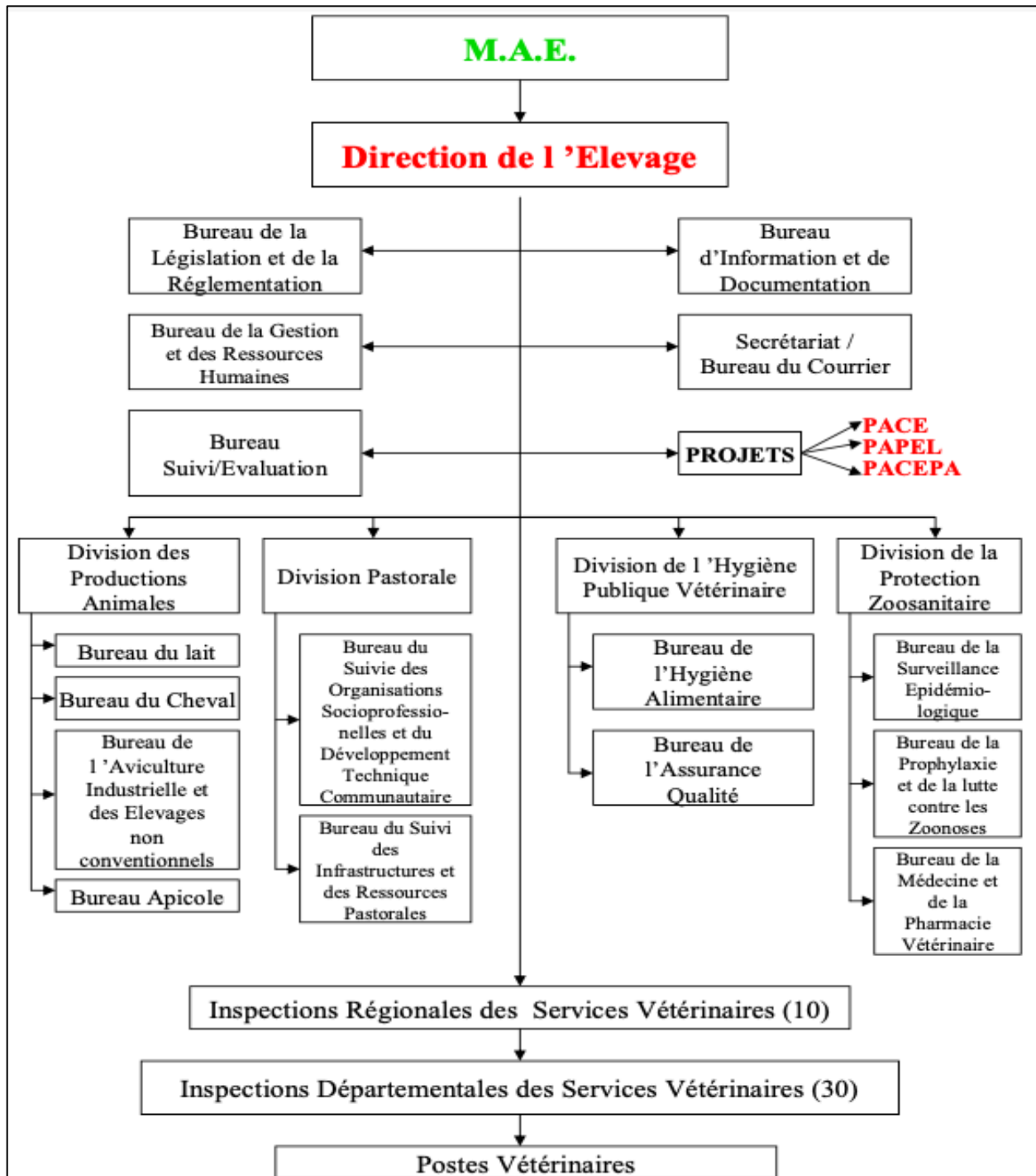
In Senegal, up to 1995 the government was solely in charge of the distribution of veterinary vaccines across the country. In the early 1990s, the veterinary profession underwent significant transformations, due to both the program of voluntary departures in the public service, which induced veterinarians to move to private veterinary services (Official Journal of the Republic of Senegal, 2010), and the reform of the animal health system in Senegal started during the Pan African Rinderpest Campaign (PARC), which supported the privatization of the veterinary services (Paul, 2005). In 1992, the law No. 92-52 of July 10 1992 established the Order of Veterinary Doctors of Senegal (ODVS), which is the regulator of the veterinary sector in Senegal. Finally, in 1995, with the Decree No. 95-645 of 6 July 1995 establishing the health mandate, the government officially granted some of its prerogatives (including collection of prophylaxis of animal diseases, hygiene and sanitary inspection of animals, and distribution of animal products) to private veterinarians. This situation contributes to the current scenario, which sees a greater participation of private veterinarians than the government in both the sales and the distributions of veterinary products. However, since there are very few private veterinarians in remote areas the state remains the main provider in those regions (Gning, 2004).

The Ministry of Livestock and Animal Production (Ministère de L’Élevage et des Productions Animales (MEPA)) is responsible for overseeing the production, import, and distribution of vaccines and other veterinary medicines in Senegal. The Directorate of Livestock (DIREL) is the Department within MEPA appointed to supervise the management of vaccines and other animal health products. In 2017, the Directorate of Veterinary Service reported that more than 93.6% of animal health products (including veterinary drugs and vaccines) were imported from the European Union (MEPA, 2017). 63.3% of veterinary drugs and vaccines are imported from French companies represented by Laprovét (26%), Merial (19.5%) and Ceva Santé Animale (17.8%). 97.24% of veterinary drugs and vaccines are imported by the main wholesalers Senevet (54.4%), Soprodel (25%), Distrivet (11.3%), Sedima (4.58%) and Sosedel (1.96%). The value of imports of veterinary drugs and vaccines in 2017 totalled about US \$4.9 billions. The largest market share (87%) was for imports of vaccines against avian diseases (around 274.7 million doses estimated). Vaccines against Newcastle disease accounted for 41% of imported avian vaccines.

In Senegal, two laboratories are involved in livestock vaccines: the “*Institut Sénégalais de Recherche Agricole (ISRA)*” (Paul, 2015) that produces livestock vaccines, and the “*Laboratoire National d'Elevage et de Recherches Vétérinaires (LNERV)*”, which is in charge of vaccine quality control. In parallel with the national laboratory, and in accordance with the recommendations of the World Organization for Animal Health (OIE), the DIREL strives to develop a network of regional laboratories. In addition to the central organization, the Directorate includes the following decentralized structures (see also Figure 1):

- The Regional Inspectorates of Veterinary Services carry out control and enforcement functions in the veterinary field. Each inspectorate is headed by a veterinary doctor, who may be assisted by a subordinate cadre of scientists and policy makers.
- The Departmental Inspections of Veterinary Services are responsible for assisting the Regional Inspectorates in the implementation of the animal health and public health protection policy, the promotion of animal production, and the development of professional organizations and pastoralism. Their mission is to ensure the implementation of the programs of collective prophylaxis, the inspection of foodstuffs of animal origin, the application of the health police, and the coordination of the network of epidemiological surveillance. These structures are managed by a livestock engineer.
- Veterinary posts: Heads of Veterinary Post, who are trained veterinarians, represent the Regional Inspectorate of veterinary services in the districts and municipalities. Their activities in the field include and are not limited to: execution of vaccination campaigns, inspection of animal products, livestock keeping counseling etc.

Figure 1- Organizational chart of the Ministry of Livestock in Senegal



Source: FAO, 2002

Animal health and disease

In Senegal, livestock diseases have high prevalence due to insufficient animal health service provision and low vaccination coverage, and constitute among the most important barriers to increased livestock productivity (Senagriculture, 2017). In 2005, the World Organization for Animal Health (OIE) provided an overview of a non-exhaustive list of diseases faced by the Senegalese livestock sector throughout

2004. Table 2 shows the list of “*A diseases*”, which are defined as having a high degree of spread and severity. “*A diseases*” have serious socio-economic and health consequences, including a likely negative impact on international trade. The majority of “*A diseases*” reported cases in Senegal was for “Peste des petits ruminants” (231 cases) and “Newcastle disease” (190 cases), which are targeted by the National System for Epidemiological Surveillance of Animal Diseases (NESS) (MEPA, 2017). The total of reported infectious disease outbreaks in 2017 (379 cases) increased by more than 50% compared to 2016 (133 cases). The analysis of the results of 204 of 379 cases examined in laboratory confirmed 118 cases of suspected diseases including “Newcastle disease” (8%) and “Peste des petits ruminants” (7%) among the top five confirmed cases (MEPA, 2017). Figure 2 shows the dominant animal diseases reported in 2017.

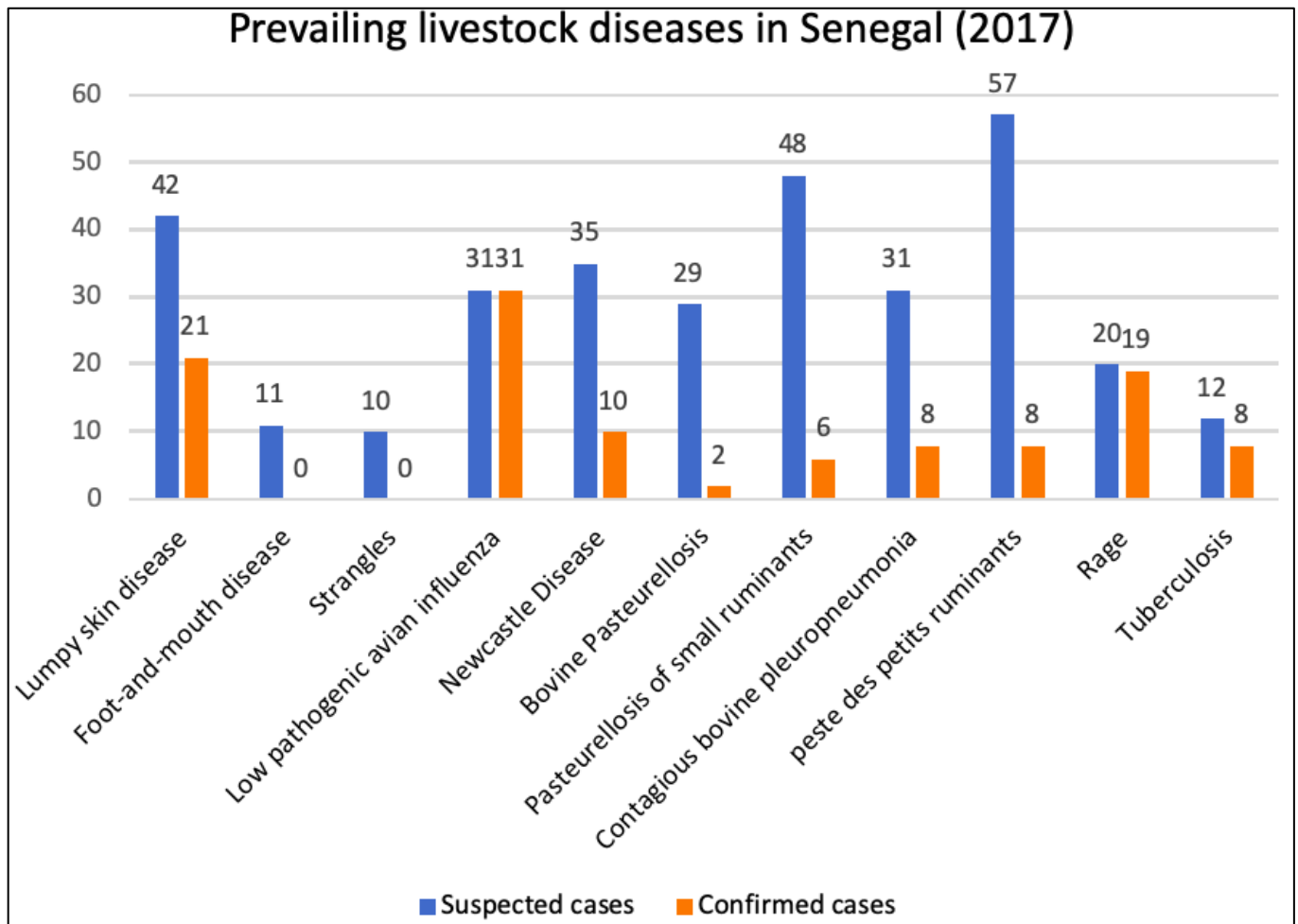
Table 2-Animal health situation in 2004 for Senegal

V: vaccination +: Case reported or known (Year): Date reported for the last time

OIE code	Disease	Occur.	Spe	Number of		
				outbreaks	cases	deaths
	LIST A DISEASES					
A010	Foot and mouth disease	+	bov	5	7	0
A020	Vesicular stomatitis	0000				
A030	Swine vesicular disease	0000				
A040	Rinderpest	(1978)				
A050	Peste des petits ruminants	+	o/c	6	231	49
A060	Contagious bovine pleuropneumonia	(1977)				
A070	Lumpy skin disease	+	bov	2	56	0
A080	Rift Valley fever	+	ovi	1	5	0
A090	Bluetongue	(1995)				
A100	Sheep pox and goat pox	+	o/c	8	79	11
A110	African horse sickness	+	equ	5	5	5
A120	African swine fever	+	sui	1	...	8
A130	Classical swine fever	0000				
A150	Highly pathogenic avian influenza	0000				
A160	Newcastle disease	+	avi	2	190	80

Source: OIE (2016)

Figure 2- Prevailing livestock diseases in Senegal (2017)



Source: MEPA (2017)

Newcastle disease is highly contagious in poultry farming in Senegal (Paul, 2005). This disease is a viral infection caused by paramyxovirus that affects bird species, especially in poultry farms. The virus is spread by direct contact with fluids of infected birds, especially their feces. The incubation period is often between 5 to 6 days, but may vary from 2 to 15 days and death may occur within 24 to 48 days (Paul, 2005). Symptoms of Newcastle include acute fever and respiratory distress, depression, nervous manifestations and diarrhea (Suarez, 2000; Alders & Spradbrow, 2000).

PPR is prevalent in Senegal where it remains in an enzootic (occurs regularly in the country) state. Since the 1970s the number of cases has increased considerably. Goats are more sensitive than sheep. In the 0 to 1-year-old age group, the average mortality rate is 27%. About 20 years ago, the losses caused by PPR, pneumopathies, and internal parasitism in small ruminants were estimated at nearly 13 billion CFA francs per year in the country (Coly, 2002). Studies on the epizootiology of the disease in Senegal highlight its seasonal nature. PPR is more prevalent from November to March and has a preferential geographical distribution along the Atlantic coast. These two characters are very related to climatic conditions.

Gender dynamics and women's role in the livestock sector

Analysis of data from the fourth General Census of Population and Housing, Agriculture and Livestock ("Recensement Général de la Population et de l'Habitat, de l'Agriculture et de l'Elevage" RGPHAE) showed that the majority of agricultural households are headed by men (84.7%), while the remaining 15.3% of households are headed by women (ANSD, 2013). In the same period, the region of Kaffrine had the lowest percentage of female-headed agricultural households of all regions (only 4.8% of the 43,916 agricultural households in this region were headed by women).

Women represent 50% of the agricultural workforce and often are marginalized compared to men. Gender can be a barrier limiting women's access to education, training, agricultural inputs and markets (Jones, 2014). One of the main factors that hinder the participation of women in agriculture and livestock farming is the unequal allocation between the sexes of land and other productive resources (Rubin, 2010). In some ethnic groups such as the Fulani the type of livestock ownership is determined by household members' gender and age. Men usually own draft animals, horses and bulls, while women are more likely to own and be responsible for small ruminants and poultry (Fisher et al., 2000). The fact that women are less likely to own draft animals, like horses and donkeys, makes it more difficult for them to own a traditional cart pulled by a draft animal. This situation hinders the participation of women in rural trade, marketing of agricultural products and access to agricultural inputs.

The participation of women in the livestock sector in Senegal is affected by gender inequalities because of cultural and religious beliefs and practices that limit girls and women's opportunities to participate in the nation's economic and political life (Rubin et al., 2010). The practice of marrying girls at a young age is one of the barriers to women's education. Among women who get married before the age of 18, the proportion of those without any primary education (36%) is higher than the proportion of women still in primary school (20%). The studies of the dynamics of pastoral life and a farming system revealed that families and their herds are bound by the movement of livestock (Ancy et al., 2008). Usually, people are gifted livestock at their birth, circumcision, and marriage, which increases the family's herd. Nowadays, there is a reluctance to give part of the cattle herd to the girls because they are more likely to leave home when they get married. In case of difficulties, girls are the first to lose their rights to the family herd, which creates gender inequality in the movement of cattle.

Table 3-Distribution of heads of farm households by sex and place of residence (ANSD, 2013)

REGION	Urbain				Rural				Ensemble			
	Masculin	%	Féminin	%	Masculin	%	Féminin	%	Masculin	%	Féminin	%
DAKAR	43 819	73,2	16 046	26,8	3 210	85,9	526	14,1	47 029	73,9	16 572	26,1
ZIGUINCHOR	7 868	64,3	4 374	35,7	23 949	79,0	6 349	21,0	31 817	74,8	10 723	25,2
DIOURBEL	4 909	71,3	1 979	28,7	48 493	85,0	8 538	15,0	53 402	83,5	10 517	16,5
SAINT-LOUIS	17 097	71,4	6 836	28,6	39 820	84,6	7 236	15,4	56 917	80,2	14 072	19,8
TAMBA	6 042	78,8	1 627	21,2	37 492	94,2	2 322	5,8	43 534	91,7	3 949	8,3
KAOLACK	8 484	72,7	3 179	27,3	43 584	93,8	2 884	6,2	52 068	89,6	6 063	10,4
THIES	22 283	74,7	7 547	25,3	57 999	86,9	8 758	13,1	80 282	83,1	16 305	16,9
LOUGA	6 525	69,7	2 830	30,3	56 702	90,5	5 974	9,5	63 227	87,8	8 804	12,2
FATICK	4 930	69,5	2 165	30,5	43 151	85,5	7 322	14,5	48 081	83,5	9 487	16,5
KOLDA	8 482	82,1	1 851	17,9	38 992	95,7	1 772	4,3	47 474	92,9	3 623	7,1
MATAM	5 568	74,2	1 939	25,8	28 422	80,8	6 758	19,2	33 990	79,6	8 697	20,4
KAFFRINE	3 665	83,8	711	16,2	38 163	96,5	1 377	3,5	41 828	95,2	2 088	4,8
KEDOUGOU	1 877	80,4	458	19,6	9 481	91,8	848	8,2	11 358	89,7	1 306	10,3
SEDHIOU	4 048	81,0	947	19,0	25 140	92,0	2 184	8,0	29 188	90,3	3 131	9,7
SENEGAL	145 597	73,5	52 489	26,5	494 598	88,7	62 848	11,3	640 195	84,7	115 337	15,3

Source: ANSD (2013)

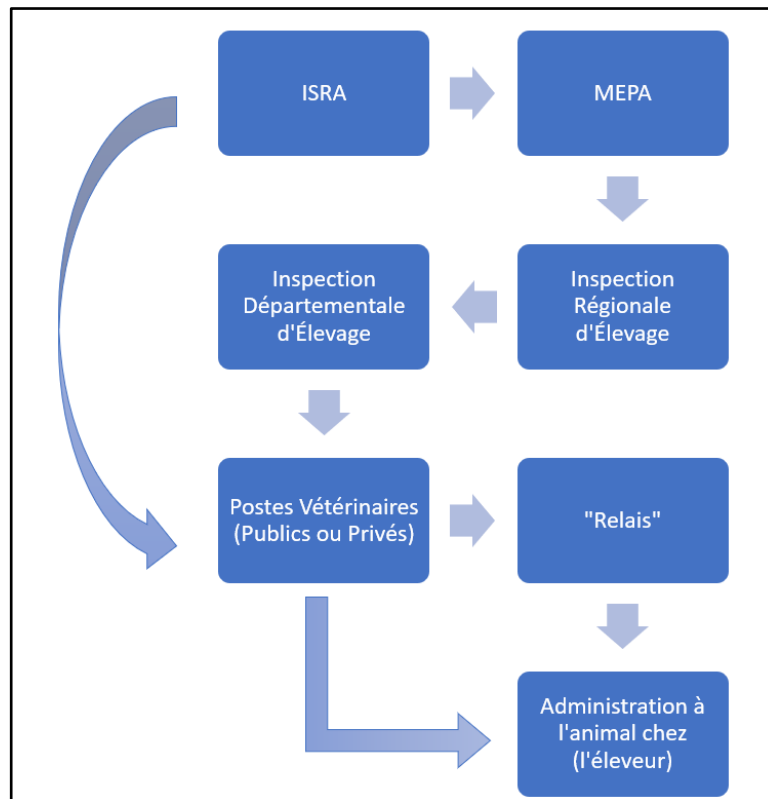
Emerging issues in the PPR and ND Vaccine Value Chains

Vaccination is one of the most conventional ways for controlling the prevalence of livestock disease, including ND and PPR. Controlling livestock diseases has important implications on rural livelihoods that depend fully or in part on livestock production. Improving animal health in these households can affect the overall food security and well-being of the household. This is why the Ministry of Livestock encourages and is promoting availability, accessibility, and acceptance of vaccines across the country. This section will describe the value chains for PPR and ND vaccines in Senegal. We first describe the overall vaccine distribution system in Senegal, along with actors working in each LVVC (both PPR and ND). Then, for each animal disease vaccine, we describe the specifics of the vaccine distribution system for that vaccine, farmer perceptions (where available), barriers to vaccine utilization, and gender dynamics of the vaccine. These findings come from both literature and field work, as described in the method section above.

The LVVC are deeply embedded in the veterinary service structure described above. The Ministry of Livestock and Animal Production (Ministère de l'Elevage et des Productions Animales (MEPA)) is the Government of Senegal's institution with overall responsibility for intervening in the livestock sector to modernize and intensify animal production systems. To meet the challenges of the livestock sector, MEPA has services such as the Directorate of Livestock (DIREL) and the Directorate of Veterinary Services (DSV) among others. DIREL is responsible for several functions, among which, the development of strategies and the implementation of action plans for the security of pastoral livestock, and the modernization of Animal Production Systems. The Directorate of Veterinary Services (DSV) has several functions, including the implementation and coordination of measures relating to the protection of

livestock and prevention of livestock diseases. The Senegalese Institute for Agricultural Research (Institut Sénégalais de Recherches Agricoles (ISRA)) is the national agricultural research organization, which is now part of the Ministry of Agriculture, but has its own board of directors. One of the main areas of research of ISRA is animal health and production. This area of research is mainly supported by one of the ISRA bodies called “Laboratoire National d'Élevage et de Recherches Vétérinaires (LNERV)”. Through this research, LNERV participates in the production of livestock vaccines against a number of animal diseases, including PPR and ND.

Figure 3- Vaccine distribution system during annual vaccination campaign



Source - Fieldwork in Senegal (Summer 2019)

PPR Vaccine

There is one PPR vaccine available in Senegal, often referred to as PPR/H, which is produced by ISRA. Farmers expressed overall positive views of livestock vaccines in Kaffrine, including PPR/H. All farmers that were interviewed or took part in focus group discussions reported having their sheep and goats vaccinated against PPR during the vaccination campaign that takes place each year.

In Kaffrine, the structure for delivery of livestock services clearly delineated from the regional services all the way to the veterinary services posts and the private veterinarians (see Figure 3). The regional service for livestock receives the PPR vaccines directly from the government (ISRA). The vaccine is then sent to the Departmental Services for Livestock (there are four of those in Kaffrine: Kaffrine, Birkilane, Malem Hodar, and Kounghoul), which then distributes the vaccine to the veterinary services posts in the districts and the private veterinarians who are mandataries of the government. Below the veterinarian, the bottom part of the VC is less organized. The veterinarians do not have graduate personnel that are trained well

enough to assist them in procedures that require intensive care. They mainly rely on independent associates who are called relay agents. The relay agents are given the PPR/H vaccines during the annual vaccination campaign and administer them for the livestock keepers for a small convenience fee, which they can retain in its entirety. However, the relay agents are only qualified to handle poultry vaccines, given that they have not received the proper training to handle small ruminant vaccines such as PPR/H. There are many constraints challenging the animal health professionals. Among those challenges are the ruptures in vaccine procurement, lack of transportation, transhumance of some herds, lack of sufficiently trained personnel, lack of formal training for the relay agents and difficulty preserving the cold chain in a tropical climate. Beneficiaries of the livestock vaccine value chain also face certain challenges among which are: the affordability of the vaccines in a poor community, access problems due to remote locales and lack of community animal health workers etc. Despite women being well-represented among livestock holders of both small ruminants, there are no women involved in the administration of PPR vaccine in the region, apart from one veterinary services post chief in Boulel, Kaffrine. PPR vaccine is handled by veterinarians who are primarily men in the region. At the highest level of the regional livestock hierarchy of Kaffrine (Regional Inspectorates of Veterinary Services), sits a woman who is the representative of the Ministry of Livestock and Animal Production in the region; her role is to oversee and activity regarding livestock in Kaffrine. In Kaffrine, the majority of women are involved in livestock whether it is in household management and production or their vaccination; however, the concept of responsibility concerning livestock at the household level remains ambiguous.

The literature concerning the livestock systems and actors in Senegal identifies many links in the value chain. There are veterinary paraprofessionals or paravets, who are the designated engineers of the livestock works, and the technical agents of livestock; they do not hold a graduate degree in veterinary medicine, but some are highly trained professionals. Then, there are the traditional practitioners, who in turn are supposed to be the first interlocutors of livestock keepers in matters of animal health. Finally, there are the livestock keepers' groups that play a very important role in the approach to livestock modernization and development. These actors, while well-known from other sources, were not found in the field. Not a single key informant or FGD participant mentioned their presence in the region. The lack of confirmation upon the existence of those entities represent a gap in this research and a priority for ongoing field work.

Additionally, the district of Kounghoul was left untouched; therefore, the results provided are not necessarily representative of the entire region of Kaffrine, and ongoing fieldwork will focus on representation of this district. When assessing results presented here, it is important to take this into consideration, because Kounghoul is a large district with extensive livestock activities, including increased prevalence of pastoralism compared to the other three districts. Other gaps to fill in ongoing fieldwork is an estimate of the number of small ruminants that come to Kaffrine from neighboring countries, since experts mentioned that trade and transhumance are conduits for the introduction of new cases of diseases each year in the region; however the magnitude of this additional burden is not known. There was also lack of consensus on which disease was the number one burden of animal health (small ruminants) in Kaffrine. While most claimed that it was Peste des Petits Ruminants (PPR), others think it is Pasteurellose. These aspects will be investigated in ongoing field work.

Perhaps the most significant gap in both the literature and field work concerns gender dynamics. The most difficult aspect of data collection was respondents' reluctance to engage in discussions concerning gender and women's role in livestock vaccination or livestock production. Respondents did not want to elaborate when questions were asked; they would just give short answers to open-ended questions, with

clear indication that they do not want to go into detail on the matter. The team has worked to revise questions, develop more open ended thematic questions, and overall work creatively to ask the essential questions in a way that is more culturally appropriate and salient to the population of respondents. Specifically, respondents seemed to not like the questions that attempted to understand marginalization or discrimination along ethnic, gender, or socioeconomic lines. They would give short answers like “it’s the same for everyone” to all those questions. Given the dearth of information on gender and intersectionality in the LVVC and wider gender dynamics in the region, this will prove to be one of the most important gaps our research aims to fill.

Newcastle disease (ND)

In Senegal, the vaccines that are primarily used against ND include: I2, ITA-new, and HB1. I2 is a live thermostable vaccine produced in Senegal by ISRA and administered orally or by eye drop. In a live vaccine, the virus has been weakened (the pathogen is still alive) to stop it from causing the disease it usually causes, but is sufficient to trigger immune response, thus protecting the animal from future disease. I2 is the only vaccine funded and distributed by the government during the annual livestock vaccination campaign. ITA-new and HB1 are imported by a wholesaler from foreign laboratories, most of which are located in Europe. ITA-new is also used during the annual livestock vaccination campaign, but this vaccine is funded by other organizations/projects in the livestock sector. ITA-new is an inactivated vaccine that is administered by injection subcutaneously (under the skin of the neck) or intramuscularly (breast or thigh muscles). In an inactivated vaccine, the pathogens lose disease-producing capacity. HB1, the third vaccine against ND available in Senegal, is also a live vaccine, and it is mainly used by private poultry companies such as SEDIMA. The HB1 vaccine is administered through drinking water or coarse aerosol spray.

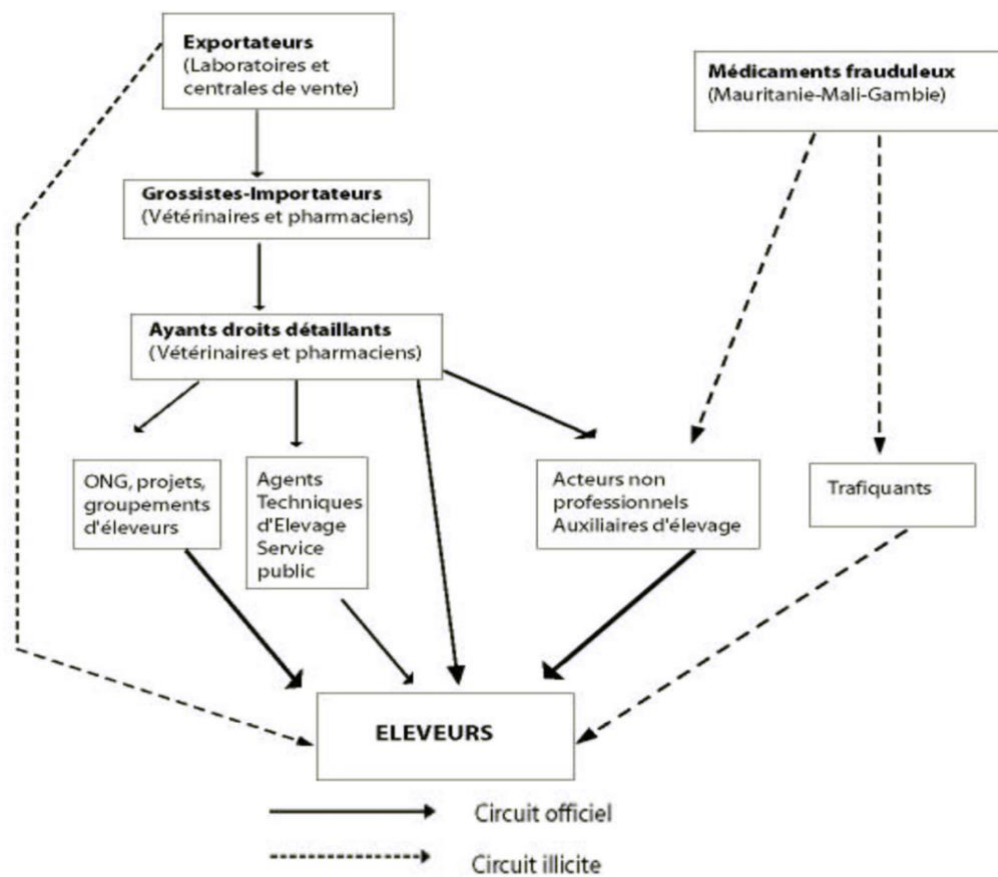
There are two main ND vaccine distribution systems in Senegal. The first distribution system, mainly used for vaccines produced in Senegal, is most commonly used for those vaccines distributed during the annual vaccination campaign or accessed by traditional poultry owners (see more detail on traditional poultry below). The second distribution system is mainly used for vaccines that are imported by the private veterinary sector.

In the first system, ISRA supplies the vaccine. From there, MEPA orders vaccines 1-2 months prior to the annual campaign through the Directorate of Veterinary Services (DSV). ISRA then transports the vaccines to the regional livestock services with refrigerated trucks, or regional services may pick up vaccines at ISRA or MEPA in their cars with coolers and store them in refrigerators at their office location. Departmental livestock services then collect the vaccines from regional services with coolers. From there, an agent at the veterinary station will typically collect the vaccines, and the animal health relay agents will pick up vaccines from the veterinary stations. At all times, collection is made using a cooler. Finally, the chief of the veterinary station, the relay agents, or auxiliaries/CAHW will go to households in a designated area to administer poultry vaccines. These are almost all distributed to traditional poultry farmers. The second distribution system of ND vaccine is the one used by the private veterinary sector, in which the vaccines may be imported or produced. In this system, depicted in Figure 5 below, there are both official and informal distribution routes (Paul, 2005). The official distribution channel is mainly dominated by the private veterinary sector (such as Laborex, Cophase, Sodepa, Sosodel, etc.), which distributes the vaccines to wholesale pharmacists and/or veterinarians, who then supply the vaccine to the retail pharmacists and/or veterinarians. The retail pharmacists and/or veterinarians are in charge of direct delivery to the livestock owners/keepers, or indirectly through intermediate entities such as NGOs, CAHWs, and others. There is also an informal distribution channel that mainly imports veterinary products (such as Oufino and Ivermectin) from neighboring countries

and uses non-professional actors to deliver the veterinary products to the end-users. The informal distribution channel is identified as one of the major obstacles for the distribution of standardized veterinary products.

Figure 4 is a representation of the distribution circuit for veterinary inputs including vaccines in the Linguere District, with the main importers of vaccines on top of the diagram (Coly et al., 2002).

Figure 4-Organization of veterinary drug distribution channels in Senegal



Source: Paul (2005)

There are two major categories of poultry farmers: traditional poultry farmers, who use traditional hen house and traditional poultry production practices, with a production capacity from 10 to a few hundreds of chickens; and industrial or semi-industrial poultry farmers, who use modern facilities with a production capacity of tens of thousands of chickens.

Both traditional and industrial/semi-industrial poultry farmers vaccinate their chickens against diseases such as Newcastle disease. Traditional poultry farmers usually wait for the annual vaccination campaign to vaccinate their chickens. Most of them think it is important to vaccinate their chickens, however some of them are reluctant due to bad experience with vaccination, during which they lost their chickens a few days after vaccination. These bad experiences led them to believe that the vaccines had killed their chickens. They also believe that the ITA-new vaccine (imported) is more efficient than the I2 vaccine

(produced by ISRA), because, for the prevention against Newcastle, ITA-new could be given to the chickens only once or twice a year. Whereas a I2 requires three boosters after the first administration, and the vial of vaccine loses effectiveness every day after being prepared. Industrial or semi-industrial poultry farmers see vaccination as highly important and vaccinate their chickens regularly according to guidelines for prophylaxis. They prefer to use HB1, because it can be administered more conveniently to a high number of birds (through water or aerosolized). However, other vaccines, including LaSota, CEVAC Broiler ND K, and ITA-new are used by SEDIMA to prevent ND.

Fieldwork interviews and FGDs identified a number of obstacles that hinder the utilization of vaccines by poultry owners in Senegal. These obstacles reflect constraints across the entire vaccine value chain – from the producer to the consumer. Starting at the producer level, one constraint is the insufficient amount of vaccine available during the annual vaccination campaign. According to ISRA, the main constraint to producing I2 vaccine is related to limited access to eggs that are Special Pathogen Free (SPF), which is the essential input for the development of I2 vaccines. From there, during the vaccination campaign, both the location of some remote village and the low level of means of transport (such as motorcycle, vehicle) make it difficult for vaccinators or auxiliaries to go to these remote villages. Thus, location and level of isolation presents another barrier to access. In some villages of the region of Kaffrine, there is very limited access to veterinary services or to agents who know how to use vaccines. In addition, there is a limited number of veterinarians (1) and CAHWs (around 4) available during vaccination period for an entire village. As you move to the household level, another barrier or constraint to vaccination is cost. The vaccination fees paid by livestock keepers are 30 CFA francs during annual livestock vaccination campaign and 50 CFA francs outside of annual livestock vaccination campaign. Even this relatively small amount may be cost prohibitive for some vulnerable households. Others may simply be reluctant to vaccinate due to lack of confidence in vaccination and veterinarians. Some farmers may prefer to seek services from a traditional animal health practitioner. Families who have relied on traditional poultry production for a long time tend to use traditional medicine instead of consulting a veterinarian or using vaccines. Which leads to the final constraint, which is an overall lack of understanding of the importance of vaccination among the majority of vulnerable people in the population. This prevents them from being persuaded to have their poultry vaccinated. Poultry keepers become very pessimistic about the benefits of vaccination whenever some of their chickens die after being vaccinated. This situation also creates a lack of trust in vaccination among poultry keepers.

Women have a higher participation than men in traditional backyard poultry keeping. They are responsible for taking care of the poultry with the obligation to inform, or seek permission from, their husbands (when they are married) regarding decision related to poultry vaccination. Women play a major role in the prevention of Newcastle disease because, in the rural communities, they are more likely to receive training as vaccinators or auxiliary agents or as relays for the administration of vaccines such as I2 and ITA-new against Newcastle disease. However, it is easier for men who are vaccinators or auxiliaries or relay agents to go far from one village to another, while women are usually confined to the first neighboring village due to cultural traditions that limits their use of motorcycles. According to seven doctors veterinarians we interviewed in Dakar and Kaffrine, it is more convenient for women to use I2 vaccine, because I-2 is a thermostable live vaccine administered orally or by eye drops.

Projects and initiatives for improving the livestock vaccine value chain

MEPA has two main projects that are involved in the poultry vaccine value chain. The first is the “Projet d’Appui de Sécurité Alimentaire Louga, Matam et kaffrine (PASA LouMaKaf)”, which contributed to the construction of vaccination centers, poultry houses, funding for ND vaccines, training sessions for women on vaccination techniques against ND. The “Projet d’Appui aux Filières Agricoles –

Extension (PAFA-E)” provides funding for Newcastle vaccines to poultry owners who are beneficiaries of the project. PAFA-E has a gender expert who works on strategies to integrate gender and prioritize the most vulnerable (women and youth) in the selection of PAFA-E beneficiaries.

In addition, there is an organization created to assist the integration of women who are interested in livestock keeping. The National Directory of Women in Livestock (DINFEL) was created on August 2, 2002 in Louga after a forum organized by livestock farmers. It has 20,000 members in all 14 regions of Senegal, who are livestock keepers, tanners, poultry keepers, beekeepers, milk processors, etc. Since 2003, DINFEL has specialized in the collection, processing and distribution of dairy products but remains active in many other areas. Its objectives are as follows: to help build the capacity of women farmers in Senegal through training, ensure the representation of women in livestock breeding institutions and partners, support and assist the institutional and organizational development of its structures base, inform and raise awareness for women in livestock keeping. In particular, DINFEL aims to facilitate access to credit, promote functional literacy, market and promote livestock products, provide support for equipment that lightens women’s work and production in relation to the risks related to their activities, to create databases, and to provide training in management, economics, exploitation, collective equipment, advocacy, etc.

At the administrative level of each region, DINFEL is represented by a regional directorate (association or GIE), which is member of the national executive board. The Regional directorate for women in livestock (*Directoire Régional des Femmes en Elevage* (DIRFEL)) participates in outreach activities and provides chicken to women in the Kaffrine region to promote women’s participation in poultry keeping and financial empowerment. DIRFEL also encourages women to participate in training to become community vaccinator, auxiliary or relay agent.

Gap analysis identified for increasing women’s engagement in and benefit from the LVVC

Livestock keeping is often viewed as men’s livelihood; however, women have for a long time fulfilled many key roles in livestock care and management, and they are increasingly turning towards livestock farming nowadays. In many villages and communities in Kaffrine, women who own poultry and small ruminants outnumber men owners. Nonetheless, gendered barriers still exist, which intersect with barriers due to geographical location, demographic and socio-economic factors, preventing some individuals from accessing to and using vaccine, as well as participating in other nodes of the value chain.

Specific gaps identified by actor node are included in Annex 3 and will inform ongoing field work and be included in final mapping deliverables for the region. On the basis of the information collected from secondary sources as well as very preliminary fieldwork, this report points to several gaps that are in the ways of increasing women’s engagement in, and benefits from, the LVVC for ND and PPR in Senegal and specifically in Kaffrine:

1. Lack of understanding and information about the function of vaccines, and the differences between the vaccine options; lack of sensitization about the importance to vaccinate livestock on time according to prophylaxis programs communicated by veterinarians and the vaccination techniques;
2. Limited reach of vaccination campaigns or vaccination services due to physical location and geographical distance (especially for remote areas) and the factors of mobility and transhumance, some of which are tied to livelihood, ethnicity, and gender;

3. Complex intra-household dynamics, whereby even when women have ownership or primary care of animals, vaccination is considered to be in the men's decision-making realms;
4. Insufficient training opportunities for vets, paravets, and auxiliaries in the VVC; with remote and rural areas suffering from a dearth of qualified personnel. Even while a new veterinary school has been established in Kaffrine (Universite de Sine Saloum) and many girls are enrolled, the question arises as to whether there is a possible mismatch between the demand and supply of veterinary personnel.
5. Insufficient business infrastructure, including lack of access to credit, for veterinary or auxiliary personnel to perform their services; women may be particularly disadvantaged from the lack of infrastructure, which compound with social norms, which for instance limit their ability to use motorcycles (which men rely on to move from village to village).

Limitations of the fieldwork

Fieldwork was limited by time, thus a minimum number of interviews and focus groups with the participants at all the different nodes of the LVVC were pursued. The fieldwork took place during an unfavorable period (July and August) to meet farmers, as it is the rainy season during which farmers carry out agricultural fieldwork. The fieldwork coincided with Eid Al Adha, and many authorities key to this value chain were preoccupied by it and hence did not have time to meet for key informant interviews. In addition, since the annual vaccination campaign period is usually from November to March, we will consider this period for future fieldwork, because we will have more opportunity for interviewing a larger group of actors in the LVVC, as well as to observe a vaccination campaign. As indicated previously in the discussion of PPR, participants were not comfortable talking about gender issues and women's empowerment. It was difficult to obtain transparent answers and opinions regarding the concept of gender and women's empowerment. In addition, it was sometimes difficult to get elaborate answers on how socioeconomic status influences potential vaccine distribution disparities. Respondents (both male and female) avoided those questions or just gave tentative answers to then move to the next question as fast as possible. Maybe it was how the questions were formulated, that men were asking the questions, or that it is just a sensitive subject in those communities. In addition, in group discussions, we now realize it is important to have both facilitators who understand Wolof for better note-taking and to reduce the loss of content during data translation into French. Finally, it is important to ensure that all team members understand how to use the research instruments to reduce biases during data collection activities

Conclusions

Livestock plays a key role in the Senegalese society and has an important contribution to the sector of agriculture. Women work along with men in many aspects concerning the care and management of livestock, however they have low say and a more limited role when it comes to important decisions, including those regarding vaccination, especially for some species (much less so in the case of poultry than for small ruminant). Furthermore, since women especially in the rural areas are less educated than men, this hinders their overall engagement at the highest level of the livestock vaccine value chain. Cultural norms including those limiting access to property and capital for women are among the obstacles that prevent women from participating at a larger scale in livestock activities. In rural areas like Kaffrine, both lack of information about the benefits of livestock vaccination and lack of power over the household's income, have a negative impact on women's access to vaccines. There are many key actors and nodes in the livestock vaccine value chain, and it is necessary to gather further information about the

potential factors that are obstacles to an increasing participation of women at the decision-making levels of each nod

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Annex 1: Organizations and projects participating in the LVVC (poultry)

Organization	Project	Type of organization	Contact information (name, title, phone and email)
MEPA	PAFA-E	Public	Fatou Kine TALL, Head of PAFA-E project in Kaffrine, +221 77 653 27 56, fatoukinetall031@gmail.com
MEPA	PASA LouMaKaf	Public	Fatou KA, Head of Regional Livestock Service at Kaffrine, +221 77 647 94 12
DIRFEL		Public	Coumba SECK, President of the Regional Directorate of Women in Livestock at Malem Hodar, +221 77 177 82 39
ISRA		Public	Dr Yaya Thiongane, Director of the research unit at “ISRA-Production Vaccins”, +221 33 832 27 62 +221 77 642 97 54 yaya.thiongane@isra.sn yayathiongane@hotmail.fr
LENERV			

Annex 2: Key stakeholders and contacts in the LVVC

Name	Title	Contact information (phone, email)	Organization
Dr Yaya Thiongane	Director of the research unit at “ISRA-Production Vaccins”	yaya.thiongane@isra.sn yayathiongane@hotmail.fr +221 33 832 27 62 +221 77 642 97 54	ISRA-Production Vaccins
Coumba SECK	President of the Regional Directorate of Women in Livestock at Malem Hodar	+221 77 177 82 39	“Directoire Régional des Femme en Élevage (DIREFEL)” at Malem Hodar
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Dr Abdoulaye SOUMBOUNDOU	General Secretary of “Ordre des Docteurs Vétérinaires Sénégal (ODVS)” Representative of “CEVAC Santé Animale”	abdoulie@live.fr +221 77 445 5685	- ODVS - “CEVAC Santé Animale”
Dr Mamadou BA	Vetoquinol advisor Technical Veterinary Support at SEDIMA	mamadou.ba@sedima.com +221 77 638 6818	- Vetoquinol - SEDIMA
Fatou Kine TALL	Head of PAFA-E project in Kaffrine	fatoukinetall031@gmail.com +221 77 653 27 56	PAFA-E project in Kaffrine
Dr Ibra DIAW	Inspector of Livestock Department at Malhem Hodar	+221 77 542 29 25	Livestock Department at Malhem Hodar
Sidy Dieng	Head of public veterinary station/office at Gniby	+221 77 293 50 91	public veterinary station/office at Gniby
C Catherine Rose Emilie COLY	Head of public veterinary station/office at Boulél	+221 77 365 17 83	Livestock Service Department at Boulél
Dr Assane DIOP	Manager of Baye Niass Vet Shop at Kaffrine	+221 77 326 00 89	Baye Niass Vet Shop at Kaffrine
Codou FAYE	General Secretary of the Group for the Promotion of Women	+221 77 618 68 46	“Groupement pour la Promotion de la Femme” (Group for the Promotion of Women)
Dr Imam THIAM	President of the “Ordre des Docteurs Vétérinaires du Sénégal (ODVS)” Owner of “VETASSISTANCE” Vet Shop	imam40gig@yahoo.fr +221 77 654 3770	- ODVS - VETASSISTANCE
Dr Fatou KA	Head of Regional Livestock Service at Kaffrine	+221 77 647 94 12	Regional Livestock Service at Kaffrine

Annex 3: Summary findings of gap analysis for increasing women's engagement in and benefit from the LVVC

Actors	Major Gaps in Knowledge	Vaccine Value Chain Gaps
ISRA (LNERV)	<p>ISRA's strategy to ensure there are enough livestock vaccines that are produced for all the country.</p> <p>Barriers and difficulties that they face during annual vaccination campaign.</p>	<p>Absence of a particular project centered in getting more women involved in the vaccine value chain.</p> <p>Why ISRA does not produce ITA-New and HB1 vaccines against ND, which livestock keepers prefer more than I2?</p> <p>How does ISRA determine the prices of its vaccines?</p>
<i>Node</i>		<p>Process of selling vaccines to other livestock vaccine stakeholders.</p> <p>Process to do quality control of livestock vaccines.</p> <p>Inspection mechanism in place to ensure the respect of the cold chain during vaccine distribution.</p>
MEPA (DIREL, DSV)	<p>Mechanism to ensure vaccination coverage for livestock across all the country during annual vaccination campaign.</p> <p>Policies and budget related to annual vaccination campaign.</p>	<p>Inspection mechanism in place to ensure each actors respect their roles in the livestock vaccine value chain.</p> <p>Process to regulate the prices of vaccines.</p>
<i>Node</i>	Policy for veterinary practitioners and veterinary Services	
ODVS	Strategy to increase livestock keepers' confidence in veterinary services and vaccine acceptance.	The role of gender regarding the delivery of official authorization to buy vaccines from the primary distributor.
<i>Node</i>	Obstacles and difficulties in regulating veterinary services.	Is ODVS involved in any decision making regarding the vaccines used during the campaign?

Regional Livestock Service	Process of allocation of vaccines to the different departments.	<p>What is the difference in the level of participation between men and women in the Regional Livestock Service?</p> <p>How does this difference affect the gender dynamics in the Livestock Vaccine Value Chain at the regional level?</p> <p>Lack of adequate number of technical staff.</p> <p>High dependency on public and external funding.</p>
<i>Node</i>	Distribution to Departmental Livestock Service	Lack of infrastructure to store livestock vaccines and maintain the cold chain.
Departmental Livestock Service	Process of allocation of vaccines to the different veterinary stations.	<p>What is the difference in the level of participation between men and women in the Departmental Livestock Service?</p> <p>How does this difference affect the gender dynamics in the Livestock Vaccine Value Chain at the departmental level?</p> <p>Lack of adequate number of technical staff and technical competence.</p> <p>High dependency on public and external funding.</p>
<i>Node</i>	Distribution to District Veterinary Office	Lack of infrastructure to store livestock vaccines and maintain the cold chain.
District Veterinary Office	Process of allocation of vaccines to the different villages.	<p>What is the difference in the level of participation between men and women in the District Veterinary Office?</p> <p>How does this difference affect the gender dynamics in the Livestock Vaccine Value Chain at the district level?</p> <p>Lack of reliable transportation to reach remote communities.</p> <p>Lack of infrastructure to store livestock vaccines and maintain the cold chain.</p>

		<p>Lack of trained personnel to assist with vaccinations requiring injections.</p> <p>Ruptures in vaccine acquisition.</p>
<i>Node</i>	Selection criteria for auxiliaries and relay agents	Training of auxiliaries
Auxiliaries and relay agents	<p>Qualifications and training required to become an auxiliaries / relay agents.</p> <p>Gender distribution of auxiliaries in all four departments.</p>	<p>Lack of reliable transportation to reach remote communities.</p> <p>Lack of infrastructure to store livestock vaccines and maintain the cold chain.</p> <p>Insufficient auxiliaries / relay agents to cover vaccination in all villages.</p>
<i>Node</i>	Auxiliaries might not be qualified enough to inform livestock keepers about the effectiveness of vaccines adequately.	The way the gender of a livestock keeper may influence the quality of service that will be offered by auxiliaries or relay agents.
Livestock Keepers	<p>Lack of information about vaccines and vaccination techniques.</p> <p>Lack of understanding and information about the function of vaccines, and the differences between the vaccine options.</p> <p>Lack of sensitization about the importance to vaccinate livestock on time according to prophylaxis programs communicated by veterinarians and the vaccination techniques.</p>	<p>The influence of gender on the level of awareness among livestock keepers to the correct and safe use of vaccines.</p> <p>Social norms that limit women's participation in annual vaccination campaign.</p>
Others (agro-vet shop owners, vet-store owners, other private actors supplying vaccines)	Insufficient business infrastructure, including lack of access to credit, for veterinary or auxiliary personnel to perform their services.	<p>Absence of vet shops in most villages.</p> <p>Difficulties and advantages for acquiring, and distributing livestock vaccines.</p>
NGO and other international actors	Uncertainty of existence of NGO and other international actors that work in the Livestock Vaccine Value Chains in Kaffrine.	