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1. Introduction

Conflict can affect agriculture and the rural economy in various ways (FAO et al., 2017). It may cause recessions, loss of assets and livestock. It can reduce employment opportunities and diminish social protection mechanisms. But above all, in destroying assets, it leads to the displacement of populations from their land and triggers or aggravates food insecurity through the collapse of local staple markets and compromised food storage mechanisms.

In large part, the impact of conflict manifests itself in the short term and reaches a peak after which people recover from shocks and market activity resumes. However, conflict may have some long-term consequences and, in the case of our study area, it is difficult to identify a peak time for the conflict or a time when the conflict can be considered over, because a state of violence, instability and insecurity is still present today.

Based on our qualitative work in the area and of our reading of the literature, particularly the report by Kimeny et al. (2014), we identified three key potential sources of a long-term impact of conflict on agriculture in Mali: 1) changes in composition of the population, 2) market access and functioning disruption, and 3) poverty traps.

Conflict can produce displacements, forcing people to migrate from their homes. The opposite can also occur, whereby conflict prevents people from moving freely across areas affected by violence. Displacement of people can produce changes in the demographic profile of the population and change its skill composition. This in turn may have second round effects on the economy by affecting remittances, labour supply, food demand and production. Hoogeveen et al (2018) have shown that during the Malian conflict, farmers were unlikely to abandon their homes and that it was mostly people in commerce to migrate from rural areas. According to their study, migrants did not return to their homes once they had found employment in urban areas. While our study area was not severely affected by violence and we cannot expect large migration flows, some specific groups or people with specific demographics might have migrated.

Conflict can also lead to the disappearance of markets or to severe disruptions by preventing access to markets. For example, markets could collapse because roads have become impassable or because of the risk incurred in transporting goods and people. Both input and output markets can be affected. Farmers may be unable to purchase fertiliser and other inputs, or may become unable to sell their output. As a result, farmers may suffer a reduction in land productivity, incomes and cash inflows. They may also be forced to produce food crops for family subsistence. Low-intensity conflict may affect production by creating a state of insecurity and uncertainty even if episodes of violence are limited.

Finally, in some cases conflict may produce some large negative shock that affect farmers in a permanent way. For example, the loss of assets, such as theft of livestock or crops, can lead farmers to destitution or unrecoverable losses. Even if shocks are limited to the conflict period, their impact on welfare can be long-lasting and can be observed after several years from occurring. Beyond farmers, traders and consumers can also be affected. Traders – mainly wholesalers (the engine of flows between production and consumption markets) – will have to face higher operating risk,

limited storage infrastructures and financial ability to ensure market functioning. Consumers' purchasing powers, due to loss of livelihoods and displacement, will fade, bringing about their reliance on food aid and assistance.

The impact of conflict on agricultural activities can be mitigated by emergency aid. The provision of food aid and other emergency relief can prevent people from abandoning risky areas. Food aid can also alleviate the collapse of markets in favour of consumers. The effects of food aid however are difficult to predict depending on the modality in which it is delivered. For example, food aid can help consumers by stabilizing prices, but for the same reason it may affect production and hurt producers. Finally, food aid may alleviate extreme poverty, though it can probably do little to shield farmers from severe economic shocks.

Our paper aims to investigating the impact of conflict on population displacement, agricultural production and agricultural assets, and the mitigating effect of food aid. The paper is structured in the following way. In the next section we provide a description of the survey data used in the analysis. Section 3 describes the interplay of conflict and emergency aid in the area. Section 4 analyses the impact of conflict on agriculture, while section 5 investigates to what extent emergency aid mitigated the negative impact of conflict on agriculture. Section 6 discusses the limitations of the study and suggests some potential future lines of research.

2. The data

This study is based on a panel of two surveys conducted 5 years apart in the Mopti region of Mali. A baseline survey was conducted in early 2012 as part of cluster-randomized trial of the national school meals program (Masset & Gelli, 2013). The school feeding programme, as well as the planned evaluation, were abandoned after the eruption of conflict in the area in early 2012. However, since baseline data had been collected just before the occurrence of conflict, and since the area became a large beneficiary of emergency aid, the original study offered an ideal opportunity to investigate the interplay of conflict and emergency aid and their combined impact on living standards.

Baseline data had been collected in January 2012 from 66 villages selected at random from food-insecure districts in the region. Twenty-five households with children in the 5–15 year age group were randomly selected for interviews within each community. To select a random sample of households within each village, a census of household was undertaken through interviews with village chiefs and other community leaders. In addition, community members were asked to indicate which farmers they would contact if they were to purchase food within the village for the provision of school meals. This latter information was used to single out the surplus farmers in the area. Surplus farmers were oversampled with the goal of assessing the impact on local agriculture of sourcing food locally for the school meals. Questionnaires collected data at household level and for each relevant household member separately. In addition, all children aged 2–15 were selected for anthropometric measurement.

A follow-up survey was undertaken in January 2017 in the same 66 villages of the Mopti region that had been involved in the baseline survey. In addition to the baseline questionnaire, new survey modules were added to explore conflict exposure, receipt of humanitarian aid, as well as a range of other potential health outcomes not covered at baseline. Secondary data from the World Food Program (WFP) humanitarian assistance were also examined to provide evidence on the coverage of aid operations. Data was available from the World Food Programme (WFP) Mali on numbers of beneficiaries (for 2014 and 2015) by operation type (2015) and by *cercle* (the 2nd level administrative

region in the country). The number of beneficiaries of WFP aid was divided by population figures to estimate coverage of food assistance in the study population.

Qualitative research was also undertaken in the Bamako and Mopti regions, at both the district and community levels. Two research tools were open-ended and required input from the community, including a timeline of events that defined both the conflict and response of humanitarian aid, and a free list of responses to specific questions about individual exposure to conflict and about reaction to the conflict and on presence or absence of humanitarian aid. Mayors of communities that were occupied and unoccupied during the civil conflict were assembled to create a timeline of conflict events and of subsequent humanitarian aid. This information was used to classify conflict exposure at the village level.

3. Conflict and emergency aid in Mopti region

Three different phases of the Malian conflict can be identified over the period running from 2012 to the present day: the Tuareg-Jihadist insurgency (2012), the military pacification of the area (2013-2014), and the resurgence of multifaceted conflict (2015 to present).

The Tuareg-Jihadist insurgency (2012). Mali has witnessed 4 Tuareg rebellions since independence: in 1963, 1990, 2006 and 2012. But the 2012 insurgency was the first to affect central Mali. The rebellion started in January 2012 when a Tuareg rebel group (the *Mouvement de Liberation de l'Azawad*, MNLA) and three jihadist groups (Al-Qaeda in Islamic Maghreb (AQIM), Ansar Dine and MUJAO) joined forces to attack Malian security forces in northern Mali. Government armies were forced to leave northern towns and on 6 April 2012, the MNLA declared the independence of the *Azawad* (the rebels' naming of northern regions of Mali). The succession of military defeats by the Malian army led to protests, an army mutiny, and eventually a coup on 21 March 2012. In the meantime, after capturing the north of the country, the MNLA and the Islamist groups progressed southwards into the Mopti region. On the 8th of January 2013, the rebels reached the city of Konna, just 60 km north of Mopti city. This development triggered a French military operation (operation *Serval*) which stopped further advance of Islamist groups and forced them out of Mopti (Ba and Boas 2017). During this period, the MNLA and jihadist groups occupied large sections of the Douentza *cercle* and other urban centers along the Mopti-Gao road (ICG 2016).

The military pacification (2013-2014). Following the rebels' defeat, the period between April 2013 and the beginning of the year 2015 was relatively peaceful, and the Malian government forces were able to partially re-establish their authority.

The resurgence of a multifaceted conflict (2015 to present). From the beginning of 2015 onwards, the Mopti region has been affected by a resurgence of violence. This period has seen an increase in actions by militias of various type (political or identity-based). The conflict in Mopti since 2015 is no longer driven by Tuareg rebels and jihadist groups. Instead, the conflict became more complex as it intensified, and it is not easy to disentangle various forms or motives of collective violence. On the one hand, jihadist violence continued to exist in Mopti, notably since the establishment in 2015 of the predominant Peulh armed group Front de Liberation du Macina (FLM) by Amadou Koffa, a Mopti-based preacher who was previously in Ansar Dine. On the other hand, Mopti has been home to other forms of organised violence, especially in relation with communal clashes (e.g. Dogon farmers versus Peulh herders; Peulhs herders versus Tuaregs herders) and with land- and resources-based conflicts (pitting farmers against herders over grazing land, or herders against each other for water) exacerbated by limited rainfalls and dry spells in recent years. The extent of violence in the

Mopti region has been such to spread out to parts of the Segou region and even into neighbouring Sahel region of Burkina Faso.

The emergency in Mali was the focus of two projects by the UN World Food Programme, including: i) emergency operation (EMOP) 200389 “Assistance to drought-affected populations in Mali”; and ii) regional EMOP 200438 “Assistance to Refugees and Internally Displaced Persons Affected by Insecurity in Mali”. These two projects reached approximately 100,000 internally displaced and 200,000 vulnerable people in the targeted regions of the country. The EMOP started in late January 2013 and ended in 2014, supporting approximately 564,000 vulnerable and food-insecure people across the most affected areas of the country. A subsequent project was implemented to continue to provide assistance during 2015. The project activities were carefully planned to ensure complementarity with the WFP country programme, which targets similar interventions to chronically food-insecure populations in the south of Mali, through food/cash for assets, nutrition and school feeding (Table 1).

Table 1: Interventions included in WFP’s food assistance activities in northern Mali from January 2013 onwards. (Source: Authors.)

Intervention	Targets	Objectives	Activities
Blanket supplementary feeding	Children 6-59 months and pregnant and lactating women	Blanket supplementary feeding to help prevent an increase in AM	Provide children half a sachet of Plumpy’ Sup per day Providing Super Cereal and vegetable oil to pregnant and lactating women Nutrition and hygiene messages for mothers
Targeted supplementary feeding	Children 6-59 months with MAM and malnourished pregnant and lactating women	Treat moderate acute malnutrition among children 6-59 months and malnourished PLW	Targeted supplementary feeding, providing 92 g of Plumpy’ Sup per day Rely on partners and community health workers’ screening and referral capacities, as well as the functioning health centres
Targeted food assistance (GFD)	Food-insecure populations, IDPs. Women headed HHs, HHs who have lost income /assets, and HHs with elderly or disabled people	Assist all accessible moderately and severely food-insecure households and non-displaced people, displaced people, and host communities	Provide 2,100 kcal per person per day, consisting of cereals, pulses, vegetable oil and salt, with Super Cereal to increase micronutrient intake
School feeding	Primary school children in areas with high food insecurity	Prevent hunger and provide incentives to arrive on time and attend school until lunchtime; school attendance will also reduce the exposure of children to other risks.	Two daily meals will be provided: a morning porridge of Super Cereal and a midday meal consisting of cereal, pulses, vegetable oil and salt.

Aid-related activities provided by WFP in the Mopti region included school meals, general food distribution, targeted supplementary feeding and resilience-related programming. In Mopti, the WFP

supported 228,649 beneficiaries in 2014 and 135,456 beneficiaries in 2015 after it scaled-down its operations.

WFP activities covered approximately 10 percent of the Mopti population in 2014 and 6 percent of the population in 2015. Average coverage between 2014 and 2015 appeared to be heterogeneous across the Mopti region, peaking at 22 percent in the cercle of Bandiagara, and at less than one percent was lowest in the cercles of Djenné and Koro. The breakdown of beneficiaries by WFP activity highlighted that nearly half of WFP beneficiaries in 2015 received general food distribution, 26 percent received targeted supplementary feeding, 20 percent received school meals and 7 percent benefitted from resilience related programming (Figure 1).

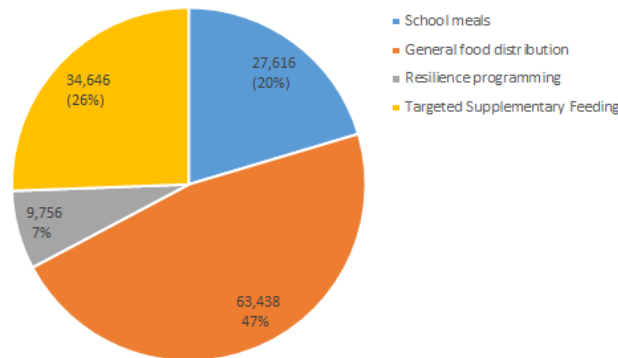


Figure 1: Breakdown of food assistance activities by WFP in Mopti region by programming activity in 2015. (Source WFP).

Our qualitative research showed that emergency aid was provided by a large number of agencies both in occupied and non-occupied areas. Donors included the Malian Government, the United Nations Agencies, international and national NGOs, associations and the private sector. During the early stages of conflict, emergency aid prioritised vulnerable populations in non-occupied areas. Occupied areas were initially neglected because inaccessible for various reasons. WFP respondents reported that road access by trucks transporting food was at times hindered by armed groups in the Mopti region, causing some delays in the delivery of food assistance. WFP's Gao was also denied access to part of the Teninkou, Ménaka and Ansongo circles by armed groups, resulting in delays in the delivery of assistance. To overcome these challenges, WFP had to resort to different, longer and more expensive logistical routes that bypassed certain “no-go” areas. In the occupied zones, respondents reported that the general food distribution began after the occupation by armed groups, coinciding with the timing of the SERVAL operation when humanitarian aid began to be scaled-up in the form of GFD.

4. Impact of conflict on agriculture

4.1 Characterizing conflict exposure

In our analysis we measured exposure to conflict as captured through direct questions on the presence of armed groups at the village level, as opposed to the distance from violence or to extent of violence. Our goal was to capture a wider range of indirect effects of conflict and insecurity, which go beyond direct exposure to combat (Tranchant, Justino, and Mueller 2014). Community leaders of seven survey villages reported the presence of armed groups in their villages between 2012 and 2014. In 34 villages, community leaders reported the presence of armed groups in the surrounding area. Leaders of 22 villages reported the absence of armed groups in the region. Following reporting by community leaders, we built a categorical variable of exposure to armed groups which took the

value 0 for unaffected villages, 1 for indirectly affected villages (that is, armed groups were present in the vicinity of the village but not in the village itself), and 2 for directly affected villages (armed groups were present in the village).

Violence and conflict affected the population in various ways. From the household survey data, between 2012 and 2016, 23% of households reported being exposed to violence linked with the presence of armed groups. Disaggregation by type of violence showed that 17 percent of households reported banditry attacks in the village, 7% reported armed attacks, 5% reported political violence, 2% reported kidnappings, and 1% reported violence in the presence of armed groups or destruction of infrastructure.

As expected, there was substantial overlap between the presence of armed groups and conflict-related violence but the relation was not always strong or obvious. Whereas 16% of households in villages free from the presence of armed groups experienced conflict-related violence, 47% experienced conflict-related violence in villages where armed groups had been present. There was a strong discontinuity between villages where armed groups had been present and other villages on all types of conflict-related violence. However, there was no clear demarcation between villages located in areas where armed groups had been present and villages located in areas free from armed groups. Political violence, kidnappings, and lynching were more prevalent in the former, but the differences were not substantive, and there was no difference in the prevalence of banditry or terrorist attacks.

The qualitative data suggested that security services such as police and the army were largely absent throughout the study period, with services limited to occasional patrols by the Malian army in villages that were unoccupied by armed groups. However, from April 2012 until the French intervention in January 2013, armed groups themselves regularly patrolled villages in the occupied areas. Though basic social services existed before the outbreak of armed conflict, their functioning was heavily impacted. In zones occupied by armed groups, schools and health centers were closed during the full period of occupation, whereas in the non-occupied zone, this period did not exceed three months. Respondents also indicated that the presence of armed groups caused men, able-bodied household members, and entire families to flee. Fear, panic, and destruction of government buildings, combined with hatred of administrative staff, also caused health and education staff to flee, thus closing health centers and schools. Many pregnant women who were unable to flee found their antenatal care suspended, and postnatal consultations were interrupted as well. It is in this context that respondents thought morbidity and malnutrition in children and lactating women increased considerably. Thus, the focus groups' discussions identified the most vulnerable groups as pregnant women, nursing mothers, the sick, old people, and children for whom health care and school services were no longer available.

4.2 Changes in population composition

Displaced populations have been reported in Mopti among farmers and pastoralists (Kimeny et al., 2014). Little is known about people's ability to move freely in areas affected by conflict. One way of looking at migration patterns in conflict areas is by observing the levels of attrition and the characteristics of attriters in our study sample. Much movement of households and people is normally occurring in the absence of conflict and produced by factors such as marriages, seasonal work, or simply errors in reporting household size. However, if migration has occurred in significant numbers, some effects should be discernible across areas differently affected by conflict. Also, if displacement affects some particular socio-economic groups or people with specific demographics, we should be able to observe this from our survey data.

The survey document (Survey, 2017) reports that four villages were not surveyed at all because of security concerns. The sample of villages included in the survey therefore is a sample of areas

moderately affected by conflict, at least at the time of conducting the interviews. By considering the four villages that were not surveyed at all, the survey team reported an attrition rate of 20% (1587 interviews out of 1700 planned interviews), which is relatively small considering five years of exposure to conflict.

This attrition rate however includes all individuals not surveyed in the insecure villages regardless of displacements and migration. If we exclude the four villages that were not re-surveyed for security concerns, household attrition over a 5-year period is remarkably low (less than 10%). It is slightly higher in high conflict areas but there is no clear pattern (Table 2). Conversely, attrition of individuals is high and it increases with exposure to conflict. The differences in household attrition across conflict areas are not statistically significant while those in individual attrition are.

Table 2 Attrition of households and individuals

	All sample	No conflict	Moderate	high
Households	9.28	10.75	8.46	12.65
Individuals	29.98	28.31	30.93	34.96

There is some indications that migration of individuals was higher in conflict areas. We ran regressions of attrition against individual and household characteristics to explore whether people leaving their households share some common characteristics (results not shown here). At the household level, variables such as household size, and extended family are negatively correlated with attrition, but wealth and education are not correlated. As for individuals, age, sex and education are significantly correlated with attrition: it appears that leavers are more likely to be young, female and better-educated. This could represent a group looking for security and better socio-economic opportunities outside the conflict areas.

Further, we estimated regression coefficients separately for areas differently exposed to conflict (no conflict, moderate conflict and high conflict). In the case of household attrition, we found very small differences: household size does not appear to matter in conflict areas; Fulani and Dogon households, as well as better educated household, are all more likely to migrate in high conflict areas. Similarly, we found only small differences when looking at individuals: individual education as well as education of the head of household does not seem to increase attrition, unlike in the rest of the sample, in high conflict areas.

Finally, we looked at the impact of different forms of food aid across conflict exposure. We found no statistically significant effects on household attrition. We found however a few statistically significant negative effects of aid on attrition of individuals in conflict areas, meaning that aid might have reduced movement away from conflict areas. This effects may have a policy interest as migration produced by conflict, and its mitigating factors, are presently a major concern among policy-makers.

4.3 Market disruption

When farmers were asked directly about disruption caused by conflict, they reported high levels of distress. More than 50% of respondents reported being unable to sell and purchase items in the market and livestock thefts, while more than 20% report the occurrence of banditry.

Things look different however when we try to measure the actual occurrence of disruption rather than farmers' subjective perceptions. We estimated the impact of conflict on reported access to markets using the difference-in-difference (DiD) change observed between the baseline and follow-

up on sale points, access to market, distance to market, transport costs incurred and a few other factors (see Table 3).

In this, as in all following DiD estimated effects in the remainder of the paper, we use a simple DiD regression model of the form:

$$y = \alpha + \beta T + \gamma P + \delta PT + \epsilon$$

in which $P=1$ if the household is affected by conflict and it is $P=0$ otherwise. A dummy variable T is equal to zero for baseline observations and equal to one for observations taken at follow-up. α is the baseline level of the variable in the control group, β is the time effect in conflict areas (assumed to be similar to the one in non-conflict areas in the absence of the intervention), γ is the baseline difference in the outcome variable between conflict and non-conflict areas, and δ is the DiD effect.

None of the estimated coefficients (with the exception of sales to consumers in high-conflict areas) is statistically significant. It appears that there was no change over time in any of the market access variables either in conflict or no-conflict areas. The signs of the coefficients are not more informative. Against expectations, market sales appear to have increased more in high conflict areas. The distance between the farm and the market has not changed (while it decreased in no-conflict areas) but the effects are not statistically significant. If conflict produced market disruption in the area at any time, as it seems likely, this was no longer the case at the time of the follow-up survey and there were no long-lasting effects of conflict on market access.

Table 3 Impact of conflict on access to markets

Variable	Time effect	Baseline diff (moderate conflict)	Baseline difference (high conflict)	DID (moderate conflict)	DID (high conflict)
Did you sell to a <i>collecteur</i> or <i>regroupeur</i> ?	0.067 (0.070)	0.021 (0.063)	-0.041 (0.143)	-0.148 (0.092)	0.323 (0.292)
Did you sell to a trader?	-0.046 (0.080)	-0.074 (0.070)	-0.270 (0.065)	0.066 (0.101)	-0.096 (0.255)
Did you sell to consumers?	-0.021 (0.036)	0.053 (0.050)	0.308 (0.171)	0.070 (0.056)	-0.352** (0.165)
Did you sell to a market?	-0.123 (0.098)	-0.152 (0.103)	0.225 (0.237)	0.205 (0.124)	0.416 (0.258)
Distance between plot and market?	-1069 (1323)	-412 (1069)	-1515 (1232)	1719 (1509)	1552 (1494)
Transport cost to the market?	-0.085 (0.077)	0.044 (0.078)	-0.001 (0.190)	-0.054 (0.098)	-0.002 (0.212)
Price established at point of sale?	0.056 (0.073)	-0.060 (0.078)	0.053 (0.112)	0.076 (0.097)	-0.046 (0.146)

Note: table displays coefficients and standard errors. *** is statistical significance at 1%, ** is 5% and * is 10%.

We assessed the impact of conflict on three indicators of agricultural production: 1) the total value of crop production at the household level, 2) the total value of sales at their reported market prices, and 3) agricultural profits (calculated as the total value of crop production minus total production costs). To account for price changes, all 2017 figures were adjusted by the change in the national consumer price index over the period considered.

The area experienced a dramatic drop in agricultural production (see Table 4). The total value of production was reduced by at least 50% in comparison to the baseline. Despite the drop in production, farmers appear to have sold their production in larger quantities than they used to do at

baseline. This result is at odds with our expectations regarding farmers engaging with subsistence farming as a result of conflict and it remains difficult to explain. Possibly, the motivation for selling the agricultural produce was determined by farming becoming the main income generating activity in this period. Finally, there was a drop in agricultural profits that was even larger than the drop in production value, suggesting that farmers were facing higher production costs and lower productivities. However, for none of the three key agricultural variables considered we found differences across areas differently exposed to conflict.

Table 4 Impact of conflict on agricultural output

Variable	Time effect	Baseline diff (moderate conflict)	Baseline difference (high conflict)	DID (moderate conflict)	DID (high conflict)
Production value (all crops)	-0.796** 0.244	-0.271 (0.276)	-0.454 (0.503)	0.440 (0.285)	-0.110 (0.661)
Sales value	1.746*** 0.474	-0.270 (0.315)	0.423 (0.710)	-0.196 (0.593)	1.184 (1.178)
Agricultural profits	-0.973*** 0.257	-0.171 (0.265)	-0.423 (0.499)	0.318 (0.295)	-0.107 (0.619)

Note: table displays coefficients and standard errors. *** is statistical significance at 1%, ** is 5% and * is 10%.

Next we looked at the impact on conflict on the use of inputs, namely land and labour. We also looked at total input costs together, but we were not able to disaggregate costs by input, such as fertiliser or labour. The dependent variable employed to assess impact on labour use consists of months of work per household in five different activities (see Table 5): farming, livestock rearing, microenterprises, other non-agricultural work, and domestic work. The data show that the use of family labour increased overall in the area and particularly in farming, livestock production and domestic work. In conflict areas, family work in farming increased less but the difference is not statistically significant. Unlike in no-conflict areas, in conflict areas there was no increase in the use of family labour in livestock production and the difference was large and statistically significant.

Table 5 Impact of conflict on labour use

Variable	Time effect	Baseline diff (moderate conflict)	Baseline difference (high conflict)	DID (moderate conflict)	DID (high conflict)
Farm family labour	4.073*** (0.610)	1.810* (0.935)	-0.251 (1.971)	-1.925 (1.176)	-1.958 (1.502)
Livestock labour	15.347*** (2.678)	-0.812 (0.798)	0.600 (1.482)	-5.117* (2.894)	-10.619*** (3.376)
Microenterprises	-1.521* (0.860)	-0.662 (0.915)	-0.110 (1.105)	0.678 (1.005)	-0.777 (1.328)
Other non-agriculture	1.228 (0.791)	-0.331 (0.589)	-0.851 (0.508)	-0.069 (1.088)	0.401 (1.051)
Domestic work	12.986*** (3.123)	-3.581 (3.602)	-0.558 (6.625)	-3.823 (4.024)	-10.662 (7.219)

Note: table displays coefficients and standard errors. *** is statistical significance at 1%, ** is 5% and * is 10%.

Conflict had a negative and statistically significant impact on the use of land (see Table 6). The impact was even larger in areas highly affected by conflict. On average, there were no impacts on costs in no-conflict areas. Costs increased in conflict areas but the observed effects are not statistically significant.

Table 6 Impact of conflict on cultivated land and input use

Variable	Time effect	Baseline diff (moderate conflict)	Baseline difference (high conflict)	DID (moderate conflict)	DID (high conflict)
Cultivated land	-0.054** (0.022)	0.084 (0.087)	-0.152 (0.135)	0.001 (0.037)	-0.076* (0.047)
Input costs	-0.080 (0.200)	0.317 (0.213)	-0.068 (0.271)	0.167 (0.229)	0.354 (0.232)

Note: table displays coefficients and standard errors. *** is statistical significance at 1%, ** is 5% and * is 10%.

Finally, we looked at the impact of conflict on cropping patterns. Is there any evidence that farmers in the areas were converting land to the cultivation of subsistence crops? It should be noted first that room for conversion to subsistence crops was limited, because most farmers in the area were already largely millet producers before the conflict, while the production of beans was limited and local consumption was supplemented mostly through imports from Burkina Faso.

To assess the extent of changes in production patterns we employed as the dependent variable the share of land cultivated to the following crops: millet, sorghum, beans, groundnut and other crops. There was a decrease in the area devoted to millet in favour of the cultivation of other crops in the no-conflict areas. In conflict areas, the size of the reduction in the cultivation of millet was much less in comparison to non-conflict areas. A similar pattern was observed in relation to beans cultivation. No major changes in cropping patterns appeared to take place in other conflict or no conflict areas. There is some very timid evidence that farmers in conflict areas were becoming more reliant on subsistence crops (millet) than cash crops (beans).

Table 7 Impact of conflict on cropping patterns

Variable	Time effect	Baseline diff (moderate conflict)	Baseline difference (high conflict)	DID (moderate conflict)	DID (high conflict)
Millet share	-0.274*** (0.036)	-0.042 (0.036)	-0.018 (0.047)	0.034 (0.042)	0.104*** (0.061)
Sorghum share	0.032 (0.025)	0.017 (0.022)	0.042 (0.057)	0.007 (0.027)	-0.068* (0.041)
Beans share	0.073 (0.015)	0.017 (0.014)	0.029 (0.023)	-0.007 (0.019)	-0.054*** (0.029)
Groundnut share	0.031* (0.017)	0.007 (0.024)	-0.026 (0.032)	-0.009 (0.023)	0.004 (0.029)
Other crops share	0.138*** (0.025)	0.001 (0.021)	-0.028 (0.027)	-0.025 (0.031)	0.015 (0.062)

Note: table displays coefficients and standard errors. *** is statistical significance at 1%, ** is 5% and * is 10%.

We summarise the main conclusions of our analysis in the following way. First, while farmers perceived the experience of severe disruptions in market operations, more objective measures of market disruption suggest that at follow-up markets were operating in similar conditions to those prevailing at baseline. Second, conflict caused a large drop in agricultural production, including in areas that were only moderately affected or not affected at all by conflict. A drop in cultivated area, also aggravated by reported floods in the Mopti region, was likely to be one of the main reasons behind the drop in production. Third, there was an increase in the use of family farm labour and a decrease in the use of land. The reduction in cultivated land however, though statistically significant, was minor in size. Overall these results point to heavy reductions in both land and labour

productivities. Fourth, the reductions in agricultural production and profits were larger in conflict areas but the differences were not statistically significant. Finally, no major changes in cropping patterns occurred in the production of subsistence crop.

4.4 Impact on livestock holdings

Households can absorb economic shocks produced by conflict by disposing of assets. The main store of wealth in the area is animal holdings, as financial markets and other form of savings are underdeveloped. Livestock sales therefore are likely to occur to smooth the economic impact of shocks. This can be compounded by insecurity and the risk of animal thefts that may encourage pastoralists to diminish their stocks. For example, Verporten (2009) reported large cattle sales during and around the Rwanda genocide of the 1990s.

If livestock and other assets are disposed in large amounts, farmers may deplete their assets, lose the ability to withstand further economic shocks and erode their income generating capacity. This in turn may lead some households to a permanent decline of living standards which will be reflected in low levels of household expenditure even years after a major conflict has occurred.

Table 8 Impact of conflict on livestock ownership

Variable	Time effect	Baseline diff (moderate conflict)	Baseline difference (high conflict)	DID (moderate conflict)	DID (high conflict)
Farm without livestock	0.111*** (0.022)	0.003 (0.008)	0.010 (0.017)	-0.032 (0.026)	0.015 (0.065)
Total livestock value	-1.325*** (0.401)	-0.335* (0.189)	0.148 (0.351)	0.581 (0.466)	-0.932 (1.108)
Tropical livestock units (TLU)	-0.150 (0.453)	-0.810 (0.555)	1.673 (1.277)	-0.310 (0.501)	-3.104** (1.182)
Cattle	0.085 (0.598)	-0.904 (0.683)	1.339 (1.610)	-0.516 (0.659)	-3.230** (1.465)
Ovines	-2.116 (0.744)	-1.816 (1.285)	7.192** (2.568)	0.641 (0.928)	-8.161** (2.463)
Chickens	0.132 (0.620)	0.451 (0.831)	1.646 (1.161)	-1.294 (0.888)	-2.722** (1.134)

Note: table displays coefficients and standard errors. *** is statistical significance at 1%, ** is 5% and * is 10%.

Most households own livestock in the area and animals are commonly used as a store of wealth in addition to be productive assets. We look at the impact on livestock wealth by observing the following variables: household not reporting the possession of any livestock, the value of total livestock owned, and total livestock units (TLU). The value of livestock is calculated at reported prices and inflated by measurement error. Hence, we also measure livestock ownership in tropical livestock units (TLU), thus removing the price component of measurement error. In tropical livestock units, all animals are converted to a common unit in the following way: cattle = 0.7, sheep = 0.1, goats = 0.1, pigs = 0.2, chicken = 0.01. We also consider holdings of cattle, ovine (goats and sheep) and chicken separately to detect effects on specific livestock.

Conflict increased the number of households without any livestock and dramatically decreased the total value of livestock holdings (Table 8). Reductions in livestock holdings were larger in areas highly affected by conflict. De-stocking of animals occurred on a very large scale in conflict areas whether produced by sales, own consumption, theft, or natural causes, such as disease, facilitated by conflict.

The disaggregation by livestock type shows that all animals holdings were affected but that it is sheep and goats that were particularly affected.

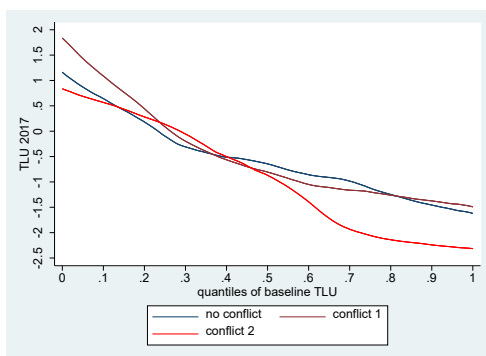
Further, we looked at the distributional impact of conflict on livestock holdings. Did the reduction affect more large or small pastoralist? Answering this question is relevant because small pastoralists are more likely to fall in destitution if affected. On the other hand, there are reports that wealthier households were targeted by rebels and bandits (Kimeny et al., 2014) and where therefore more inclined to dispose their animal assets.

To assess whether the reduction in animal stock was favouring or against wealthier households we calculated the percentage growth in the TLU numbers between baseline and follow-up (as difference in the natural logarithms) and we plotted this number against ordered quantiles of baseline holdings. The relationship is shown in Figure 1. Households with few livestock at baseline are on the left-hand side of the chart, while large livestock herders are on the right hand side. The plotted lines represent the 5-year growth in livestock and the slope shows whether growth was larger among smaller or larger herders. We plot three different lines for the three areas differently affected by conflict.

The chart shows that much of the growth was negative in all areas, households were disposing or losing their livestock over the period. The lines are negatively sloped suggesting that growth was negative for large farmers but positive for small one. But it should be noted that a regression to the mean process led by measurement error is likely to in place. Households that were erroneously reported not having any livestock at the baseline appear to bounce back at the follow-up, thus giving the lines their negative incline. A better estimate could be obtained by instrumenting livestock holdings by other assets to remove baseline reporting errors.

The negative effects of conflict on livestock growth are indistinguishable in no-conflict and moderate conflict areas. However, in high-conflict areas the drop in livestock holdings is much larger for large pastoralists, suggesting that large livestock farmers were particularly affected by conflict.

Figure 2 Change in livestock holdings by baseline quantiles



5. The mitigating impact of emergency aid

5.1 Characterizing access to food assistance in the household survey

The 2017 endline survey, included detailed questions on receipt of food aid in relation to the 24 month before the interview. According to the household-level data, 67% of households did not receive any food assistance, 23% were beneficiaries of targeted food assistance (GFD), 14% were school feeding beneficiaries, 2% received targeted school feeding, and 2% participated in food for work programs. There was a limited overlap between these modalities of aid at household level as only 7% of households received two forms of aid or more. When overlap existed, it overwhelmingly involved GFD which had been reported by 94% of households who received at least two forms of aid.

Food assistance provision and intensity of exposure to aid in the 24 months before the interview was characterized through the following variables: a binary variable “Any aid” with value 1 if the household received any form of aid, a binary variable called “GFD” with value 1 if the household received GFD, a binary variable called “SF” with value 1 if the household received school feeding and a categorical variable with the value 1 if the household received one form of aid, and the value 2 if the household received 2 forms of aid or more.

At the village level, generalized food distribution (GFD) was the most common form of food assistance experienced by the study population, with 51 out of 63 village respondents declaring that generalized food distribution had occurred in their village since 2012. School feeding and targeted supplementary feeding were reported to have been implemented in 26 and 24 villages, respectively. It is interesting to note that targeted supplementary feeding and school feeding programs were mostly implemented in villages where general food distribution was also present. Hence, only 3 villages experienced targeted supplementary feeding or school feeding without any generalized food distribution program. At the household level, 67 percent of households did not receive any food assistance, 23 percent of households received aid in the form of generalized food distribution, 14 percent in the form of school feeding, 2 percent in the form of targeted supplementary feeding, and 2 percent in the form of participation in food-for-work programs. There was limited overlap between modalities of aid at the household level, as only 7 percent of households received two or more forms of aid. The overlap overwhelmingly involved generalized food distribution, which was reported in 94 percent of households that received at least two forms of aid.

Access to aid tended to decrease with greater proximity to armed groups, contrary to what the logic of prioritization of conflict-affected populations would imply, though perhaps reflecting the practicalities of logistic aid operations during conflict. This relationship manifested itself in a higher likelihood of conflict-affected populations living in villages without any access to aid, and a lower likelihood of conflict-affected populations living in villages with one form of food assistance. Specifically, while all unaffected villages had access to at least one form of food assistance, 10 percent of villages indirectly affected by conflict and almost a quarter (23 percent) of villages directly affected by conflict had no access to food assistance at all. However, villages where armed groups were present were as likely to have access to two forms of aid as villages in peaceful environments.

The relationship between proximity to armed groups and access to aid was not as marked at the household level. The strongest effect of conflict was to reduce the chance of receiving two forms of aid (10 percent in unaffected villages, 7 percent in indirectly affected villages, and 4 percent in affected villages) and a lower likelihood of obtaining school feeding (16 percent, 13 percent, and 9 percent, respectively), in contrast to the village-level results.

5.2 Mitigating effects of emergency aid

In this section we look at different forms of food aid and their mitigating impact on agriculture. To assess the mitigating impact of emergency aid we observe the effects of food aid separately for three areas differently exposed to conflict (no-conflict, moderate conflict and high conflict). For this exercise we selected a set of key agricultural outcomes among those analysed in the previous sections: value of crop production, value of crop sales, agricultural profits, use of family labour in the farm, use of family labour in livestock activities, total cultivated land, total production costs, and total livestock units.

Of all forms of aid considered in our analysis (any aid, global food distribution (GFD), and school feeding), GFD is the most likely to have an impact on agriculture. The coverage of this interventions was larger than the other forms of food aid and the size of the food support provided to each family was also larger. School feeding (SF) was unlikely to produce a major impact as the size of the support was not such to alter households' food budget substantially. Similarly, the aid categories "any aid" and "one type of aid" include school feeding and are likely to show a diluted effect compared to the effect produced by GFD alone. The category "two types of aid" is likely to include GFD and therefore should present similar results. It is the GFD modality however that should produce the largest effects.

We first look at the impact of aid on agricultural outcomes for the whole sample (table 9). GFD had a clear negative impact on agricultural production, sales, profits and labour use. There are two possible interpretations for this. First, the negative impact on production could be the result of negative production incentives. As households receive free food, they invest fewer resources in agricultural production that they would normally do. Second, the allocation of food aid could be endogenously determined. Recipients and non-recipients of aid were matched on a series of household and village characteristics to remove this type of bias. But it cannot be excluded that aid was provided to villages that suffered largest set-backs in production either because of the conflict or as a result of adverse weather conditions. In this second case, the association observed between aid and agricultural production simply reflects the fact that donors were targeting the most affected areas for food distribution. Interventions areas are often identified in a collaborative way by NGOs, local Governmental agricultural authorities, and early warning systems.

Table 9 Impact of food aid on agricultural outcomes regardless of conflict

	Any aid	GFD	SF	1 type of aid	2 types of aid
Δ Crop production	-0.156 0.145	-0.508** 0.208	0.197 0.203	-0.151 0.144	-0.298 0.221
Δ Sales value	-0.515 0.345	-0.949** 0.427	0.187 0.617	-0.424 0.375	-1.153*** 0.428
Δ Agricultural profits	-0.093 0.299	-0.906** 0.402	0.740* 0.404	-0.181 0.312	-0.485 0.448
Δ Farm labour	-0.360 0.680	-1.908** 0.677	-0.055 1.189	-0.353 0.732	-1.621* 0.809
Δ Livestock labour	0.238 0.555	-0.024 0.751	0.656 0.868	0.405 0.561	0.410 0.871
Δ Cultivated land	0.117** 0.054	0.137 0.072	0.059* 0.056	0.129 0.058	0.064 0.066
Δ Input costs	-0.049 0.128	-0.101 0.181	0.102 0.162	-0.108 0.129	-0.170 0.221
Δ Total Livestock units	-0.383 0.488	-0.111 0.704	-0.646 0.472	-0.509 0.475	-0.689 0.434

Note: table displays coefficients and standard errors. *** is statistical significance at 1%, ** is 5% and * is 10%.

When we disaggregated the data by levels of exposure to conflict we obtain diverging results that are not always easy to interpret. In no-conflict areas aid increased agricultural production while the impact was negative in no-conflict areas, though the effects were never statistically significant. Similarly, agricultural sales and profits appeared to benefit from aid in no-conflict areas but not so in conflict areas. Overall, aid appears to have relatively benefited no-conflict areas more. Interestingly, according to donors' records, much of the food distributed in the area was procured locally, which would explain the positive impact of food aid in no-conflict areas.

In no-conflict areas aid decreased the use of family labour. However, family labour in farming and livestock was favoured by aid in conflict areas, particularly livestock labour in high conflict areas. Aid had no impact on land use in no-conflict areas but some negative impact in areas moderately affected by conflict. Overall, the impacts on agricultural inputs suggest that aid, possibly substituting for local production, reduced factor use, particularly in conflict areas.

Finally, aid had a positive impact on livestock holdings both in no-conflict and in high conflict areas. Impact however was particularly large in high conflict areas. This effect might suggest that food aid generated a flow of resources for livestock feeding or that it prevented the decumulation of stocks and the impoverishment of the population. Recall that small ruminants represent the main form of store of wealth and savings in the area and that they are typically sold off by households in need.

Table 10 Impact of food aid on agricultural outcomes (no conflict)

	Any aid	GFD	SF	1 type of aid	2 types of aid
Δ Crop production	0.712 0.423	0.653 0.559	0.570 0.398	0.667 0.437	0.670* 0.361
Δ Sales value	1.974* 1.057	2.141* 1.251	-0.251 0.894	2.020* 1.044	-0.586 1.091
Δ Agricultural profits	0.782* 0.387	0.618 0.504	0.666 0.462	0.781* 0.403	0.658 0.487
Δ Farm labour	-0.956 1.019	-3.119** 1.249	0.767 0.867	-0.662 1.136	-0.564 1.600
Δ Livestock labour	-3.356 4.132	-4.918 3.387	-3.386 4.809	-3.218 4.019	-0.235 7.148
Δ Cultivated land	0.049 0.056	0.042 0.037	0.050 0.054	0.043 0.067	0.005 0.089
Δ Input costs	0.328 0.294	0.245 0.310	0.033 0.375	0.455 0.302	0.342 0.352
Δ Total Livestock units	3.196* 1.588	3.358 2.356	1.761 1.138	2.703 1.828	-0.619 0.999

Note: table displays coefficients and standard errors. *** is statistical significance at 1%, ** is 5% and * is 10%.

Table 11 Impact of food aid on agricultural outcomes (moderate conflict)

	Any aid	GFD	SF	1 type of aid	2 types of aid
Δ Crop production	0.073 0.215	0.328 0.387	0.289 0.294	0.035 0.205	-0.129 0.327
Δ Sales value	-0.848 0.582	-0.191 0.709	-0.890 0.632	-0.953 0.569	-1.139 1.085
Δ Agricultural profits	0.008 0.248	0.284 0.470	0.194 0.322	-0.004 0.242	0.335 0.376

Δ Farm labour	0.323 1.663	3.634* 1.656	-2.732 2.248	0.422 1.770	1.583 1.200
Δ Livestock labour	-3.570** 1.560	-2.811 1.976	-3.439 2.115	-3.993** 1.576	0.304 3.088
Δ Cultivated land	-0.108** 0.041	-0.080 0.054	-0.074 0.050	-0.098** 0.038	0.123 0.084
Δ Input costs	0.304 0.248	0.633** 0.305	-0.009 0.319	0.377 0.281	0.212 0.338
Δ Total Livestock units	-0.104 0.536	-0.008 0.636	0.255 1.169	-0.383 0.505	-0.592 0.772

Note: table displays coefficients and standard errors. *** is statistical significance at 1%, ** is 5% and * is 10%.

Table 12 Impact of food aid on agricultural outcomes (high conflict)

	Any aid	GFD	SF	1 type of aid	2 types of aid
Δ Crop production	-0.238 0.806	-0.191 0.882	-1.208 0.595	-0.046 0.789	0.195 0.782
Δ Sales value	-8.882 8.676	-	-	-	-
Δ Agricultural profits	-0.147 0.682	-0.181 0.744	-0.840 0.566	-0.078 0.651	0.639 1.069
Δ Farm labour	3.952** 1.033	4.062** 0.925	1.437 1.943	4.029** 1.139	-2.090 2.970
Δ Livestock labour	-0.700 2.355	0.647 1.600	-5.395 5.566	-2.091 2.255	-1.449 4.684
Δ Cultivated land	0.040 0.083	0.010 0.076	0.095 0.027	0.001 0.081	0.079 0.163
Δ Input costs	-0.358 0.305	-0.228 0.319	-2.109** 0.488	-0.257 0.294	1.246 0.735
Δ Total Livestock units	3.794** 1.491	1.854 2.423	4.565* 1.890	3.638* 1.852	-1.135 2.456

Note: table displays coefficients and standard errors. *** is statistical significance at 1%, ** is 5% and * is 10%.

6. Conclusions

Our study assessed the impact of conflict in Mali on migration, agricultural production, and livestock holdings. Our data do not contain direct information on migration of households or individuals and we had to rely on the analysis of attrition rates of panels of individuals across 5 years between the baseline of 2012 and the follow up of 2017. We found no evidence of large displacements of population. The attrition rates, both at household and individual level, were extremely low, suggesting that no substantial migration away from the area took place after the conflict. It is also possible that many of the persons interviewed in 2017 were returning migrants who were absent from the area for the period of the conflict. However, we have no additional data in our survey to investigate this hypothesis.

The analysis of attrition also suggested that movements of individuals from the area were larger in conflict-affected region. The demographic profile of individuals leaving their homes points to young people, predominantly female, and well-educated. These seem to be the only characteristics correlated with migration from the area. Household wealth and social status or occupation were not

correlated with migration. Finally, we found that food aid seemed to have a mitigating effect on migration. Individuals residing in villages beneficiary of emergency food aid were less likely to migrate between the two survey rounds.

The main conclusions of our analysis is that the protracted conflict in the area did not result in large migration flows. This seems to conform to observations from studies of migration which find the economically better-off and more educated as more likely to migrate to urban areas and abroad. People residing in extremely deprived areas are unlikely to migrate in large numbers because they lack the resources to travel and the skills to start economic activities in new places. While widespread conflict can result in migration within and outside the country, poor rural households residing in conflict areas are less likely to migrate. Our data also seem to suggest that limited support in the form of food aid can reduce migration flows from conflict areas.

Next we looked at the impact of conflict on market access, agricultural production and use of agricultural inputs. Despite common reporting of disruptions in input and output markets, we found no evidence of a negative impact of conflict on the operation of agricultural markets. Farmers in the area appeared to be able to purchase and sell goods as before the conflict. This of course does not mean that markets had not been disrupted during the conflict, but it implies that if market had been disrupted, they were able to resume activities or that new markets and alternative marketing strategies re-emerged after the collapse of those operating in areas closer to the conflict.

Perhaps the most striking effect of conflict on agriculture was a dramatic drop in production to less than 50% of baseline output. The reduction was larger in high-conflict areas but was observed throughout the whole study areas, including in regions that were not directly affected by the hostilities. Without further data on production shocks and rainfall it is difficult to say to what extent this dramatic drop in agricultural production is an direct consequence of conflict or the outcome of a poor agricultural year. Severe agricultural shocks in the forms of floods and droughts have been reported in the area during the past years as affecting both crop production and livestock activities. Parallel to the reduction in agricultural output there was a reduction in the cultivation of land - though again it is difficult to say to what extent this was the result of conflict or of poor weather conditions. On the other hand, labour use appears to have increased in all areas, which given the drop in output, points to a substantial reduction in labour productivity.

Strangely, despite the reduction in agricultural production, households reported higher volumes of agricultural crop sales in comparison to the baseline. Interpreting this result is difficult and there is a possibility that it was driven by differences in the survey questionnaires between the baseline and the follow up or in household reporting. However, the increase in the volume of sales seems to exclude that household retreated to the production of subsistence food as a consequence of conflict. The disaggregation of the impact of conflict on the production of different crops also shows that the only visible change in cropping patterns was a reduction in the production of millet and an increase in the production of beans. Since millet is a typical subsistence crop produced with rainfall irrigation and minimum fertiliser input, these data do not point to an increase in subsistence farming. There is however, some weak evidence that the production of millet increased in conflict-affected areas where subsistence farming might have become more common.

Finally, we tried to infer the permanent impact of conflict on living standards by looking at the impact on livestock holdings, which represent the main form of store of wealth in the area and much of household productive capacity. Similarly to what we observed in relation to agricultural production, conflict appears to have considerably decreased livestock holdings. De-stocking of animals was larger in high-conflict areas and affected large pastoralists the most. The disaggregation of the impact by livestock type indicates that destocking of sheep and goats was particularly common.

Without additional information on shocks and household coping strategies, it is difficult to say to what extent the reduction in animal stocks was the result of sales made to smoothen adverse income shocks or the result of direct shocks to animal herds in the form of thefts, confiscations or other losses related to conflict. It is also possible that farmers sold their livestock, particularly sheep and goats, because they were a common target of food requisitions conducted by rebel forces. Whatever the cause, the impact of this reduction in animal stocks cannot be underestimated. Animals represent a store of wealth and a buffer stock against shocks in the area. The widespread loss of animal stocks represents a substantial impoverishment of the population.

Did the inflow of food aid by the WFP, as well as by other donors, mitigate the negative impact of conflict on agriculture? Our data indicate a negative correlation between receipt of aid at the village level and agricultural production. This seems to suggest that areas that benefited from food aid reduced the production of food, possibly because domestic consumption was provided for by external assistance. The association between agricultural production and aid however is not strictly causal. Our analysis employed a matching strategy that reduced the endogeneity of programme placement but there is no proof that this was successfully achieved. The correlation of poor agricultural performance and food assistance may also reflect targeting of aid towards poorest areas.

On a positive note, food aid was also associated with a lower reduction in livestock holdings in high-conflict areas. Given the role played by livestock as a buffer stock against income shocks and as a store of wealth, this is a remarkably positive effect of aid that might have prevented some households from falling into destitution. Other effects of aid on the use of labour, on cultivated land, and land sales are more difficult to interpret. The effect sizes are small and not always in the direction suggested by theoretical expectations. In addition, given the large number of hypotheses being tested, it remains difficult to distinguish real impacts from those produced by chance alone.

We conclude by stressing two main limitations of our study. First, the categorisation of conflict adopted does not make justice to the complexity of the nature of conflict in the area. Alternative categorisations are possible that are more closely related to factors affecting agriculture. Also, a continuous measure of conflict reflecting the different intensity of adverse effect could be more appropriate in some cases. We intend to further investigate how households and villages were affected by conflict and to formulate measures of conflict exposure that are better designed to identify the effects of conflict on living standards.

Second, despite the matching strategy adopted, the study does not fully address the potential endogeneity of conflict and of emergency aid. Conflict and aid could have been correlated with agricultural outcomes, particularly if conflict affected, for example, specific resource-rich regions, or if aid targeted, for example, regions negatively affected by weather shocks. As a result, the estimated impacts of conflict on agricultural variables should be interpreted with caution. Given the data available and the study design, an instrumental variable approach seems the only option to correct for endogeneity. We will further explore this possibility in future research.

What is definitively clear from our analysis is that conflict had a considerable negative impact on agricultural production in the entire area and that this affected livestock holdings and therefore long term farmers' productive capacity. The reasons for this are not entirely clear though. Why did agricultural production decrease so dramatically over the period? What factors inhibited farmers' recovery from the initial shock? Why farmers disposed of their most valuable assets and how? These and other questions will be investigated in a revised version of this paper.

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