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Towards Sedentarization of Cattle Farming Systems in Sudanian and Sudano-Guinean Zones of Benin: A Typological Analysis of Conflicts Between Farmers and Herders

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Abstract

Conflicts between farmers and herders are a persistent challenge in Sudanian and Sudano-Guinean zones of Benin, largely driven by competition over access to pastoral resources. This study aimed to characterize the prevalence, causes, and typology of such conflicts and to assess their implications for the sedentarization of cattle farming systems. Data were collected from 480 livestock farms across four municipalities (Materi and Gogounou in the Sudanian zone; Tchaourou and Djougou in the Sudano-Guinean zone) through surveys, mapping, and herd productivity assessments. Multiple Correspondence Factorial Analysis was used to classify the conflict types. The results revealed that 52.29% of herders had experienced conflicts, with a higher incidence in the Sudano-Guinean zone (36.88%). Four main categories of conflict were identified: (i) blows and injuries to people and animals (38.64%), (ii) displacement of herders and their farms (34.26%), (iii) property damage and animal slaughter (15.13%), and (iv) violent verbal altercations and animal poisoning (11.97%). These findings indicate that recurrent conflicts are accelerating the shift from transhumance towards sedentarization, underscoring the need for tailored conflict management strategies and sustainable livestock policies.

Keywords: cattle mobility; conflicts; pastoralists; pastoral resources; West-Africa

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Academic Editor: Ortwin Renn

Received: 9 August 2025
Revised: 1 November 2025
Accepted: 3 November 2025
Published: 11 November 2025

Citation: Tidjani, M.; Assani Seidou, A.; Iwaka, C.; Agballa-Belrou, A.R.A.; Azalou, M.; Azando, E.V.B.; Yabi, J.; Alkoiret Traore, I. Towards Sedentarization of Cattle Farming Systems in Sudanian and Sudano-Guinean Zones of Benin: A Typological Analysis of Conflicts Between Farmers and Herders. *World* **2025**, *6*, 151. https://doi.org/10.3390/world6040151

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1. Introduction

In Benin, livestock farming contributes to the rural economy with 13% of agricultural GDP and an estimated livestock capital of 242 billion FCFA [1]. However, as in most West African countries, cattle production systems remain largely traditional and extensive, with productivity closely linked to the availability of pasture and water. These pastoral resources determine herd mobility and support nomadic or transhumant practices [2]. Ruminant herders primarily rely on natural rangelands and crop residues for livestock feed [2,3], while transhumance has become an essential adaptation strategy in the face of climate variability and feed shortages [4,5]. By moving animals from different ecological zones, livestock farmers exploit ecological complementarities and ensure a supply of fodder during critical periods [6]. However, population growth, the expansion of farmland, and climate change have drastically reduced the available pastoral resources [7–9]. Access to land, water, and grazing areas has therefore become highly competitive, triggering recurring conflicts

between herders and farmers. These conflicts often result in significant damage to crops, injuries to people and animals, loss of livestock, and even deaths [10]. Despite multiple government and community initiatives, these conflicts remain widespread and complex in origin, combining environmental, socioeconomic, and institutional dimensions [9,11].

The Sudanese and Sudano-Guinean areas of northern Benin offer a particularly favorable context for studying conflict dynamics. Indeed, these zones contain the largest concentrations of cattle herds in the country and constitute major corridors for national and cross-border transhumance from neighboring countries such as Burkina Faso, Niger, and Nigeria [12]. Furthermore, these zones have high agricultural potential, with vast areas under cultivation, which intensifies the competition for land and water between farmers and herders [2]. Finally, these areas illustrate two distinct agroecological contexts where pastoral practices are being reconfigured; while the Sudanese zone is traditionally a transit area for mobile herds, the Sudano-Guinean zone increasingly represents an area of settlement and reception for local and mobile herders [4]. These characteristics make these two areas strategic places to analyze how conflict patterns differ and how sedentarization processes are reshaping relations between farmers and herders. Despite numerous studies addressing the environmental or socio-economic dimensions of these conflicts, few have examined their typological diversity and how this relates to the ongoing transition from mobile to sedentary livestock systems.

According to Perrot and Landais [13], typologies provide a way to group farms into classes that simplify complex realities while preserving their key specificities. Such classifications allow for meaningful comparison between farm groups, assessment of their functioning, identification of potential solutions to challenges, and the development of context-appropriate recommendations [14]. To address this research issue, this study aimed to characterize conflicts between farmers and herders in the Sudanian and Sudano-Guinean zones of Benin. More specifically, it addresses the following research questions: (1) What are the main causes and manifestations of conflicts between farmers and herders in the Sudanian and Sudano-Guinean zones of Benin? (2) How is the process of sedentarization of cattle farming reshaping herders' practices and their relations with farming communities? (3) To what extent can sedentarization contribute to the prevention or mitigation of conflicts between farmers and herders?

This study contributes theoretically by proposing a typological framework that links the forms and drivers of farmer–herder conflicts to the broader process of herder sedentarization. By integrating socio-economic and ecological variables, the research introduces a novel analytical perspective that moves beyond descriptive approaches. This framework deepens the theoretical understanding of how resource competition, livelihood strategies, and agroecological transitions interact to shape farmer–herder relations in West Africa.

2. Materials and Methods

2.1. Study Area

The study was conducted in two agroecological zones of northern Benin: the Sudanian and the Sudano-Guinean zones (Figure 1). The spatial data used to produce Figure 1 (administrative boundaries and land use classes) were obtained from the National Institute of Geography of Benin [15]. The Sudanian zone (9°45′–12°25′ N) is characterized by annual rainfall ranging from 900 to 1100 mm, relative humidity averaging 18% during the harmattan, and mean monthly temperatures between 24 °C and 31 °C. Its soils are mainly hydromorphic, drained, ferralitic cuirasses, and lithosols. In contrast, the Sudano-Guinean zone (7°30′–9°45′ N) has comparable rainfall levels (900–1100 mm) but slightly lower mean temperatures (25–29 °C), and is dominated by poorly evolved mineral and ferruginous soils on a crystalline basement of variable fertility [2]. In the Sudano-Guinean zone of

Benin, agriculture is mainly based on mixed cropping and livestock systems, with maize, cowpeas, cassava, peanuts, yams, cotton, and cashews, as well as goats, sheep, cattle, and poultry. In the drier Sudanese zone, agriculture is more agropastoral, based on sorghum, maize, millet, cowpeas, and cotton, with cattle and small ruminants raised on extensive rangeland through transhumance.

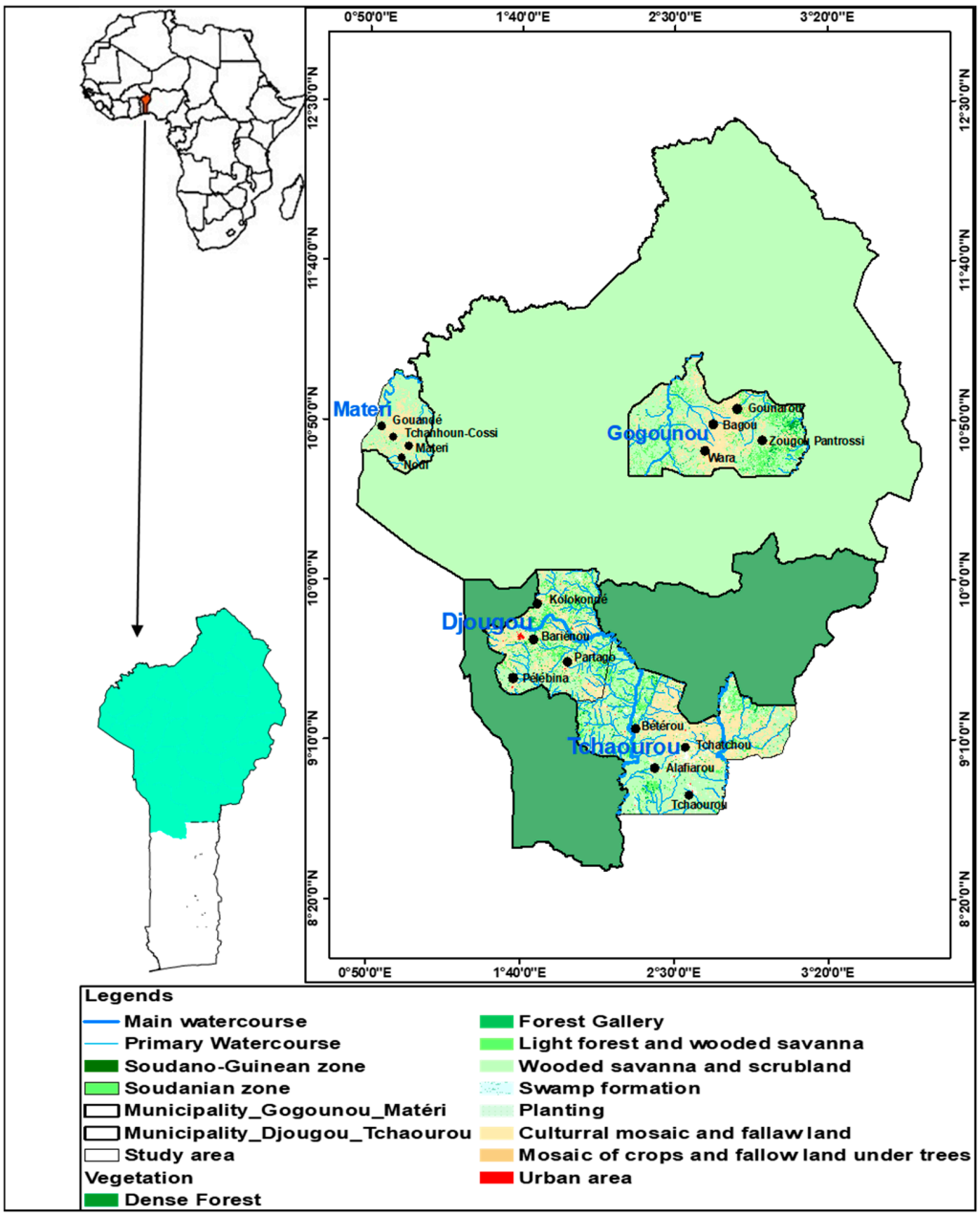


Figure 1. The map showing the municipalities of Gogonou and Materi in Sudanian Zones (in light green) and Tchaourou and Djougou Sudano-Guinean zones (in green) in the North of Benin [15].

In the Sudano-Guinean zone, the study covered the localities of Alafiarou, Tchaourou, Beterou, and Tchatchou in municipality of Tchaourou, as well as Pélébina, Kolokondé, Barienou, and Partago in municipality of Djougou. In the Sudanian zone, data were collected in Bagou, Wara, Gounarou, and Sougou Kpantrossi (municipality of Gogounou), and in Tchanhoun-Cossi, Gouande, Materi, and Nodi (municipality of Materi).

2.2. Data Collection

The data collection was performed in two phases: survey preparation and in-depth survey.

2.2.1. Preparing the Survey

During the preparatory phase, the districts and herders to be surveyed were identified. At the level of each municipality, interviews were conducted with managers of Agricultural Development Agencies (ATDA) and the Departmental Directorates for Agriculture and Livestock (DDAEP) and leaders of herder organizations. These authorities facilitated the selection of study districts, community entry, and the organization of focus group discussions prior to the survey. With their support, four districts were selected in each municipality, resulting in a total of sixteen districts for the study. The selection was based on spatial coverage and focused on villages with high agropastoral potential, accessibility, active cattle mobility, and thus, greater exposure to farmer–herder conflicts.

In each district, a focus group discussion was held (16 in total) to characterize conflict typologies and validate the survey instrument. Subsequently, 30 respondents (herders and farmers) were randomly selected per municipality, yielding 480 respondents overall. A total of 265 farmers and 215 herders were surveyed. Selection criteria required respondents to own at least five cattle and possess a minimum of five years' experience, thereby ensuring informed responses on livestock systems and conflict dynamics [16].

2.2.2. In-Depth Investigation

The survey was conducted in four municipalities of northern Benin: Materi and Gogounou (Sudanian zone) and Tchaourou and Djougou (Sudano-Guinean zone), selected for their high cattle density and their position as major entry points for transhumant herds from Nigeria, Burkina Faso, Togo, and Niger [12].

The survey was conducted from April to June 2023 through semi-structured interviews and direct observations, assisted by a local translator familiar with the study area. Data collected from herders included demographic and socioeconomic characteristics, herd structure, and conflict experiences, and were recorded digitally using the KoboToolbox platform on Android devices.

2.3. Data Analysis

Survey data were exported from KoboToolbox in Excel® 2019 and analyzed using SPSS (v17) and R (v4.2.2) [17]. Descriptive statistics summarized respondents' characteristics, while Chi-square and Z-tests were used for categorical variables, and Kruskal–Wallis and Mann–Whitney U tests for non-normal quantitative data ($p < 0.05$) [18]. To identify conflict typologies, Multiple Correspondence Factor Analysis (MCFA) followed by Hierarchical Ascending Classification (HAC) was performed using the *Factoshiny* package [17]. This method was preferred because it best handles categorical survey data, reveals multidimensional relationships, and produces coherent typologies validated in similar agricultural system studies [13,14].

3. Results

3.1. Socio-Demographic Characteristics of Cattle Herders Surveyed

The socio-demographic characteristics of respondents are summarized in Table 1. The sample was overwhelmingly male (98.96%), with the majority being married (98.33%) and belonging to the Fulani ethnic group (83.13%). Most herders adhered to Islam (86.04%) and had no formal education (90.42%). Livestock breeding constituted the principal activity (78.96%), followed by agriculture (18.54%). Family labor was the predominant source

of workforce (88.13%). Despite the generally low educational attainment, a substantial proportion of herders (64.58%) reported regular contact with extension services. The mean herd size was 50 ± 2.71 head of cattle.

Table 1. Socio-demographic characteristics of herders surveyed.

Variable	Modality	Climate Zone		Total	X^2	p-Value
		ZS	ZSG			
Sexes	Female	1.04 [a]	0.00 [b]	1.04	5.05	0.024
	Male	48.96 [a]	50.00 [a]	98.96		
Ethnic groups	Gando	10.00 [a]	0.00 [b]	10.00	65.94	$p < 0.05$
	Bariba	0.21 [b]	1.04 [a]	1.25		
	Yom	0.00 [b]	2.08 [a]	2.08		
	Fulani	37.50 [b]	45.63 [a]	83.13		
	Other ethnicities	2.29 [a]	1.25 [b]	3.54		
Marital status	Married	49.58 [a]	48.75 [b]	98.33	8033	0.018
	Single	0.00 [b]	1.25 [a]	1.25		
	Widower	0.42 [a]	0.00 [b]	0.42		
Religion	Animism	0.42 [a]	0.21 [b]	0.63	48.88	$p < 0.05$
	Christianity	1.25 [b]	12.08 [a]	13.33		
	Islam	48.33 [a]	37.71 [b]	86.04		
Contact with extension	No	18.96	16.46	35.42	1.31	0.25
	Yes	31.04	33.54	64.58		
Level of education	No education	44.38	46.04	90.42	7.67	0.053
	Primary	2.92	1.46	4.38		
	Secondary	2.71	1.67	4.38		
	University	0.00	0.83	0.83		
Literacy	No	44.38	46.46	90.83	2.5	0.11
	Yes	5.63	3.54	9.17		
Main activity	Agriculture	15.83 [a]	2.71 [b]	18.54	55.11	$p < 0.05$
	Breeding	33.33 [b]	45.63 [a]	78.96		
	Trade	0.42 [b]	0.83 [a]	1.25		
	Other main activities	0.42 [b]	0.83 [a]	1.25		
Workforce	Family	48.96 [a]	39.17 [b]	88.13	44.74	$p < 0.05$
	Family and employee	0.63 [b]	7.50 [a]	8.13		
	Occasional employee	0.00 [b]	1.67 [a]	1.67		
	Permanent employee	0.42 [b]	1.67 [a]	2.08		
Cattle herd size	Mean ± SD	58 ± 6.75	47 ± 2.58	50 ± 2.71	-	0.12

Values in the same row followed by different superscript letters (a, b) differ significantly at the 5% level ($p < 0.05$). ZS = Sudanian Zone; ZSG = Sudano-Guinean Zone; SD = Standard Deviation; X^2: Chi-square.

3.2. Percentage of Conflicts Between Farmers and Herders

Table 2 presents the percentage of respondents who experienced conflicts between herders and farmers. The general percentage of conflict cases between farmers and herders was 52.29%. Herders in the Sudano-Guinean Zone (ZSG) (36.88%) were more exposed to conflicts than those in the Sudanian Zone (ZS) (15.42%).

Table 2. Percentage of respondents who experienced conflicts between herders and farmers in the two agroecological zones.

Percentage (%)	ZS	ZSG	Total	X^2	*p*-Value
No	34.58 [a]	13.13 [b]	47.71	88.59	$p < 0.05$
Yes	15.42 [b]	36.88 [a]	52.29		

Values in the same row followed by different superscript letters (a, b) differ significantly at the 5% level ($p < 0.05$). ZS = Sudanian Zone; ZSG = Sudano-Guinean Zone; X^2: Chi-square.

3.3. Causes of Conflicts

In this study, the majority of herders mentioned that it is crop damage by animals (60.96%) that is often the cause of conflicts between these two actors (Figure 2). Then, the other causes include the occupation of corridors by farmers' crops (11.55%), the occupation of water points by farmers (9.96%), and the occupation of grazing areas by farmers (7.97%).

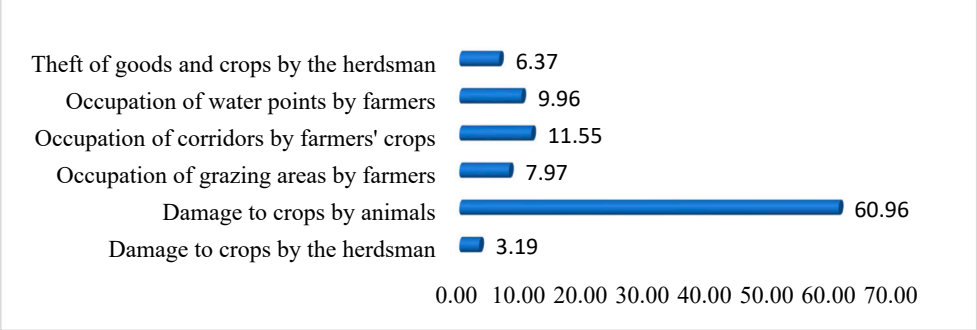


Figure 2. Causes of conflicts between farmers and herders.

3.4. Manifestations of Conflicts

Conflicts between farmers and herders manifest themselves in several forms. The majority of herders reported that these conflicts manifest themselves most in form of violent verbal altercations (37.50%), blow and injuries to animals (26.25%), beatings and injuries to people (between the two actors) (12.08%), poisoning of animals (5.83%), and slaughter of animals (3.33%) (Figure 3).

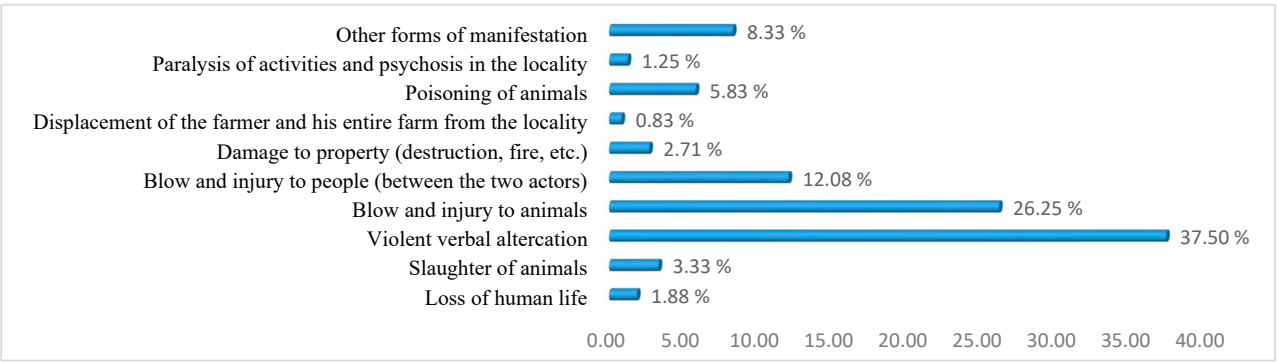


Figure 3. Manifestation of farmer–herder conflicts.

3.5. Conflict Resolution Methods

The predominant mode of resolving farmer–herder conflicts is through informal, amicable settlement (56.57%), with intervention by traditional chiefs (21.91%), intervention by local authorities (17.53%), and intervention by courts (3.98%) to resolve the dispute (Figure 4).

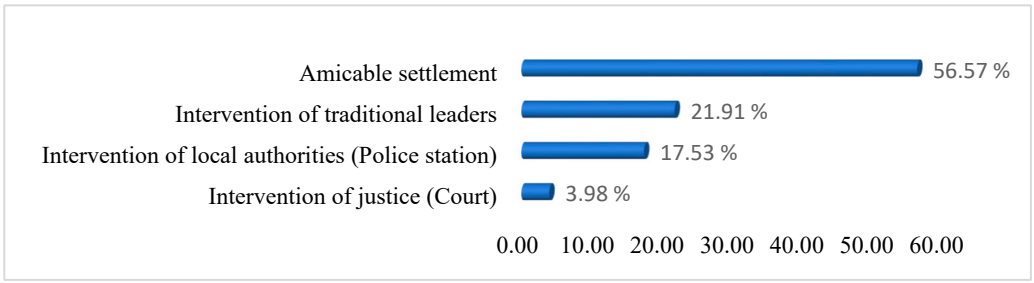


Figure 4. Mechanisms employed to resolve farmer–herder conflicts.

3.6. Correlation Between Agroecological Zone Variables and Factor Axes

Table 3 shows five dimensions with varying proportions along the Multiple Component Analysis (MCA) correlation matrix (Figure 5). The cumulative proportions of dimensions are 16.63%; 27.04%; 36.75%; 44.39%; 50.95% for dimensions 1, 2, 3, 4, and 5, respectively. This indicates that information on farmer–herder conflicts is contained in five dimensions. The interpretation of the eigenvalues of the matrix mentioned below shows that these five dimensions explain 50.95% of the variability of conflicts in the Sudanian and Sudano-Guinean zones (Table 3).

Table 3. Summary of models of first five factor axes.

Dimensions	1	2	3	4	5
Property values	0.166	0.104	0.097	0.066	0.066
% of variance	16.63	10.41	9.71	7.64	6.56
Cumulative % of variance	16.63	27.04	36.75	44.39	50.95

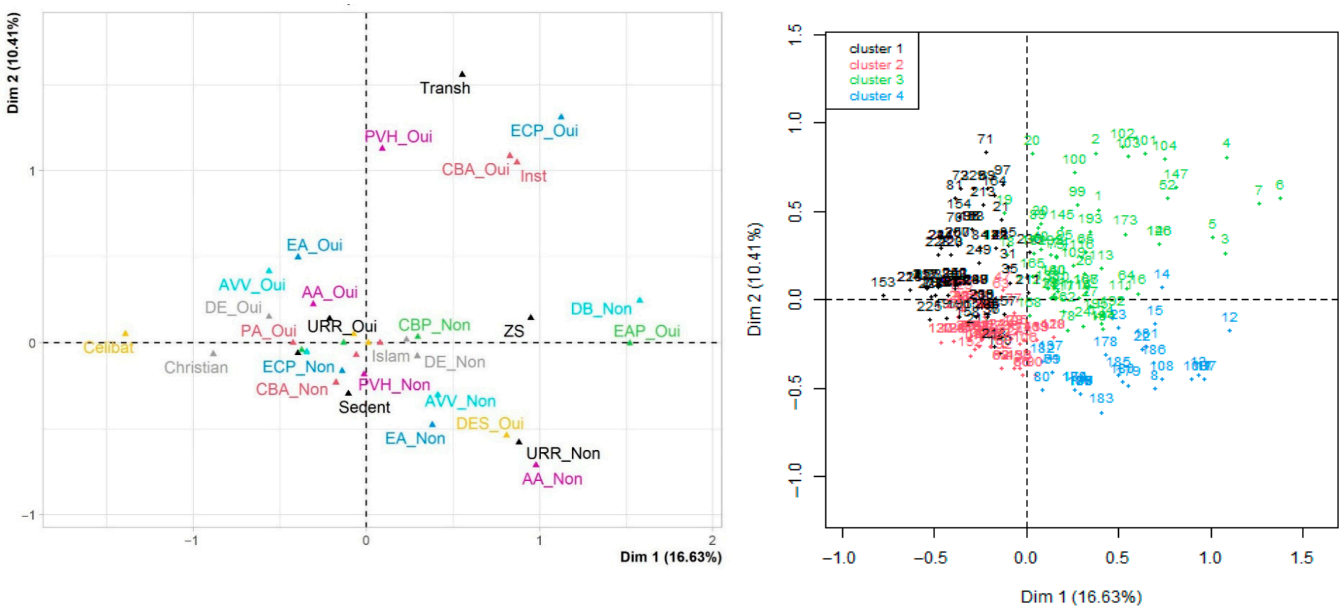


Figure 5. Groups of manifestations of conflicts between farmers and herders (**right**) and the variables (**left**) in the projection of the factorial axes. AVV: Violent Verbal Altercation; CBP: Blows and Injuries to People (between the two actors); DB: Damage to Property (destruction, fire, etc.); AA: Slaughtering of Animals; DE: Displacement of Herder and his entire farm from the locality; PA: Paralysis of Activities and psychosis in the locality; CBA: Blows and Injuries to Animals; PVH: Loss of Human Life; CBP: Blows and Injuries to People (between the two actors); EA: Poisoning of animals; ZSG: Sudano-Guinean Zone; ZS: Sudanian Zone.

Category 1: Blows and Injuries to Humans and Animals (CBHA)

This category mainly concerns herders in Sudano-Guinean zone (92.78%) where all herders are married. The herders who belong to this category are mainly from the Fulani ethnic group (91.75%) and practice Islam (76.29%). As shown in Table 4, breeding is their main activity (96.91%). They are not educated (93.18%) and do not belong to a herder organization. On the other hand, they are in contact with ATDA services (83.51%) and private services/NGOs (70.10%) and also have access to information. The majority of them practiced sedentary farming systems (92.78%) oriented towards prestige (80.41%) with an average cattle herd of 48 ± 3.89 heads. This category of conflicts represents 38.64% of herders and includes three major manifestations: blows and injuries to animals, loss of human lives, and blows and injuries to people (between the two actors) (Figure 5). The labor force used by the herders in this group is mainly family (93.81%). In this category of conflicts, the most dominant causes of conflicts are related to the occupation of water points by farmers (51.43%) and the theft of goods and crops by the herdsman (37.14%). These conflicts are mainly manifested in blows and injuries to animals (89.86%). The resolution of these conflicts is mainly performed by the intervention of justice in courts (62.07%) and by the intervention of local authorities at police stations (37.93%) to resolve tensions (Table 5).

Category 2: Movement of Herder and his entire Farm from the Locality (DEEL)

This category of conflict was represented by 34.26% of the surveyed herders (Table 4 and Figure 5). They are mainly located in the Sudano-Guinean zone (94.19%) and they are generally married (98.84%). These herders are largely of the Fulani ethnic group (95.35%) practicing Islam (83.72%) and breeding is their main activity (98.84%). These herders are not educated and do not belong to a herders' association. A majority reported interactions with ATDA services (73.26%) and with private or non-governmental organizations (74.42%). They also have access to information (83.72%). These herders are sedentary (95.35%) with a market-oriented breeding objective (100.00%). The mean cattle herd size was 48 ± 2.99 head.

In this category, conflicts are caused by the occupation of corridors by farmers' crops (63.16%) and the occupation of water points by farmers (23.68%). The causes are mainly manifested in the displacement of the herder and his entire exploitation of the locality (60.00%). With regard to conflict resolution, herders resort to the intervention of amicable settlement (75%) and traditional chiefs (25%) to resolve disputes (Table 5).

Category 3: Property Damage and Animal Slaughter (DBAA)

This third category was represented by 15.13% of herders. These herders are located mainly in the Sudanese zone (84.21%). They are all married, with Islam as the dominant religion (83.72%). The herders in this category are of the Fulani (84.21%) and Yom ethnic groups (13.16%), whose main activity is livestock farming. They are mostly uneducated (86.84%), are mostly not members of livestock organizations, and do not have access to information on livestock farming. However, the majority of livestock farmers in this group are in contact with ATDA services (92.11%) and have little contact with private services/NGOs. They are all transhumant with market-oriented livestock farming (76.32%) as production objectives (Table 4 and Figure 5). The mean herd size in this category was 52 ± 5.16 head of cattle.

For this category, the causes of conflicts are related to damage to crops by animals and the occupation of corridors by farmers' crops. The majority of these conflicts are manifested in the slaughter of animals, blows and injuries to people, and damage to property. Thus, the mitigation of these conflicts involves the intervention of local authorities through the police station (Table 5).

Table 4. Frequency of variables in projection on the factorial axes.

Variables	Terms and Conditions	Category 1	Category 2	Category 3	Category 4
	F	38.88	34.26	15.13	11.97
Agro-ecological zones	ZS	7.22	5.81	84.21	30.00
	ZSG	92.78	94.19	15.79	70.00
Marital Status	Bachelor	0.00	1.16	0.00	0.00
	Bride	100.00	98.84	100.00	100.00
Religion	Christianity	23.71	16.28	31.58	66.67
	Islam	76.29	83.72	68.42	33.33
Ethnic group	Bariba	3.09	1.16	0.00	0.00
	Gando	3.09	2.33	0.00	0.00
	Fulani	91.75	95.35	84.21	100.00
	Yom	1.03	2.33	13.16	0.00
	Other ethnicities	1.03	1.16	2.63	0.00
Main activity	Agriculture	2.06	0.00	13.16	0.00
	Trade	1.03	0.00	0.00	0.00
	Breeding	96.91	98.84	86.84	100.00
	Other activities	0.00	1.16	0.00	0.00
Level of education	No	93.81	100.00	86.84	96.67
	Yes	6.19	0.00	13.16	3.33
Type of labor	Family	93.81	95.35	86.84	100.00
	Family and employee	0.00	2.33	2.63	0.00
	Occasional employee	3.09	2.33	5.26	0.00
	Permanent employee	3.09	0.00	5.26	0.00
Membership in an organization	No	71.13	87.21	73.68	100.00
	Yes	28.87	12.79	26.32	0.00
Contact with ATDA services	No	16.49	26.74	7.89	100.00
	Yes	83.51	73.26	92.11	0.00
Contact with private services/NGOs	No	28.87	25.58	81.58	96.67
	Yes	70.10	74.42	18.42	3.33
Breeding method used	Sedentary	92.78	95.35	0.00	96.67
	Transhumant	7.22	4.65	100.00	3.33
Breeding objectives	Market oriented	19.59	100.00	76.32	100.00
	Prestige	80.41	0.00	23.68	0.00
Access to information related to breeding	No	23.71	16.28	31.58	66.67
	Yes	76.29	83.72	68.42	33.33
Mean ± SD	Cattle herd size	48 ± 3.89	48 ± 2.99	52 ± 5.16	59 ± 15.74

ZS: Sudanese Zone; ZSG: Sudano-Guinean Zone; SD: Standard Deviation; F = Frequency of herders in each category.

Category 4: Violent verbal altercation and poisoning of animals (AVEA)

This fourth category is the smallest and represents 11.97% of the herders surveyed, the majority of whom were from the Sudano-Guinean zone (70.00%). All the herders were married and practiced Christianity (66.67%). This group was exclusively composed of Fulani herders, whose main occupation was livestock breeding (100%). They are mostly uneducated (96.67%) and are neither members of any organization nor in contact with ATDA services, private services, or NGOs, and they lack access to breeding-related information (Table 4 and Figure 5). The breeding method is sedentary, with the objective of production oriented towards the market (100.00%). The average livestock size of herders in this category is 59 ± 15.74 heads of cattle.

Table 5. Frequency of additional variables of factorial axes.

Variables	Terms and Conditions	Category 1	Category 2	Category 3	Category 4
	F	38.88	34.26	15.13	11.97
Cause of conflicts	Crop damage from cattle herds	11.43	0.00	0.00	0.00
	Crop damage caused by animals	0.00	0.00	94.81	0.00
	Occupation of grazing areas by farmers	0.00	13.16	0.00	66.67
	Occupation of corridors by farmers' crops	0.00	63.16	3.25	20.83
	Occupation of water points by farmers	51.43	23.68	1.95	12.50
	Theft of goods and crops by the herdsman	37.14	0.00	0.00	0.00
Manifestations of conflicts	Slaughter of animals	0.00	0.00	9.52	0.00
	Violent verbal altercation	7.25	0.00	0.00	94.52
	Blow and injury to animals	89.86	0.00	0.00	0.00
	Blow and injury to persons (between the two actors)	0.00	0.00	76.19	0.00
	Damage to property (destruction, fire, etc.)	0.00	0.00	14.29	0.00
	Moving the herder and his entire farm from the locality	0.00	60.00	0.00	0.00
	Animal poisoning	0.00	0.00	0.00	5.48
	Loss of life	1.45	20.00	0.00	0.00
	Paralysis of activities and psychosis in the locality	1.45	20.00	0.00	0.00
Dispute resolution method	Intervention of justice (court)	62.07	0.00	0.00	0.00
	Intervention by local authorities (Police Station)	37.93	0.00	100.00	1.92
	Intervention of traditional leaders	0.00	25.00	0.00	0.00
	Amicable settlement	0.00	75.00	0.00	98.08

F = Frequency of herders in each category.

Family labor is used by these herders. The main causes of conflict in this group include the conversion of grazing areas into farmland (66.67%), the obstruction of livestock corridors by cultivated fields (20.81%) and the obstruction of water points by farmers (12.50%). The main manifestations are violent verbal altercations (94.52%) and the poisoning of animals (5.48%). Amicable settlement (98.08%) is the most used solution by herders to manage conflicts (Table 5).

4. Discussion

4.1. Causes of Farmer–Herder Conflicts

More than half of the herders interviewed had experienced at least one conflictual interaction with farmers. This finding reflects the growing incidence of conflicts between farmers and herders. Several authors have reported similar observations, indicating that this phenomenon is becoming increasingly widespread across West Africa. We can cite Kratli and Toulmin [19] and Brottem [9] who, following their studies, have reported a general increase in conflicts over the past decade in West Africa, with specific reference to Benin. Their analyses reveal that more than half of recorded conflict cases since 2010 have occurred after 2018.

Our results show that livestock farmers in the Sudano-Guinean zone (36.88%) are significantly more exposed to conflicts with farmers than those in the Sudanese zone

(15.42%). This difference reflects the distinct agroecological and socioeconomic contexts of the two zones. The ZSG, characterized by higher agricultural potential and population density, has become both a settlement area for local livestock farmers and a reception area for transhumant herds. This dual pressure intensifies competition for land, water, and corridors, making conflicts more frequent. Similar trends have been reported in the upper Ouémé basin [20] and in studies conducted in northern Cameroon and Chad [21,22] where sedentarization and agricultural expansion have contributed to an increase in conflicts between farmers and herders. In contrast, the Sudanese zone (ZS), although also exposed, experiences fewer conflicts, probably due to its lower population pressure and the continued predominance of transhumance. These results suggest that conflict prevention strategies should be specific to each zone, with an emphasis on land use planning and corridor protection in the ZSG and better management of pastoral mobility in the ZS.

This study identified crop damage by animals as the primary cause of farmer–herder conflicts (60.96%), followed by the occupation of livestock corridors by farmers' crops (11.55%), the occupation of water points by farmers (9.96%), and the occupation of grazing areas by farmers (7.97%). These findings are consistent with those reported by other authors [6,22–25] where the occupation and encroachment of pastoral corridors and tracks reserved for cattle movement constitute the main factors driving farmer–herder conflicts. Other authors such as Brottem [9] and Pierre and Gaddoum [26] recorded similar results in their studies on relations between farmers and herders. These authors report that conflictual relations are increasingly acute because of damage to fields, the occupation of passage corridors and the development of pastures by farmers. Schönegg [27] noted that the occupation of lowlands by fields is one of the main causes of conflicts, because herders must make large detours to find passages or are forced to cross these fields, which causes damage, and this can degenerate into conflicts [20,28].

It should be noted that the two actors involved blame each other [29]. A study conducted in Côte d'Ivoire reports that farmers complain about the use of underage herdsmen who cannot properly guard the animals, which are often oversized [30]. As a result, some animals enter the crop fields to cause damage. For other farmers, herders are often concerned about feeding their animals and make early seasonal movements into fields that have not yet been harvested, which causes conflicts. Added to this is the aggressive behavior of herders, which they experience on a daily basis [27]. On the other hand, herders complain about a progressive limitation of their movements (prohibition on entering fields that have already been harvested or fallow land, obstructed corridors). It should be noted that herders and herdsmen are still not at the root of the conflicts, because some farmers consciously set up trap fields, with the intention of being compensated in the event of damage by animals, in areas prohibited for agricultural use by local laws, which are used for pastoralism [29,31]. This is supported by the research carried out by Gnanglè [32] in Benin. The author mentions that the animal passage corridors that had been recognized and accepted by all were no longer respected by farmers in search of arable and fertile land. In addition, farmers in certain localities engage in deviant behavior and develop maneuvers to cause the death of herders' livestock. Knowing that an animal that is not slaughtered according to the rites of Islam is a "djoufa" and will not be consumed by the herder, who is most often Muslim, farmers kill the animals, usually by poisoning or any other means. As a result, they are able to dispose of the corpse of the animal, which is abandoned by the herder, and have the meat to consume without spending money. All these causes undermine socio-economic and environmental development and hinder cohabitation and living together due to farmer–herder conflicts [33].

4.2. Conflict Resolution Strategies

Conflicts between farmers and herders are manifested in verbal and violent altercations (37.50%), beatings and injuries to animals (26.25%), beatings and injuries to people (12.08%), poisoning of animals (5.83%), and slaughter of animals (3.33%). The results of this study are similar to those recorded by Djenontin et al. [25]; Demba Ba and Descroix [34]; and Maman et al. [35] who have also identified several manifestations of farmer–herder conflicts over access to local resources. Some studies show that conflicts between farmers and herders sometimes manifest themselves in the loss of human life and loss of property among both herders and farmers [36]. This study also reported cases of loss of human life, even if they seem very low. The low rate of cases of loss of human life linked to these conflicts corroborates the thinking of Brottem [9], who believes that mortalities in this case are often amplified by the strong emotional charges of religion, ethnicity, culture, and land. In any case, it is still human life, which is above all, sacred. Whatever its proportion, its loss, due to a conflict between actors called to live together, is deplorable.

These conflicts are sometimes at the root of insecurity. As soon as they take hold, there is a paralysis of economic activities and a psychosis in communities that are prey to major banditry and terrorism. This can be an obstacle to the steps and prospects for achieving the global sustainable development goals regarding the eradication of poverty and hunger [36,37].

In this study, the conflict cases reported by the herders were resolved in different ways. The main methods of settlement are as follows: amicable settlement (56.57%), intervention of traditional chiefs (21.91%), intervention of local authorities (17.53%), and intervention of justice (3.98%). The findings are similar to those of Dagbelou et al. [38]; Djohy and Bouko [39]; and Adédigba et al. [40] who mentioned that several actions and approaches are often implemented to resolve conflicts when they arise to prevent their consequences from creating other harmful and regrettable problems. For amicable settlement, it is often between the herder and the farmer who owns the field that the negotiation takes place. These two actors agree on an amount or a compromise. It is in the event of the failure of the negotiations between the two that one of them, most often the farmer, brings the problem to the attention of the traditional chiefs for their mediation in order to resolve the situation. Sounon et al. [41] and Djohy et al. [42] highlighted the involvement of traditional authorities in conflict management. A few cases are presented to the administrative authorities, because sometimes one actor is not satisfied with the verdict. However, the authorities are often criticized for excessive fines when an animal accidentally enters a farmer's field as well as their position in favor of the owner of the field [27]. It also happens that the farmer feels frustrated at the outcome of the sentence handed down by the authorities to his disadvantage. The conflict is therefore not resolved in the eyes of the farmer. This increases his bitterness, and he may decide to take justice into his own hands or with the support of his relatives or his entire community. Thus, the easily manageable conflict can take on an intercommunity or interethnic dimension, one that is difficult to manage. Brottem [9] believes that the chain of events from manageable conflicts between farmers and herders to spirals of intercommunity violence is very complex and varied.

To prevent conflicts with farmers, some herders move their animals from the crop environments where they live with their herds (camps). This observation was made by Bouko et al. [20] and Djohy et al. [43]. The negotiation of crop residues by herders allows farmers to give their favorable opinion before the introduction of animals into the fields [34] and thus avoid possible conflict. Finally, there are studies that have focused on pastoral and agropastoral infrastructure in a participatory approach in order to avoid conflicts between farmers and herders [6,33]. This is supported by the work of [44,45] who believe

that access to pastures and water points remain at the heart of conflicts for access to very limited resources.

4.3. Sedentarization as a Driver and a Solution

The findings indicate that many herders in northern Benin have progressively adopted sedentary or semi-sedentary livestock systems in response to the escalation of disputes, closure of pastoral corridors, and increased pressure on land resources. Similar observations have been made in Burkina Faso, Cameroon, and Mali, where recurrent conflicts and ecological constraints have driven pastoralists to establish permanent settlements [5,6,21].

However, this transition toward sedentarization also represents a driver of new tensions when it occurs spontaneously and without institutional regulation. As livestock herders settle, the demand for arable land and water increases, creating fresh disputes with farmers, especially in areas already marked by land fragmentation and insecure tenure. Studies from Nigeria and Chad show that unregulated sedentarization often exacerbates resource competition and can escalate into intercommunal conflicts [9,22,36].

Conversely, when supported by participatory land use planning, sedentarization can serve as a conflict mitigation mechanism. Planned settlement schemes that ensure grazing areas, fodder banks, and water access can improve resource management and social cohesion. Empirical evidence from northern Benin confirms that structured sedentarization strengthens livestock productivity and farmer–herder relations [40,41].

Therefore, sedentarization in the Sudanian and Sudano-Guinean zones of Benin should be seen as a double-edged process: it can intensify local competition when unmanaged, but it can also become a pathway toward stability and coexistence when integrated into inclusive governance frameworks. This interpretation aligns with findings showing that sedentarization outcomes depend on institutional and ecological contexts [37].

4.4. Policy Implications

The findings of this study point to the imperative of using distinctive policy interventions in the Sudano-Guinean and Sudanian zones. The Sudano-Guinean zone where conflicts predominantly take place requires that land use planning is complemented by protecting and implementing pastoral corridors and water points. Participatory systems of governance by farmers, herders, and local administrators can regulate seasonally managed access to resources and reduce tensions. In addition, the role of community institutions and traditional leaders in conflict resolution should be strengthened and recognized by the incorporation of formal mediation systems. Supporting sedentary pastoralists through increased fodder production, improved animal genetic resources, utilization of crop residues, and veterinary services would also decrease the frequency of conflicts with farmers. Given the transborder character of pastoral movement, coordination among countries surrounding the Great Lakes, such as Burkina Faso, Niger, and Nigeria, is also needed to harmonize the policies for livestock movement to eliminate cross-border conflicts.

While this study provides valuable insights into the perceptions and experiences of herders, it does not capture the perspectives of farmers, who are equally affected by these conflicts. Including farmers' viewpoints would enrich the analysis by revealing complementary or contrasting narratives on the causes and manifestations of conflicts. Previous studies [9,20] have shown that differences in perceptions between farmers and herders often shape conflict escalation and resolution pathways. Future research should therefore adopt a dual-actor approach to develop more inclusive conflict prevention and management strategies.

4.5. Limitations of Study

There are a few limits to this study that should be taken into account in the interpretation of the findings. First, the study was carried out in four municipalities alone, and as such, it does not represent the entire range of conflict issues in northern Benin. Second, the data were primarily collected from herders, and their statements reflect individual perceptions that may not always perfectly correspond to reality. However, similar subjectivities have been reported among farmers, whose own narratives often differ from herders' accounts due to contrasting livelihood interests and experiences [9,15]. Future studies integrating both perspectives would therefore provide a more balanced understanding of farmer–herder conflict dynamics. Third, the research was carried out over a short period of time and therefore does not record the seasonal or yearly variation that may affect conflicts. Finally, farmers' perceptions were not directly included, yet they are at the center of these conflicts.

5. Conclusions

This study highlighted the frequency of farmer-herder conflicts in two climatic zones of northern Benin, noting that the phenomenon is more pronounced in the Sudanian-Guinean Zone. The study also revealed that crop damage by animals, the occupation of livestock corridors by farmers' crops, the occupation of water points by farmers, and the occupation of grazing areas by farmers constitute the main causes of these conflicts, in that order. Correspondingly, the conflicts are manifested primarily through violent verbal altercations, physical assaults and injuries to animals, assaults and injuries to people, as well as the poisoning and slaughter of animals.

In most cases, these conflicts are resolved amicably. Four categories of herders involved in conflicts with farmers were identified in this study. They differ according to the forms of conflict manifestation, climatic zones, breeding systems, herd size, and breeding objectives. The lack of grazing areas and livestock corridors, limited fodder production, poor utilization of crop residues, inadequate use of feed concentrates, and insufficient knowledge of the regulations governing livestock mobility were identified as key limiting factors characterizing the different groups.

Although this research focused on Benin, its implications extend to the West African Sudano-Sahelian belt, where similar agroecological conditions, transhumance systems, and land use pressures prevail. Countries such as Niger, Burkina Faso, Nigeria, and Chad face comparable challenges, marked by competition for land and water and the ongoing transition from mobile to sedentary livestock systems. Therefore, the patterns and typologies identified in this study reflect broader regional trends. This typology provides a valuable basis for identifying sustainable measures aimed at preventing conflicts between farmers and herders.

Author Contributions: Conceptualization, M.T., C.I. and A.A.S.; methodology, M.T., A.A.S. and C.I.; validation, E.V.B.A., J.Y., I.A.T. and M.A.; formal analysis, M.T., M.A., C.I. and A.A.S.; investigation, M.T. and A.R.A.A.-B.; writing—original draft preparation, M.T., M.A., C.I. and A.A.S.; writing—review and editing, E.V.B.A., J.Y. and I.A.T.; visualization, E.V.B.A., J.Y. and I.A.T.; supervision, E.V.B.A., J.Y. and I.A.T. All authors have read and agreed to the published version of the manuscript.

Funding: This research received no external funding.

Institutional Review Board Statement: The study protocol was carried out in full compliance with the fundamental ethical principles that govern scientific research at University of Parakou (Letter of ethical certificate No. 113 of 3 April 2023).

Informed Consent Statement: Informed consent was obtained from all individual participants included in the research study. Participation in the survey was voluntary and anonymous, and data collection was carried out in the strictest confidence.

Data Availability Statement: This article contains all original contributions from the study. Further inquiries should be addressed to the corresponding author.

Acknowledgments: The authors thank the ATDA agents, village chiefs, herders, and their organizations for their collaboration, as well as the Laboratory of Ecology, Health and Animal Production (LESPA), University of Parakou, for institutional support.

Conflicts of Interest: The authors declare no conflicts of interest.

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