

Pre-Analysis Plan: Can Contact Reduce Conflict Among Farmers and Herders in the Middle Belt of Nigeria*

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1 Introduction

This pre-analysis plan pertains to endline assessments in the evaluation of Farmer-Herder dialogues by Search for Common Ground (henceforth SFCG). The objective of the evaluation is to conduct research on the impact of an intervention that provides targeted contact between two groups in conflict with each other. The intervention and evaluation have been implemented as a collaboration between SFCG, Innovations for Poverty Action, and the University of Chicago. Below, we first provide a brief overview of the intervention. Then, we describe the experimental methodology and study sample. We next describe the data collection. Finally, we provide an overview of our econometric specifications and measurement.

2 Overview of the Interventions

Our design involves two interventions, farmer-herder inter-dialogues which constitute our primary intervention (henceforth SFCG workshops) of interest and health workshops which we consider a benchmark case of neutral contact without a target focus on sources of conflict. Figure 1 visualizes the design. Below we discuss each in turn.

2.1 Primary Intervention: Inter-Dialogue Workshops

The main intervention consists of farmer-herder inter-dialogue workshops organized by Search for Common Ground (SFCG). The SFCG workshops unfold through three steps. First, preparatory meetings are held with farmers and herders separately; then both parties are brought together in two to three-day long fora. These fora include key local leaders, such as the chairmen of the farmer and herder associations, chiefs and local councilors, as well as women and youth leaders. However, there may be as many as 50 individuals from each of the communities, including rank and file herders and farmers. During the fora, farmers and herders collectively discuss key challenges and sources of tension within their community. At the end of the session, they produce a collective record of this discussion, which requires them to reach basic agreement on how these challenges are represented. Third, SFCG organizes follow-up visits to the communities, 6 weeks after the fora to discuss progress in implementing the action plans. 32 SFCG workshops were implemented involving 96 farmer-herder community pairs. The first workshop took place on July 15, 2020 and the final workshop on November 3, 2021 with the last follow up visit on December 10, 2021.

2.2 Neutral Treatment Arm: Health Workshops

Additionally, we designed a neutral treatment arm which consists of health workshops. We partnered with a Nigerian health consulting firm, Dan Meshak Consulting, to provide health workshops to farmer and herder communities following the same structure and setup as the SFCG workshops (first farmers and herders meet separately, then together, and a follow-up visit six weeks later). In contrast to the SFCG workshops, issues surrounding the conflict between farmers and herders

Figure 1: Treatment Assignment



are not discussed at the health workshops. Only health care problems are addressed, such as child and maternal health, sanitation practices, and COVID-19 prevention. 32 health workshops were implemented involving 96 farmer-herder community pairs. The first health workshop took place on November 24, 2020 and the final health workshop on June 13, 2022 with the last follow up visit on September 30, 2022.

3 Overview of Evaluation

The evaluation employed a randomized control trial to assess the causal impact of the SFCG workshops.

3.1 Experimental Methodology and Sample

Our sample included farmer-herder community pairs in three states of the Middle-Belt of Nigeria: Benue, Nassarawa, and Plateau states. We excluded communities that SFCG has previously worked in and coordinated with other NGO's working on farmer-herder relations to avoid contamination.

We stratified the randomization by Local Government Areas (LGA), the Nigerian administrative division below states, this created 13 strata. Within each LGA stratum, we selected a random third of farmer-herder community pairs to the SFCG workshop treatment and another third to the health workshop treatment. Since both SFCG and health workshops involve three communities in one workshop, we sampled 9, 18, 27, or 36 communities per LGA. The randomized sample included 288 farmer-herder community pairs; 96 were assigned to SFCG workshop treatment, 96 to health workshop treatment and 96 to the control group. We refer to farmer-herder community pairs as communities, for brevity.

3.2 Description of Data Collection

Below we will discuss baseline, endline, and smartphone data collection.

Baseline Data Collection

Baseline data collection was completed in two rounds. The first round included 135 communities from two states (Nasarawa and Plateau). The field activities for this round were concluded by December 2019. After receiving additional funds, we were able to expand the sample and conduct a second round of data collection in the first quarter of 2021. 153 communities from three states (Benue, Nasarawa, and Plateau) were included.

In each community we surveyed 11 household heads: 5 randomly sampled herders, 5 randomly sampled farmers, and 1 farmer who also herds or has herded in the past. We also surveyed 6 key informants—3 from the farmer community and 3 from the herder community—such as village heads, religious leaders, youth leaders, or women leaders.

Endline Data Collection

Our partner organizations did not have the capacity to implement all interventions simultaneously, but instead organized workshops one after the other. Health workshop implementation started later and took longer. Further, the COVID-19 pandemic and the associated stop in activities due to movement restrictions within Nigeria, led to more time between when health and SFCG workshops took place. To accommodate the varying timelines, endline activities are conducted on a rolling basis (14 batches) starting with Local Government Areas where there has been at least nine months since the last dialogue activity. To make sure inter-dialogue communities and health workshop communities always have a reference group that has been surveyed at the same moment in time, we survey control communities twice: once when the inter-dialogue communities in their LGA are surveyed and a second time when the health workshop communities in their LGA are surveyed.¹

¹When inter-dialogues and health communities within the same LGA are surveyed within 3 months of each other we do not survey control communities twice.

Piloting activities for the endline took place in December 2021; enumerator training and data collection activities started in February 2022. Endline data collection will last a total of 17 months with the last endline survey batch to be collected in July 2023.

In each community we surveyed 11 household heads: 5 randomly sampled herders, 5 randomly sampled farmers, and 1 farmer who also herds or has herded in the past. We also surveyed 6 key informants, 3 from the farmer community and 3 from the herder community, such as village heads, religious leaders, youth leaders, or women leaders. The households surveyed in the endline are from a new random sample and thus not necessarily the same households as surveyed during the baseline. The key informants surveyed during the endline were largely the same as surveyed during the baseline except for cases where local leadership changed. We also conducted behavioral games (dictator games and trust games) with 12 individuals: 3 farmer household heads were paired with 3 herder household heads and 3 farmer key informants were paired with 3 herder key informants.

Smartphone Data Collection

In addition, we also implemented a smartphone data collection. In each community we identified one herder and one farmer to act as village-level respondents. We distributed a phone to each of them and trained them in filling out a survey on disputes and conflicts every two weeks. Respondents who cannot read or write were given a no-touch phone and are called to answer the survey on the phone. Respondents were recruited from August to December 2022 and data collection will last for 12 months. In most of the intervention community the smartphone data collection started more than 12 months after the intervention.

4 Econometric Specifications

4.1 Community-Level Analysis

The randomized experimental design of our project means that we can isolate the causal effect of our intervention using simple econometric specifications. To gauge the causal effect of the treatments on endline outcomes, we will estimate Intent to Treat (ITT) effects using the following specification:

$$y_{i,t} = \alpha_s + \beta SFCG_i + \gamma Health_i + X_i\delta + \psi_t + \epsilon_{i,t} \quad (1)$$

Here, $y_{i,t}$ is the endline outcome of community i surveyed in month t ; α_s represents LGA² stratum fixed effects; $SFCG_i$ is the main treatment indicator, which equals 1 for communities assigned to participate in SFCG’s farmer-herder inter-dialogues and 0 otherwise; $Health_i$ is the neutral treatment indicator, which equals 1 for communities assigned to participate in the health workshops and 0 otherwise; X_i denotes a vector of baseline characteristics for community i . This vector will also include a relevant subset of baseline dependent variables, for outcomes that we are able to access historical (pre-treatment) data. We will additionally estimate the difference in difference

²Two LGAs were included in both rounds of the baseline and therefore have two strata each.

specifications for outcomes collected in the baseline. ψ_t are survey month fixed effects. Standard errors will be clustered at the community level.

As mentioned above, the COVID-19 pandemic and differences in implementation speed by our partners led SFCG interventions happening at different times than health workshops in the same LGA. We therefore surveyed control communities in each LGA where this occurred twice during the endline: once when inter-dialogue communities were surveyed and again when health workshop communities were surveyed. In addition to our main specification we will also run specifications that only contain inter-dialogue communities and the contemporaneously surveyed control communities as well as separately ones that contain health workshop communities and the contemporaneously surveyed control communities. In addition we will run the main specification with LGA-month fixed effects to only compare intervention communities to the simultaneously surveyed communities in the same LGA.

We will also estimate Treatment Effects on the Treated (TOT). In this specification, treatment assignment is used as an instrument for whether the community actually received the workshop treatment.

The estimating equations for the first stage is:

$$Workshop_i^{SFCG} = \alpha_s + \beta SFCG_i + \gamma Health_i + X_i\delta + \epsilon_i \quad (2)$$

and

$$Workshop_i^H = \alpha_s + \beta SFCG_i + \gamma Health_i + X_i\delta + \epsilon_i \quad (3)$$

where $Workshop_i^{SFCG}$ is an indicator which equals 1 if a community received the SFCG workshops and $Workshop_i^H$ is an indicator which equals 1 if a community received the Health workshops. We consider a community to have “received the workshops” if both farmer and herder representatives from the community attended both the intra- and inter-dialogue workshops.

The estimating equation for the second stage is:

$$y_{i,t} = \alpha_s + \theta \widehat{Workshop}_i^{SFCG} + \eta \widehat{Workshop}_i^H + X_i\delta + \psi_t + \epsilon_{i,t} \quad (4)$$

where $\widehat{Workshop}_i^{SFCG}$ and $\widehat{Workshop}_i^H$ are the instrumented indicators of whether the community received either the SFCG or health workshops.

4.2 Household-Level Analysis

We will also allow household level outcomes and use the following specification:

$$y_{j,i,t} = \alpha_s + \beta SFCG_i + \gamma Health_i + X_{j,i}\delta + \psi_t + \epsilon_{j,i,t} \quad (5)$$

here $y_{j,i}$ is the endline outcome of household j in community i ; α_s represents LGA stratum fixed effects; $SFCG_i$ is the main treatment indicator, which equals 1 for households in communities assigned to participate in SFCG’s farmer-herder inter-dialogues and 0 otherwise; $Health_i$ is the

neutral treatment indicator, which equals 1 for households in communities assigned to participate in the health workshops and 0 otherwise; $X_{j,i}$ denotes a vector of controls, including baseline characteristics for community i and characteristics of household j . This vector will also include a relevant subset of baseline dependent variables, for outcomes that we are able to access historical (pre-treatment) data. Pre-treatment household characteristics measured in the baseline will be averaged to the community level. ψ_t are survey month fixed effects. Standard errors will be clustered at the community level.

4.3 Smartphone Data Analysis

For the smartphone data we have panel structure which allows us to implement the following specification:

$$y_{i,t} = \alpha_s + \beta SFCG_i + \gamma Health_i + X_i\delta + \psi_t + \epsilon_{i,t} \quad (6)$$

Here, $y_{i,t}$ is the smartphone outcome of community i in period t ; α_s represents LGA stratum fixed effects; $SFCG_i$ is the main treatment indicator, which equals 1 for communities assigned to participate in SFCG's farmer-herder inter-dialogues and 0 otherwise; $Health_i$ is the neutral treatment indicator, which equals 1 for communities assigned to participate in the health workshops and 0 otherwise; X_i denotes a vector of baseline characteristics for community i ; ψ_t are reporting period fixed effects. Standard errors will be clustered at the community level.

To investigate how the effect changes over time we will estimate the following equation:

$$y_{i,t} = \alpha_s + \sum_{k=k_{min}}^{k=k_{max}} \beta_k SFCG_i \times 1(t = T_i^D + k) + \sum_{k=k_{min}}^{k=k_{max}} \gamma_k Health_i \times 1(t = T_i^H + k) + X_i\delta + \psi_t + \epsilon_{i,t} \quad (7)$$

where the indicator $1(t = T_i^D + k)$ takes value 1 if the the reporting period is k sub-periods after the community received the inter-dialogue and $1(t = T_i^H + k)$ is the equivalent for the health workshops.

Further, in each community we have two smartphone respondents. We will run the analysis in three ways: first, with the answers for both respondents pooled; second, with each respondent's submission as a separate observations while including respondent characteristics; third, separately for farmer and herder respondents. We will also pool all smartphone reports in a community and run a cross-sectional specification as in Specification 1.

Note: because in almost all intervention communities the smartphone data collection took place more than 9 months after the intervention, we will focus our analysis on the endline data and use the smartphone data to look at long-run effects.

5 Outcomes and Hypotheses

In this section we list the outcomes we plan to examine as well as the variables measuring our hypothesized mechanisms.

For the directly measured outcomes we will combine survey responses related to an outcome into a mean effects index, following [Kling et al. \(2007\)](#). To do this, we will first express responses in terms of standard deviations from the control group mean. We will then sum all standardized responses related to an outcome into an index switching signs if necessary to ensure that the positive direction always indicates a “better” outcome. We will also report a robustness test using the method of [Anderson \(2008\)](#), which weights the index items by their inverse covariance matrix. We will also present estimates of individual indicators within each family to better gauge how various indicators contribute to overall effects within families.

5.1 Endline Outcomes

1. Primary Outcomes: Disputes and Violence

(a) Farmer-Herder Disputes

- From Household endline survey:
 - Was the household involved in a farmer-herder dispute in the previous 9 months? [by type] (disp1_party)
 - How many disputes has the household been involved in in the last 9 months? [by type] (disp1b_number)
- From KII endline survey:
 - Have any farmer-herder disputes taken place in the community in the last 9 months? [by type] (disp1a_XX)
 - How many farmer-herder disputes have taken place in the community in the last 9 months? [by type] (disp2a-2f; disp3a-3f; disp4a-4f)

(b) Farmer-Herder Violence

- From Household endline survey:
 - Farmer-Herder Violence From Disputes
 - * Percentage of disputes that lead to violence, number and type. (disp4i_party, disp4i_violencenum, disp4i_violence)
 - * What was the total value in Naira of crops/property lost/destroyed due to the dispute? (disp1_lostvalue)
 - * Have there been any incidents of cattle rustling or being killed in the last 9 months? (disp6a-6d)
 - * Number of incidents of cattle rustling or being killed in the last 9 months (disp7a-7d)
 - * Separate cattle rustling by farmers and herders from this community vs Herders from another community vs Unknown herders. (disp8a-dips8d; disp9a-disp9d; disp10a-disp10d)
 - Other Farmer-Herder Violence:

- * Was the household involved in or victimized by farmer-herder conflicts [by type] (ic1_victim)
 - * Number of violent events household was involved in or victimized by [by type] (ic1_number)
 - * Was there any reprisal? (ic6_reprisal)
 - * Did any household member get killed in the conflict? (ic2_killed)
 - * Did any household member get sexually assaulted in the conflict? (ic3_assaulted)
 - From KII endline survey:
 - In the past 9 months, have violent events involving farmers and herders taken place in the community? (disp12_violentevents)
 - In the past 9 months, how many violent events involving farmers and herders have taken place in the community? (disp13_violenteventsnum)
 - How many people died because of farmer-herder conflict in the past 9 months? (disp12_death)
 - In the past 9 months, how many people in this village were killed due to farmer-herder violence? (disp15_killed)
 - In the past 9 months, how many women and girls in this village were sexually harassed/assaulted due to farmer-herder violence? (disp16_assault)
2. Secondary Outcomes: Cooperation, Economic Indicators, Economic Exchange, and Subjective Security Situation
- (a) Long-run disputes
- From Smartphone data collection:
 - Incidence and number of disputes between farmers and herders in your community?[by type] (c1_fhdisputes_lw, c1_fhdisputesnum_lw, c1_fhdisputesnum)
 - How many herding and farming households were involved [by type](c3_herdershhinvolved_lw, c7_farmershhinvolved_lw)
- (b) Long-run violence
- From Smartphone data collection:
 - Did the dispute lead to any violence in the last two weeks? [by type] (c22_violence_lw)
 - What type of violence? (c22_violencetype_lw)
 - In the last two weeks, were there any incidents of violence or destruction between farmers and herders that did not originate from a dispute? (av1_violence_lw, p2a_previousconflict_mw)
 - How many violent events occurred in the last two weeks? (xx_violencenum_lw)
 - Did the dispute in the last two weeks lead to any cattle (or other animal) theft or injury? [by type](xx_cattletheft_lw)

- For the incident How many were killed in the last two weeks ? [by type](xx_killed_lw)
- For the incident How many were injured in the last two weeks? [by type](xx_injury_lw)
- For the incident How many were raped in the last two weeks? [by type] (xx_rape_lw)
- For the incident How many properties were destroyed in the last two weeks? [by type] (xx_ploss_lw)

(c) Other Violence

- From Household endline survey:
 - Any incidents of community level violence such as riots, attacks, clashes etc? (cc1_commviolence)
 - Was household involved in any incidents of community level violence? (cc2_hhviolence)

(d) Economic Indicators

- From Household endline survey:
 - Types of crops grown (such as permanent crops vs. seasonal, underground vs. overground, perishable vs. storable) and harvested by household (ep32_crops, ep33_harvest)
 - Amount harvested and value of harvest. [by crop] (ep35a_cropunit, ep35c_cropvalue)
 - Did the household use pesticides, herbicides, fertilizer, or dung (ep1_pesticide; ep4_herbicide; ep7_fertilizer; ep11_dung)
 - How much did the household spent on pesticides, herbicides, fertilizer, or dung (ep3_pcost; ep6_hcost; ep10_fcst; ep12_dcost)
 - Binary indicator and amount of animal products (milk/meat) bought. (ep38a_purchasedmilk; ep38b_purchasedmeat)
 - Binary indicator and amount of animal products sold. (ep41a_milksale; ep41b_meatsale)
 - Have you owned any of these [ANIMALS] at any point in the last 12/9 months? (ah0_hhlivestock (group))
 - How many [ANIMALS] are owned by your household now (present at your farm or away)? (ah1_ownership (group))
 - If you would sell one of the [ANIMALS] today, how much would you receive from the sale? (ah2_value (group))
 - How many [ANIMALS] did your household own in the last 12/9 months? (ah3_holding (group))
 - In the last 12/9 months: how many calves/cattle/sheep were born; raised; bought; sold; slaughtered; died from disease; lost; stolen; killed/poisoned? (calf/cattle/sheep_hol ah5h_raised)
 - Number of plots used for agriculture, size, type of landholding, distance to plots, number of plots lost in previous 9 months (lo1_ffarming–lo15b_fgenright)

- Number of plots used for herding, size, type of landholding, distance to plots, number of plots lost in previous 9 months (lo1_hherding–lo10b_ggenright)
- Number of plots used for herding, size, type of landholding, distance to plots, number of plots lost in previous 9 months (lo1_mherdfarm–lo16b_mapproval)
- Household economic welfare: Number of children, education of children, relative economic well-being, electricity, housing quality (hd9_hhchildren, hd22_school, hd23_schoollevel, il1_hhcomp, il2_hhroof, il2_hhroofother, il3_hhbrick, il3_hhbrickother, il4_hhelectricity)

(e) Economic Exchange

- From Household endline survey:
 - Did the household sell crops to other group? (ep37_customer)
 - Dung from herder used as fertilizer? (ep8_ftype, ep15_freedung, ep16_barterdung, ep20_nondungfert, ep21_purchaseddung, ep21_barterdung)
 - Animal traction used in agriculture? (ep22_animaltraction, ep24_tractioncost)
 - Did the household sell dung and value of amount sold (ep13_dungsale, ep14_dungamount)
 - Animal products bought from herder (ep40a_milkpurchase; ep40b_meatpurchase)
 - Animal products sold to farmers (ep43a_milkbuyer; ep43b_meatbuyer)
 - Other economic exchange between group, indicator and value (ep44_otherprod, ep46_value, ep47_psale, ep49_pvalue)

(f) (Subjective) Security Situation

- From Household endline survey:
 - Perception of safety: how safe do you feel going to the other group’s village? how safe is it for women? (sec1c_nfvillage, sec1c_nhvillage, sec3_nfwomen, sec3_nhwomen)
- From KII endline survey:
 - Likert scale: My community is peaceful (ss3_security)
 - Likert scale: A member of this community will be a victim of violence in the next 9 months (ss4_security)
 - How much has the ability to do the activities: travel around/outside community; get clean water; conduct daily activities; conduct community activities; farm; herd been affected by conflict in your community? (ss5a_security–ss5g_security)
- From Smartphone data collection:
 - In the last two weeks, were there any violence or destruction events in your community relating to the j electoral process? (av1_election_violence)
 - How many such violent events occurred? (av1_election_violencenumn)
 - In the last two weeks, were there any other incidents of violence or destruction NOT related to any farmer-herder conflict? (av1_violencen_lw)

- Select an option that best describes the security situation in the village in the last two weeks? (w1_security)
- How would you describe the tension between farmers and herders in the village in the last two weeks? (w2_tension)

(g) Migration and Displacement

- From Household endline survey:
 - How many nights in the past 9 months has the household not slept in the village due to violence? (sec7_nightsoutside)
- From KII endline survey:
 - Have any households been displaced in the last 9 months due to violence? (ss7_displacement)
 - How many farmer households have been displaced in the last 9 months due to violence? (ss8a_fviolence)
 - How many herder households have been displaced in the last 9 months due to violence? (ss8a_hviolence)
 - Was there an influx of herders from nearby villages in the past 12 months, and from where? (hb3_influx)
 - In the past three months, have there been any strange fulanis (from other communities or other states) who have come through this village? (hb3_strangefulani)
- From Smartphone data collection:
 - Have any households been displaced in the last 9 months/in the last 2 weeks due to violence? (ss1_displacement, ss2_displacement)
 - How many farmer households have been displaced in the last 9 months/in the last 2 weeks due to violence? (ss1a_fviolence, ss2a_fviolence)
 - How many herder households have been displaced in the last 9 months/in the last 2 weeks due to violence? (ss1b_hviolence, ss2b_hviolence)

3. Hypothesized Mechanisms

(a) Behavior

- From Behavioral Games after endline survey:
 - Dictator Game: Money sent by respondent to fellow respondent (dg_payout1, dg_sent)
 - Trust Game: Money sent by respondent to fellow respondent (tgsender_payout1, tgr_payout1, tgr_payout2, tgr_return2)
 - Trust Game: Money sent back by the respondent (tgr_return1, tgsender_return1, tgsender_payout2, tgsender_return2)

(b) Cooperation

- From Household endline survey:
 - Unblocking of cattle routes: have any routes been unblocked, number unblocked, are there routes that are not blocked, how many? (co1v_unblkdroutes, co1vi_unblkdroutesnum, coli_routes, colii_routesnum)
 - Signalling herbicide: Do farmers in this community use any system to indicate that they have sprayed herbicide on their crops? (co2i_herbicides)
 - Night grazing: Have there been any incidents in this community in which cattle ended up feeding on crops during the night? Was the household involved in any incidents? (co4i_nightgrazing, co4ii_cattle)
 - Bush burning: time after harvest until bush is burned, household, perception of adequate length (co3i_hbburning, co3i_fbburning, co3ii_croppresidue)
 - Grazing permission: how often was permission for grazing requested and how often was it granted? (r5_hpermission, r6_permissiongranted, r3_fpermission, r4_permissionnum)
 - Shared markets: presence of shared market, its age, attended by both groups, attended by household. (co6i_commmarket, co6ii_commmarket2, ep51_marketuse, co6iii_pastmarket)
 - Shared farming: has there been shared farming between the groups, has the household participated? (co5i_shrdfarming, co5ii_fshrdfarming, co5ii_hshrdfarming)
 - Are herders grazing in plots where they have permission? Are farmers giving herders the permission to graze on their land? (lo7_fgazing, lo7b_fgazingp, lo8_fownanimals, lo8_permission, lo10a_gpermission, lo10b_ggenright, lo7_mgrazing, lo7_mgrazingp, lo8_mownanimals, lo8_mpermission)
- From KII endline survey:
 - Unblocking of cattle routes: have any routes been unblocked, number unblocked, are there routes that are not blocked, how many? (co1v_unblkdroutes, co1vi_unblkdroutesnum, coli_routes, colii_routesnum)
 - Signaling herbicide: Do farmers in this community use any system to indicate that they have sprayed herbicide on their crops? (co2i_herbicides)
 - Night grazing: Have there been any incidents in this community in which cattle ended up feeding on crops during the night? Was the KI involved in any incidents? (co4i_nightgrazing, co4ii_cattle)
 - Bush burning: time after harvest until bush is burned, household, perception of adequate length (co3i_hbburning, co3i_fbburning, co3ii_croppresidue)
 - Illicit structures: In the past 9 months, have there been any incidents in this community where someone has built structures illegally on land that is owned by another person? How many? By whom? (co8i_istructures, co8ii_structuresincident, co8iii_identity)

- Shared markets: presence of shared market, its age, attended by both groups. (co6i_commmarket, co6ii_commmarket2, ep51_marketuse, co6iii_pastmarket)
- Shared farming: has there been shared farming between the groups, has the KI participated? (co5i_shrddfarming, co5ii_fshrddfarming, co5iii_hshrddfarming)
- Public goods: Was the construction done in cooperation with the farmer/herder village? (pg2_construction)
- Public goods: Was the improvement done in cooperation/coordination with the [farmer/herder] community? (pg4_cooperation)
- Public goods: In the past year, has there been any change in who is allowed to access or use any of the selected facilities? (pg_access)
- Public goods: How has access changed? (pg6_change)
- From Smartphone data collection:
 - On certain occasions, individuals may invite their friends, families, neighbours and members of their communities or other communities to celebrate memorable occasions like Christmas, Big Sallah, funeral rites, marriage ceremonies etc. where they share food, dance together, etc. In the last two weeks, have farmers and herders from your village and the neighboring village celebrated any special occasion together? (invitation)
 - Sometimes farmers and herders meet to discuss issues of disputes and violence in their communities or neighboring communities and find ways of resolving them. In the last two weeks, have farmers and herders from your village and the neighboring village met to discuss disputes and violence incidents in your community or other neighboring communities? (meeting)

(c) Asymmetric Information

- From Household endline survey:
 - Information about economic production and cost to conflict to the other party. (ai2a_maizevalue, ai2b_sorghumvalue, ai2c_cassavavalue, ai2d_tambavalue, ai2e_yamvalue, ai3a_grownfcow, ai3b_grownmcow, ai4_fertilizerprice, ai5_dungprice, ai6_treatedcrops, ai7_pbenefits, ai8_trampled crops, ai8_trampled crops, co3ii_croppresidue)
 - Knowledge of causes of conflict/other party's concerns (aq1_conflict, aq3_othergroup)
 - Perception of other party's concerns (aq5_fcattleroutes, aq6_fbburning, aq7_fpcattle, aq8_fwateraccess, aq9_fcroppresidue, aq10_ffarmeryouth, aq11_fdiscrimination, aq12_heatencrops, aq13_hherderyouth, aq14_hdiscrimination)
- From KII endline survey:
 - Knowledge of causes of conflict/other party's concerns (aq1_conflict, aq3_othergroup)
 - Perception of other party's concerns (aq5_fcattleroutes, aq6_fbburning, aq7_fpcattle, aq8_fwateraccess, aq9_fcroppresidue, aq10_ffarmeryouth, aq11_fdiscrimination, aq12_heatencrops, aq13_hherderyouth, aq14_hdiscrimination)

(d) Trust

- From Household endline survey:
 - General trust (a1e_therders, a1f_tfarmers)
 - Trust in other group to lend money, would lend money, did lend money (oo5_nloanpeople, oo_giveloan, oo1_loan, oo3_nloan)
 - Alleviation of commitment problems: If somebody in the farming village promises that he will keep cattle paths open, do you believe that he will? If somebody in the farming village promises to consult with the herders before burning any bush, do you believe that he will? (a2_tcattlepath, a3_tbburning)

(e) Stereotypes & Discrimination

- From Household endline survey:
 - Stereotypes about the other group (ds1_agree, ds2_agree, ds6_bokoharam, ds3_agree, ds4_agree)
 - Attitudes towards discrimination of the other group. Inter-group marriage. (ds13_equal, ds14_fulani, ds15_indigene, ds7a_mintermarriage, ds7b_cintermarriage, ds8_marriagenum, ds9a_hintermarriage, ds9b_fintermarriage, ds10_marriagenum, ds11a_cmmarriage, ds11b_mcmarriage, ds12a_fhmarriage, ds12b_hfmarriage)
 - Perceptions about other community (ds0a_ableai, ds0a_ableaii, ds0b_violenceai, ds0b_violenceaii, ds0c_tolerantai, ds0c_tolerantaii, ds0d_resourcesai, ds0d_resourcesaii, ds0e_successai, ds0e_successaii)
 - Opinion on political rights (ds5a_hrights, ds5b_hrights, ds5c_hrights)
 - Grazing rights (r1_grazerights, r2_grazerights2)
- From KII endline survey:
 - Stereotypes about the other group (ds1_agree, ds2_agree, ds6_bokoharam, ds3_agree, ds4_agree)
 - Attitudes towards discrimination of the other group. Inter-group marriage. (ds13_equal, ds14_fulani, ds15_indigene, ds7a_mintermarriage, ds7b_cintermarriage, ds8_marriagenum, ds9a_hintermarriage, ds9b_fintermarriage, ds10_marriagenum, ds11a_cmmarriage, ds11b_mcmarriage, ds12a_fhmarriage, ds12b_hfmarriage)
 - Perceptions about other community (ds0a_ableai, ds0a_ableaii, ds0b_violenceai, ds0b_violenceaii, ds0c_tolerantai, ds0c_tolerantaii, ds0d_resourcesai, ds0d_resourcesaii, ds0e_successai, ds0e_successaii)
 - Opinion on political rights (ds5a_hrights, ds5b_hrights, ds5c_hrights)

(f) Religious Views

- From Household endline survey:
 - Suppose you have a friend named Abdullahi/Jamila. Imagine you and Abdullahi/Jamila are outside and you see someone insult the Prophet. Is it ok for Ab-

dullahi/Jamila to take the following actions against this person? (rs6_factionsmm, rs7_actionsmm)

- Suppose you have a friend named Emmanuel/Blessing. Imagine you and Emmanuel/Blessing are outside and you hear someone insult Jesus. Is it ok for Emmanuel/Blessing to take the following actions against this person? (rs6_factionsmm, rs7_actionsmm)
- I prefer living in a community where everyone shares my religion (rs3_commreligion)
- I feel that Muslims do not belong in this community (rs4_muslimsincomm)
- I feel that Christians do not belong in this community (rs4_ctiansincomm)
- People who are not Christian will go to hell in the afterlife (rs2_cafterlife)
- People who are not Muslim will go to jahannam in the afterlife (rs2_mafterlife)

(g) Social Networks

- From Household endline survey:
 - Friendships & social interactions: how many of the other group does the household know, has as friends, visited, attended wedding, funeral? (sn1a_farmers, sn1b_herders, sn2a_ffriends, sn2b_hfriends, sn3_nvillage, sn4_nwedding, sn5_nfuneral)
 - Other ties: do you know the leader of the other group? how often do you speak to them? [by type] (sn7e_fheadman, sn7e_hardo etc.; sn8e_hardo, sn8e_fheadman etc.)
- From KI endline survey:
 - Other ties: do you know the leader of the other group? how often do you speak to them? [by type] (sn7e_fheadman, sn7e_hardo etc.; sn8e_hardo, sn8e_fheadman etc.)

(h) Empathy

- From Household endline survey:
 - If you see a farmer/herder eat a very good meal, how good does that make you feel? (em0_mealai, em0_mealbi)
 - If you see a farmer/herder stub their toe, how bad does that make you feel? (em0_toeai, em0_toebi)
 - It upsets me to see [farmers/herders] being treated disrespectfully (em1_cow)
 - When I see a [farmer/herder] being treated unfairly, I do not feel very much pity for them (em2_roof)
 - I get a strong urge to help a [farmer/herder] when I see that they are upset (em3_herderson)
 - I am not really interested in how [farmers/herders] feel (em4_farmerson)
- From KI endline survey:

- If you see a farmer/herder eat a very good meal, how good does that make you feel? (em0_mealai, em0_mealbi)
- If you see a farmer/herder stub their toe, how bad does that make you feel? (em0_toeai, em0_toebi)
- It upsets me to see [farmers/herders] being treated disrespectfully (em1_cow)
- When I see a [farmer/herder] being treated unfairly, I do not feel very much pity for them (em2_roof)
- I get a strong urge to help a [farmer/herder] when I see that they are upset (em3_herderson)
- I am not really interested in how [farmers/herders] feel (em4_farmerson)

(i) Perception of Justice

- From Household endline survey:
 - If someone from the farmer village were to kill someone from the herder village, or vice versa, do you think they would be held accountable? (pj1_accountable)
 - Are people from the herder and farmer community both treated equally by the security forces? (pj4_treatment)
 - Are people from the herder and farmer community both treated equally by the courts/justice system? (pj_court)

(j) Dispute Resolution

- From Household endline survey:
 - Did your household attempt to resolve the dispute in some way? (disp5_party)
 - Did your household try to resolve the dispute on your own with the other party (but without the involvement of any others)? (disp6_party)
 - Who else did your household approach to try to resolve the dispute? (disp7_party)
 - If you had a dispute with someone in the NEIGHBOURING FARMER VILLAGE who would you first turn to in order to resolve the dispute? (sec6_nfvillage)
 - If you had a dispute with someone in the NEIGHBOURING HERDER VILLAGE who would you first turn to in order to resolve the dispute? (sec6_nhvillage)
 - In any of these, did you contact anyone to report the incident? OR Did any member of the household contact anyone to report the incident? (ic5_hhmember/ic4_contact)
 - Who? (ic6_report/ic5_who)
 - Is your household satisfied with the way the dispute was resolved? (disp8_partya)
- From KI endline survey:
 - By type of dispute, percentage of incidents that were mediated by the leader in the last 9 months? (disp5a-5f)
 - Were you involved in mediation of the violent event(s)? (disp17_mediation)

- Did you contact a third party for resolution of the violent event(s)? (disp18_thirdparty)
- In how many of them did you contact the third party for resolution? (disp20_report)
- From Smartphone Data Collection:
 - For incident_i: Was this violence or destruction reported to anybody in the last two weeks? (av12_violence_lw)
 - Resolved disputes and by whom? (c14_resolution_lw, c12_disputeresolution_lw, p1a_previousconflict)

(k) Institution Building

- From Household endline survey:
 - Did the household contact a farmer-herder committee following a dispute or conflict? (disp7_party, ic6_report/ic5_who)
 - Would your household turn to a farmer-herder committee following a hypothetical dispute? (sec6_nfvillage, sec6_nhvillage)
 - Likert scale: The police are doing a good job of providing security for this community (ss1_security)
 - Likert scale: The military is doing a good job providing security for this community (ss2_security)
- From KI endline survey:
 - Are there currently any committees in this community that address issues around farmer-herder conflicts? (cf1_committees)
 - How many such committees are there? (cf2_committeesnum)
 - How long has the committee existed? (cf4_committeemonths)
 - Think of the last 12 months. Over this time, how many times did the committee meet in a month on average? (cf5_meetingfrequency)
 - In the last 1 month, how many times has the committee met? (cf6_lastmonth)
 - Over the last 12/9 months, has the committee resolved any farmer-herder disputes or associated conflicts? (cf10_fhdisputes)
 - Over the last 12/9 months, how many such disputes has the committee resolved? (cf11_resolved)
- From Smartphone Data Collection:
 - Farmer and herder communities meeting to discuss issues of disputes and violence (meeting)

(l) Intervention Knowledge and Attendance

- From Household endline survey:
 - Did respondent hear about a SFCG intervention? When do they think it happened? Did they attend? (mc1_dialogue1, mc2_dialogue2, d_date)

- Did respondent hear about a health intervention? When do they think it happened? Did they attend? (mc3_workshop1, mc4_workshop2, h_date)
- From KI endline survey:
 - Did respondent hear about a SFCCG intervention? When do they think it happened? Did they attend? (mc1_dialogue1, mc2_dialogue2, d_date)
 - Did respondent hear about a health intervention? When do they think it happened? Did they attend? (mc3_workshop1, mc4_workshop2, h_date)

(m) Health Outcomes

- From Household endline survey:
 - Did the mother go to a clinic or hospital for any of the following: (hc2_clinic)
 - What should one do when a child is convulsing?(hc3_convulse)
 - How can one prevent the spread of COVID-19?(hc4_covid)
 - Does the community have a system in place to ensure water for different uses (drinking, washing, waste, cattle) are separated? (hc5_water)
 - Do farmers and herders collaborate on the use of water in the community?(hc6_watercollab)
- From KI endline survey:
 - Did the mother go to a clinic or hospital for any of the following: (hc2_clinic)
 - What should one do when a child is convulsing?(hc3_convulse)
 - How can one prevent the spread of COVID-19?(hc4_covid)
 - Does the community have a system in place to ensure water for different uses (drinking, washing, waste, cattle) are separated? (hc5_water)
 - Do farmers and herders collaborate on the use of water in the community?(hc6_watercollab)

6 Dimensions of Heterogeneity

We will look at the following dimensions to investigate heterogeneous treatment effects:

- We will run our analysis separate for farmer and herders and farming and herding communities. This is relevant for differential effects by type and if there are different tendencies to report in the communities. For example, baseline data suggest lower reported violence among herder communities.
- To look at the effects of asymmetric information, we will create a household indicator that identifies if a household currently undertakes both economic activities (farming and herding) concurrently or if they have recently undertaken both. We will compare the treatment effects on them to households that only farm.
- To look at the effects of resource pressure we will interact our specification with an indicator for adverse climate conditions. We will use two data sources:

- Publicly available data on rainfall, temperature, evaporation and similar indicators to create measures of drought conditions and [below average/lowest quartile] rainfall, temperature, etc. over the previous 9 months.
 - Proprietary data from IGNITIA that estimates predicted weather at the village level to create indicators of [below average/lowest quartile] climatic conditions, if we are able to gain access to this source.
- To look at the effect on gender we will subset the analysis to female household heads and key informants as well as focusing on gender related outcomes.
 - We will create a measure of the ethnic and religious diversity of each community (Herfindahl index) and interact our specification with indicators of above median religious/ethnic diversity. We will also look into heterogeneity by (respondent and community majority) religious group and ethnicity.
 - We will be investigating the effects of pre-treatment violence and socio-economic conditions by looking at heterogeneity by baseline levels of the outcome groups for which we have baseline data. We will also look at heterogeneity by baseline levels of poverty and other measures of economic deprivation.
 - To look at whether workshop attendance matters we will conduct two heterogeneity exercises: first, by looking at heterogeneity by those more likely to attend, such as key informants.
 - Since state-level policy-making could shape farmer-herder relations, we will run our analysis by state and dropping each state from the analysis.
 - The incidence of disputes and conflict could be tied to the agricultural seasons. For example conflict could be higher before harvest. To investigate this possibility we will subset our analysis by agricultural season of communities' main crops.
 - Farmers and herders in our sample have different settlement patterns. In some instances farmers and herders live in separate neighboring communities, while in other instances farmers and herders live in the same mixed community. To account for whether this difference in settlement patterns affects the impact of the interventions we will test for heterogeneity by settlement pattern.

7 Addressing Known Issues

Below we will list potential challenges to identification and how we plan to address them.

7.1 Sample Assignment, Community Inclusion, and Survey Timing

- We have two communities that were surveyed in baseline 1 and baseline 2. This means our effective sample is two communities smaller.

- Due to the COVID-19 pandemic there was a pause in activities leading to some communities being surveyed more than 12 months after the intervention. To account for this variation we will run a specification that includes the time since intervention as an interaction term.

7.2 Addressing Attrition

Farmer-herder conflict might lead to out-migration by respondents, especially herders, thereby causing attrition. We will employ the following strategies:

- We will run specifications where we control for community-level out-migration.
- We will also have specifications where we remove communities with high levels of out-migrations.
- Outcomes that measure the number of events (such as disputes or violent events) will be alternatively coded as per capita.

7.3 Spillovers

To investigate spillovers we will run a specification where we include control communities' distance to the nearest treatment community.

References

- Anderson, Michael L.** 2008. "Multiple inference and gender differences in the effects of early intervention: A reevaluation of the Abecedarian, Perry Preschool, and Early Training Projects." *Journal of the American statistical Association* 103 (484): 1481–1495.
- Kling, Jeffrey R, Jeffrey B Liebman, and Lawrence F Katz.** 2007. "Experimental analysis of neighborhood effects." *Econometrica* 75 (1): 83–119.