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## RESEARCH ARTICLE

# PRACTICES AND INFORMATION NEEDS OF TRANSHUMANT HERDERS IN A CONTEXT OF UNCERTAINTY IN THE ALIBORI-DOSSO CROSS-BORDER AREA (BENIN, NIGER)

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### ABSTRACT

Dry related to climate change and insecurity in the Sahel and West Africa may affect the information needs and practices of pastoralists. Knowledge of these practices and information needs is necessary to design and deliver information services that support their resilience. A structured questionnaire including dichotomous, multiple choice and open-ended questions was used to interview 1008 herders, including 530 agropastoralists and 498 pastoralists in Benin and Niger, and eight focus groups were organized on this issue. The results showed that the majority of herders seek information through several sources, with a preference for herders' organizations (64.65% of transboundary transhumants) and elders (52.52% of nationals). More than half of the herders surveyed use simple cell phones and reported significantly ( $P < 0.01$ ) needing information on a local scale (54.13% of national transhumants), a reduced time step (weekly to decadal), an affordable cost (1 to 30 F CFA) and accessible by phone on natural resources, animal health, mobility conditions and security conditions. This information can be used to design relevant information services, for which we recommend taking into account the environment and the socio-cultural context of the herders.

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## INTRODUCTION

Transhumance is one of the forms of pastoral mobility characterized by a set of well-regulated seasonal movements and pendular rhythms of a cyclical nature in generally well identified territories (Bollig et Linstädter, 1999). This mobility is based on local information and knowledge (Bollig et Linstädter, 1999) mobilized within the framework of numerous social networks (Husain, 2019) in which the herders are involved. However, in West Africa, climate change and variability, demographic pressure, insecurity, and the progression of the agricultural front to the detriment of pastoral areas have considerably influenced this mobility of herders in recent decades (Grünewald, 2023; Jean Boutrais, 2007). The endogenous information systems based on a network of pastoral resource prospectors and word-of-mouth information sharing during various gatherings (Bode, 2015) built up over the years by the herders seem to have reached their limits (Dicko, 2003). Transhumance in this context has become increasingly risky, costly and uncertain (SNV, 2019). It is therefore necessary to act in order to support this type of livestock farming, which, in addition to its contribution to food security and its ecological role, constitutes an important factor of peace and regional integration (Timpong-Jones et al., 2023). In a solution-oriented approach, authors (Jacquemot, 2023; Grünewald 2023) recommend developing systems

and mechanisms that allow access to useful information on herd management, such as the information systems and services based on information and communication technologies developed by actors such as Veterinarians Without Borders, Chambers of Agriculture Network, Bilital Maarobé Network, AGRHYMET, etc. The community of designers of such solutions assures that knowledge of the context and informational needs of users is an important starting point for the design of such a service if it is to be relevant and sustainable (Waugaman, 2016). In their review of the effectiveness of seasonal climate forecasts and regional climate risk management strategies, for example, (Vogel & O'Brien, 2006) concluded that the issue of user needs for climate information is one of the important issues that must be addressed by researchers. Thus, focusing on the informational needs of users allows for analysis of how information providers can meet those needs (Simonnot, 2009). Defined as an adaptive human mechanism that causes humans to re-search, recognize, and then adapt to changes in their social and physical environment (Cole, 2011), informational need is conceived as both a trigger and a driver that sustains the information seeking process of individuals (Savolainen, 2017). This information seeking is an integral part of what is called in-formational practice defined as "a set of socially and culturally established ways of identifying, seeking, using and sharing information available from various sources such as television, newspapers and the Internet" (Savolainen, 2008). Thus,

knowing the information use environment and identifying the informational needs of the actors allows information service promoters to propose relevant in-training offers for a sustainable use of their services (Waugaman, 2016). In sub-Saharan Africa, research on the information needs and practices of transhumant herders is rare (Weibel, 2010). Some research has been conducted in East Africa (Mosha et al., 2018). In West Africa, the work of certain authors (Kitchell, 2013; Moundjoa, 2008; Rasmussen et al., 2014) has made it possible to lift a veil on the information needs of herders. However, in the transboundary area of Benin and Niger where transhumance linking the Sahelian states to the coastal states takes place, we are not aware of any scientific studies specifically devoted to the information needs and practices of transhumant herders. It is important in this environment of innovation and weakness of endogenous systems to try to understand, from the perspective of designing a regional pastoral information service, how transhumant herders go about looking for information and what their current information needs are for peaceful transhumance in the zone. The aim is to contribute to improving the supply of information for the sustainable use of technical information for peaceful transhumance. This is the aim of this study, which presents and discusses the general characteristics of herders, their information-seeking and information-use practices and the difficulties that accompany them, as well as their current information needs.

## METHODS

**Study area:** Benin and Niger were used as research sites for this study. These are two of the least advanced countries in terms of digital development, with low coverage and penetration rates for telecommunications (ITU, 2023). The study was conducted in the cross-border area of these two countries, which includes the Alibori Department (Benin) and the Dosso Region (Niger) (Fig. 1). This area is divided between the semi-arid zone to the north of Dosso and the Guinean zone to the south of Alibori. In Alibori, the climate varies from the Sudano-Guinean type at latitude 10° 30' N to the Sudano-Sahelian type around latitude 12° N. In Dosso, the climate is Sahelian in the north, Sahelo-Sudanese in the central part and Sudanese in the south. These two administrative units cover a total area of 57,242 km<sup>2</sup> divided between Alibori, 26,242 km<sup>2</sup> (INSAE, 2014) and Dosso, 31,000 km<sup>2</sup> (HC3N, 2023). Like other regions with semi-arid conditions in West Africa, the economy of these two regions is based on the primary sector, with an important share attributed to agriculture and livestock. In both Alibori and Dosso, there are two livestock production systems: agropastoral and pastoral. The agropastoral system is characterized by a combination of livestock and agriculture and limited movement of livestock during part of the year, while high mobility remains a main characteristic of the pastoral system between the states. Transhumance in this area is facilitated by international corridors crossing their respective territories as well as several local corridors.

**Selection of Participants:** A stratified and reasoned sampling made it possible to choose two communes per administrative unit selected for the study. In Alibori, the communes of Gougounou and Malanville were selected. In Dosso, the communes of Dioundiou and Falmey were selected. These communes were selected based on their proximity to the ECOWAS international transhumance corridor. In each commune, a quarter of the number of transhumant herders from the census of herders in the Alibori department and estimates made by communal livestock agents and herders' representatives in the communes of Niger were retained for field surveys. Thus, 249 herders in Gougounou, 180 in Malanville, 124 in Dioundiou, and 494 in Falmey were selected with an adjustment to a rate of 3% to take into account potential non-responses, for a total of 1,047 herders to survey. Together with regional and communal officials of the services in charge of livestock and representatives of the herders' associations (ANOPER in Benin and AREN in Niger), 21 localities in Gougounou, 14 in Malanville, 08 in Dioundiou and 08 in Falmey were chosen on the basis of their accessibility, level of security, the size of their

herding and agropastoralist communities and their cell phone network coverage for the field surveys.

**Data Collection:** Survey data was collected from pastoralists and agropastoralists who were heads of households or adults responsible for organizing transhumance. A team of ten interviewers selected at the communal level administered a structured questionnaire to herders in the selected areas, deployed on cell phones equipped with the KoboCollect application. The questionnaire covered multiple choice, dichotomous and open-ended questions on their demographic, socioeconomic characteristics as well as their information needs and practices. The questionnaire was pre-tested in the vicinity of Gougounou and Dioundiou with herders and then revised based on observations before administration. At the same time as the questionnaire survey was being conducted, group discussions were held with pastoralists and agropastoralists with experience of transhumance in the area. These group discussions focused on the difficulties of accessing information for transhumance. We supervised the survey operation both online and in the field to ensure the quality of the data.

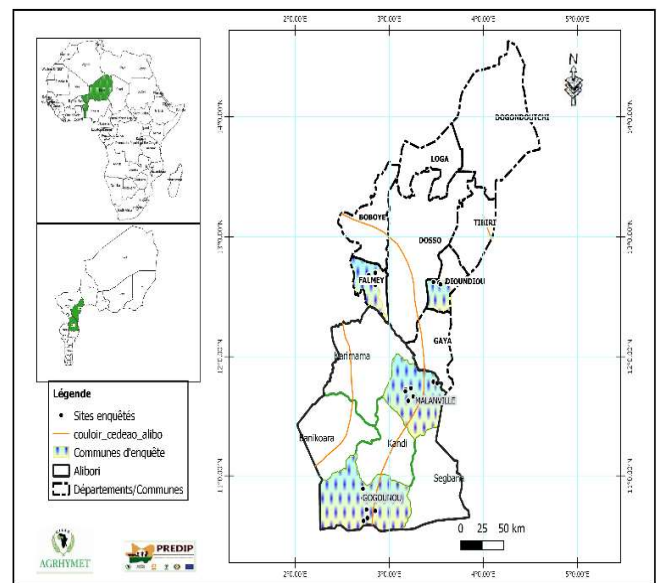


Fig. 1. Location map

**Data analysis:** Descriptive statistics were used to analyze the numerical and categorical data from the surveys and text mining techniques were used for the data from the focus groups transcripts and open-ended questions. These analyses were performed using R software (R Version 4.1.3, 2022-10-03, The R Foundation for Statistical Foundation) and the Excel spreadsheet. Analyses were performed on the calculation of frequencies, mean values of numerical data and statistical parameters. Contingency tables and the Chi-square test of the likelihood ratio were used to test for statistically significant relationships between categorical variables (Parameters versus type of transhumant) by considering a p-value less than 0.05 to be significant.

## RESULTS

**Demographic and socio-economic characteristics of the herders surveyed:** A total of 1008 herders out of the 1047 planned, or 96.30%, were surveyed, i.e. 48.21% in Benin and 51.79% in Niger. More than half of the herders surveyed (55.56%) were under 40 years of age (30.16% of pastoralists and 25.40% of agropastoralists). Also, more than three quarters (82.74%) of these herders have no education (40.77% among pastoralists and 41.96% among agropastoralists) (Table 1). There is a significant relationship between the category of herders and the level of education as well as with the country of residence ( $p < 0.01$ ).

**Table 1. Demographic and socio-economic characteristics of the herders surveyed between Benin and Niger in 2022**

Characteristics	Pastoralists (%)	Agropastoralists (%)	Total (%)	p-value
<b>Country</b>				
Benin	13.89	34.33	48.21	< 0.01
Niger	33.53	18.25	51.79	
<b>Age group</b>				
< 20	01.98	00.69	02.68	
20- 39	30.16	25.40	55.56	< 0.01
40- 59	14.48	23.02	37.50	
60 and over	00.79	03.47	04.27	
<b>Level of education</b>				
None	40.77	41.96	82.74	
Others	04.96	06.85	12.10	
Primary	01.49	01.79	03.27	< 0.01
Secondary	00.20	01.29	01.49	
Higher	00.00	00.40	00.40	
<b>Size of herd</b>				
0 - 50	14.60	34.76	49.35	
50 - 100	27.81	16.09	43.89	< 0.01
>100	05.06	01.60	06.75	
<b>Telephone ownership</b>				
Single	25.99	23.91	49.90	< 0.01
Smartphone	00.30	02.78	03.08	
None	17.56	24.31	41.87	
No answers	03.57	01.59	05.16	
<b>Transhumance practiced</b>				
National	15.52	36.12	51.64	< 0.01
Transborder	31.94	16.42	48.36	
Average experience n year (min – max)	12.55 (2 -32)	17.24 (2 -60)		

Source: Compiled by researcher on the basis of field survey.

**Table 1. Preferred sources of access to information by herders**

Sources	National Transhumants (%)	Transborder transhumants (%)	p-value
Garçoo/Rugga	52.52	47.48	< 0.05
Herder’s organizations	35.35	64.65	
State Technical Services	49.36	50.64	
Known people	49.69	50.31	
Radio	43.29	56.71	

Source: Data survey, 2022

**Table 2: Channels and methods of access to transhumance information among transhumant herders between Benin and Niger in 2022**

Channels/Modalities	National Transhumants (%)	Transborder transhumants (%)
Others (n= 56)	96.43	3.57
Telephone (n = 577)	49.57	50.43
Radios (n = 168)	90.48	9.52
WhatsApp (n = 36)	88.89	11.11
Face-to-face oral communication (n = 890)	56.85	43.15
<b>Modality</b>		
Free access (n = 974)	50.41	49.59
Cost access (n = 29)	89.66	10.34

Source: Data survey, 2022

Approximately 50% of herders (14.60% among pastoralists and 34.76% among agropastoralists) have herds ranging in size from 0 to 50 head of animals and use simple cell phones to communicate (Table 1). In general, transhumance in the study area takes place within national borders (51.64%) and there is a significant relationship between the type of transhumance practiced and the category of herders surveyed ( $p < 0.01$ ). The average transhumance experience of herders was 12 years for pastoralists and 17 years for agropastoralists (Table 1).

**Information seeking and use practices of transhumant herders**

**Information search practices:** In general, the herders surveyed mobilize several sources to search for and obtain the information needed to organize and succeed in their transhumance. Herders' organizations are a preferred source of information for 64.65% of

transhumant herders, while for national transhumants, it is the elders (Rougga and Garçoo) (Table 2). There is a significant association between the preferred sources and the type of transhumance of herders in the zone ( $P < 0.01$ ) (Table 2). The most preferred channel for accessing information is "word of mouth" used by 57% of national transhumants and 43% of transborder transhumants out of the 890 herders who responded to the question. The telephone is used by more than 50% of cross-border transhumants and about 50% of national transhumants (Table 3). Access to information from the various sources is generally free for the majority of herders who responded to the question on how they access the information sought (974 herders), and the proportions are almost equal between national (50.41%) and transborder (49.59%) transhumants (Table 3).

**Practices of use and sharing of information sought:** The information use practices of the herders are characterized by a variation in the decisions taken during the transhumance process (Table 4).

**Table 3. Information use and sharing practices of transhumant herders between Benin and Niger in 2022**

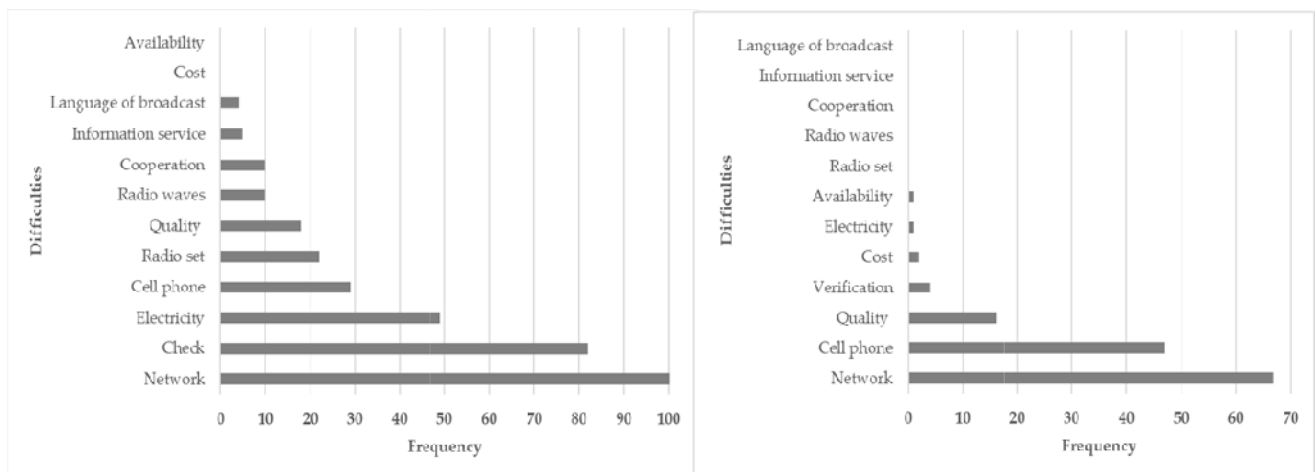
Decisions	National transhumants (%)	Transboundary transhumants (%)	p-value
<i>Before the departure</i>			
Do not go	78	22	
Change route	49	51	< 0.05
Delay departure	55	45	
<i>During the trip</i>			
Change destination	56	44	< 0.05
Delay travel	49	51	> 0.05
Accelerate travel	84	16	< 0.05
Return to home	50	50	
<i>Arriving in the reception area</i>			
Change area	55	45	
Seek help	57	43	< 0.05
Return to homeland	39	61	
Other	100	0	
<i>Sharing information</i>			
Yes	51.39	48.31	0,601
No	0.20	0.10	

Source: Data survey, 2022

**Table 4. Decisions on pastoral practices made after receiving information by transhumant herders between Benin and Niger in 2022.**

Decisions	National transhumants (%)	Transboundary transhumants (%)	p-value
<i>Forage deficit</i>			
Purchase of cattle feed	59	41	
Choice of resistant animals	67	33	< 0.01
Reduction of cow movement	69	31	
Reduction of the number of cows	63	37	
Other	9	91	
<i>Animal diseases reported</i>			
Vaccinate all animals	56	44	
Vaccinate cattle only	41	59	< 0.01
Deworm all animals	68	32	
Deworm cattle only	43	57	> 0.05
<i>Price change in the target market</i>			
Change market on the way	51	49	> 0.05
Leave market for another	53	47	
Sell on the spot	57	43	< 0.05
Other	92	08	

Source: Data survey, 2022

**Fig. 2. Frequent difficulties in accessing information among national (a) and cross-border (b) transhumants in Benin and Niger in 2022**

Just over half of transhumant farmers (51%) use information obtained from preferred sources before leaving for transhumance to decide to change their route in the event of a problem, while about 78% of national transhumants use it to decide not to leave (Table 4). During the move, 84% of national transhumants decide to accelerate their move and leave in the event of unfavorable information, while half of the national transhumants decide to delay their move or return to their home area based on this information. On arrival in the host area, while 61% of cross-border transhumants use unfavorable information to return to their country of origin, 57% of national transhumants use this information to seek assistance or make other adaptation decisions.

In addition, 99.70% of transhumant farmers (51.39% of nationals and 48.31% of transhumant farmers) claim to have shared the information they received on transhumance conditions. Transhumants reported making several other decisions related to their specific livestock practices as a result of the information they received during the transhumance process (Table 5). More than half of national transhumants reported that they made decisions to reduce cow movement when they were informed of the forage deficit. The corresponding proportion among transborder transhumants is 31%.

**Table 6. Areas of information desired by transhumant herders between Benin and Niger in 2022**

Informations	Transboundary transhumants(%)	Transboundary transhumant(%)	p-value
Rain (n =737)	50.20	49.80	0.13
Water et pastures (n = 786)	54.20	45.80	0.00
Brush fire (n = 207)	90.34	9.66	0.00
Animal diseases (n = 742)	49.06	50.94	0.00
Animal concentration (n = 481)	47.82	52.18	0.02
Mobility corridors (n = 724)	45.44	54.56	0.00
Herder markets (n = 395)	46.08	53.92	0.00
Lows and regulations (n = 406)	53.45	46.55	0.33
Security conditions (n = 470)	51.06	48.94	0.74

Source: Data survey, 2022

**Table 7. Desired information content by information domain and type of transhumance among transhumants in the Benin-Niger cross-border area in November 2022**

Area/Content	National transhumant(%)	Transboundary transhumant(%)	p-value
<b>Pastures</b>			
Grazing area	56	44	0.02 **
Access conditions	55	45	0.77 ***
Animal concentration	50	50	0.00 *
Forage quality	51	49	0.00 **
<b>Water</b>			
Location of water points	54	46	0.87 ***
Depth	89	11	0.00 *
Access conditions	61	39	0.00 *
Animal concentration	45	55	0.00 *
<b>Bush fires</b>			
Burned areas	90	10	0.642 ***
Time elapsed after fire	92	8	0.042 **
Other	90	10	0.379 ***
<b>Security</b>			
Existence of banditry	46	54	0.001*
Areas concerned	49	51	0.498 **
Frequency of theft	53	47	0.035 **
Attacks on wild animals	47	53	0.258 ***
Recourse possibilities	35	65	0.000 *
Other	49	51	0.009 **
<b>Market dynamics</b>			
Location concerned	48	52	0.414 ***
Prices charged	53	47	0.000 *
Distance to grazing area	44	56	0.004 *
Other info	45	55	0.009 *
Mobility corridors			
Status	46	54	0.088 ***
Integrity	50	50	0.001 *
Level of use	57	43	0.000 *
Other	47	53	0.001 *
<b>Animal diseases</b>			
Type of disease	52	48	0.000 *
Affected area	48	52	0.580 ***
Veterinary presence	47	53	0.040 **
Availability of veterinary products	53	47	0.000 *
Quality of care	51	49	0.106 ***
Other	48	52	0.006 * *
<b>Rain, flood and wind forecasts</b>			
Start and end of rains	50	50	0.580 ***
Daily rainfall forecast	45	55	0.00 *
Flood-prone areas	44	56	0.010 **
Storm forecast	48	52	0.028 **
<b>Laws and regulations</b>			
Mandatory documents	54	46	0.881 ***
Official entry points	53	47	0.562 ***
Level of hassle	52	48	0.035 **
Recourse and assistance	73	27	0.000 *

\* Valeur de p-value &lt; 0,001 ; \*\* Valeur p-value &lt; 0,05 ; \*\*\* Valeur de p-value &gt; 0,05 Source: Data survey, 2022

The vast majority (91%) of transhumant herders also made decisions other than purchasing feed, choosing hardy animals for transhumance, and reducing cow movement. Herders reported making decisions to vaccinate and deworm their animals when they were informed of suspected or reported animal diseases. More than two-thirds of national transhumants reported having dewormed (68%) and vaccinated (56%) all their animals. Among cross-border transhumants, only cattle were vaccinated (59% of herders) and dewormed (57%). There is a significant relationship between decisions taken in the event of a forage deficit and animal diseases and the type of transhumance practiced ( $p < 0.01$ ). Information on price changes in the markets was also used by transhumant farmers to either sell their animals locally (57% of national transhumant farmers and 43% of cross-border farmers) or resort to other options (92% of national transhumant farmers) such as selling to butchers or livestock traders in the vicinity.

**Difficulties in accessing information for herders:** Transhumant herders experience several difficulties in accessing information from their preferred sources. Among national transhumants, the telephone network, the possibility of verifying information, and electricity are the top three of the ten most frequently encountered difficulties (Fig. 2a). In contrast, among transborder transhumants, the telephone network, the quality of the information, and the possibility of verification are among the ten most frequent difficulties encountered in accessing information from their preferred sources (Fig. 2b).

**Herders' current information needs:** For peaceful transhumance in the zone, the herders surveyed express the need for information on several areas related to their livestock activities. Mobility corridors, livestock markets, animal concentrations, and animal diseases are the areas in which the majority of transhumant herders feel the need to have quality information (Table 6).

conditions, there is a significant association between the other information areas and the types of transhumance practiced ( $p < 0.05$ ). The information content desired by herders to adjust their movements and take advantage of the potential of their livestock is diversified and focused mainly on the location of resources and social facts related to their livestock (Table 7). In most cases, there is a significant relationship between the content of the information desired by area and the type of transhumance practiced ( $P < 0.05$ ) (Table 7). The majority of the herders surveyed (58.83%) stated that they needed this information content by domain to be provided at the local level and at a weekly time step for 45.93% of the herders (Table 8). There is a significant relationship between types of transhumance and the resolution of information desired for peaceful transhumance in the area ( $p < 0.01$ ) (Table 7). Regarding the cost of accessing information, herders are generally willing to pay money for reliable information at a reduced cost (Fig. 3). The majority of transhumant herders (63%) say they are willing to pay an acceptable cost of between 0 and 5 CFA francs for reliable information by SMS (compared to 37% of national transhumants) (Fig. 3.c). As for access to information by telephone call, many national transhumant herders (55%) say they are willing to pay the same cost for a one-minute call (compared to 45% of cross-border transhumant herders) (Fig. 3.d).

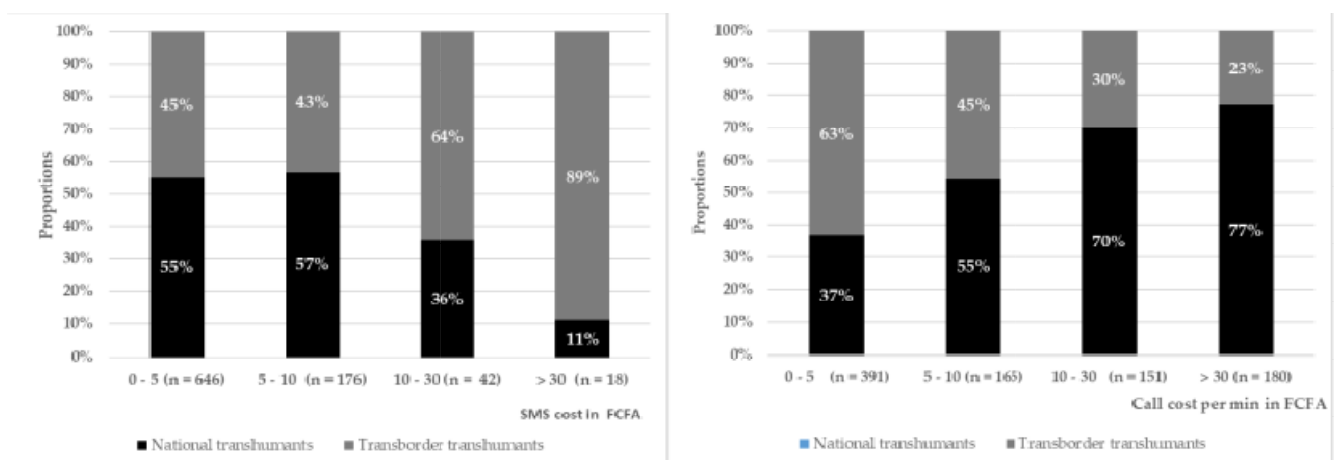
## DISCUSSION

The present study revealed that transhumant herders need information on a variety of topics in order to be successful in their transhumance campaigns in the Benin-Niger cross-border area. These include mobility conditions, livestock market dynamics, health and safety conditions at the range level, rainfall conditions, livestock feeding conditions (water and pasture), and administrative and regulatory conditions.

**Table 8. Needs for spatial and temporal resolution of information by transhumant herders between Benin and Niger in 2022**

Scale	National transhumants (%)	Transboundary transhumants (%)	All (%)	p-value
<b>Spatial resolution</b>				
Local (n = 593)	54.13	45.87	58.83	< 0.01
Regional (n = 212)	29.25	70.75	21.03	
National (n = 200)	68.00	32.00	19.84	
<b>Temporal resolution</b>				
Weekly (n = 463)	28.51	71.49	45.93	< 0.01
Daily (n = 439)	80.64	19.36	43.55	
Decadal (n = 73)	19.18	80.82	7.24	
Monthly (n = 29)	62.07	37.93	2.88	
Biannually (n = 01)	100.00	0.00	0.10	

Source: Data survey, 2022



**Fig. 3. (c) Proportion of herders willing to pay a given cost of an SMS for information; (d) Proportion of herders willing to pay a given cost of a call/minute for information**

In the case of national transhumant herders, the majority of herders' report needing information on bush fires (90.34%), water and pasture, laws and regulations, security conditions, and rainfall (54.56%) (Table 6). Apart from rainfall, laws and regulations, and security

These results confirm those obtained in Burkina Faso (Rasmussen et al., 2014). However, these needs vary according to the type of transhumance practiced by the herders surveyed. In fact, transboundary transhumant herders, who are more pastoral than

agropastoralists, are more sensitive to information on mobility corridors, the dynamics of livestock markets, animal concentrations in grazing areas and animal diseases than their colleagues transhumant within national borders. Similar results were also obtained among Maasai pastoralists in Tanzania (Mosha *et al.*, 2018) depending on whether they practiced pure pastoralism or agropastoralism. The analysis of the survey data also found that the diversified information content needed by these herders is mainly localized, provided at a local scale and a short time step (1 to 10 days), and accessible by cell phone at low cost (0 to 5 F/SMS or 30 F CFA and more/min call). These results confirm those obtained for pastoralists in Kenya and Ethiopia (Luseno *et al.*, 2003), for whom the information disseminated by radio on a coarse spatial and temporal scale was of little value to them, and it is therefore advisable to provide them with spatially explicit, real-time information that includes the conditions of access to fodder in order to be useful to them. In order to satisfy their information needs in order to succeed in their transhumance campaigns, transhumant herders develop various information-seeking and information-use practices. Indeed, the frequency analysis of herders' information-seeking practices showed that the majority of transhumant herders (64.65%) and national herders (52.52%) use herders' organizations and their traditional mechanisms such as the Rouggas and Garços among the Fulani, as their preferred sources of information. The media, especially radio, is a secondary source of information for them. This result corroborates those obtained about the daily information search of herders in the drylands of Iran (Jamali *et al.*, 2019), who prefer information sources that exploit their local and indigenous knowledge and that value experience and skills, with recourse to elders, traditional chiefs and relatives to obtain them. A similar result was also found among pastoralists in Tanzania (Mosha *et al.*, 2018) and even among farmers in the same country (Mtega, 2021).

The study also revealed that access to information from these sources is generally free and through a variety of channels. Verbal exchanges or "word of mouth" remains the most used channel, followed by the single cell phone used mainly. These results confirm those obtained among pastoralists in Kenya (Butt, 2015), which stipulate that despite the widespread use of cell phones in pastoral settings, information sharing is still strongly mediated through parents and classes due to pre-existing social relations within and between social groups. Almost one out of every two farmers owns a telephone and uses it for diversal purposes (Djohy *et al.*, 2017). The use of cell phones and their positive implications in the lives of pastoralists and agro-pastoralists has also been widely emphasized by authors (Parlasca, 2021; Coldefy, 2017; Boas, 2022). It can thus be deduced that channels offering the possibility of direct interaction with the holders of information are those that are likely to find support from transhumant herders in the dissemination of technical information. However, before doing so, it is necessary to consider how to overcome a certain number of difficulties faced by these herders in making optimal use of these channels. In fact, the data mining analysis of the textual data from the open-ended questions and group discussions highlighted logistical and cognitive obstacles that limit access to quality information in the zone: In addition to the low proportion of the population with access to information, there is also a lack of understanding of the information provided by the radio stations, and the fact that some of the information provided by the radio stations is not understandable. In addition, a small proportion of herders have smartphones (3%) and use social networks, particularly WhatsApp, to exploit its potential for disseminating voices and images, and a fairly large proportion of these herders do not have a simple cell phone (42%) or a radio (about 45%). (Ramadhani *et al.*, 2017)] also found that power source, low smartphone penetration in rural areas, level of education, proportion of subscribers to a telephone network, language of communication, quality of government support and policies that promote the development of producers are factors influencing information accessibility in rural Tanzania. It has also been noted by other authors (Aker *et al.*, 2010; Butt, 2015) that false information and the distrust that accompanies it, causing herders to always want to travel to verify information in situ, can considerably reduce the value of cell phone communication among pastoralists. This refers both to the

value and the strategic or non-strategic character of information circulating in pastoral environments, as explained, and which should require the full attention of promoters of innovative information services (PESah, 2015). The study also showed that in most cases, transhumant herders use information obtained from their preferred sources to make decisions regarding their mobility practices, livestock care and maintenance, and the sale and purchase of animals. More than half of the transhumant herders use this information before leaving for transhumance, to decide on the route to follow, during the trip to change their destination or not, and upon arrival in the host area to stay or to opt for another area. The information is also used in the event of a forecasted forage deficit, to purchase feed and take care of the cows. This practice of using information was also reported in Burkina Faso in 2014 (Rasmussen *et al.*, 2014).

## CONCLUSION

The study carried out in the cross-border area of Benin and Niger showed that herders use a variety of sources and channels to seek and access information for transhumance. They have a preference for traditional sources, which they access via the widely adopted telephone, as well as through in situ verification. So far, these practices remain effective for the majority of herders, who are satisfied with them, particularly as regards the preferred sources of information. However, this effectiveness is severely tested by logistical and cognitive obstacles that limit farmers access to quality information. Despite this, many farmers are prepared to pay an affordable price for information that is locally located, available at short notice and accessible by mobile phone. This is because they need to overcome the constraints on their livestock production systems (feed, health, market price fluctuations and security), for which they currently have information needs. This information can be used by providers of innovative information services to design and/or improve their services to support transhumance and pastoralism in the area. Before doing so, however, the need to identify the necessary strategic options requires knowledge of the range of information offerings and current technical solutions in their end-user environment.

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