

Effectiveness and impact of livestock vaccination performed during humanitarian crises in Africa

June 2023 online workshop report

Chris Daborn, Shauna Richards and Theodore Knight-Jones

International Livestock Research Institute



October 2023


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Editing, design and layout—ILRI Editorial and Publishing Services, Addis Ababa, Ethiopia.

Cover photo—Foot and mouth disease control zone, Songwe Valley, Northern Malawi, September 1981 (photo credit: ILRI/Chris Daborn).

Citation: Daborn, C., Richards, S. and Knight-Jones, T. 2023. *Effectiveness and impact of livestock vaccination performed during humanitarian crises in Africa: June 2023 online workshop report*. Nairobi, Kenya ILRI.

Patron: Professor Peter C. Doherty AC, FAA, FRS

Animal scientist, Nobel Prize Laureate for Physiology or Medicine—1996

Box 30709, Nairobi 00100 Kenya
Phone +254 20 422 3000
Fax +254 20 422 3001
Email ilri-kenya@cgiar.org

ilri.org
better lives through livestock

ILRI is a CGIAR research centre

Box 5689, Addis Ababa, Ethiopia
Phone +251 11 617 2000
Fax +251 11 667 6923
Email ilri-ethiopia@cgiar.org

ILRI has offices in East Africa • South Asia • Southeast and East Asia • Southern Africa • West Africa

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Abbreviations and acronyms

BHA	Bureau of Humanitarian Assistance
CAHW	Community animal health worker
CBPP	Contagious bovine pleuropneumonia
CCPP	Contagious caprine pleuropneumonia
CPD	Continuing professional development
DLA	Detailed livelihood assessment
eCSI	Reduced Coping Strategy Index
ELE	Evaluation of livestock emergencies
FAO	Food and Agriculture Organization of the United Nations
FCS	Food Consumption Score
FGD	Focus group discussion
FMD	Foot and mouth disease
HDDS	Household Diet Diversity Score
HHS	Household Hunger Scale
ILRI	International Livestock Research Institute
IPC	Integrated Food Security Phase Classification
KII	Key informant interview
LCS	Livelihood coping strategies
LSD	Lumpy skin disease
PE	Participatory epidemiology
PPR	Peste des petits ruminants

RACIDA Rural Agency for Community Development and Assistance

RVF Rift Valley fever

SGP Sheep and goat pox

Acknowledgements

We acknowledge the support of the United States Agency for International Development (USAID) through the Bureau of Humanitarian Assistance which has funded the Evaluating Livestock Emergencies project, under which this virtual workshop was held.

1 Introduction

Within the United States Agency for International Development (USAID) Bureau of Humanitarian Assistance (BHA)-funded project 'Evaluation of Livestock Emergencies'(ELE), The International Livestock Research Institute (ILRI) will assess the effectiveness and impact of livestock vaccination performed during humanitarian crises in Africa. Having soon completed a desk review of the subject we are now designing field studies. We are keen to receive comments on the proposed design from those with expertise and interest in this area.

2 Workshop objectives

The online workshop, which was held on 8 June 2023, discussed ELE field studies inclusive of the objectives and approach, consideration of purpose of vaccination program, study design including country and site selection, and disease and livestock systems targeted.

3 Meeting agenda

The two and half-hour long meeting held on 8 June 2023 and was opened by representatives from ILRI and BHA. The full program and agenda of the meeting is available in Annex 1.

4 Presentations

The presentations at the meeting were on '[Livestock vaccination in response to a humanitarian crisis: A desk review](#)' by Chris Daborn Veterinary Consultant at ILRI; '[Evaluation of livestock vaccinations in response to humanitarian crises – process & outcome measures](#)' by Shauna Richards, postdoctoral fellow, Animal & Human Health at ILRI; and an '[ELE case study selection study](#)' by Theo Knight-Jones, principal scientist, Veterinary Epidemiologist Animal & Human Health, ILRI.

5 Discussions

Below we list some broad topics of discussion, held to obtain participant views on the study design. Key feedback is in italics.

5.1 Process and outcome measures

Discussion points to be considered for each measure

- a. Are the measures reasonable?

Indicators need to generally be able to measure the food and livelihood security

- b. Should the measures be qualitative or quantitative – considering 12-month time period in six study sites to collect data in variable settings (country, vaccine, species will all be different).
- c. Which measures are a priority?
- d. Did we miss any measures?

Food and livelihood security-related indicators

Diversified animal-sourced livelihoods

5.1.1 Process measures

The evaluation of different process measures was considered, that is outcome measures considering the process of design and delivery of the vaccination program based on the following questions.

1. Was the design based on clear and achievable humanitarian objective?

- a. This can be measured by quantitative and qualitative measures with the implementing organization through key informant interviews (KII) and focus group discussion(s) (FGD)– i.e., collecting data on objective(s), monitoring and evaluation plans, and vaccine selection process etc.

Include as a humanitarian outcome— livelihood and food security.

Ensure awareness/acceptance by livestock keepers.

Supporting documentation should include budget and procurement plan.

2. What is the efficiency of vaccination (timing, choice, quality, safety, storage, and management of response)?

Quantitative data from implementing organization and published data

- a. Timing — is it appropriate for the disease outbreak cycle? Are sufficient doses administered?
- b. Choice — was the vaccine choice was appropriate for the region and for the pathogen strain(s) present?
- c. Quality — mainly assessed via available literature, consider source (internal/external to country), quality control process if available.
- d. Safety — via literature on vaccine, approval process to bring vaccine to market in producing country, any quality control with producer.
- e. Storage — data via implementor in terms of vaccine storage from producer to animal.
- f. Management — includes administration method/technique, implementation plan (aim of coverage, geographic reach).

Include handling facilities and cold storage in transport.

3. Was there access to/use of quality epidemiological information?

Quantitative data from implementor. Did implementors have access to appropriate epidemiological data (disease prevalence/incidence, outbreak patterns/strains, populations and make up, current vaccine status? Is data trustworthy?

Should question if data used is 'trustworthy'.

4. What was the degree of coordination, partnership, and communication with public/private veterinary services?

Qualitative data from implementor and stakeholders via KII/FGD.

Include livestock keepers. Make 'coordination' priority 2.

5. What were the vaccine inventories? (linked to item 2)

What vaccines were used and in what quantity, number of doses, etc.

Include quantitative data from implementor/stakeholders.

6. What was the financial return on vaccination, assessed by partial budget analysis

This will be captured by quantitative data from literature, participatory epidemiology at sites, livestock keepers at sites and key informants.

- a. Using an existing disease/vaccination cost calculator tool data will be collected on herd size, vaccine cost, prevalence of disease with and without vaccine, cost per case of diseased animal, doses of vaccines used, outbreak frequency, cost vaccine/year

7. What workforce training/continuing professional development (CPD) was implemented? (linked to item 4)

Qualitative data from implementor and stakeholder KII/FGD.

8. What laboratory-based evidence of vaccine impact and effect is there?

Quantitative data from available lab reports.

9. Is there a protective serological response to vaccination?

Quantitative data from local animals involved in vaccine intervention.

Can happen opportunistically with other projects able to fund this work, but cannot be done for many vaccines.

Do we need to combine the lab reports and serological responses? The difference, if any, needs more clarity.

The serological responses need to be more specific.

Serological reports can indicate how effective the vaccination was but not necessarily the humanitarian effect.

Need to distinguish immune response from vaccination vs natural exposure.

5.1.2 Outcome measures

Evaluation of program outcome measures were considered, i.e. what is trying to be achieved by the vaccination program (increased livestock derived livelihoods and nutrition).

1. Herd size composition and reproductive rate (linked to partial budget)

Quantitative data

- a. This data can come from individual livestock keepers' visits and available literature if unable to do individual farm visits and get representative estimates.

2. Morbidity/mortality rates of livestock

Mixed data via participatory epidemiology and published data.

- a. Use of proportional piling with livestock-keeper groups.
- b. Plan for overall rates for top causes of morbidity and mortality.

3. Target disease prevalence

Mixed data via participatory epidemiology and published data.

- a. Use of proportional piling with livestock-keeper groups
- b. Look at other top disease rates (i.e. consider what other diseases might be priority over vaccine choice).

4. Gender impact on livestock-based livelihoods

Qualitative via livestock keepers KII/FGD

- a. Consider importance of livestock/roles/responsibilities, power dynamics, decision-making, resources sharing, control, ownerships, and changes.

Are we measuring the impact of gender on livestock-based livelihood or the livelihoods on gender?

5. Marketing data Livestock-derived income (links to partial budget).

Quantitative data via livestock keepers and stakeholders.

- a. Relates to economic returns on livestock i.e., value of livestock sales.

Measure of selling livestock disinvestment: 1) generate income, 2) disinvestment.

6. Livestock outputs (linked to partial budget and item 5)

Quantitative data collected from livestock keepers.

- a. Milk, meat, draft, sale, social, loans, gift, dowry etc.
- b. Consider these outputs have many confounding influences aside from vaccine use.

7. Consumption of animal-source foods

Quantitative via livestock keepers.

8. Numbers vaccinated by species, herd; number of households impacted, adverse vaccine reactions

Quantitative via implementors, and in FGDs with livestock keepers (impact and adverse reactions).

5.1.3 Discussion points raised by participants

- Participants said they often lack accurate and relevant data leading to wrong findings and conclusions.
- Good rapid assessments will be needed (using mixed methods, scrutinised existing quantitative data as it may be poor)
- Participatory epidemiology (PE) methods will be relevant including an assessment of the role of livestock in livelihoods and through this the programs' benefit on livelihoods.
- It is important to step back and consider why are we vaccinating? If there are good routine programs, then there should be no need for humanitarian emergency livestock vaccination – Routine programs often fall by the wayside during drought – although there is a lot of vaccination during crisis, emergency programs disrupt routine vaccination
- Contagious bovine pleuropneumonia (CBPP) may spread after drought so may be considered for evaluation in ELE
- Emergency vaccinations pay better for community animal health workers (CAHWs) which often disrupt normal/ routine vaccination programs. (In northern Kenya, however, little effect of emergency vaccination which often target low impact, sporadic diseases was noted compared to routine programs with treatment of sick animals which saved bigger proportion of animals with bigger impact and cost-effectiveness).
- Countries such as South Sudan and Somalia are often permanently in crisis – all vaccinations here can be considered as 'emergency'. Diseases that lead to humanitarian crises such as Rift Valley fever (RVF) could be also considered.
- Look at expected morbidity/mortality: This gives the upper limit of expected vaccination impact (vaccine choice selection is key), put value on animals saved compared to the cost of the program (i.e., vaccination may only be of value if it prevents an epidemic (e.g. peste des petits ruminants [PPR], RVF) especially if disease is then transmitted to a wider population, but difficult to quantify this from field studies, if the unwanted outcome was prevented. However, for endemic slow diseases effect may be easier to estimate (using split proportional piling across causes),
- Collateral damage from emergency program can damage institutions more than they benefit markets – they can destroy markets. Emergency programs disrupt markets, which can take 3–5 years to recover, see the Livestock Emergency Guidelines and Standards (LEGS) recommendations of ways to prevent this and use emergency interventions to benefit long-term capacity. Aid should be applied in a way that does not damage routine systems and markets.

- Besides vaccination there are other community engagement activities such as the administration of deworming agents, that take place at the same time. They are important and increase engagement with livestock keepers and can increase vaccine uptake during crisis vaccination campaigns. Do we capture this engagement and its importance?
- One participant expressed concern at the outcome indicators, as they do not capture the top one or two objectives that humanitarian partners claim are the reasons where a livestock vaccination campaign is necessary: improved food security, improved livelihood security (also improved child nutrition). Most humanitarian projects are implemented with multiple activities that contribute to an objective, but in fact that objective must be measured as an outcome to evaluate a mass vaccination program's impact.

Possible food security indicators include the household diet diversity score (HDDS), household hunger scale (HHS), food consumption score (FCS), reduced coping strategy index (rCSI) and livelihood coping strategies (LCS). These are recognized within the Integrated Food Security Phase Classification (IPC) as direct outcome indicators and typically are best to measure levels of acute food insecurity. Granted, many things are happening within and without a project that impact these factors, but in fact if a partner is saying they want to do mass vaccination to protect or improve food security, these indicators need to be measured. Similarly, ILRI should look into accepted measures of livelihood security and measure those.

5.2 Implementation methods

Discussion points to be considered for each measure:

A. What pros and cons do you see for each method that the study team should be aware of?

Migration nature of pastoral communities, not practical to visit twice.

High turnover of small ruminants/poultry will potentially need shorter window for evaluation.

Can be helpful to go initially for baseline of animal, herd-level serology.

Focused vaccination due to resources etc. Hard to tell difference between vaccinated and unvaccinated animals (use permanent marker but lasts 2–3 months).

Retrospective evaluation comparing vaccinated livestock to unvaccinated animals/region.

Community willingness to allow animal sample collection in some areas enhanced if incentives are offered.

B. Which implementation methodology is preferable in your group's opinion—consider what is logistically feasible and realistic to implement while collecting good-quality data

Retrospective study is more practical and feasible in a pastoral setting.

Need to document procedures well.

C. Any alternative methods you consider to be more appropriate?

Different vaccine programs (risk-based vs mass vaccine) changes way you will see impacts and harder/easier for case control

5.2.1 Implementation options

Discussions were based on two basic study designs, with a single visit (retrospective design), or at least two visits (prospective design).

1. Visit a vaccine implementation site within 2–4 months of vaccine administration. The vaccination campaign should be completed (or at least mostly completed) (1 visit only, potentially 2 visits if a cursory initial visit is done to evaluate and understand field site).

- a. During single visit evaluate pre and post vaccine metrics.
- b. Need to consider recall bias.
- c. Simple to implement and lower cost due to one-time visit.
- d. Can have comparison between those who have and do not have vaccines if possible – could be whole herds comparison or within herds (if not all animals in herds vaccinated).
- e. One species per site (i.e. bovine/small ruminant/poultry/donkey) can have multiple vaccines/interventions but ideally one vaccine.

2. Visit a vaccine implementation site before planned intervention (two visits needed).

- a. Visit 1: collect pre-vaccine metrics – ideally in month prior to intervention
- b. Visit 2: collect post-vaccine metrics – ideally 2-4 months post intervention ending after vaccine campaign is completed or mostly completed.
- c. Avoids issue of recall bias but more costly and time consuming.
- d. Can have comparison between those who have and do not have vaccines if possible (herds or animals within herds).
- e. One species per site (i.e. bovine/small ruminant/poultry/donkey) – can have multiple vaccines/interventions but ideally one vaccine

5.2.2 Discussion points

- Collaboration and engagement with key in-country organizations is essential
- Good to get pre-visit data by use of pre-visit questionnaire
- Leave post-visit data collection template in place.
- It will be challenging if there is no livestock identification system in place to facilitate follow-up identification of any animals being studied.
- Somalia and South Sudan with permanent crisis – could do visits before and after vaccination – but Ethiopia where crises are more sporadic it would be harder to do before and after vaccination visits. Crisis needs fund raising, which takes time (allowing the study to prepare during this time). Target PPR, CCPP, RVF and Anthrax in outbreaks. If the study needs to focus on a crisis best to target these areas.
- Before and after–different perceptions (the prior visit will get expectations – the visit after will get lessons learned) – during the preliminary visit you may get situation-specific ideas of indicators.
- A visit when vaccination is in progress will allow observation of the program in progress (to see the chaos and what actually happens) – which may be different to what is actually reported retrospectively – so three visits sometimes recommended.
- When there is regular PPR vaccination, in drought there may be abnormal livestock movement. If vaccination of PPR prevents all outbreaks, how do you measure impact?

- Start from mortality estimates from farmers (proportional piling) then compared as baseline (did routine endemic vaccination slow diseases?). Each epidemic is different.
- Could put a range of impact estimates with probability.
- Some emergencies are dangerous (security) e.g. floods and make it difficult to perform field work.

5.3 Site/disease/vaccine/crisis selection

1. Which countries should we focus the study on?

List priorities in order including countries from East, West, Southern Africa): Ethiopia, Kenya, Somalia, Sudan, South Sudan, Karamoja (Uganda), Niger, Mali, Mauritania, Burkina Faso, Zimbabwe, Malawi, Mozambique and Madagascar.

- Consider already ongoing humanitarian efforts in target regions
- Acute vs chronic situations, complex emergency vs non-complex emergency
- Funder perspective is only if it is a humanitarian crisis regardless of above
- Need to include a variety of donors and implementors
- Routine vs emergency: compare and evaluate impact of one on other etc. and value for money
- Mali (hard to get into field) and working with Nigeriens was difficult (unwillingness to go to field). Sudan (difficult to get out of capital), Burkina Faso (insecurity), Karamoja, Uganda, is also a difficult location to work in.

East Africa

- If humanitarian crisis (varies in Ethiopia, just finished a crisis but now rains are good, there could be rehabilitation money which includes more planned vaccination). No Food Agriculture Organization of the United Nations (FAO) vaccination planned but Vétérinaires Sans Frontières International (VSF) may have more information.
- Kenya – now rained
- Somalia – VSF (can be dangerous but possible)
- Ethiopia – BHA (USAID Bureau of Humanitarian Assistance), FAO, Ethiopian government PPR control/ sheep goat/pox, VSF Suisse ongoing and in pipeline.
- Northern Kenya – Mandera Country, the Rural Agency for Community Development and Assistance (RACIDA) and BHA USAID, and areas without insecurity, PPR, CCPP and sheep pox and goat pox (SGP), recently completed a few days ago
- West Africa: Mali Niger Burkina Faso, work through local organizations
- Southern Africa: Zimbabwe, Malawi (poultry vaccination)

Are there programs that may be willing to work with us?

- VSF has the most programs in the Horn, with others in West and Central Africa.
- In Southern Africa there are fewer organized vaccinations leading to a relative increase in livestock deaths. Find out who has most livestock (Zimbabwe and Mozambique), conflict (some in Malawi), Botswana is supported by government but could still consider the country.

2. Which diseases/vaccines do we assess?

Put in order of priority: pasteurellosis/haemorrhagic septicaemia, RVF, FMD, anthrax, black leg (bivalent anthrax/black leg), CBPP, lumpy skin disease (LSD), PPR, CCPP, sheep and goat pox (SGP).

- PPR, CCPP, SGP?, RVF sometimes, but not many RVF vaccines – sometimes there are LSD waves – ELE

will have to react to the situation.

- An El Nino year is expected and so RVF could be considered.
- Pasteurella vaccination often requested by local vaccinators but often needs multiple doses so questionable impact.
- CBPP vaccination is performed in some locations;
- Some participants stated that there is no prior prioritization of diseases, it should be based on the program implementing.
- Serological response to vaccines is variable and depends on the vaccine – sometimes it will be helpful and at other times not.
- Few humanitarian programs will do serology.
- Chicken vaccination is more done for routine programs not in a crisis – as undertaken in sedentary communities in parts of Kenya.

3. Any other suggestions

On species, livestock system etc.

- Little camel vaccination is done by FAO but there are requests if ELE considers humanitarian crises vaccination it is almost only in pastoral areas.
- Are vaccinated animals marked? VSF do not mark animals when vaccinated , they record household and owners know their animals. Could use permanent markers.
- Issues about emergency vs routine and impact on each other should be considered. Donor funding does not achieve useful coverage.
- Strengthen collaboration.
- In Ethiopia it is mostly emergency in pastoralist areas, small ruminants are the priority then cattle.
- Vaccine plans usually focus on households with limited resources hence the focus on small ruminants.
- Cattle/camels may be less served because they are sometimes owned by higher income households.
- Focus should be on pastoralist areas as this is most often the target for humanitarian groups.
- Once ELE chooses a site, it will have priorities already for disease/species/farm type.
- Some species have few vaccines available.

6 Evaluation of livestock emergencies during humanitarian crises—proposed field study design

Based on the literature review, questionnaire responses and comments by workshop participants the following field study design is proposed.

6.1 Objectives

To evaluate emergency livestock vaccination during times of humanitarian crises.

Specifically (1) evaluate vaccination program effectiveness, coverage, impact on livelihoods of livestock keepers, impact on disease burden, and cost-effectiveness, (2) determine attributes of success for vaccine campaigns, (3) understand the role of gender during these crises and interventions, (4) develop guidelines based on these findings.

6.2 Methodology

We will evaluate the vaccine program considering the goal of the implementor, i.e., their objectives, the suitability of these objectives, as well as process/outcome measures reflecting the impact of the vaccination program on livestock and livestock-based livelihoods.

Reasoning

The nature of livestock vaccination during crises is highly variable, including in:

- The vaccination program (species, vaccine/disease, ongoing/planned vs. reactionary, risk-based, mass vaccine campaign etc., the implementing organization).
- The crises (complex/ongoing, localized/short-term, people/animal movement, etc.)
- The setting (country, livestock system, infrastructure culture).

Hence, it is important that the evaluation method is suitable for application in these different situations.

To achieve this a mixed qualitative and quantitative methodology is required. This will involve collection of data from beneficiaries, stakeholders, and implementors.

Qualitative data collection, inclusive of participatory epidemiology, KII, FGD, questionnaires and a literature review, can be used to gather data to understand the livestock-based livelihoods situation both before and after a vaccine program has been implemented.

This will provide a situation analysis inclusive of all potential positive and negative influences on livestock-based livelihoods (inclusive of vaccines). By collecting information on other factors that can influence livestock-based livelihoods (drought, fodder access, infectious disease(s), monetary inputs, resource inputs (including vaccines), etc. they can be considered in the analysis and interpretation of program effect.

These methods will help tease out what is problematic and what is helpful for livestock-based livelihoods during a humanitarian crisis. This will allow the study team to evaluate not only the impact of vaccines, but to understand the main limiting factor(s) on livestock-based livelihoods during a crisis, and what might have been a preferred intervention if vaccination was not considered helpful by beneficiaries and/or the study evaluation.

Quantitative data will be collected on livestock population dynamics, numbers vaccinated and diseased in order to evaluate incidence and level of vaccine protection and will be used as inputs for simple economic models describing the economic value of the vaccination program at the household and program levels.

These methods will quantify impact and guide interventions to sustain and improve livestock-based livelihoods during humanitarian crises inclusive of if vaccines are a positive or negative interventions, and epidemiological and economic measures of their impact.

6.3 Study outcomes to measure

1. Livestock-based livelihoods – measuring variables that can impact livestock-based livelihoods (includes vaccines)
 - a. Process measures: monetary value and livelihood importance of livestock (amongst all livelihood avenues)/ livestock products for each species kept obtained via market data and proportional piling; coping strategies being used by livestock keepers to protect livestock-based livelihoods (using selected methods from livelihood impact appraisal by FAO and livelihood coping strategies (LCS) and FGD/KII).
 - b. Outcome measures: morbidity and mortality of livestock species via owner recall and proportional piling (FGD/KII), marketing data and livestock outputs and their use (household consumption, other consumption, sale – for key ‘products’ milk, meat, blood, draft, sale, social, loans, dowry, gift etc.); also food consumption score (FCS) via KII; importance of different interventions for livestock-based livelihoods via proportional piling (FGD/KII); disease diagnostics and serology will be used if available.
2. Program implementation evaluation – measured qualitatively based on process and outcome measures, and quantitatively based on beneficiaries reached (coverage) compared to goals.
 - a. Process measures: Number of beneficiaries with access to sustainable veterinary services and veterinary pharmaceuticals (KII/FGD livestock keepers/stakeholders/implementors). Coordination/partnership/communication with public/private veterinary services (stakeholders/implementors); workforce training; design based on clear humanitarian objective, efficiency of vaccination (timing, choice, quality, safety, storage, management, access to use of appropriate epidemiologic information, vaccine inventories) via implementors, documentation, to assess soundness of the strategy for achieving the epidemiologic, livestock outcomes intended.
 - b. Outcome measures: numbers vaccinated by species/herd, number of households impacted, adverse vaccine reactions (via FGD and KII implementors and livestock keepers); all considered against appropriate denominators, e.g., number vaccinated by type and age, as a proportion of the target population.
 - c. Suitability and achievement of key objectives: Livestock vaccination during humanitarian crises is conducted to improve human well-being; typically, through improve food security, improved (child) nutrition or protected livelihoods. Through KII and FGD the perceived appropriateness of the vaccination campaign objectives will be explored. The success of achieving the objectives will be assessed; depending on the objectives this could

be via 1b (food consumption scores for food security, child nutrition through mapping usage of animal products and changes in their availability, or livelihood, further explored through 3.)

3. Cost-benefit of implementing vaccine (costs are inputs like vaccines, human resources, time, etc.; benefits are reduction in lost value of livestock and livestock products due to market changes, livestock disease and death, resulting in improved livestock-based livelihoods).
 - a. Vaccine efficacy (literature), duration of immunity (literature), efficiency of vaccine application (see 2a and from literature), vaccine cost (implementor), vaccine effectiveness (morbidity/mortality with and without vaccination, see 1b and available literature), cost per case of diseased animal (KII), doses of vaccine used (implementor), outbreak frequency (KII and literature), herd size and reproductive rates (household interviews)
 - b. These various vaccination outcomes will serve as inputs into simple economic models, along with other variables related to the value of household livestock and their products, to model how vaccination affects livelihoods
4. Gender impacts – measured qualitatively – this is a key measure as minority groups may be disproportionately impacted during these crises and it will be important when developing resulting guidelines
 - a. KII/FGD with livestock keepers to consider the importance of livestock/roles/responsibilities, power dynamics, decision-making, resource sharing, control, ownership changes.

6.4 Outputs

Program evaluation results.

Guidelines – built from above study outcome measures.

6.5 Study design

Study population – livestock keepers facing a humanitarian crisis that are receiving a vaccine intervention from a humanitarian organization.

We propose a retrospective study design, dependent on findings from an initial planning visit, and views of the implementing organization.

1. Retrospective cohort. At an initial scoping visit information on the program objectives and plan will be obtained, and details of the study site established (if this visit proves unnecessary, we will discard it in later studies). We will then return to the study site 2–4 months after vaccination; although the overall program and vaccinating may still be ongoing elsewhere depending on the design and timeline of the vaccination program.
 - a. During the visit pre- and post-vaccine metrics will be collected
 - Recall bias will be considered in questionnaire design.
 - Having one visit is simpler to implement and requires fewer resources and less time.
 - b. Can have comparison between those who have and have not been vaccinated if possible, adjusting for confounding outcomes.
 - c. One species will be included per site (i.e., bovine/small ruminant/poultry/donkey). Could consider multiple vaccines/interventions but ideally one vaccine.

6.6 Site selection

1. South Sudan: contact person is Wilson Makuwaza of FAO, who oversees FAO and non-governmental organization (NGO) vaccine programs. Timeline November 2023.
 - a. Mainly work on small ruminants in pastoral setting, with a variety of vaccines.
 - b. Ongoing yearly vaccine campaigns.
2. Burkina Faso: contact person is Giles Vias of VSF Belgium. Timeline February 2024
 - a. ILRI has good connections in Burkina Faso for field staff.
 - b. Potential partners work with small ruminants and poultry (Newcastle Disease) vaccination.
 - c. Ongoing yearly vaccine campaigns.
3. Southern Africa

Few options for field studies so far.

7 Field evaluation design concept note

Following the workshop the above inputs were used to develop a concept note outlining the design of a field study to evaluate a program performing livestock vaccination during a humanitarian crisis.

Concept note: Evaluation of livestock emergencies during humanitarian crises

7.1 Objectives

To evaluate emergency livestock vaccination during times of humanitarian crises.

Specifically

1. evaluate vaccination program effectiveness, coverage, impact on livelihoods of livestock keepers, impact on disease burden, and cost-effectiveness,
2. determine attributes of success for vaccine campaigns,
3. understand the role of gender during these crises and interventions, and
4. develop guidelines based on these findings.

7.2 Methodology

We will evaluate the vaccine program considering the goal of the implementor, i.e., their objectives, the suitability of these objectives, as well as process/outcome measures reflecting the impact of the vaccination program on livestock and livestock-based livelihoods.

Reasoning

The nature of livestock vaccination during crises is highly variable, including variation in:

- The vaccination program (species, vaccine/disease, ongoing/planned vs. reactionary, risk based, mass vaccine campaign etc., the implementing organization).
- The crises (complex/ongoing, localized/short-term, people/animal movement, etc.).
- The setting (country, livestock system, infrastructure culture).

Hence, it is key that the evaluation method is suitable for application in these different situations. To achieve this, a mixed qualitative and quantitative methodology is required. This will involve collection of data from beneficiaries, stakeholders, and implementors.

Qualitative data collection, inclusive of participatory epidemiology, KII, FGD, questionnaires and a literature review, can be used to gather data to understand the livestock-based livelihoods situation both before and after a vaccine program has been implemented. This will provide a situation analysis inclusive of all potential positive and negative influences on livestock-based livelihoods (inclusive of vaccines). By collecting information on other factors that can influence livestock-based livelihoods (drought, fodder access, infectious disease(s), monetary inputs, resource inputs including vaccines, etc.) they can be considered in the analysis and interpretation of program effect.

These methods will help tease out what is problematic and what is helpful for livestock-based livelihoods during a humanitarian crisis. This will allow the study team to evaluate not only the impact of vaccines, but to understand the main limiting factor(s) on livestock-based livelihoods during a crisis, and what might have been a preferred intervention if vaccination was not considered helpful by beneficiaries and/or the study evaluation. Quantitative data will be collected on livestock population dynamics, numbers vaccinated and diseased in order to evaluate incidence and level of vaccine protection and will be used as inputs for simple economic models describing the economic value of the vaccination program at the household and program level.

These methods will quantify impact and guide interventions to sustain and improve livestock-based livelihoods during humanitarian crises inclusive of if vaccines are considered to be a positive or negative intervention, and epidemiological and economic measures of their impact.

7.3 Study outcomes to measure

1. Livestock-based livelihoods – measuring variables that can impact livestock-based livelihoods (includes vaccines)
 - a. Process measures: monetary value and livelihood importance of livestock (amongst all livelihood avenues)/livestock products for each species kept obtained via market data and proportional piling; coping strategies being used by livestock keepers to protect livestock-based livelihood (using selected methods from livelihood impact appraisal FAO detailed livelihood assessment (DLA) and livelihood coping strategies (LCS) (FGD/KII)
 - b. Outcome measures: morbidity and mortality of livestock species via owner recall and proportional piling (FGD/KII), marketing data and livestock outputs and their use (household consumption, other consumption, sale – for key 'products' milk, meat, blood, draft, sale, social, loans, dowry, gift etc.); also food consumption score (FCS) via KII; importance of different interventions for livestock-based livelihoods via proportional piling (FGD/KII); disease diagnostics and serology will be used if available.
2. Program implementation evaluation – measured qualitatively based on process and outcome measures, and quantitatively based on beneficiaries reached (coverage) compared to goals.
 - a. Process measures: number of beneficiaries with access to sustainable veterinary services and veterinary pharmaceuticals (KII/FGD livestock keepers/stakeholders/implementors); coordination/partnership/communication with public/private veterinary services (stakeholders/implementors); workforce training; design based on clear humanitarian objective, efficiency of vaccination (timing, choice, quality, safety, storage, management, access to use of appropriate epidemiologic information, vaccine inventories) via implementors, documentation, to assess soundness of the strategy for achieving the epidemiologic, livestock outcomes intended.

- c. Outcome measures: numbers and proportion vaccinated by species/herd, number of households impacted, adverse vaccine reactions (via FGD and KII implementors and livestock keepers); all considered against appropriate denominators, e.g., number vaccinated by type and age, as a proportion of the target population.
 - d. Suitability and achievement of key objectives: Livestock vaccination during humanitarian crises is conducted to improve human well-being; typically, through improve food security, improved (child) nutrition or protected livelihoods. Through KII and FGD the perceived appropriateness of the vaccination campaign objectives will be explored. The success of achieving the objectives will be assessed; depending on the objectives this could be via 1b (food consumption scores for food security, child nutrition through mapping usage of animal products and changes in their availability, or livelihood, further explored through 3).
3. Cost-benefit of implementing vaccine (costs are inputs like vaccine, human resources, time, etc.; benefits are reduction in lost value of livestock and livestock products due to market changes, livestock disease and death, resulting in improved livestock-based livelihoods assessed in an economic model).
- a. Vaccine efficacy (literature), duration of immunity (literature), efficiency of vaccine application (see 2a and from literature), vaccine cost (implementor), vaccine effectiveness (morbidity/mortality with and without vaccination (see 1b and available literature), cost per case of diseased animal (KII), doses of vaccine used (implementor), outbreak frequency (KII and literature), herd size and reproductive rates (household interviews)
 - b. These various vaccination outcomes will serve as inputs into simple economic models, along with other variables related to the value of household livestock and their products, to model how vaccination affects livelihoods.
4. Gender impacts – measured qualitatively – a key measure as minority groups may be disproportionately impacted during these crises and it will be important when developing guidelines.
- a. KII/FGD with livestock keepers to consider the importance of livestock/roles/responsibilities, power dynamics, decision-making, resource sharing, control, ownership changes etc.

7.4 Outputs

Program evaluation results.

Guidelines – built from above study outcome measures.

7.5 Study design

Study population – livestock keepers facing a humanitarian crisis that are receiving a vaccine intervention from a humanitarian organization.

We propose a retrospective study design, dependent on findings from an initial planning visit, and views of the implementing organization.

1. Retrospective cohort – At an initial scoping visit information on the program objectives and plan will be obtained, and details of the study site established (if this visit proves unnecessary, we will discard it in later studies). We will then return to the study site 2–4 months after vaccination; although the overall program and vaccinating may still be ongoing elsewhere depending on the design and timeline of the vaccination program.

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- a. During the visit pre and post vaccine metrics will be collected.
 - Recall bias will be considered in questionnaire design
 - Having one visit is simpler to implement and requires fewer resources and less time.
 - a. Can have comparison between those who have and have not been vaccinated if possible, adjusting for confounding outcomes.
 - b. One species included per site (i.e., bovine/small ruminant/poultry/donkey). Could consider multiple vaccines/interventions, assessed individually and collectively, but ideally one vaccine.

7.6 Site selection

Options so far – USAID Geoteam approval to be requested in advance.

1. South Sudan: contact person is Wilson Makuwaza of FAO. He oversees FAO and NGO vaccine programs. Timeline November 2023
 - a. Mainly work on small ruminants in pastoral setting, with a variety of vaccines.
 - b. Ongoing yearly vaccine campaigns.
2. Burkina Faso: contact person is Giles Vias of VSF Belgium. Timeline February 2024
 - a. ILRI has good connections in Burkina Faso for field staff.
 - b. Potential partners work with small ruminants and poultry (Newcastle Disease) vaccination.
 - c. Ongoing yearly vaccine campaigns.
3. Southern Africa
 - a. Not much so far, Malawi poultry possibly.

Resources

Some information related to food security indicators can be found in the FSC indicators handbook: <https://fscluster.org/handbook/content.html>

Annex 1

Online meeting agenda

Time (East Africa)	Agenda	Speaker
16.00 (5min)	Opening remarks	Theo Knight-Jones & BHA
16.05–16.15 (10min)	Review of literature and indicators from questionnaire	Chris Daborn
16.15–16.25 (10min)	Process and outcome measures	Shauna Richards
16:25–16.45 (20 min)	Discussion 1	
16.45–16.55 (10min)	Present key points discussion 1	Facilitator: S Richards
16.55–17.05 (10min)	Implementation methods	Shauna Richards
17.05–17.25 (20min)	Discussion 2	
17.25–17.35 (10min)	Present key points discussion 2	Facilitator: S Richards
17.35–17.45 (10min)	Site, disease/vaccine, crisis selection & collaborating programs	Theo Knight-Jones & BHA
17.45–17.50 (5min)	Initial feedback on site/disease/vaccine/crisis selection	Facilitator: T Knight-Jones
17.50–18.10 (20min)	Discussion 3	
18.10–18.20 (10 min)	Present key points discussion 3	Facilitator: T Knight-Jones
18.20–18.30	Final thoughts and close meeting	Theo Knight-Jones

Annex 2

Participants who attended the online meeting

No.	Name	Organization
1	Mark Fitzler	USAID-BHA-Kenya
2	Mateen UI Hassan Khan	International Medical Corps
3	Wilson Paulo	BHA-Pretoria
4	Nico Buono	ILRI-Kenya
5	Wesinew Adugna	VSF-Suisse-Ethiopia
6	Buckary Barkadle	VSF-Suisse-Ethiopia
7	Wudu Temesgen Jemberu	ILRI-Ethiopia
8	Gijs Vant Klooster	FAO
9	Nimaya Moga	FAO-South Sudan
10	Christine Jost	USAID-BHA
11	Leslie Brooks	USAID-BHA
12	Dida Wako	USAID-Somalia
13	Eman Mohammed	International Medical Corps
14	Shaina Craige	USAID-BHA
15	Jonathan Hamrell	USAID-BHA
16	Martin Barasa	VSF-Germany
17	Jeffrey Mariner	Tufts University
18	Abdikathar Hassan	PACIDA-Kenya
19	Desta Hiwot	ILRI
20	Chris Daborn	Consultant
21	Theo Knight-Jones	ILRI
22	Shauna Richards	ILRI
23	Buke Wako	ILRI



The International Livestock Research Institute (ILRI) works to improve food and nutritional security and reduce poverty in developing countries through research for efficient, safe and sustainable use of livestock. Co-hosted by Kenya and Ethiopia, it has regional or country offices and projects in East, South and Southeast Asia as well as Central, East, Southern and West Africa. ilri.org



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