ASSESSING LOCAL FOOD SYSTEMS' RESILIENCE IN CONFLICT AFFECTED AREAS

Results from a pilot study in the Yagha Province in Burkina Faso

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Table of Contents

Background and objectives of the study

Armed conflicts and the violence they cause are among the major shocks which disrupt local food systems in most low- and middle-income countries. This generally results in physical and economic disruptions of the food supply operations -leading to food shortages, food losses, high and volatile food prices both in rural and urban areas, that may have short-term and long-term implications for both chronic and acute hunger and malnutrition. In addition, armed conflicts can severely affect the activities and livelihoods of the main actors of the local food system including food producers, processors transporters and retailers, leading a significant decline in incomes.

In 2021, three institutions, French agricultural research and international cooperation organization (CIRAD), The International Center for Tropical Agriculture (CIAT) and the United Nations World Food Programme Country the Burkina Faso Office (WFP) in Burkina Faso established an international collaboration with the ambition to better document the effects of conflict-related shocks on the functioning of local food systems. More specifically the objectives of the collaboration were to:

✦ Analyze how food systems' activities are disrupted by the conflicts

✦ Identify which actors in the system are the most affected

✦ Document the strategies put in place by these actors to 'buffer' the impact of the disruptions induced by the conflict

✦ Identify positive deviants and determine whether those positive deviants differ substantially by their behaviors and response strategies from the other actors

Propose lessons on the resilience of food systems in the context of armed conflict

In parallel to these main objectives, the ambition was to demonstrate that key information about the status, processes and dynamics at work in those local food systems could be captured through 'light' questionnaires; that those questionnaires could be implemented despite the difficulty to operate in those highly insecure, rapidly changing conflict zones; and that the information provided could be useful in complementing the Integrated Food Security Phase Classification (IPC) Tables that are used in routine by governments and international humanitarian agencies to monitor changes in food security in conflicts-affected areas.

To deliver those different objectives, empirical data were collected as part of a pilot study conducted in one of the provinces currently severely affected by armed attacks (the Yagha Province). This report summarizes the main results of this pilot study.

Current security situation in the Yagha province

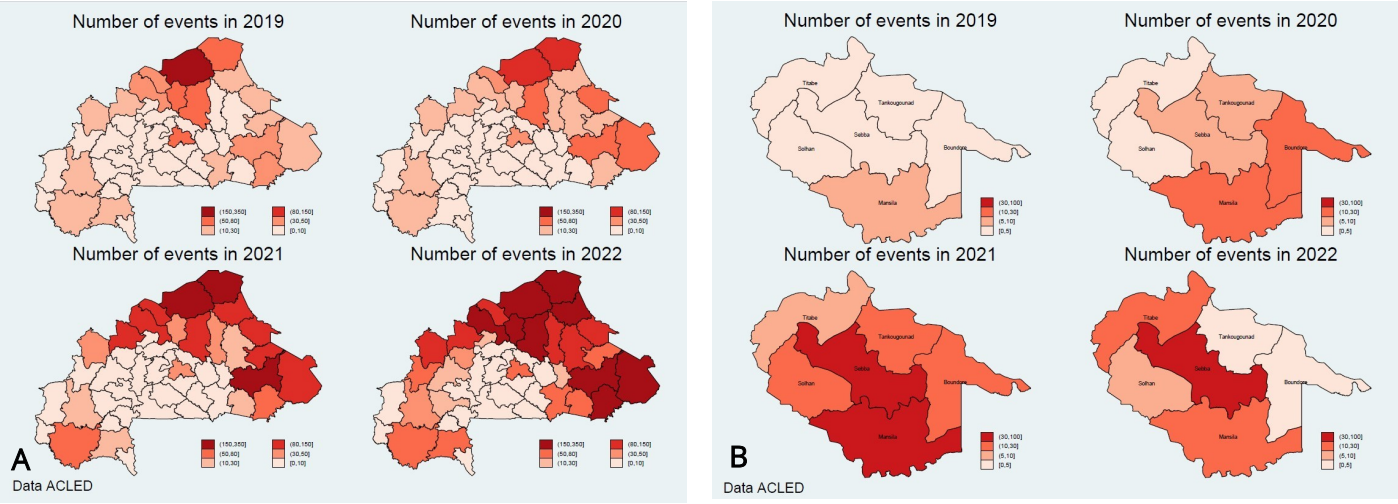

Figure 1. Evolution of reported fatalities in the Burkina Faso (left) and the Yagha province (right)

Between 2019 and 2022 the security situation in Burkina Faso degraded very rapidly, with a high increase of reported fatalities (Fig.1, left). Armed conflicts, originally located in the northern part of the country, had expanded over the eastern parts. The number of violent events increased massively in the Yagha province (Fig.1, right), and translated into massive displacements of internal population towards small cities that are perceived as safer than remote villages because of the presence of security forces. In June 2022, the displaced population was estimated to be around 12000 at the level of Sebba, the city capital of the Yagha province, representing between 40 and 59% of the autochthone population (CONASUR 2022).

The evolution of the numbers of person that are food insecure in the Yagha Province during the *lean season* (Fig.2 left) confirms that the situation is degrading very rapidly. The visual correlation with the reported armed attacks in the Yagha province since 2018 (Fig.2 right) suggests potential causality between the two phenomena. Without more precise information about the actual impacts of the armed attacks on the local food system, those causalities remain, however, only hypothetical. The data collected through the pilot study presented in this report will allow this causality to be established more rigorously.

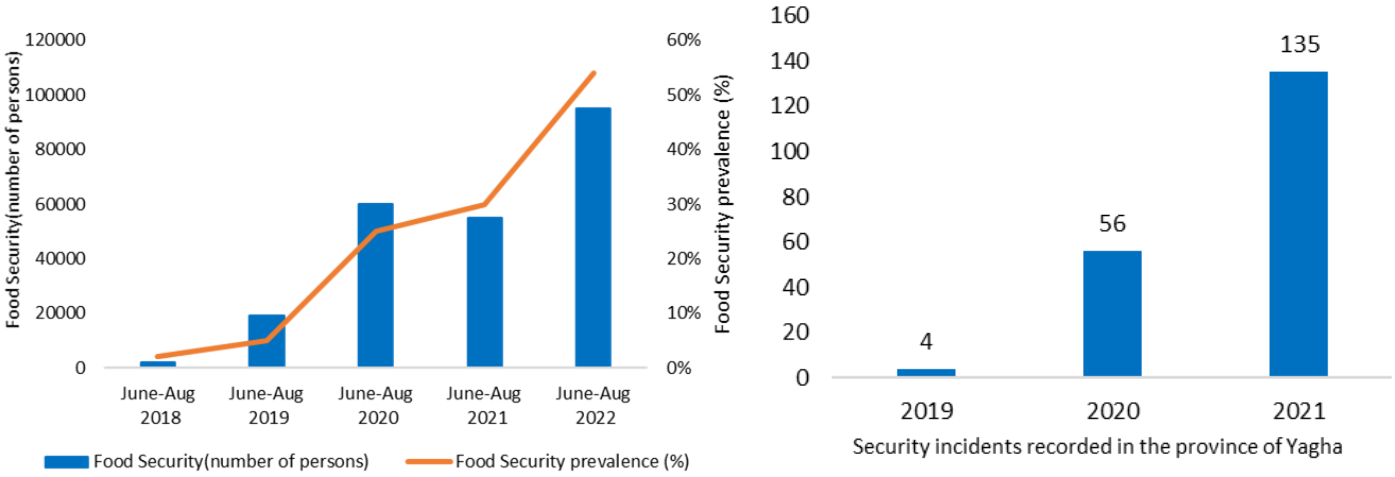

Figure 2. Prevalence of food insecurity and occurrence of security incidents in the Yagha province

Data collection

A series of three successive surveys were conducted between Sept 2021 and May 2022. The two first surveys were aimed at documenting local food systems disruptions related to armed conflicts while the third survey was aimed at documenting how the Sebba food system, which ensures the food supply of the city capital of the Yagha province, reacted to the massive influx of displaced people that ran away from other places, perceived as less safe.

The first survey was carried out in Sept 2021 on a sample of 343 food system actors living in 40 different localities (villages, small or medium cities) across 6 departments of the Yagha Province. The survey was conducted face to face when the access to the locality was possible and secure, and by telephone otherwise. A total number of 130 producers (farming and livestock rearing), 62 processors, 57 transporters and 93 traders were interviewed. For the second survey, 309 actors from the initial 343 respondents were surveyed again in Nov 2021. The relatively high 10% attrition (34 missing in a 2-month period) is thought to be the consequence of the constant disruptions affecting the mobile phone networks and the move/displacement of those individuals – or a combination of both – following the rapid degradation of the security situation in 2021 in the region.

The third survey was conducted in May 2022 and targeted two groups of actors which appeared to be particularly important in the potential resilience of the local food systems and which had developed their economic activity in Sebba: the transporters and the traders. A group of 263 actors (198 traders and 65 transporters) operating from the Yagha capital, Sebba, was targeted for this third survey.

The design of the three surveys was adapted to the conflict situation. In particular the number of questions was reduced and their structure simplified as much as possible so they could be administered either face-to-face in a limited period of time or on the phone. These "conflict-situation" questionnaires included series of questions related to the socio-economic status of the respondents (gender, ethnic group, matrimonial status, family size, education), their main income-generating activity (producers, processors, transporters, traders), self-reported level of wealth, perception about and direct exposure to the armed attacks, and the self-assessed impact of those attacks on various aspects of their economic activity. Distinction was also made during the interviews between 'acute crisis' (which refers to the first few days that follow a specific attack) and 'latent insecurity' (period between two attacks).

Key findings

Who are the food system actors in the Yagha province?

The proportions of each activity group (producers, processors, transporters, traders) observed in the different surveys reflect our sampling strategy, and not the actual proportions of the different groups in the food systems. The respondents' gender, on the other hand, was not intentional, and, as such, provides some element of information about the gender proportion as observed in the Yagha food system. Based on data from the first survey, it appears that males are essentially engaged in production, trading and transport activities (making 82% of all the actors engaged across these 3 groups) while females are engaged mainly in processing activities (87% of all the processors), with some also engaged in the trading business (Table 1). Statistical test confirmed that gender and activities are not independent (Pearson chi2(3) = 251.01; Pr < 0.0001). Overall, food system actors belong to the Peulh ethnic group (62%), followed by the Gourmantche group (27%), the Mossi and Haoussa, thus reflecting relatively closely the ethnic composition in the province.

Table 1: Primary activity and gender

	Male		Female	
	Freq (N)	Percent (%)	Freq (N)	Percent (%)
Producers	129	46.0%	2	3.2%
Transporters	57	20.4%	0	0%
Processors	7	2.5%	55	87.3%
Traders	87	31.1%	6	9.5%
Total	280	100%	63	100%

Pearson chi2(3) = 251.01; Pr < 0.0001

In term of education, data indicate that almost half of the respondents did not attend schools (46%), while some went to coranic schools (27%) or elementary schools (25%), and very few went to secondary schools (2%). When asked about their literacy, 155 respondents (50%) reported they can read and/or write in at least one language. Table 2 shows literacy level broken down by main activity. Most transporters and traders are literate (70% in both cases), while only 41% of the farmers and 24% of the processors are literate. It is worth recalling that 87% of the processors in our sample were also women.

Table 2. Respondents' literacy level and main activity

	Literate		Non-Literate		Total	
	Freq (N)	Percent (%)	Freq (N)	Percent (%)	Freq (N)	Percent (%)
Farmers	50	41%	73	59%	123	100%
Processors	13	24%	42	76%	55	100%
Transporters	33	70%	14	30%	47	100%
Traders	59	70%	25	30%	84	100%
Total	155	50%	154	50%	309	100%

Pearson chi2(3) = 41.03; Pr < 0.0001

To assess the respondents' wealth, a simplified self-reported wealth assessment was conducted whereby actors were asked to situate themselves along a gradient 'poor', 'neither rich nor poor', and 'rich'. The data showed that a large proportion of food system actors (53% of the respondents) consider themselves as 'neither rich nor poor', while 20% consider themselves as being 'rich' and 27% as being 'poor'. When broken down by activity, data showed that a larger proportion of traders (40%) consider themselves as 'rich' (Table 3) compared to producers (12%) and processors (only 8%). A statistical test confirmed that wealth and activity are significantly correlated (Pearson Chi2(6) = 47.79; Pr < 0.0001). Given those numbers and the fact that the majority of processors are women (cf. Table 1), one may hypothesize that women engaged in food system activities may be part of the poorest group.

Those results, which were obtained through the first survey, could be refined, however, through the third survey. In that later survey, questions had been included to quantify the value of the transport assets (trucks, pick-ups, motorbikes, bicycles, charts, etc.) owned by the traders and transporters operating from Sebba. We used this information as a proxy to assess those actors' 'business wealth'. The data showed no statistical difference between the values of men and women' transport assets for the trader group (Table 4), suggesting that, at least for the trader group, this hypothesis is not confirmed.

Table 3. Self-reported wealth status by activity group (N=340)

Group	Producer	Processor	Transporter	Trader	Total
Rich	12.4%	8.2%	17.5%	39.8%	20.0%
Neither rich, nor poor	48.8%	57.4%	63.2%	50.5%	53.2%
Poor	38.8%	34.4%	19.3%	9.7%	26.8%
Total	100%	100%	100%	100%	

Pearson Chi2(6) = 47.79; Pr < 0.0001

Table 4. Value of transport assets own by traders operating from Sebba

Value of transport assets in FCFA	N	Mean	*p*-value
Men	152	4 265 132	
Women	44	4 062 386	
Difference		202 745	0.874

Note: the group of 65 transporters we interviewed did not included any woman

Exposure to insecurity

Most respondents (87%) reported that there has been at least one attack in their village or in neighboring villages or area of activity during the past 12 months. Fig.3 indicates the distribution of the number of nearby armed attacks in the last 12 months reported by food systems actors. On average, respondents reported between 3 and 5 violent events occurring in their village or in neighboring villages or area of activity in the last 12 months.

When asked about whether they (or some of their direct family members) have been victims of one of those attacks, 39% of the respondents answered positively. Considering the main activity reveals some slight variations (Table 5), with respondents in the transporter group showing the highest report of direct attack (47%) while producers and traders showed the lowest (37% for both). Those differences were not statistically significant however (Table 6).

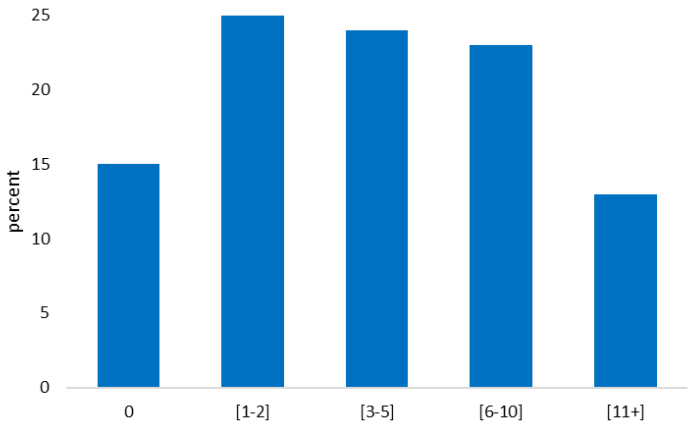

Fig.3. Frequency of armed attacks as reported by respondents

Table 5. Direct victim reported and main activity of respondents

	Direct victim reported		No direct victim reported		Total	
	Freq (N)	Percent (%)	Freq (N)	Percent (%)	Freq (N)	Percent (%)
Producer	48	36.6	83	63.4	131	100
Processor	25	40.3	37	59.7	62	100
Transporter	27	47.4	30	52.6	57	100
Trader	34	36.6	59	63.4	93	100
Total	134	39.1	209	60.9	343	100

Pearson chi2(3) = 2.26; Pr = 0.52

Table 6. Difference between group activities and direct victim reported in % point (diff and p-value)

	Producer	Processor	Transporter	Trader
Producer				
Processor	-3.7 (0.622)			
Transporter	-10.7 (0.167)	-7.0 (0.439)		
Trader	0.1 (0.990)	3.8 (0.636)	10.8 (0.191)	

Not too surprisingly, the level of anxiety in response to latent insecurity or even acute crisis was remarkably high amongst all the respondents, with two thirds of them (66%) declaring to be 'always worried', and an additional 20% to be 'often worried'. When (self-reported) wealth is considered, it seems that those in the 'rich' group are slightly less anxious than respondents in the two other groups (Fig.4). The difference is actually statistically significative (Pearson chi2(8) = 35.14; Pr < 0.0001). In contrast, the level of anxiety does not appear to be significantly different between activity groups (Pearson chi2(12) = 11.43; Pr = 0.492) even if the proportion of processors who declare to be always anxious (76%) is higher than amongst the other groups (Table 7).

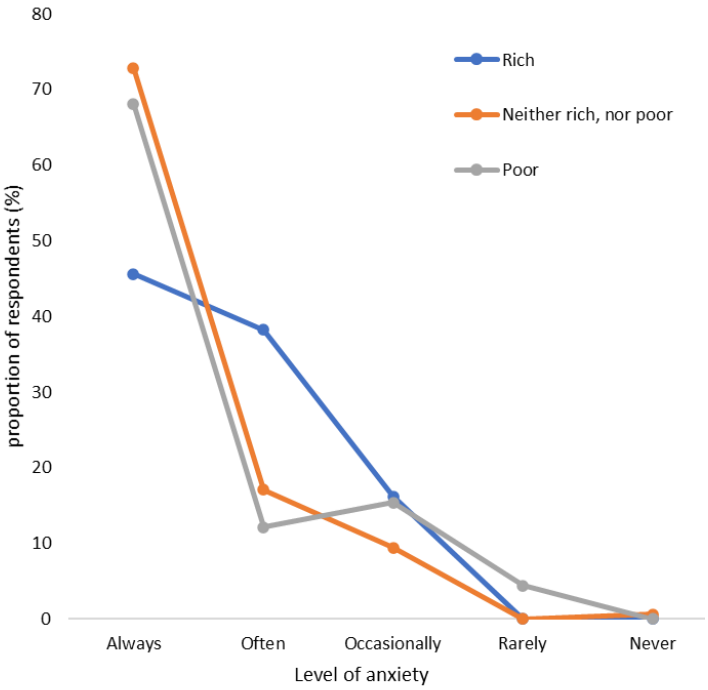

Fig.4. Self-reported wealth and level of anxiety (N=340).

Table 7. Activity and the level of anxiety (n=343)

	Always	Often	Occasionally	Rarely	Never	Total
Producer	64.9%	22.1%	10.7%	2.3%		100%
Processor	75.8%	14.5%	8.1%	1.6%		100%
Transporter	59.7%	22.8%	17.5%	4.4%		100%
Traders	63.4%	21.5%	14%		1.1%	100%
Total	65.6%	20.7%	12.2%	1.2%	0.3%	100%

Pearson chi2(12) = 11.43; Pr = 0.492

Social capital among food system actors

Social capital (and in particular personal or professional network) is a critical element in actors' economic strategy during normal time but also as an element of resilience in time of crisis. As part of the second survey, respondents were therefore asked whether they had been seeking help before and after the start of the armed attacks and if so, how and to what extent they relied on those networks in those specific circumstances.

The data indicated that the proportion of individuals relying on their personal and/or professional networks before and after the start of the conflict is relatively high and constant, around 90%.

In fact, 82% of the respondents who answered 'yes' to the question related to the period before the crisis started, also responded 'yes' to the similar question considering the period after the security crisis started. However, data also revealed that the number of support (friends, relatives, colleagues) that people could call for in case of personal problems has reduced on average by 12% since the start of the conflict and the reduction is noticeable across the four groups (Table 8). Transporters were the individuals who reported the largest reduction in the size of their network (more than 20% reduction), while producers experienced the lowest reduction (9%). Transporters are also the group with the smallest network after the conflict started.

Table 8. Average size and relative change in actors' networks before and after the insecurity started

	Farmers		Processors		Transporters		Traders		Total	
	Before	After	Before	After	Before	After	Before	After	Before	After
Nber of pers	5.4	4.9	4.7	4.2	5.1	4.0	5.5	4.9	5.2	4.6
Change (%)	-9%		-11%		-22%		-11%		-12%	

Looking at the details of to whon (persons, groups, or organizations) the respondents turn to in case of problem (Table 9), data showed that amongst the 277 persons who would ask for help before the conflict, 94% indicate they would turn to the family and 74% to friends or neighbors. This is remarkably similar to the situation after the conflict, where 91% and 68% of the support would be provided by the family and by friends/ neighbors respectively. The figures for food organizations and NGOs are surprisingly low, around 8% and 16% for NGOs (before/after) and 2% and 9% for food aid organizations (before/ after).

Table 9. Which entities food system actors turn to in case of problem before and after the insecurity crisis started

	Before		After	
	Freq (N)	Percent (%)	Freq (N)	Percent (%)
Family	260	94%	249	91%
Neighbors	205	74%	186	68%
Work contacts	53	19%	50	18%
Informal loan provider	43	16%	44	16%
Kolweogos[(1)]	19	7%	4	1%
Project NGO	21	8%	44	16%
Food aid organization	5	2%	24	9%

Note: (1) Kolweogos are local/village level informal security committees.

Losses and damages related to armed conflicts (direct impact)

Table 10 shows the proportion of respondents who reported some damages/losses amongst those who experienced at least one-armed attack in the last 12 months. Note that crop damage, livestock and farm asset losses apply only to the subgroupe of producers. We observe that the most important losses reported by those producers are those of livestock (62%). A large group of respondents also reported merchandises losses (26%) followed by losses of transportation assets (22%).

When self-reported wealth is considered (Table 11), no statistical difference was observed amongst those who reported some crop damage (Pearson chi2(2) = 0.64; Pr = 0.72) or livestock damage (Pearson chi2(2) = 1.81, Pr = 0.40). In contrast, tests suggest that losses amongst those who reported merchandise losses (Table 11 top) and transportation assets losses (Table 11 bottom) are statistically more frequent amongst the 'rich' respondents than amongst the two other groups (Table 12). This could be interpreted by the fact that richer actors may be perceived as more prominent targets.

Table 10. Damage/loss suffered by the respondents who report at least one attack

	Damage/loss suffered					
	Yes		No		Total	
	Freq (N)	Percent (%)	Freq (N)	Percent (%)	Freq (N)	Percent (%)
Crop*	32	30.2	74	69.8	106	100
livestock*	66	61.7	41	38.3	107	100
Farming asset*	16	14.7	93	85.3	109	100
Storage facilities	57	19.5	235	80.5	292	100
Transportation assets	63	22.0	223	78.0	286	100
Merchandise	74	25.7	214	74.3	288	100

Note * crop damage, livestock and farm asset losses relate to producer group only

Table 11. Self-reported wealth level and losses

	Merchandise losses (Pearson chi2(2) = 11.06; Pr = 0.004)					
	Yes		No		Total	
	Freq (N)	Percent (%)	Freq (N)	Percent (%)	Freq (N)	Percent (%)
Rich	25	42.4	34	57.6	59	100
Neither rich, nor poor	32	20.7	123	79.4	155	100
Poor	16	22.5	55	77.5	71	100
Total	73	25.6	212	74.4	285	100
	Transportation asset losses (Pearson chi2(2) = 4.81; Pr = 0.090)					
	Yes		No		Total	
	Freq (N)	Percent (%)	Freq (N)	Percent (%)	Freq (N)	Percent (%)
Rich	19	32.2	40	67.8	59	100
Neither rich, nor poor	31	20	124	80.0	155	100
Poor	12	17.4	57	82.6	69	100
Total	62	21.9	221	78.1	283	100

Table 12. Difference between self-reported wealth level and merchandise losses (top) and transportation asset losses (bottom) in % point (diff and *p*-value)

		Rich	Neither rich, nor poor	Poor
Merchandises	Rich			
	Neither rich, nor poor	21.7 (0.001)		
	Poor	19.8 (0.015)	-1.9 (0.747)	
Transportation assets	Rich			
	Neither rich, nor poor	12.2 (0.059)		
	Poor	14.8 (0.051)	2.6 (0.647)	

Strategy changes related to armed conflicts (indirect impact).

Table 13 top shows the proportion of respondents who reported a change of strategy as a response to latent insecurity, while Table 13 bottom the proportions of respondents who reported some adjustments after the latest attack (acute crisis). Data show that a change in strategy was observed in all groups (producers, processors, transporters, traders). However no statistical difference was recorded, neither in the changes adopted in response to latent insecurity (Pearson chi2(3) = 5.52; Pr = 0.137) or in the changes adopted in response to acute conflict (Pearson chi2(3) = 5.35; Pr = 0.148) , suggesting that actors respond in a similar proportion irrespective of their main economic activity. On average, more than 75% of the food system actors we interviewed reported to have changed some of their activity strategy in response to latent security and/or acute crises.

Table 13. Strategy change in response to latent or acute insecurity (N=298)

	Response to latent insecurity (Pearson chi2(3) = 5.52; Pr = 0.137)					
	Yes		No		Total	
	Freq (N)	Percent (%)	Freq (N)	Percent (%)	Freq (N)	Percent (%)
Producer	80	70.8	33	29.2	113	100
Processor	40	72.7	15	27.3	55	100
Transporter	38	76.0	12	24.0	50	100
Trader	68	85.0	12	15.0	80	100
Total	226	75.8	72	24.2	298	100
	Response to acute crisis (Pearson chi2(3) = 5.35; Pr = 0.148)					
	Yes		No		Total	
	Freq (N)	Percent (%)	Freq (N)	Percent (%)	Freq (N)	Percent (%)
Producer	91	80.5	22	19.5	113	100
Processor	36	65.5	19	34.5	55	100
Transporter	40	80.0	10	20.0	50	100
Trader	63	78.8	17	21.2	80	100
Total	230	77.2	68	22.8	298	100

Using the event of the 4th and 5th of June 2021 in Solhan, Sahel region, (during which 174 civilians were killed) as a major marker in the degradation of the security in the Yagha province, we documented the different strategies that the four groups of actors (producers, processors, transporters, traders) adopted in response to the Solhan attack, using a list of 20 different economic indicators. While some of those indicators were specific to a given group of actors (for instance 'reduction in the cultivated area' was specific to the producers, while 'reduction in kilometric distance travelled per week' was specific to the transporters), other indicators were common to the four groups (e.g. 'number of hours worked per week) -allowing some comparative analyses across groups of actors.

For each indicator, we compute arithmetic averages by groups of actors to estimate the average reduction in the volume of economic activity. In total, out of the 20 different indicators considered across the four groups, every single one shows a severe decline between 'before' and 'after' Solhan.

In particular, across the 12 different indicators used to assess the producers' activities, the average relative decline was 42%. The decline found for the four indicators used for the processors was of the same magnitude (42%). As for traders, the data indicate a 44% relative decline in the five indicators used to assess their activities. The most affected group, however, appears to be the transporters, displaying a 53% relative decline across the six indicators used to capture their activity. Table 14 summarizes those results and illustrates the substantial contraction in economic activity that took place between 2020 and 2021, which affected the entire local food system. The details of those changes are presented in Tables A.1-A.4 in appendix.

Table 14. Impact of armed attacks(1) on the economic activities of different local actors of the food system

Producers	Mean difference	Min	Max	Relative change (%)	Av. change (%)
Difference in cultivated area (ha)	-1.5***	-7	0	-0.44	-0.46
Difference in millet production (tons/ year)	-3.5***	-33	0	-0.59	
Difference in sorghum production (tons/ year)	-2.0***	-16	1	-0.49	
Difference in maize production (tons/ year)	-0.8***	-10	1	-0.51	
Difference in sesame production (tons/ year)	-1.0**	-10	1	-0.54	
Difference in bean production (tons/ year)	-0.3***	-2	0	-0.56	
Difference in the number of grain storage huts	-0.9***	-4	0	-0.47	
Difference in the amount of chemical fertilizers applied (number of 50 kg bags/ year)	-2.8***	-25	0	-0.52	
Difference in cattle size (heads)	-4.5***	-50	0	-0.34	
Difference in the number of goats and sheep raised (heads)	-3.8***	-30	5	-0.29	
Difference in the number of poultry raised (heads)	-6.3***	-53	13	-0.37	
Difference in weekly working hours	-18***	-60	0	-0.34	
Processors					
Difference in the weekly quantity of processed product (kg/ week)	-42.6***	-200	0	-0.42	-0.40
Difference in weekly working hours	-16.7***	-70	0	-0.42	
Difference in the number of providers	-0.7***	-2	0	-0.33	
Difference in weekly sales (FCFA)	22,467***	-120,000	45,000	-0.45	
Transporters					
Difference in the weekly travelled distance (km/ week)	-142.5***	-380	0	-0.56	-0.55
Difference in the weekly transported quantity of perishable food (tons/ week)	-0.2***	-1	0	-0.62	
Difference in the quantity of grain transported per week (t)	-1.4***	-12	0	-0.50	
Difference in the number of journeys realized per week	-2.9***	-10	0	-0.58	
Difference in weekly sales (FCFA)	-43,888***	-140,000	10,000	-0.57	
Difference in weekly working hours	-22***	-61	0	-0.45	
Traders					
Difference in the number of operated markets per week	-2.1***	-5	0	-0.54	-0.45
Difference in the weekly quantity of grains traded (kg)	-0.4***	-3	4	-0.42	
Difference in weekly working hours	-21.2***	-90	0	-0.36	
Difference in the number of providers	-1.5***	-10	1	-0.45	
Difference in weekly sales (FCFA)	-162,687***	-2,200,000	70,000	-0.49	

* significant at 10%; ** significant at 5%; *** significant at 1% - Note: (1) Attack of Solhan (June 2021) used as the reference in the original question.

While globally the picture is very worrying and depicts changes suggesting an overall contraction of 50% or more of the overall food system economic activity, Table 16 also shows that not all food systems actors are not all impacted the same way. Whereas most of them have been forced to reduced substantially their economic activity, a small number has on the contrary maintained or even expanded their activity ('Max' values column in Table 16). The next section is about a more complete analysis of those so-called "positive deviants".

Who are the positive deviants of the food system?

The third survey focused on two specific groups (the transporters and the traders) operating from Sebba. The objective was to meet with a large number of those actors and determine how they had to adapt their activity to the context of armed conflicts and notably to the massive internal displacement of population that took place in Sebba. More specifically, we wanted to determine whether the presence of some "winners" (or positive deviants) amongst those two groups could contribute to build or maintain some level of resilience of the food system after the start of the crisis.

Data indicated that 17% and 19% of the transporters and traders respectively have relocated to Sebba in since the substantial raise in the level of insecurity in the province. Insecurity has been the main reason for relocating to Sebba for 70% and 71% of both transporters and traders respectively – and amongst those, 79% also reported to have been directly victims of some of these attacks (transporters and traders aggregated). The value of the transport assets of those new-comers are 22% lower than those of the traders and transporters who were already established in Sebba before 2021, suggesting that those new-comers might be slightly 'smaller' or more 'informal' than the actors who were already operating from Sebba prior to the insecurity crisis. Data revealed however that the difference in transport assets is not statistically significant.

Traders in Sebba appear to be slightly more 'specialized' than their transporter counterparts. On average traders sell 3.0 different food items whereas transporters declare that they transport 5.6 items. When asked whether their own business was doing better or worse than before the start of the insecurity crisis in 2020, 32% of the traders and 20% of the transporters responded they are doing better or much better, but 58% of the traders and 76% of the transporters consider their businesses were now doing badly or very badly. In that regard, transporters seem to struggle more than traders (Table 15). While transporters reported a reduction of 11% in the number of employees and a reduction of 36% in the number of hours worked per week between before and after 2020, the reductions were only 1% and 7% for the traders. In terms of weekly revenues, the reduction was significant for both groups: 49% for the transporters and 40% for the traders.

Table 15. Comparison of the business status for traders and transporters before/after the security situation started to degrade in 2020

	Traders		Transporters	
	Mean	RD(1)	Mean	RD(1)
Number of employees before/after 2020	2.29/2.27		1.88/1.66	
Difference	-0.03	-1%	-0.21	-11%
Weekly sale revenues before/after 2020	378,862/229,117		298,385/152,408	
Difference	-149,745	-40%	-145,977	-49%
Number of worked hours per week before/after 2020	69/64		84/54	
Difference	-5	-7%	65	-36%

Note: (1): RD = relative difference (in %)

We were also able to compare the situations of those, amongst traders and transporters, who reported that their business was doing well or very well (the positive deviants -or "more resilient" actors) against those who reported difficulties (the 'others', less resilient). For this, we looked at a series of business indicators that were collected as part of the third survey, and compared those between the different groups (more resilient versus less resilient). Data revealed that for each indicator except for the number of kilometer (km) traveled per week, the difference is always statistically significant (Table 16), indicating that the two groups are distinct in terms of responses to the crisis.

Table 16. Comparison between the positive deviants and the other transporters and traders, following the degradation in security in 2020

	Obs (N)	Mean	p-value
Change in number(1) of employees amongst positive deviants	80	0.4	
Change in number of employees amongst the other transporters and traders	135	-0.56	
Difference		0.96	< 0.001***
Change in weekly sale revenues amongst positive deviants	86	-62,901	
Change in weekly sale revenues amongst the other transporters and traders	141	-259,284	
Difference		196,383	0.004**
Change in number of working hours for positive deviants	87	-16	
Change in number of working hours for the other transporters and traders	146	-21	
Difference		5	0.069*
Change in number of clients amongst positive deviants	68	-13	
Change in number of clients amongst the other transporters and traders	100	-49	
Difference		36	0.006***
Change in number of km traveled per week by positive deviants	14	-172	
Change in number of km traveled per week by the other transporters	43	-260	
Difference		-88	0.244

* significant at 10%; ** significant at 5%; *** significant at 1% - Note (1): "change in number" refers to changes in the indicators observed between before and after 2020.

The data also indicate that, with the exception of the number of employees, for which an increase is observed amongst the positive deviants, all the other indicators show decreases in their values - even amongst the positive deviants- meaning that everyone including those positive deviants experienced a contraction in their activities after 2020. The critical point, however, is that this contraction is (statistically) less significant for the positive deviants than for the rest of the transporters and traders. In a nutshell, the resilience of those positive deviants relates to in their capacities to protect their activities from the impact of the crisis better than their counterparts: they were not able to avoid a contraction in their business, but that contraction was less marked than for the other actors.

Amongst those more resilient actors, 53% for the traders and 83% for the transporters reported that the main reason for their apparent higher level of resilience was the relative security that Sebba offers compared to the rest of the province. This explanation is not fully satisfactory however since the relatively higher level of security observed in Sebba should also have benefitted the other traders and transporters operating from there. This apparent lack of coherence also applies to the second most frequent reason reported by the successful traders. In 39% of the case, those positive deviants mentioned the presence of Internally Displaced Persons (IDPs) which, they argue, boosted the demand for food. Yet another part of the survey revealed that only 19% of the traders and 5% of the transporters considered the presence of IDPs to be an opportunity (Table 17). For the vast majority (75% of traders and 91% of the transporters) the presence if IDPs was neither an opportunity nor a constraint/threat for their business. And for those who declared to have more difficulties now than before 2020, the most frequent responses to explain those difficulties were not related to those IDPS, but to the constraints they face to get inputs (43%), followed by the strong competition amongst traders and transport (40%), combined with the general lack of cash amongst the local population (40%).

To sum up, the factors explaining the resilience of the positive deviants do not emerge clearly from the data and the role of the IDPs -either as an opportunity or as a constraint- does not makes consensus.

Table 17. Perceived impact of the Internally Displaced Persons on the local food system actors

For your business, do you consider the influx of displaced populations as...	Traders		Transporters		Total	
	Freq (N)	Percent (%)	Freq (N)	Percent (%)	Freq (N)	Percent (%)
A very good opportunity	14	7%	2	3%	16	6%
A small opportunity	23	12%	1	2%	24	10%
Does not change anything	142	75%	53	91%	195	79%
A source of small problem	8	4%	1	2%	9	4%
A serious threat for our business	2	1%	1	2%	3	1%
Total	189	100%	62	100%	241	100%

Implications for the local food system

While the positive deviants managed to minimize the losses (Table 16), many other actors struggle and reported some significant contractions in their activities (Tables 14 and 15). The next step in the analysis was therefore to assess more specifically the impacts of these contractions on the different food products. Fig.5 shows the percentages of traders and transporters who declared they had "reduced" or "reduced significantly" their activities for particular food items. The data showed that cereals are the food item which for the larger number of traders and transporters are to reduce their activity (more than 20% of the total). The data indicated however that the other food products affected by the insecurity vary greatly between traders and transporters. For exemple, while the next items most reduced by traders (after cereals) are cooking oil and sugar, the next items most reduced by transporters are vegetables and legumes. Likewise, while meat was reported to be barely reduced amongst transporters, it makes the fourth most reduced item amongst traders. Conversely tubers were reported to be the fourth most reduced food items by transporters, while it was only marginally reduced by traders.

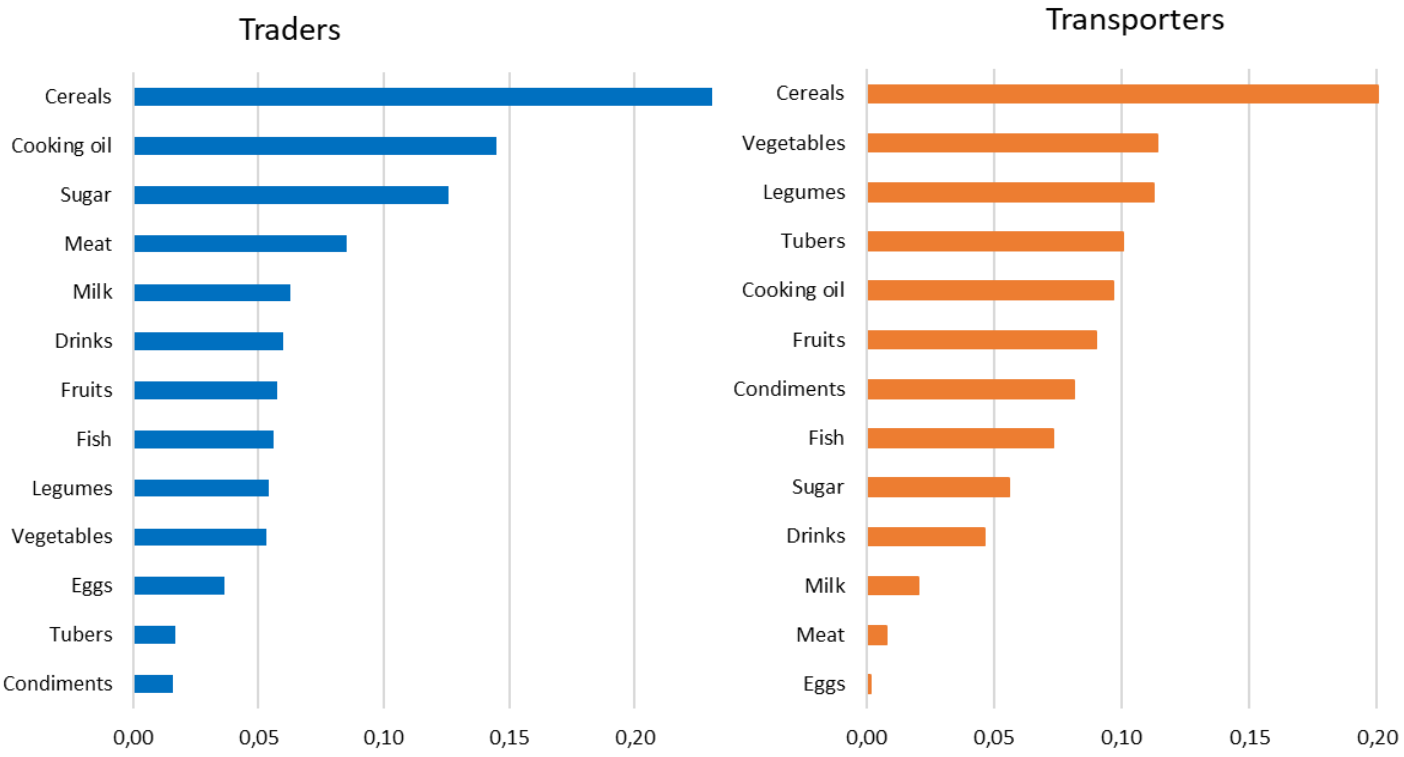

Fig.5. Proportion of traders and transporters who declared to have "reduced" or "reduced significantly" their activities in relation to specific food products after 2020. Total = 100%

This apparent dissemblance between the two groups (beyond the common reduction in quantity of cereals transported/traded) is also observed in the quantity of different food items traded and transported before and after 2020 (Table 18). For instance, while the reduction in legume reported by traders is minor (3%), the figure reported by the transporters is much larger, around 50%. These dissimilarities may indicate that individuals in each group are facing specific constraint(s) and that their (forced) choices about which food item(s) to reduce and which one(s) to try to maintain is unique to the group or even to the individuals. It also indicates that with the data generated through our surveys, we were not able to detect clear ripples effects.

Table 18. Differences in quantities of specific food items traded or transported by individual actors before and after 2020

Item sold/transported by individual actor	before 2020	after 2020	diff	p-value
Cereals sold (kg per week)	1 985	811	-1 175	0.01**
Average relative difference [1]			-22%	0.02**
Cereals transported (kg per week)	4 548	2 073	-2 475	0.001***
Average relative difference			-36%	0.003***
Legume sold (kg per week)	537	166	-371	0.012**
Average relative difference			-3%	0.821
Legumes transported (kg per week)	2 326	1 068	-1 259	< 0.001***
Average relative difference			-50%	< 0.001***
Egg sold (pallets per week)	34	19	-15	0.074*
Average relative difference			-37%	0.011**
Eggs transported (pallets per week)	53	25	-28	0.217
Average relative difference			-43%	0.185
Cooking oil sold (litres per week)	314	84	-231	0.072*
Average relative difference			-18%	0.036**
Cooking oil transported (litres per week)	814	338	-476	<0.001***
Average relative difference			-38%	0.002***
Sugar sold (kg per week)	258	114	-145	0.014**
Average relative difference			-12%	0.154
Sugar transported (kg per week)	1 509	831	-678	<0.001***
Average relative difference			-34%	<0.001***

* significant at 10%; ** significant at 5%; *** significant at 1% - Notes: (1): Average relative difference refers to the relative differences computed for each actor and averaged across the whole group

What is clear however is that the reductions in volumes of food items traded and transported before and after 2020 are all statistically (highly) significant, suggesting a rapidly degrading food security situation. This abrupt decline in the various food items transported/traded by actors operating from Sebba is consistent with the other pieces of evidence that were described previously in this document and that affected the different groups of actors across the entire food system. All those results are in line with the information that was displayed in Fig.1 above where the prevalence of food insecurity at household level in the Yagha province was shown to have increased from less than 5% in 2018 to more than 50% in 2022.

By carefully documenting the causal nature of the relation between the emergence of armed attacks (and more generally the level of insecurity in the region) and the nature and magnitude of the disruptions that these latent or acute crises have generated among the different groups of local food system actors, we have become able to better understand and anticipate the dynamics of the system. Had this information been collected and shared with the authorities and the international community sufficiently in advance, it would have been possible to predict and perhaps prevent - or at least mitigate - the collapse of the system. food as we see it unfold before us in 2022.

1 Ripple effects refer to interactions that occur along the value chain, when the decision of one group of actors affect other groups upward or downward.

Conclusion

This pilot study, that resulted from a collaboration between WFP, CIRAD and CIAT, was motivated by the recognition that in today's increasingly urbanized and market-oriented world, the food and nutritional security of local populations no longer depends only on the performance of the local agricultural sector to produce food, but more widely on the capacity of the entire local food system to produce, process, transport and distribute safe, affordable and nutritious food to both rural and urban populations.

When armed conflicts and insecurity emerges in a region, however, those conditions severely affect the different actors involved in local and regional food supply chains (food producers, retailers, transporters, etc.) and prevent most of them from operating efficiently. This generally results in physical and economic disruptions in the food supply operations -leading to food shortages, food losses, high and volatile food prices in both rural and urban areas, with short-term and long-term implications for both chronic and acute hunger and malnutrition.

The objective of this study was to observe, describe and quantify those disruptions in the case of the current security crisis affecting the northern and eastern parts of Burkina Faso. Using a series of surveys conducted in the highly affected Yagha province, we were able to generate critical information about the nature and the magnitude of the disruptions that affect the local food system and its different groups of actors.

The data showed that, in the context of a rapidly degrading security situation, those food system actors are adopting a wide range of responses. Although independently decided, most of those responses have a common feature which consists in cutting their levels of investments and their activities and, for some of them, to relocate in the province capital city of Sebba, in a clear attempt either to reduce their direct exposure to the effects of the conflict or to re-orient their economic activity towards the displaced population.

While some of the food system actors claimed that they have managed to successfully adapt to this new situation (and as such could be considered as positive deviants), the vast majority of their colleagues report serious difficulties to continue functioning at a viable level. This resulted in a very severe contraction of the food system, affecting both the diversity and the quantity of food items produced, processed, transported and traded.

This contraction of the system and the reduced ability by the actors to operate, combined with the concentration of a large number of internally displaced persons in Sebba (which population was multiplied by two in 12 months), triggered the likely collapse of the local food system and led to an 'explosion' in the number of food insecure households. In fact, the prevalence of food insecurity in the province increased 10-fold, from less than 5% in 2018 to 54% in 2022. To sum up, the resilience of a few positive deviants was not sufficient to maintain the resilience of the entire system.

In parallel to these analytical objectives, the ambition of this pilot study was to demonstrate that key information about the status, processes and dynamics at work in those local food systems can be captured through a series of 'light' questionnaires that can be implemented despite the difficulty to operate in those highly insecure, rapidly changing conflict zones.

The long-term objective is to demonstrate that, if collected in a timely manner, the information provided by those questionnaires can be used to complement the Integrated Food Security Phase Classification Tables currently used in routine by governments and international humanitarian agencies to monitor changes in food security in conflicts-affected areas.

The next steps in this collaboration between the Burkina Faso Office of WFP, CIRAD and CIAT are, first, the extension of this type of survey/analysis to the neighboring provinces of Burkina Faso affected by the conflict and to neighboring countries. of the region (Mali, Niger); then, building on the results accumulated through these surveys, the design and field validation of a series of interventions aimed at building the resilience of a large number of food system actors across the board. of the system.

Appendix

Table A.1. Quantification of changes operated by farmers

	Mean	Min	Max	*p*-value
Cultivated area before the attack (ha)	3.4	1	12	
Cultivated area after the attack (ha)	1.9	0	8	
Difference in cultivated area (ha)	-1.5	-7	0	<0.001***
Millet production before the attack (tons/ year)	5.9	0	33	
Millet production after the attack (tons/ year)	2.4	0	10	
Difference in millet production (tons/ year)	-3.5	-33	0	<0.001***
Sorghum production before the attack (tons/ year)	3.9	0	16	
Sorghum production after the attack (tons/ year	2.0	0	6	
Difference in sorghum production (tons/ year)	-2.0	-16	1	<0.001***
Maize production before the attack (tons/ year)	1.6	0	10	
Maize production after the attack (tons/ year)	0.8	0	10	
Difference in maize production (tons/ year)	-0.8	-10	1	<0.001***
Sesame production before the attack (tons/ year)	1.8	0	13	
Sesame production after the attack (tons/ year)	0.8	0	5	
Difference in sesame production (tons/ year)	-0.9	-10	2	0.003**
Bean production before the attack (tons/ year)	0.6	0.1	1.5	
Bean production after the attack (tons/ year)	0.3	0	0.8	
Difference in bean production (tons/ year)	-0.3	-2	1	<0.001***
Number of grain storage huts before the attack	1.9	1	4	
Number of grain storage huts after the attack	1.0	0	2	
Difference in the number of grain storage huts	-0.9	-4	0	<0.001***
Amount of chemical fertilizers applied before the attack (number	5.4	1	25	
Amount of chemical fertilizers applied after the attack (number of	2.6	0	18	
Difference in the amount of chemical fertilizers applied (number of	-2.8	-25	0	<0.001***
Cattle size before the attack (heads)	13.1	1	50	
Cattle size after the attack (heads)	8.6	0	40	
Difference in cattle siz (heads)	-4.5	-50	0	<0.001***
Number of goats and sheeps raised before the attack	13.2	2	33	
Number of goats and sheeps raised after the attack	9.4	0	30	
Difference in the number of goats and sheeps raised	-3.8	-30	5	<0.001***
Number of poultry raised before the attack	16.9	3	65	
Number of poultry raised after the attack	10.6	0	36	
Difference in the number of poultry raised	-6.3	-53	13	<0.001***
Hours of work per week before the attack	53.6	8	100	
Hours of work per week before the attack	35.6	0	70	
Difference in hours of work per week	-18.0	-60	0	<0.001***

Table A.2. Quantification of changes operated by processors.

	Mean	Min	Max	*p*-value
Quantity of processed product before the attack (kg/ week)	102.2	5	500	
Quantity of processed product after the attack (kg/ week)	59.7	0	300	
Difference in the quantity of processed product (kg/ week)	-42.6	-200	0	<0.001***
Hours of work per week before the attack	40.1	7	80	
Hours of work per week after the attack	23.4	0	63	
Difference in the hours of work per week	-16.7	-70	0	<0.001***
Number of providers before the attack	2.1	1	4	
Number of providers after the attack	1.4	0	3	
Difference in the number of providers	-0.7	-2	0	<0.001***
Weekly sales before the attack (FCFA)	50423.1	5000	200000	
Weekly sales after the attack (FCAF)	27955.8	0	120000	
Difference in weekly sales (FCFA)	-22467.3	-120000	45000	<0.001***

Table A.3. Quantification of changes operated by transporters.

	Mean	Min	Max	*p*-value
Kilometric distance travelled per week before the attack	253.8	100	600	
Kilometric distance travelled per week after the attack	111.3	0	350	
Difference in the kilometric distance travelled per week	-142.5	-380	0	<0.001***
Quantity of perishable food transported per week before the attack (tons)	0.3	0.03	1	
Quantity of perishable food transported per week after the attack (tons)	0.1	0	0.7	
Difference in the quantity of perishable food transported per week (tons)	-0.2	-1	0	<0.001***
Quantity of grain transported per week before the attack (tons)	2.9	0	12	
Quantity of grain transported per week after the attack (tons)	1.4	0	10	
Difference in the quantity of grain transported per week (tons)	-1.4	-11.5	0.4	<0.001***
Number of weekly journeys realized per week before the attack	5.0	2	12	
Number of weekly journeys realized per week after the attack	2.1	0	4	
Difference in the number of weekly journeys realized per week	-2.9	-10	0	<0.001***
Weekly sales before the attack (FCFA)	77166.7	15000	150000	
Weekly sales after the attack (FCFA)	33277.8	0	90000	
Difference in weekly sales (FCFA)	-43888.9	-140000	10000	<0.001***
Hours of work per week before the attack	49.2	12	91	
Hours of work per week after the attack	27.3	0	48	
Difference in the hours of work per week	-22.0	-61	0	<0.001***

Table A.4. Quantification of changes operated by traders

	Mean	Min	Max	*p*-value
Number of operated markets per week before the attack	3.9	1	6	
Number of operated markets per week after the attack	1.8	0	4	
Difference in the number of operated markets per week	-2.1	-5	0	<0.001***
Weekly quantity of grains traded before the attack (tons)	0.9	0	5	
Weekly quantity of grains traded after the attack (tons)	0.5	0	4	
Difference in the weekly quantity of grains traded (tons)	-0.4	-3	4	<0.001***
Weekly hours of work before the attack	58.5	2	126	
Weekly hours of work after the attack	37.3	0	72	
Difference in the weekly hours of work	-21.2	-90	0	<0.001***
Number of providers before the attack	3.3	1	10	
Number of providers after the attack	1.8	0	4	
Difference in the number of providers	-1.5	-10	1	<0.001***
Weekly sales before the attack (FCFA)	332375.0	2	3000000	
Weekly sales after the attack (FCFA)	169687.5	0	1500000	
Difference in weekly sales (FCFA)	-162687.5	-2200000	70000	<0.001***

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