

# Dynamics of transhumant livestock systems in West African coastal countries: A review

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## Abstract

Pastoral mobility occupies an important place in the West African livestock sector. Despite its importance, the transhumant livestock system still faces serious constraints that threaten its productive base. Thus, we carried out a systematic review using the PRISMA method in order to document the scientific knowledge on the dynamics of the transhumant livestock system and the factors of its transformation, and to finally identify the prospects for research. Thus, 64 peer-reviewed scientific articles in French and English between 2011 and 2020 dealing with the evolution of transhumance were used. However, the literature has made it possible to distinguish four evolutions of the following transhumant livestock systems: agropastoralism, the semi-intensive system, Ranching and Neo-pastoralism. This ongoing transformation is due to environmental, socio-economic and political factors. The reduction of grazing areas linked to the extension of cultivated areas, the cultural occupation of pastoral areas, the appearance of new diseases, conflicts between actors, etc. lead to difficulties of livestock mobility and access to natural resources. This access vulnerability is accentuated with the environmental and socio-political crises that Africa is going through. The new issues and challenges for transhumant pastoralism in West African coastal countries are population growth, monetarization and decentralization. Beyond decentralization, the problem of land and modes of access to land remains a concern in a context of redefining local powers.

**Keywords:** Pastoralism; Evolution; Challenges; West Africa; Coastal countries.

## Introduction

Throughout the world, livestock plays an essential role after agriculture and constitutes a means of capitalization in the family economy, as well as food and financial security, especially for poor households (Richard et al., 2019). It is the main insurance against risks related to rainfed agriculture (Kamuanga et al., 2008). Its contribution is 8 to 15% to the GDP of West African countries (Eboh et al., 2004), while remaining traditional, extensive, with productivity linked to the availability of pastoral resources, which controls the mobility of herds and determines nomadic or transhumant production modes.

In the States of the Sahel and West Africa, pastoral societies are exposed to uncertainties linked to the great variability of pastoral resources offered by natural environments (Marty et al., 2006; Toutain, 2001). Mobility is an essential condition in ecosystems marked by change and hazards, with diverse productive trajectories for a herd to adapt well within a system (Sauvant and Martin, 2010). It is also reasoned to make the most of the conditions of exchange between livestock and cereals, particularly in agricultural areas, including coastal countries. The breeders' logic of movement is not fixed and the practices and strategies are diversified in the face of fodder reduction (Djenontin et al., 2009; Idrissou et al., 2020). The distance traveled by these breeders is increasing and oriented towards the south. These movements change from one season to another depending on climatic conditions, the availability and distribution of pastoral resources in the host areas (Diop et al., 2012; Kitchell et al., 2014).

Despite these uncertainties, livestock numbers, during the period from 1974 to 2014, increased significantly in southern countries (FAOSTAT, 2018). This results from the increase in the herds of pastoralists and agropastoralists and also from the demands both for animal products and for labor and manure inputs in agropastoral systems (Ayantunde et al., 2014; Richard et al., 2019). It also corroborates with an occupation of pastoral areas, which modified the sanitary environment of animals, reducing the risk of trypanosomiasis, and allowed access to fodder resources in areas of sub-humid zones, little frequented by breeders before 1974 (Richard et al., 2019). This results in a closer cohabitation as soon as the animal densities are not high, a certain convergence of the strategies of adaptation and management of the herds, but also a competition for the land and for the resources between the stockbreeders and the farmers (Idrissou et al., 2020; Sanou et al., 2018). During the balance of power between the various actors, how do transhumant herders modify their spatial practices to adapt to the new constraints of saturation of spaces by agriculture? Spatial competition to which herders are subjected is a new study topic in research on pastoralism (Hagmann and Ifejika Speranza, 2010).

In various southern countries and parts of Africa, many farming systems have been described. Changes are observed and will continue in the decades to come, as shown by the analysis of the dynamics of livestock systems carried out by Herrero et al. (2008). This situation has had an impact on the production systems in place and on the way of allocating production factors for this purpose as well as on the relationship between man and his environment (Guengant et al., 2003). All these factors combined have led to profound changes in the management of livestock farming in sub-Saharan Africa, particularly in the West African coastal countries. This traditional eco-climatic complementarity of ecosystems is called into question by the major changes underway. It is therefore necessary to address the viability of pastoral systems and livestock sectors at a time when livestock production issues are being strongly debated. It is also necessary to question the implementation of new support methods for transhumant and sedentary herders in changing socioeconomic contexts. The dynamics of ruminant farming in Africa thus raise new questions that should be answered by operational proposals based on original approaches. This literature review systematically documents the available knowledge on the evolution of transhumant livestock systems in West African coastal countries. Hence, the aim of this review was to provide relevant and updated information on the evolutionary trends of transhumant pastoral systems; (2) to identify the determining factors of this evolution; and (3) to highlight the issues and challenges of this change on the social, economic and natural environment.

## Materials and methods

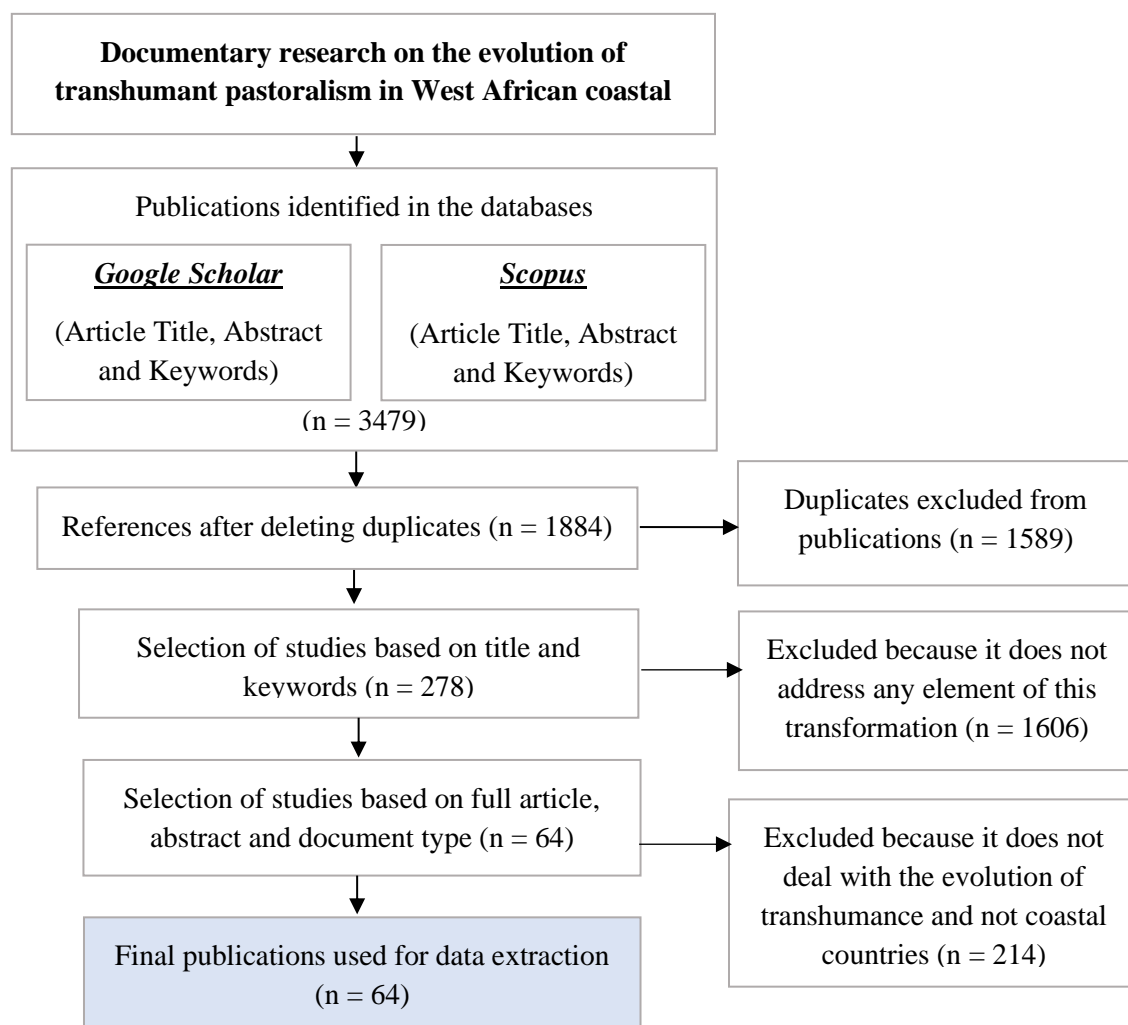
The documentary review is the tool used in this scientific work. We conducted a systematic review, the advantages of which are transparency, rigor and reproducibility (Mulrow, 1994), following the PRISMA guidelines (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) (Moher et al., 2009), which have also been used in previous systematic reviews related to pastoral livestock systems (Barnes et al., 2017; Spigarelli et al., 2020). A systematic review is a research method that was developed to identify, appraise and interpret relevant research on a chosen topic and a specific research question (Thomas and Harden, 2008).

### Search strategy and literature selection

As part of this study, an electronic search was carried out to obtain documents in two databases: Google Scholar and Scopus. The documents downloaded online were obtained using the combination of the following keywords: pastoralism; transhumance or transhumant livestock system, dynamics or evolution, Africa and coastal

countries. These keywords were used in French and then translated into English, to obtain as many documents as possible. Different combinations of keywords have been used with the Boolean operators “AND and OR” to capture the breadth of the subject (Hassoune et al., 2017; Viseur, 2012). The lead author independently searched the databases between February and August 2021, resulting in a total of 3479 articles (not including duplicates).

The selection of articles for this review was based on the publication date, the language (English or French), and on the research topic (dynamics of transhumance in African coastal countries). Regarding the geographical coverage of the articles, it was limited to the coastal countries of West Africa. For the 3479 articles, titles, abstracts and keywords were read. As soon as the research topic appeared in one of the documents or was addressed in some other way, the article was uploaded and thoroughly checked. The search option of Adobe Reader software was also used for this purpose. The inclusion and exclusion criteria set out above were applied to the total number of original articles and we finally retained 64 scientific publications (Fig 1). These publications for this synthesis are not analyzed as the only ones on the subject, but are supposed to provide a representative overview of the evolution of transhumance in West African coastal countries up to the time this synthesis was carried out.



**Fig 1:** Process of research and selection of documents analyzed, (Moher et al., 2009)

### Data management, review and statistical analysis

After the selection of documents, the 64 retained articles were examined in detail and underwent a comprehensive review. These final publications were imported into the Zotero software which enabled to identify the nature or type of document that was recorded. A series of questions was then developed according to the method of

(Berrang-Ford et al., 2011) to study these articles in order to document and clarify if and how transhumance evolves in the coastal countries of Africa by focusing on the literature published between 2011 and 2020. The questionnaire begins with questions on the general characteristics of the article and covered the title and authorship of the article, the year of publication, the country where the study was carried out, the affiliation of the main author, the duration of the study, the actors targeted by the study, different transformations of pastoralism, the factors of evolution of transhumance and the challenges faced by this livestock system.

The various responses to the questions above were entered into the Excel 2013 spreadsheet for the 64 articles selected for in-depth analysis. These responses were coded during the process. Descriptive statistics using R.4.0.1 software. (R Core Team, 2020) were performed to summarize trends in publications.

## Results

### Number, type of publications and affiliation of the main author

The number of peer-reviewed scientific papers on the evolution of the transhumant herding system has increased since 2013 with a drop in 2017 (Figure 2a). The classification based on the affiliations of the main author showed that the publications considered were more written by authors from the higher education sectors (78.13%), followed by authors from universities & research centers (10.94%), research centers (7.81%), and others (3.13%). A few were published by private environmental consultancies (2%) (Figure 2b).

Most of the publications analyzed are from original journal articles (81.25%), with a few review articles (12.5%), book chapters (4.69%) and a conference paper (1.56%). (Figure 2c). The results of these searches were obtained from secondary data sources (40.63%), primary surveys (37.5%) and the combination of these two data sources covered 21.88%.

### Geographical distribution of publications

The geographical distribution of publications by African coastal country (Table 1) shows a strong dominance of those from Benin (26.56%), Nigeria (15.63%) and 14.06% each for Senegal and Ghana. Some publications from Côte d'Ivoire, Togo and Mauritania were also representative in the selected batch with a proportion ranging from 7.81 to 9.38%. On the other hand, only one publication (1.56%) within the framework of this review came for each of the countries such as Liberia, Guinea and Gambia. The figure 3 shows the coastal countries described in the West African region.

### Target group for studies on the evolution of transhumance in Africa

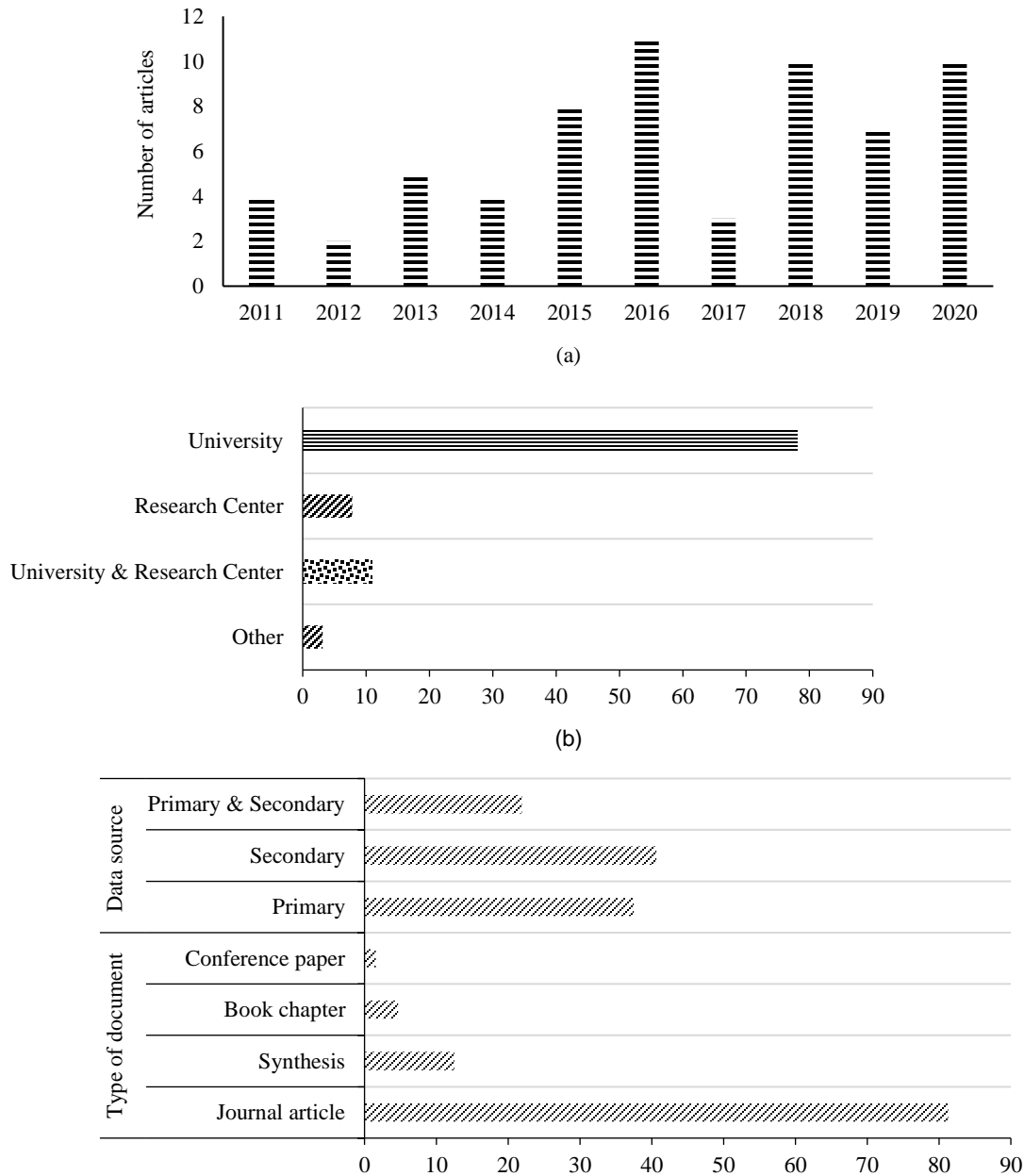
The categories of actors or target groups involved in carrying out work on the evolution of transhumant pastoralism were more the association of pastoralists, agricultural technicians and local authorities (53.13%) and only pastoralists (21.88%) (Fig 4). The association of “pastoralists and farmers” and that of “pastoralists and agro-pastoralists” are around 12.5% and 9.38% respectively. In 3.13% of cases, agro-pastoralists were the target of these works during the analysis period.

### Evolution of transhumant pastoral systems in West Africa

The study of the dynamics of the functioning of traditional livestock systems in the coastal countries of West Africa takes into account, within the framework of this synthesis, the philosophy of the systemic approach and that of the livestock system concept through these three elements (man and his social organization; animals and their socio-economic role; resources and use of space). Based on the articles analyzed, transhumant pastoralism is still ongoing in the West African region with a gradual evolution towards (1) semi-sedentarization or agropastoralism (65.63%) marked by an association of livestock and agriculture, (2) the semi-intensive system (25%), (3) Ranching (6.25%) and (4) Neo-pastoralism (1.56%) (Fig 5). The transformation of transhumance into a semi-intensive system, also called new opportunistic breeding, was favored by the proximity of the urban market.

### Factors in the evolution of transhumance in West African coastal countries

Many factors, endogenous or exogenous, combine to profoundly transform pastoral livestock systems (Fig. 6). Thus, the transformation of transhumant pastoralism underway in the coastal countries of West Africa, on the basis of information drawn from the articles selected, is due to environmental factors (85.94%), socio-economic factors (95.75%) and politicians (68.75%).



**Fig 2.** Publications analyzed grouped by (a) number of publications per year; (b) classification of first authors by affiliation and (c) source and type of data; N=64.

The analysis of the factors associated with the evolution of the transhumant livestock system shows on the environmental level that the eco-climatic crises of the 1970s led to changes favoring the emergence of agropastoralism. At the socio-economic level, there is increased pressure on land for the benefit of agriculture (75%) and other natural resources which leads to the occupation and reduction of traditional pastoral areas (71.88%) causing conflicts of various shapes. The work carried out during the period from 2011 to 2020 also shows an extension of the period of stay (26.56%) of transhumant herders, an increase in the distances traveled (57.81%). The settlement of breeders in host areas has encouraged the appearance of new diseases and the diversity of cross-border livestock markets, thus forcing breeders to create alternative routes. On the political level, there is a decentralization and the transfer of the management of resources to local authorities and which constitutes an opportunity for pastoralists, while also presenting risks. Changes in the transhumant livestock system are more a matter of declaration of intent or the adoption of new public policies that tend to favor the sedentarization of breeders.

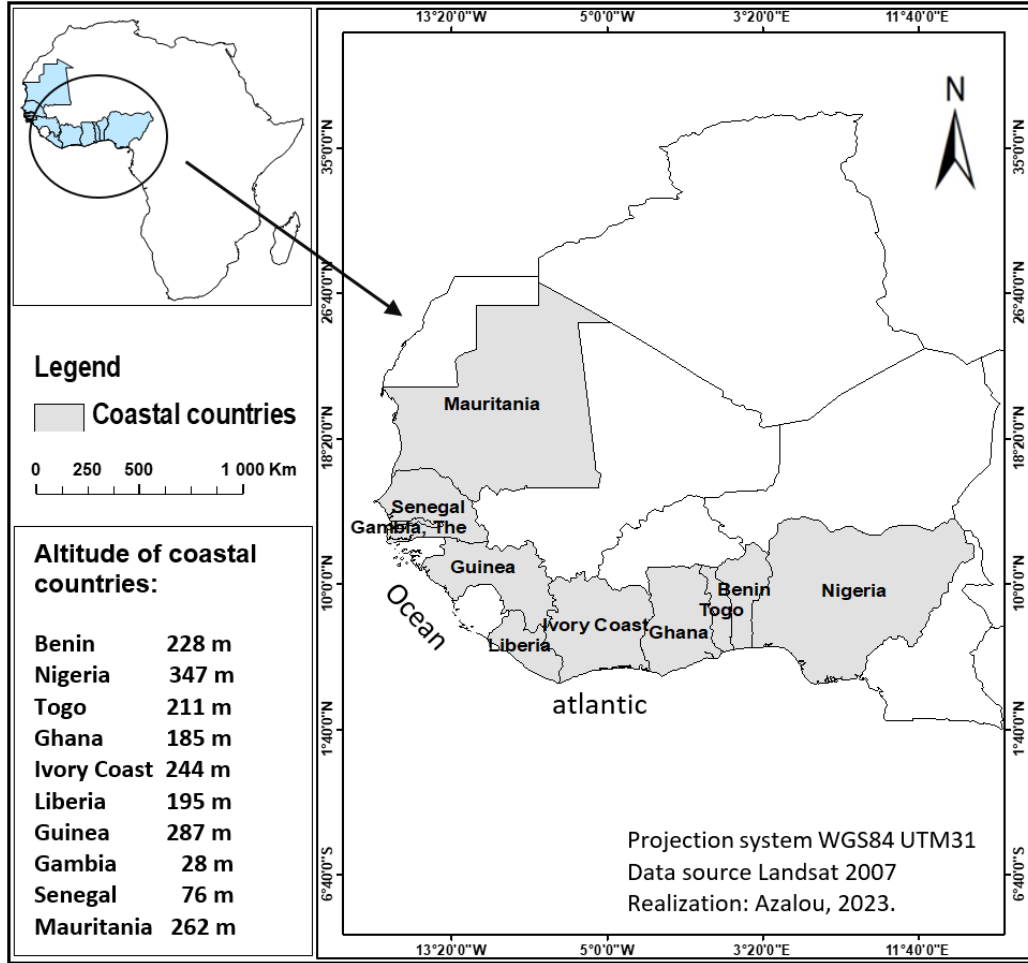


Figure 3: Location of coastal countries for transhumance dynamics in West Africa

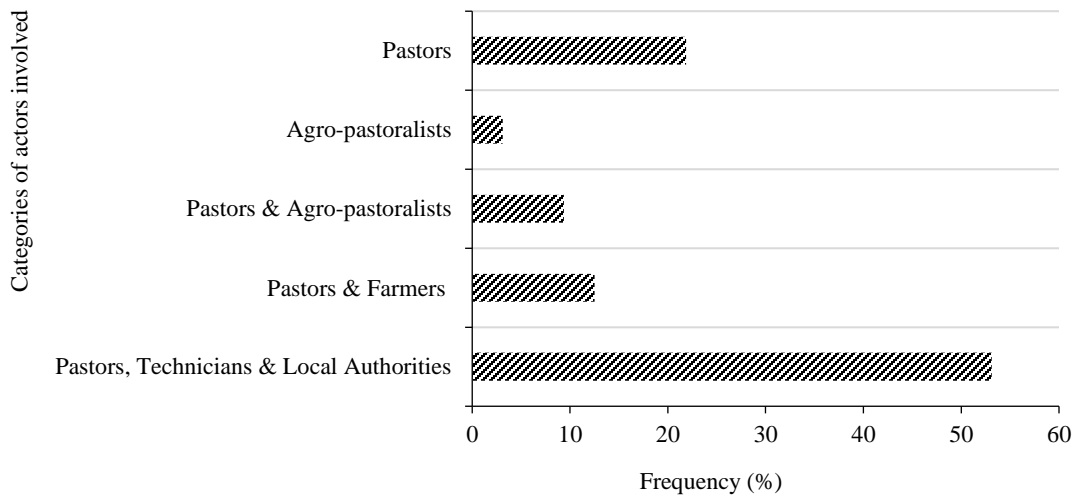


Figure 4: Categories of actors involved in the dynamics of transhumance

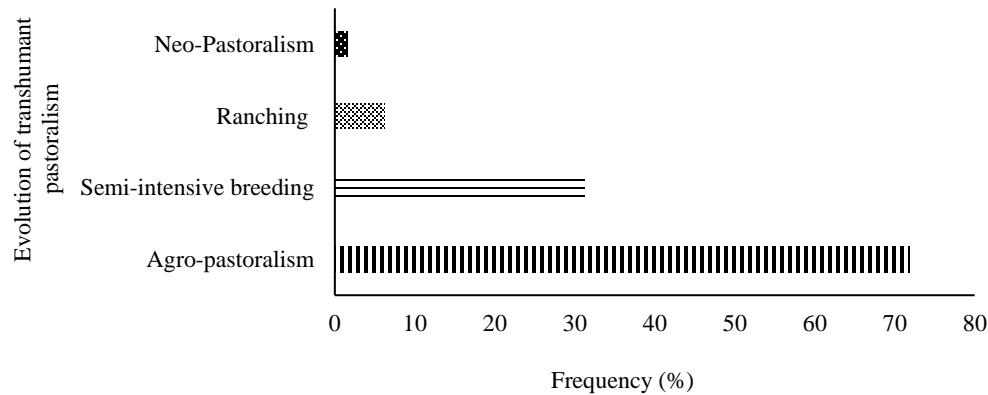


Figure 5: Evolution of transhumant pastoralism in West African coastal countries

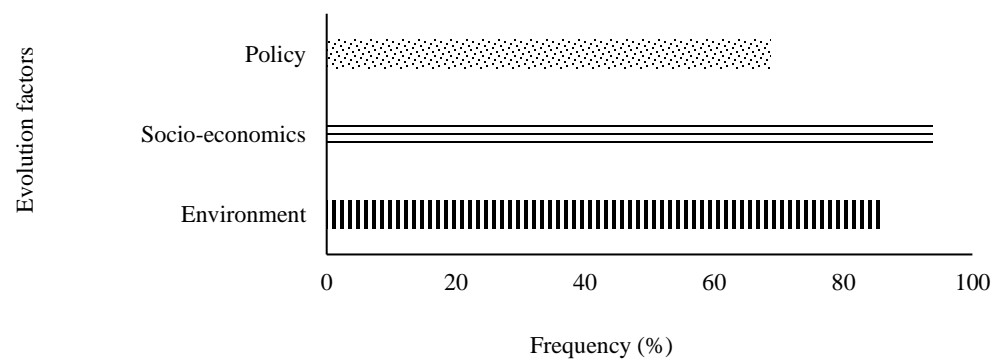


Fig 6: Transhumant system transformation factors revealed by the articles analyzed

## Discussion

### Context and dynamics of pastoral mobility in coastal countries

The analysis of the results from this review revealed that the transhumant pastoral system has evolved over the ten (10) years (2011 to 2020) considered in this study. Similarly, these different studies were carried out by authors from higher education as well as research centers and others. This testifies to the importance of the research work carried out by these various actors to secure the transhumant pastoral system, which is undergoing profound changes due to transhumance movements towards coastal countries (Corniaux et al., 2018b; Dongmo et al., 2007; Richard et al., 2019). Thus, most of the coastal countries have carried out studies in this direction and the most represented in this analysis are Benin, Nigeria, Ghana and Senegal. Despite the extensive livestock system practiced in Guinea, Liberia and Gambia, transhumance is not practiced on a large scale, which could be the reason for the limited documentation in these countries (Sylla et al., 2014). However, the majority of the articles examined showed the involvement of several groups of actors who are interested in changing this farming system (Ayantunde et al., 2014; Kiema et al., 2014; Sounon Kon'De et al., 2019; Sy, 2011). The practice of mobility is done with multi-actor consultation in order to properly manage pastoral and agro-pastoral resources (Corniaux et al., 2018a; Hiya Maidaya et al., 2016; Sy, 2010).

The analysis of scientific studies on transhumance shows four different evolutions of the transhumant livestock system in the coastal countries of West Africa. Mobile or transhumant herders move permanently with their farms according to the constraints of the environment. In recent years, this system has gradually evolved towards agro-pastoralism, a sedentary or semi-transhumant livestock system. Currently, crop farmers and breeders coexist on the same soils and increasingly practice both activities: the breeder becomes an agro-pastoralist and the farmer in turn becomes an agro-breeder (Diop et al., 2012; Klein and Grimaud, 2014; Sy, 2011; Véron, 2014). Thus, agro-pastoralists develop agriculture alongside livestock during the rainy season and go on transhumance during the dry season to take advantage of pastoral resources (fodder, water, etc.) often distributed randomly in space and in time (Hiernaux et al., 2014; Marega and Mering, 2018; Sy, 2010). This association between agriculture and transhumance livestock is one

of the strategies for adapting to both the high climatic variability and the threat of drought that the region has been experiencing for more than forty years (Dongmo et al., 2012; Idrissou et al., 2020). The main changes concern: the increase in livestock, the diversification of livestock systems, the gradual integration of the latter into the market (Assani et al., 2016; Azalou et al., 2017; Magrin et al., 2011), the eradication of major epizootics (Lancelot et al., 2011).

The simultaneous evolution of animal husbandry and agriculture in the same territory has favored the appearance and development of new opportunistic or semi-intensive animal husbandry such as fattening, box breeding and animal peri-urban breeding, resulting from the reciprocal influences of pastoralism and agropastoralism (Ayantunde et al., 2014; Godde, 2020; Roessler et al., 2016; Sounon Kon'De et al., 2019). This pattern of evolution found in some proactive pastors who have strategies essentially based on opportunities, is neither linear nor valid for all production units. The most notable impact of the market is the emergence of high-input systems (fatteners and dairymen in both rural and peri-urban areas) (Houessou et al., 2019; Lawal-Adebawale et al., 2018; Magrin et al., 2011; Richard et al., 2019; Vall et al., 2014). Breeders in this category start the breeding activity with a strong economic orientation (Corniaux et al., 2018b; Dongmo et al., 2012; Kouassi et al., 2019). This new development enhances animal production, even if it does not constitute an actual intensification of livestock farming, at least corresponds to a diversification of agricultural activities for these actors. This allows cattle breeding systems to express all their societal and economic functions (Sounon Kon'De et al., 2019). Peri-urban systems are developing rapidly in response to the growing demand from cities for animal products (Vall et al., 2014).

For some governments, it is important to create grazing reserves to limit somewhat the mobility of cattle herds and the resulting conflicts. For (Ele, 2020; Magrin et al., 2011; Sy, 2011), certain ideas lead to experimenting with the Ranch formula and prohibiting the open grazing of cattle and their gathering from one place to another. Thus, the intention was to encourage cattle owners to establish ranches. If the establishment of highly productive ranches is still difficult in the Sahelian region subject to climatic variations which sooner or later impose the mobility of livestock, the formula may be more attractive in coastal countries. Ranching, a method of pastoral farming based on the mobility of animals in fenced and most often privatized areas (Richard et al., 2019; Thébaud and Corniaux, 2019), is not unanimous because contrary available to some coastal countries (Uzodinma, 2018). Pastoral systems have such a significant advantage over sedentary systems or the ranching system. In fact, by enabling to adapt the animal load permanently and with great flexibility to the capacity of the pastures, they help to avoid the degradation associated with a prolonged stay of animals on the same plot (Jullien, 2006). Meat production in fixed areas also has the advantage of reducing problems related to livestock mobility and especially to cross-border transhumance entering the host country. As a partial alternative to the problem of meat supply, ranching would therefore remain an option to consider. In this case, it is important to consider certain aspects to be taken into consideration (Thébaud and Corniaux, 2019). Another transformation of pastoralism, neo-pastoralism is characterized by large cattle farms owned by non-pastoralists, guarded by paid herders, often involving "the use of sophisticated arms and ammunition", stemming from the need to hiding stolen wealth, trafficking proceeds or income that comes from terrorism with the aim of making profits for investors (Ajala, 2020). This form of mobility is typical of herders in Nigeria where it is practiced. Moreover, mobility is practiced in a context of major climatic constraints (droughts), institutional changes (decentralization), social changes despite the fact that it constitutes an effective strategy for the management of natural resources for better security of pastoral livestock farming. (Awa et al., 2004; Hiya Maidaya et al., 2016).

### **Constraints of this change on the social, economic and natural environment**

Transhumant livestock farming in sub-Saharan Africa is a rural activity well adapted to the specificities of this region characterized by the relative scarcity of the resources necessary for its exercise, water and fodder, as well as by their random and unequal distribution over time and space (Afane and Gagnol, 2014; Véron, 2014). Transhumant pastoralism is confronted with various forms of insecurity, which are all constraints. They are obviously the product of this particular agro-climatic context, but they also result from competition for access to resources, both between the breeders themselves and with other actors, in particular the farmers who operate in the region (Veron, 2014). Transhumant households consider today that it is difficult to be mobile today because of the constraints of various forms which cause conflicts and whose resolution generates costs (money, animals) (Thébaud et al., 2018). Today, new systems are emerging as a result of environmental, economic and social changes (Awa et al., 2004). The usual constraints of pastoralists have been accentuated following the arrival of new actors who weaken and make the joint management of pastoral resources more conflictual (Afane and Gagnol, 2014; Liba'a, 2012). The causes of changes in transhumance are multiple and sometimes interfere with each other. This development is attributed to the increase in livestock, drought, the expansion of cropping areas on transhumance corridors and the birth and diversity of cross-border livestock markets, thus forcing herders to create alternative routes (Azalou et al., 2019; Diop et al., 2012). The factors that explain land changes are in most cases linked to demographic pressure, the rainfall deficit,



with the progressive abandonment of arable land and pasture by the populations (Sournia, 1998). Population growth has undoubtedly been the most determining factor in the development of livestock farming through its multiple direct and indirect effects (Vall et al., 2014). This growth has led to a strong densification of the rural space. Thus, agricultural production has increased mainly by increasing livestock and by extending cultivated areas, the initial low population density having favored such an evolution (Dewa Kassa et al., 2018; Houinato et al., 2013; Petit, 2011; Richard et al., 2019; Sanou et al., 2018; Turner et al., 2016). For some authors, demographic phenomena impose two constraints on nomadic herders: the gradual encroachment of grazing areas and access to water. The degradation and shrinkage of pastoral rangelands is reported by several studies following demographic pressure (Houinato et al., 2013; Kitchell et al., 2014; N'Guessan et al., 2019; Sylla et al., 2019).

Thanks to the reconfiguration of the transhumant pastoral system, decentralization policies in recent years have led to the establishment of local communities to which the States are gradually transferring the management of natural resources. These policies support the laws and regulations that govern pastoral activities by increasing the role of local authorities (Hiernaux et al., 2014). For Koné et al. (2006) and Dia et al. (2008), far from facilitating the management of resources and agropastoral activities, this transfer of power aggravates the level of complexity of land tenure status, and therefore arbitrations concerning access to resources.

### **Current issues and challenges of the evolution of the transhumant system in West Africa**

Extensive livestock farming is at the crossroads of economic issues for its security and mobility as well as land development issues (Bonnet and Guibert, 2011; Corniaux et al., 2018a). Its future is attracting the interest of experts because of droughts, population growth and the multiplication of conflicts between farmers and herders, jeopardizing the future of pastoral livestock production in Africa (Marty et al., 2006; Turner et al., 2006; al., 2014). In addition, land changes and the recomposition of pastoral space constitute an obstacle to the development of transhumant livestock farming and modify the way of life of pastoralists. It therefore has an impact on the organization of pastoral space, creating a dynamic of territorial recomposition and land grabbing (Gonin and Tallet, 2012; Thibaud, 2010). These changes have contributed to the marginalization of pastoralists and amplified conflicts between farmers and pastoralists. Access to pastoral resources and rural damage remain the centers of conflict of use between the different actors with the appropriation of dominant groups and the balance of power (Hiya Maidaya et al., 2016; Liba'a, 2012; Waziri Mato, 2004). Animal mobility is becoming an adaptation strategy (Turner et al., 2014) to climate variability and will continue to play a very important role in food security among poor rural populations. The intensification of transhumance has generated socio-economic problems which can be summed up by conflicts, the main causes of which are damage to fields and an increase in the mortality rate of small ruminants (Konare and Coulibaly, 2019). Policies and strategies aimed at supporting transhumant pastoralism, while creating the conditions for its transformation into other sustainable systems should be encouraged. Today, pastoral systems are faced with rapid changes in their environment. Major socio-economic, agro-ecological and institutional changes such as population growth, climate change, the internationalization of markets, the evolution of demand for animal products, decentralization and the withdrawal of the State, are upsetting the context in which pastoral societies operate. The evolution of these systems must be accompanied to better respond to these changes in order to prevent possible crises and conflicts (Corniaux et al., 2018b; Diop et al., 2012; Gerber et al., 2012).

### **Conclusion and perspectives**

This synthesis highlights the importance of transhumant herding, its current transformation and the factors that contribute to it in the coastal countries of West Africa. This system evolves in various forms in a context of natural and human constraints: climatic, land, institutional and economic. Indeed, pastoralism, through its mobility and its ability to adapt to climatic constraints, remains an essential activity for rural development. Transhumant herders have been able to develop their practices but they still remain vulnerable. The regional pastoral space as it is currently sketched out will remain viable as long as there are abundant pastures in the countries of the South. The progression of agricultural activities is a major trend, linked to demographic pressure, and potentially explosive. The economic environment of livestock farming in West Africa remains marked by uncertainties and difficulties that call for high-level political decisions to support this activity. Securing the supply in the long term will require support for the current transformations, which are broken down differently depending on the livestock systems: securing the pastoral space, encouraging the integration of agriculture and livestock and supporting the market integration of livestock farming. This support seeks to strengthen the process of structuring livestock farmers around product chains, participatory management and the development of pastoral areas.

### **Author contribution**

MA, AAS, and ABGC participated in the planning and design of this synthesis. MA collected the data from the various online databases. AM, YI, and ACD tabulated and entered the data into the Excel spreadsheet. MA, AAS,

and YI performed the statistical analyses. IAT and AAS also participated in the conceptualization and interpretation of the analysis results. MA and ABGC wrote the first draft of the manuscript. AYJ and IAT participated in the methodology and critical revision of the manuscript and approved the publication of the final version. All authors read and approved the final manuscript.

#### Declaration of interest

No personal conflict of interest.

#### Ethics standards

The manuscript does not contain clinical studies or patient data.

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