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AIRS ETHIOPIA

COMMUNITY-BASED IRS MODEL: COMPARATIVE EVALUATION

MARCH 2013

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ACRONYMS

AIRS	Africa IRS
CB IRS	Community-based IRS
DB IRS	District-based IRS
DHO	District health office
EC	Environmental compliance
FMoH	Federal Ministry of Health
GoE	Government of Ethiopia
HEP	Health extension program
HEW	Health extension worker
IRS	Indoor residual spraying
ORHB	Oromia regional health bureau
PMI	President's Malaria Initiative
PPE	Personal protective equipment
SOP	Spray operator
ZHO	Zonal health office

I. PILOT OF COMMUNITY-BASED IRS

I.1 INTRODUCTION

In Ethiopia, malaria is generally a seasonal and unstable disease, peaking during and/or following the rainy season for 2-5 months in most of the malaria-risk areas. The malaria control and prevention program in Ethiopia has a history of more than five decades, with indoor residual spray (IRS) of houses as the main component of the program. The aim of IRS is to spray houses at the right time with the right insecticide at sufficient dosages, and at adequate intervals of time so that resting anopheles mosquito vectors will be killed throughout the transmission period.

In Ethiopia, IRS was first launched in 1959 as part of the Global Malaria Eradication Program spearheaded by the WHO. After the program was phased out globally in 1969, the Ethiopian government continued spraying campaigns solely with its own funding through approximately 2004. Revived IRS support through PMI began in 2008.

In September 2008, Research Triangle Institute International (RTI) began implementation of IRS with PMI funding in 19 districts in Oromia. By 2011 the number of PMI-supported districts had increased to 50, with a total of 858,657 structures sprayed. In 2012, Abt Associates, under a new PMI project, Africa IRS (AIRS), delivered full support to 36 districts and provided limited assistance to 24 districts that had graduated from full PMI support in 2011.

Out of 554,063 structures found by AIRS Ethiopia in 36 districts, the project sprayed 547,421 structures, achieving 99 percent coverage. In 24 graduated districts, the project supported government spraying of 428,459 structures, by supplying some personal protection equipment (PPE), and training on IRS and handling of carbamate chemicals, to over 80 health workers from the Oromia region, including participants from the 24 districts.

In 2012, AIRS Ethiopia also piloted the feasibility of integrating IRS into the health extension program (HEP) and decentralizing organization of the operation from the district to the community level.

I.2 HEALTH EXTENSION PROGRAM IN ETHIOPIA

The Health Extension Program (HEP) is a government-funded health service delivery program that aims for universal coverage of primary health care. The program gives priority to the prevention and control of communicable disease, with active community participation, with the goal of providing equitable access to health services. HEP's package of services includes basic and essential prevention, promotion, and selected high-impact curative health services. As a preventive program, HEP focuses on four areas of care provided at the community level: disease prevention and control, family health, hygiene and environmental sanitation, and health education and communication. Key health areas that are under the aegis of HEP work are: HIV/AIDS prevention and control, TB prevention and control, malaria prevention and control, and first aid. The program is based on expanding physical health infrastructure and developing a cadre of health extension workers (HEWs) who provide basic preventive and curative health services at the community level.

The HEP deploys two HEWs in every village (kebele¹) of 5,000 residents, with the aim of strengthening the community-based health care system by promoting prevention behaviors and improving access to health services.

The Government of Ethiopia (GoE) typically employs young women who concluded a one-year training course on the HEP package of services to serve as HEWs. Currently, there are about 34,000 HEWs in 15,000 rural kebeles in Ethiopia. For this program, the GoE constructed over 15,000 health posts to have two HEWs assigned to each post. Ethiopia has been implementing HEP since 2005, and it has shown remarkable achievements in the reduction of maternal and child mortality and in the numbers of communicable disease cases.

1.3 DEFINITION OF TWO IRS MODELS

Traditionally, IRS in Ethiopia has been planned and implemented by the district health office (DHO) with technical and operational inputs from regional, zonal, and central health offices. We define it as a **district-based IRS model** (DB IRS). Each district on average includes two operation sites with a soak pit, washing, bathing, and camping area, where the spray team stays for the duration of the IRS campaign. The spray team comprises a team leader, up to four squad leaders and porters, and 16-20 spray operators (SOPs). The number of spray teams depends on the number of structures targeted for spraying in the district. District health staff train temporary-hire SOPs, who are recruited from towns in the same district. The SOPs are stationed in a temporary camp, usually set up near a health center or a school for the duration of the spray campaign. From there, SOPs travel to the villages to conduct the spraying on a daily basis. Moving the spray teams from the district operation sites to the villages requires vehicles. For camping accommodations, tents, mattresses, and other items are required. In most cases, the SOPs are not familiar with the village and not very trusted by the community.

Community-based IRS (CB IRS) is a new model to organize IRS operations with mini operational sites established in each kebele. HEWs serve as IRS squad leaders and assume responsibility for managing store rooms, washers, operators, and the data collection and reporting processes. SOPs are hired from the same communities and do not require transport and camping facilities. Instead, they go home at the end of each spray day.

The Federal Ministry of Health (FMoH) had planned to shift implementation of IRS to CB IRS by incorporating the planning and execution of the operation into the HEP. The main reasons for this shift in IRS were to:

- Increase community participation and acceptance;
- Reduce cost and make it more sustainable; and
- Increase structure coverage.

However, the CB IRS model through a HEP has never been tested. In 2012, with support from PMI and ORHB, AIRS Ethiopia piloted CB IRS in 20 kebeles in Kersa district. The project closely monitored the process in order to conduct detailed analyses of implementation, results, and lessons learned.

1.4 DESCRIPTION OF THE PILOT PROGRAM

Kersa district is one of the PMI/USAID-supported districts that started the 2010 IRS campaign. The district is located in Oromia region, Jimma zone, 335 KM from Addis Ababa. The total number of kebeles in the district is 31, out of which 20 kebeles are at a higher risk of malaria and are targeted for IRS. PMI, in partnership with the Oromia regional health bureau (ORHB) and Jimma zonal health

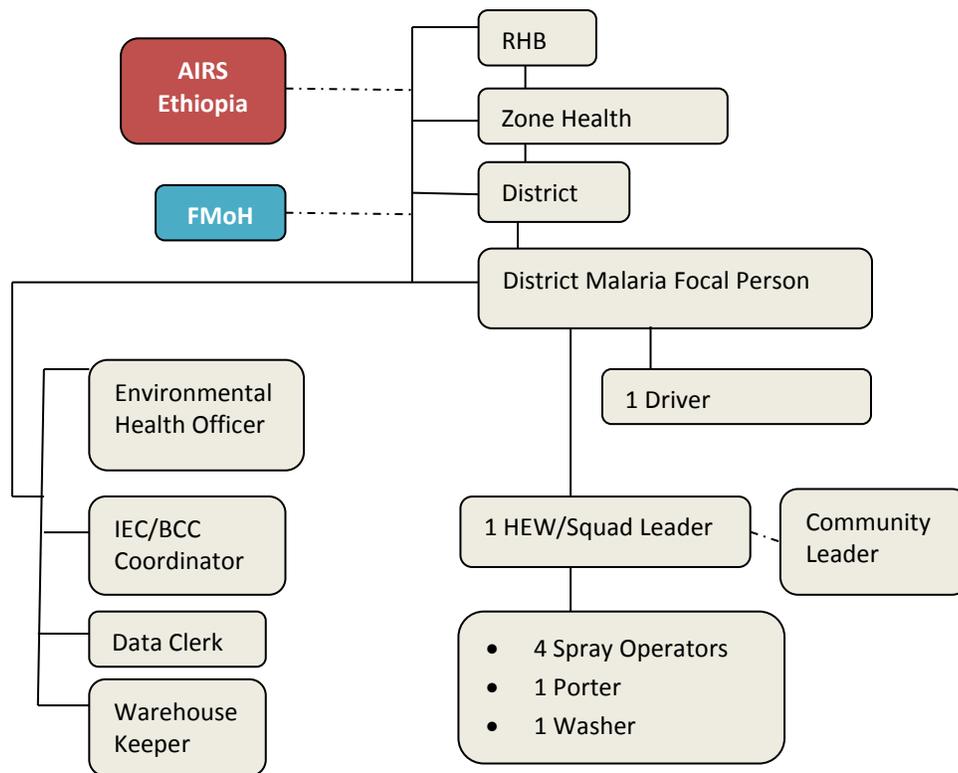
¹ The kebele is the smallest administrative unit in Ethiopia; it comprises approximately 1,000 households.

department, selected Kersa district to be a pilot area for CB IRS to spray the 20 kebeles with a carbamate class of insecticide for a month starting at the end of August 2012.

1.1.1 ORGANIZATION

Usually, two HEWs were assigned to a kebele health post. Both of them were prepared to run an IRS campaign. The HEWs would alternate their duties – if one was involved in IRS, the other one did the routine work. As demonstrated in Figure 1, an HEW acting as squad leader, four spray operators, and one porter selected from the community were responsible for planning and implementing IRS in their kebele. The head of the DHO, malaria focal person, and ECO of each district closely supervised the operation and provided technical back-up when required. A clerk stationed at the DHO was responsible for daily data entry and reporting.

FIGURE 1: ORGANIZATION OF COMMUNITY-BASED IRS



With the help of the project, HEWs had micro-planning and needs assessments to decide on the spraying equipment, PPE, and number of sprayers, and set up basic tracking and reporting systems. Community administration worked together with HEWs to allocate a facility for the temporary store and help to mobilize locals to serve as sprayers, community mobilizers, and other IRS personnel during the spraying period.

1.1.2 TRAINING

During the regional training of trainers for DB IRS, AIRS Ethiopia oriented the district health officers on how to train HEWs to serve as squad leaders and assist them with selection of SOPs from the targeted kebeles. A total of 39 HEWs received a five-day training on key IRS implementation strategies, spray pump maintenance, communication skills and messages, and data recording and reporting (see Figure 2).

Senior operation technicians, malaria focal persons, and other trained health staff from the district coached the HEWs on their role as squad leaders and on the skills and responsibilities it entails. Specifically, HEWs' responsibilities included training of SOPs selected from the community, and management and implementation of the IRS in their respective kebeles. In 20 IRS targeted kebeles, HEWs recruited 100 SOPs (five from each kebeles) and taught them for six days on IRS operations in their kebeles, with minimal support from the district health staff and the project.

FIGURE 2: HEWS DURING TRAINING AS CB IRS SQUAD LEADERS



1.1.3 ENVIRONMENTAL COMPLIANCE

All operation sites were established within the premises of a health post prior to the spraying campaign. In line with the PMI Best Management Practices Manual (BMP), each operation site had a soak pit to manage effluent waste and a store room to keep the PPEs, IRS equipment and insecticide stock. The project contracted a professional developer to build two-by-two meter soak pits with one meter depth, with wash areas, in 18 kebeles. The district focal person closely supervised the process, with technical guidance from the AIRS environmental compliance officer. Two other kebeles used soak pits constructed during previous spray campaigns. To further protect soil from chemical contamination, wash areas were covered with polyethylene sheets, as shown in Figure 3. The project also constructed 20 temporary baths in all operational sites.

FIGURE 3: OPERATION SITE WITH SOAK PIT AND WASH AREAS IN A CB IRS KEBELE



1.1.4 SUPPLIES AND MOBILIZATION

The project provided main IRS materials like spray pumps, spray pump spare parts, PPEs and buckets and barrels for rinsing. The DHO together with AIRS distributed IRS logistics and insecticides for the targeted kebeles, using vehicles and animals, before the start of the spray operation. During the spraying, HEWs were responsible for ensuring that all SOPs used the PPEs properly as required by the standards. District and AIRS staff who supervised the campaign observed that HEWs also strictly followed standard procedures for PPE use.

As in districts implementing DB IRS, HEWs performed the tasks of mobilizers/enumerators, by conducting social mobilization, IRS card distribution, and census of the structures eligible for the 2012 spray operation.

1.5 RESULTS

The spray operation in the pilot district took four weeks (22 working days) and engaged a total of 190 spraying actors. During the campaign, SOPs sprayed 22,744 structures covering 98 percent of all eligible structures found. Table I shows detailed results by kebele, including data on population protected. During the 22 days, CB IRS did not require vehicles to transport SOPs, and therefore no vehicles were deployed for spray operation. The project supplied only one car for supervision and for the timely collection of spray operation reports from each kebele on a daily basis.

TABLE I: 2012 CB IRS PERFORMANCE RESULTS IN KERSA DISTRICT

	Kebeles	Found US	Sprayed US	Coverage (%)	Population Protected
1	Ankeso	606	606	100	1,662
2	A/Sabu	2,061	2,060	100	5,945
3	B/Bechane	1,091	1,083	99	3,468
4	B/Wajo	663	663	100	2,016
5	Babo	1,179	1,158	98	4,157
6	Bulbul	1,264	1,220	97	3,932
7	Dogosso	416	413	99	1,480
8	Gello	1,386	1,365	98	4,400
9	Girma	1,044	1,018	98	2,803
10	Gunju	1,777	1,735	98	5,300
11	Kelecha	2,039	1,995	98	6,811
12	Kitinbile	1,553	1,552	100	4,614
13	K/Beru	1,565	1,552	99	5,291
14	Merewa	590	575	97	1,891
15	Serbo	1,520	1,378	91	4,112
16	Siba	630	617	98	2,041
17	T/Abulu	564	564	100	1,655
18	T/Balto	1,290	1290	100	4,247
19	T/Kersu	1,106	1094	99	2,569
20	Wadiko	836	806	96	2,488
	Total	23,180	22,744	98	70,882

2. COMPARATIVE ANALYSIS OF CB IRS vs. DB IRS

As stated earlier, the AIRS project closely monitored preparation and roll-out of CB IRS in Kersa. The team also kept accurate records of all financial resources provided to support the CB IRS. The purpose of the close resource tracking was to analyze actual expenses, compare them with similar efforts required to implement DB IRS, and to project potential cost savings in the future IRS rounds.

2.1 KEY ADVANTAGES OF CB IRS

2.1.1 COST

Overall, the total cost for CB IRS was slightly less than for a similar-sized activity implemented through the DB IRS model. However, some costs were higher in CB IRS, because it was a first year of operation and certain capital investments had to be made for each kebele. These investments included construction of soak pits, and supply of IRS materials (pumps, parts, PPEs, etc.). Because these are not recurrent costs, they will not appear during the next two to three years of operations. In addition, CB IRS required more SOPs (five from each kebele) compared to district-based IRS, where on average 20 SOPs spray the whole district. Similarly, the training cost is higher with CB IRS because the number of actors to be trained is higher. Wage payment to the spray operation actors is slightly lower in the CB IRS than in the DB IRS, even though the number of actors is higher in the CB IRS. This is because CB IRS operation takes less time to complete compared to the DB IRS.

The main cost saving in the CB IRS came from transportation. In the DB IRS each spray team requires two vehicles to carry teams from an operation site to villages. In CB IRS, SOPs work in the same village where they live, or nearby, and therefore do not need transportation. In a DB IRS setting, the district would have required three spray teams and six vehicles to complete the spraying of all kebeles and unit structures in the district in 30 working days. In addition, while camping is mandatory for DB IRS, there was no need for such arrangements and relevant equipment in CB IRS, because the operators would go home at the end of each spray day.

Table 2 shows the implementation cost breakdown for the two models. The column with CB IRS Year 1 data shows actual expenses in Kersa district. The column with DB IRS Year 1 data shows estimates of what the district would have spent if it had implemented the DB IRS model. In summary, due to minimized use of transportation there was about a 10 percent savings from using CB IRS compared to the DB IRS in the first year of implementation. In the second year of operations in the same area, CB IRS is expected to cost about 63 percent less than in the previous year, and may produce savings of up to 40 percent compared to the DB IRS. Key savings factors are capital investments in the IRS infrastructure and minimal use of transportation.

**TABLE 2: COST-BENEFIT ANALYSIS OF CB IRS VS. DB IRS
IN YEARS ONE AND TWO OF OPERATION**

Activity	CB IRS Year 1	DB IRS Year 1	CB IRS Year 2	DB IRS Year 2	CB vs. DB IRS Difference Year 1	CB vs. DB IRS Difference Year 2
IRS materials	4,719	1,826	0	0	2,893	0
Soak pit construction	12,070	1,341	0	0	10,729	0
Operation site maintenance	274	133	274	133	141	141
Training	8,964	3,519	8,964	3,519	5,445	5,445
Paying spray actors	17,358	19,651	17,358	19,651	-2,293	-2,293
Transporting spray actors	1,481	24,000	1,481	24,000	-22,519	-22,519
Transportation of IRS materials and supplies	497	131	497	131	366	366
Total	45,363	50,601	28,574	47,434	-5,238	-18,860

2.1.2 TIME

Spray operation in the CB IRS pilot district took an average 22 working days compared to the 31 days used to complete an average DB IRS, because CB IRS hired SOPs for each kebele and their total number is often larger than that normally recruited for DB IRS. Therefore, the period of performance was shorter.

2.1.3 QUALITY

Spray quality assessment showed that operators learned well, and that the spraying technique and spraying quality in the Kersa district were adequate. Wall bioassay tests conducted 1-3 days after spraying showed mosquito mortality at 100 percent. The results were the same with the DB IRS quality assessment test in the adjacent areas. In addition, AIRS Ethiopia received strong feedback from SOPs, communities and district health workers that the overall quality of spraying in the pilot area was most likely even better than from DB IRS. Possible reasons for this follow.

1. In DB IRS, a large number of SOPs are trained by a few health workers at the district level. In CB IRS, two HEWs train only five SOPs, and this provides better interaction between trainer and trainee.
2. The SOPs, as well as HEWs, might feel sense of ownership because of serving their own communities.
3. Kebele leaders are more easily involved in the oversight of operations and provide supervision more frequently.
4. SOPs perform the required steps with added diligence when spraying in their village, which increases the community's trust of the operators.

2.2 ADDITIONAL ADVANTAGES OF CB IRS

Mop-up operations are important to increase coverage of spraying. With HEWs and SOPs stationed in a kebele, it is much easier to undertake intensive mop-up operations for the households that may not be available during planned spray team visits. This might not be possible with the mobile district teams.

2.3 CHALLENGES OF THE PMI CB IRS PILOT

1. Storage space for insecticides and IRS equipment was a problem at the village level. In Kersa district, the AIRS pilot project used part of the health post facility in each kebele to store insecticides and equipment during the operation period. However, in many cases, such space could not be used to store the items in between the spraying campaigns. Items had to be transported back to the district store. The government is planning to build mini-stores in kebeles selected for CB IRS. Collaborating with the community could be another way of trying to solve the space availability problem.
2. For the pilot, AIRS Ethiopia provided new spray pumps that did not require maintenance. For the future IRS campaigns, HEWs would require enhanced training and better skills to manage and repair used pumps.

2.4 FUTURE PMI/AIRS PLANS TO EXPAND CB IRS

In 2013, PMI will continue providing full IRS support to 36 districts in six zones of Oromia region. While the IRS in 30 districts will follow the DB IRS model, six districts (Kersa and five more) will implement CB IRS. The number of districts under PMI support moving to the CB IRS model could increase in 2014 depending on the performance of the 2013 campaign.

3. GOVERNMENT-SUPPORTED CB IRS IN OROMIA REGION

In 2012, ORHB also began testing the CB IRS model in the East Shoa and Jimma zones. The GoE, together with some local NGOs, provided funds to pilot the model in the two zones. ORHB introduced the CB IRS model in three districts in Jimma zone, and in eight districts in East Shoa zone. After the spray campaigns ended, ORHB jointly with AIRS Ethiopia undertook an assessment of the CB IRS pilots. For the purpose of this report, assessment observations are limited to the description and analysis of one district from each zone. In Jimma zone, it is Kosa district. Observations of CB IRS in the district can be generalized to the overall approach and performance demonstrated during the Jimma zone pilot. Observations in Adama district of East Shoa zone also represent the overall approach to the implementation that the zone authorities followed during the CB IRS trial. Following are the observations from the assessment.

3.1 JIMMA ZONE, LIMMU KOSA DISTRICT: DESCRIPTION AND BRIEF ANALYSIS

Limmu Kosa district of Jimma zone implemented CB IRS in 10 kebeles. DHO organized a two-day squad leader training for HEWs in the district. After that, the HEWs selected five SOPs from their respective communities and, jointly with the district malaria team, conducted two-day training for about 40 SOPs. The district authorities transported all IRS materials including insecticides to the kebele health posts to store them during the IRS campaign.

As the district had a limited number of spray pumps, overalls and boots, kebeles were sprayed in shifts, not simultaneously. When one kebele had completed spraying, the DHO moved the equipment and PPEs to the next kebele.

CB IRS implementers did not use soak pits or wash or bath areas during the operation, because this infrastructure does not exist and no attempt was made to set up such operation sites. Overalls were washed once about every 2 to 3 weeks. Empty sachets and contaminated cartons were collected and burned at the health post, either in pits or in an open field.

In the district, the operation was extended to about 42 working days from the original 30 working day timeline due to a shortage of spray equipment and PPE. The two-day training for SOPs and HEWs was not enough to make sure participants understood all the needed information, and this could have had an impact on the quality of spraying.

3.2 EAST SHOA ZONE, ADAMA DISTRICT: DESCRIPTION AND BRIEF ANALYSIS

Until 2011 PMI supported 11 districts in East Shoa zone that are now considered as graduated but which continue receiving minimal PMI support in the form of PPE and technical assistance. Adama district is one of the assessed districts from East Shoa zone.

The DHO organized a 15-day training session for HEWs in the CB IRS-targeted kebeles. The training included sessions on IRS techniques, spray pump maintenance, data collection and reporting, and the roles and responsibilities of a squad leader. After the training, the HEWs participated in the selection of five SOPs from their respective kebeles. Similar to in the Jimma zone approach, the district malaria team and HEWs trained the SOPs at central locations. However, the training lasted six days and was based on the national IRS training guide.

The DHO transported IRS materials and insecticides to the nearest health centers. Then the HEWs organized the community to move the IRS items and insecticides by animal to the kebeles that are not accessible by car. Equipment and insecticide were kept temporarily at the health post in the separate rooms. As in Limmu Kosa district, the DHO facilitated spraying of kebeles in shifts because the district did not have enough spray pumps and overalls to provide all SOPs in all kebeles. The SOPs themselves washed the overalls. In some cases, SOPs brought spray pumps to homes at the end of the spray day, and in others, pumps were kept at the health post.

The HEWs mobilized the community to dig holes in the ground and use them as soak pits for waste disposal and washing areas for spray pumps during the operation. However, most of them were just pits without the ingredients required for a soak pit. The reason districts gave for this is a shortage of resources to cover the cost of labor and the material required. The attempt to use these pits to dispose of the insecticide waste in the East Shoa districts is encouraging; environmental compliance of any form is not widely practiced in IRS operations by the national program during waste disposal.

FIGURE 4: EXAMPLES OF TEMPORARY SOAK PITS, ADAMA DISTRICT.



SOPs did not use barrels or buckets for triple rinsing, and poured wastes from rinsing of spray pumps directly to the pits. Used masks, empty sachets, and contaminated cartons were collected and stored at the health post.

Overall, the HEW training in East Shoa was better organized and had adequate time for HEWs to build necessary skills to perform as squad leaders. Unlike in Jimma zone, both the HEW and SOP trainings followed national guidelines and timelines. CB IRS implementers in East Shoa also tried to create environmentally friendly ways of disposing of waste, though the pits were not built according to standards, and proper rinsing and waste management procedures were not followed.

3.3 CHALLENGES AND LESSONS LEARNED FROM THE GOVERNMENT-SUPPORTED CB IRS

Lessons learned:

- HEWs proved capable of undertaking IRS in their kebeles.
- HEWs and SOPs both showed a sense of ownership. With a minimal budget, large numbers of unit structures were sprayed, and more people were protected from malaria.
- The strong community participation in the construction of pits and transporting of IRS equipment was encouraging.

Challenges

- Limited numbers of spray pumps and PPE led to an extended period of spray operations. Transporting IRS materials and equipment to each health post was a serious challenge for many districts.
- Lack of a proper storage facility forced HEWs to store insecticides in spaces at the health post that were not adequately equipped and designed for this. Additional cost was also incurred to transport the remaining chemicals back to the districts' stores.
- The insecticide waste management system was poor. The districts had no soak pits and operations areas, or the ones they had were sub-standard. Poor storage and disposal of solid wastes were also a problem in the government-supported CB IRS.

3.4 CONCLUSION AND RECOMMENDATIONS

It seems that the FMoH and regional health office are preparing and planning to scale up CB IRS in the next few years. The AIRS team recommends the following issues be addressed during the planning phase of the scale-up:

- Training for the HEWs on spray techniques and spray pump maintenance needs to be adequate.
- Sufficient quantities of PPEs and spray equipment need to be supplied in advance.
- Environmental compliance issues like standard soak pits and water supply should be prioritized prior to the spray campaigns, and this infrastructure should be safeguarded.
- A proper solid waste collection and disposal mechanism should be established.
- Mini storage facilities for insecticide and IRS materials are required in each kebele.
- Close supportive supervision by the nearest health center/DHO is required during the planning and implementation stages of CB IRS.

Moreover, the AIRS team sees a need for standardization and uniformity of CB IRS implementation procedures. As a first step, the AIRS team is proposing to organize an experience-sharing forum among health offices and partners involved in piloting or implementing CB IRS.