PMI | Africa IRS (AIRS) Project

Indoor Residual Spraying (IRS 2) Task Order Four

ETHIOPIA
END OF SPRAY REPORT
2014

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Prepared by: Abt Associates Inc.

Abt Associates Inc. | 4550 Montgomery Avenue | Suite 800 North | Bethesda, Maryland 20814 | T. 301.347.5000 | F. 301.913.9061 | www.abtassociates.com

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ACRONYMS

AIRS	Africa Indoor Residual Spraying
CB IRS	Community-based IRS
CDC	Center for Disease Control and Prevention
DB IRS	District-based IRS
DCV	Data Collection Verification
DDT	Dichlorodiphenyltrichloroethane
DEC	Data Entry Clerk
EC	Environmental Compliance
EE	Error Eliminator
FMOH	Federal Ministry of Health
HEW	Health Extension Worker
HLC	Human Landing Catch
IEC	Information, Education and Communication
IRS	Indoor Residual Spraying
IT	Information Technology
M&E	Monitoring and Evaluation
MFP	Malaria Focal Person
MSP	Mobile Soak Pit
NMCP	National Malaria Control Program
ORHB	Oromia Regional Health Bureau
PMI	President's Malaria Initiative
PPE	Personal Protective Equipment
PSC	Pyrethrum Spray Collection
PSECA	Pre-season Environmental Compliance Assessment
SBCC	Social Behavioral Change Communication
SL	Squad Leader
SOP	Spray Operator
TL	Team Leader
TOT	Training of Trainers
USAID	United States Agency for International Development
USG	U.S. Government
WHO	World Health Organization

EXECUTIVE SUMMARY

The President's Malaria Initiative (PMI) has been supporting indoor residual spraying (IRS) in Ethiopia since 2008. In August 2011, Abt Associates was awarded the three-year Africa Indoor Residual Spraying project (AIRS), IRS 2 Task Order 4, funded by the United States Agency for International Development (USAID) under PMI. In 2014, the third year of AIRS operations in Ethiopia, the key objectives of the program were to contribute to the reduction of malaria-associated morbidity and mortality by:

- Implementing IRS in 36 districts of the Oromia region;
- Providing technical and logistic support to IRS in 24 PMI-graduated districts in the Oromia region; and;
- Building capacity of the national malaria program.

The project implemented the IRS operation in all 36 project districts between August 13 and September 25, 2014. Bendiocarb, a carbamate-class insecticide, was used for the IRS in all districts. In 30 districts, the district health offices, with technical and logistic support from AIRS, were responsible for implementing all IRS components: planning, training, spraying, and ensuring environmental compliance activities. This model is referred to as district-based IRS (DB IRS) in this report. In six other districts, the responsibility for training spray operators (SOPs) and for planning and implementing the spraying was decentralized to the village level and specifically to health extension workers (HEWs). HEWs were also put in charge of ensuring environmental compliance during spray operations. This model is referred as community-based IRS (CB IRS) in this report. The district and AIRS Ethiopia provided supportive supervision in both models. The project also provided technical and logistics support to 24 districts that graduated from PMI support in 2011.

Table 1 shows the main achievements of AIRS Ethiopia during the spray campaign in 2014.

TABLE 1. MAIN 2014 IRS RESULTS

Number of districts covered by PMI-supported IRS	36 districts in the Oromia region
Number of structures found by SOPs	670,303
Number of structures sprayed by PMI-supported IRS	667,236
2014 spray coverage	99.5%
Population protected by PMI-supported IRS	Total population – 1,647,099 Children under 5 – 230,862 Pregnant women – 23,919
Dates of PMI-supported IRS campaign	Aug 13–Sep 25, 2014
Length of campaign (total days)	44 days
Number of people trained with U.S. Government funds to deliver IRS	2,886

As part of the spray campaign, the project conducted comprehensive tests on spray quality and insecticide resistance using wild and susceptible mosquitoes. These entomological results include the following:

- Mortality of wild and susceptible mosquitoes was 100 percent in 43 of the 48 houses sampled one to five days after spraying in four districts (two CB and two DB IRS districts).
- The project tested susceptibility of the main vector to 11 World Health Organization (WHO)-approved insecticides for IRS in four of the eight sentinel sites. The vector is susceptible to Pirimiphos-methyl, Fenitrothion, and Propoxur in all tested sites. The vector is susceptible to Bendiocarb in two sites; resistant in one site, and possibly resistant in one other site. *An. gambiae* s.l. is resistant to dichlorodiphenyltrichloroethane (DDT) and most of the pyrethroid-class insecticides in all sites.

CHALLENGES AND LESSONS LEARNED

AIRS Ethiopia dealt with several challenges in making the above achievements. These challenges, and lessons learned that will be applied to future spray rounds, include the following:

- Some operation sites were inaccessible due to heavy rains and bad roads. Some districts had to work from accessible operation sites until things improved or were forced to walk long distances.
- Competing priorities of health offices created delays in the start of operations in some districts. This was particularly relevant to seven districts in West Wollega zone where the start of spray was delayed by nine days from the original schedule.
- Network connectivity was inconsistent in several districts, which delayed some of the IRS campaign data reporting.
- Collection and analysis of boot size data from the 2013 spray personnel and using the findings to inform procurement helped to significantly reduce problems with size mismatches in 2014.
- As a result of early internal planning, all international and local procurement of IRS items was done well ahead of spray campaign and distributed to districts on time.
- Storage spaces at the community health posts in CB IRS districts did not meet the required size standard but due to lack of other available space, the project used them for storing IRS materials during the spray period. All items were returned to the district stores at the end of the operation. The project reinforced the importance of keeping the space in compliance with safety and security standards during the implementation.

1. INTRODUCTION

In August 2011, Abt Associates was awarded the three-year Africa Indoor Residual Spraying project (AIRS), IRS 2 Task Order 4, funded by USAID under the President's Malaria Initiative (PMI). The mandate of the project is to limit exposure to malaria and reduce the incidence and prevalence of malaria in up to 17 countries in sub-Saharan Africa through the implementation of indoor residual spraying (IRS) programs.

1.1 PROJECT OBJECTIVES IN 2014

The major objective of the AIRS Ethiopia project is to continue contributing to the national and PMI goals of reducing malaria morbidity and mortality in Ethiopia through the implementation of quality IRS in selected districts of the Oromia region.

In 2014, AIRS Ethiopia had the following specific objectives:

- Spray up to 640,000 structures in 36 districts and provide technical support to IRS operations in 24 graduated districts of Oromia;
- Reach a minimum coverage of 85 percent of the structures found in targeted villages by implementing high-quality IRS operations;
- Build capacity at the national, regional state, district, and local levels to manage IRS operations, including planning, spraying, resource allocation, and monitoring and evaluation (M&E); and
- Monitor the impact of IRS operations on selected entomological and disease indicators.

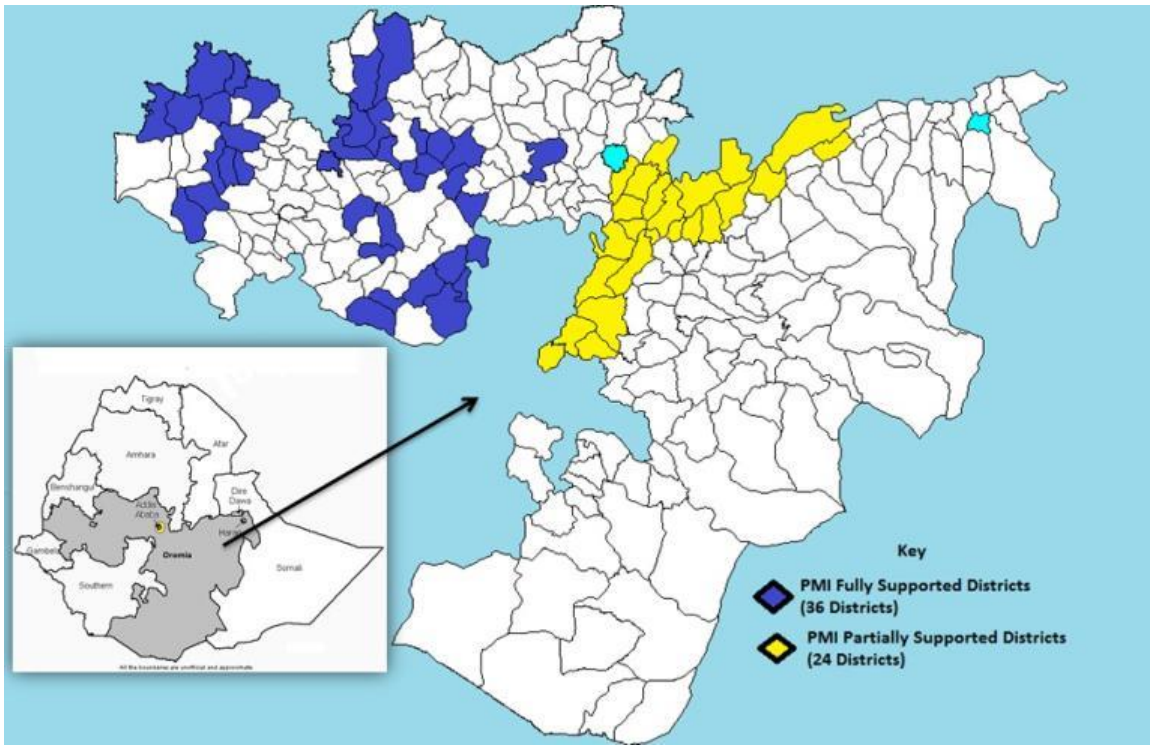
In addition to implementing the IRS campaign, AIRS Ethiopia aimed to carry out the following activities:

- Conduct insecticide resistance studies, wall bioassays, vector density, and behavioral studies to generate adequate data to guide insecticide selection for IRS; monitor whether insecticide pressure will force mosquitoes to change or modify their feeding and resting behavior; assess the quality of spraying; and determine the residual life of different insecticides in the country context; and
- Coordinate the process of disposing expired DDT from 43 PMI district stores and assist the Federal Ministry of Health (FMOH) with a plan to dispose of obsolete insecticides, primarily DDT.

1.2 SPRAY SITES

The AIRS Ethiopia project is carried out in collaboration with the FMOH, the Oromia Regional Health Bureau (ORHB), and other implementing partners in Oromia regional government. The largest region by surface area and population in Ethiopia, Oromia also has the highest malaria prevalence in the country. The 2014 PMI-supported districts are all located in western and southwestern areas of the region, as shown in Figure 1.

FIGURE 1. MAP OF PMI FULLY AND PARTIALLY SUPPORTED DISTRICTS



PMI and the ORHB conducted a series of consultative meetings discussing the incidence of malaria, history of spray, altitude, and other epidemiological factors to make an informed decision about the districts that required full IRS support. The same 36 districts in six zones that were covered last year received full PMI support during the 2014 IRS operation. Table 2 shows number of districts by zone.

TABLE 2. NUMBER OF PMI FULLY SUPPORTED DISTRICTS BY ZONE

	Zone						
	East Wollega	West Wollega	Illu Aba Bora	Jimma	Kellem	West Shoa	Total
Number of districts	9	7	4	6	5	5	36

1.3 INSECTICIDE SELECTION

In 2013, AIRS Ethiopia tested the main malaria vector, *An. gambiae* s.l., for susceptibility to 11 insecticides in the four permanent national sentinel sites and three additional sites in the Oromia region. The results (Table 3) showed that according to the WHO classification, the vector was fully susceptible to pirimiphos-methyl, fenitrothion, and propoxur in all study sites. It was also fully susceptible to bendiocarb in four of the seven sites; possibly resistant in one site, and resistant in two sites. The vector was highly resistant to DDT. Moreover, the vector was resistant to all pyrethroids including etofenprox.

Of the seven sites where insecticide resistance testing was performed, six were in Oromia region and one was in a different region (Amhara). Two of the six Oromia sites are in PMI AIRS project districts. Bendiocarb test mortality rate was 100 percent in four out of five sites and 92 percent in one site.

Based on these results, the FMOH sprayed bendiocarb and propoxur in all its IRS-targeted districts in 2014. AIRS Ethiopia used bendiocarb for the spray operations in the PMI-supported districts. Table 4 presents results of insecticide resistance tests that AIRS Ethiopia conducted in 2014. They should be used for selection of insecticide for the 2015 campaign.

TABLE 3. SUMMARY OF 2013 INSECTICIDE RESISTANCE TESTS (% MORTALITY)

#	Insecticides	Districts						
		Asendabo†*	Zwai†	Chewaka†*	Bahrdar (Amhara region)	Ameya†	Wonchi†	Abaya†
1	DDT	9 (9/100) (R)	26 (26/100) (R)	22 (22/100) (R)	16 (16/100) (R)	2 (2/100) (R)	4 (4/100) (R)	8 (8/100) (R)
2	Lambda-cyhalothrin	15 (15/100) (R)	-	44 (44/100) (R)	-	9 (9/100) (R)	18 (18/100) (R)	13 (13/100) (R)
3	Deltamethrin	26 (26/100) (R)	36 (36/100) (R)	51(51/100) (R)	20 (20/100) (R)	16 (16/100) (R)	23 (23/100) (R)	13.5 (10/74) (R)
4	Fenitrothion	97 (97/100) (POR)	-	100 (102/102) (S)	100 (100/100) (S)	100 (100/100) (S)	100 (98/98) (S)	100 (100/100) (S)
5	Malathion	81 (81/100) (POR)	90 (90/100) (POR)	71 (71/100) (R)	33.3 (25/75) (R)	60 (60/100) (R)	88 (88/100) (POR)	96 (96/100) (POR)
6	Pirimiphos-methyl	100 (100/100) (S)	100 (100/100) (S)	100 (100/100) (S)	100 (100/100) (S)	100 (100/100) (S)	100 (98/98) (S)	100 (75/75) (S)
7	Propoxur	98 (98/100) (S)	100 (100/100) (S)	100 (100/100) (S)	96 (96/100) (POR)	100 (100/100) (S)	100 (100/100) (S)	75.4 (132/175) (R)
8	Bendiocarb	92 (92/100) (POR)	100(100/100) (S)	100 (100/100) (S)	75 (75/100) (R)	100 (100/100) (S)	100 (100/100) (S)	75.6 (208/275) (R)
9	Permethrin	22 (22/100) (R)	-	-	-	12 (12/100) (R)	19.1 (18/94) (R)	-
10	Alpha-cypermethrin		21 (42/200) (R)			-	-	24 (24/100) (R)
11	Etofenprox	-	20 (20/100) (R)	-	54.7 (41/75) (R)	-	-	33 (33/100) (R)

†Districts from Oromia region
†*Project districts
R- Resistant, POR- Possible Resistant, S- Susceptible

TABLE 4. SUMMARY OF IR TESTS 2014

No.	Insecticide	% mortality						
		Chewaka‡*	Omonada‡*	Zwai‡	Bahirdar	Alamata	Amibara	Gambella
1	DDT	6 (6/100) (R)	6.8 (6/88) (R)	6.2 (6/97) (R)	9.3(7/75) **(R)**	25 (25/100) **(R)**	18.8 (19/101) (R)	12.5 (11/88) (R)
2	Lambda-cyhalothrin	11.2 (11/97) (R)	39 (39/100) (R	4.3 (4/94) (R)	24(24/100) **(R)**	58 (58/100) **(R)**	46.2 (43/92) (R)	14.7 (13/88) (R)
3	Deltamethrin	45.5 (42/97) (R)	42 (42/100) (R)	21 (21/196) (R)	25.3(19/75) **(R)**	44 (44/100) **(R)**	45.4 (45/99) (R)	18.1 (15/83) (R)
4	Fenitrothion	100 (100/100) (S)	100 (100/100) (S)	100 (106/106) (S)	100 (75/75) **(S)**	100 (100/100) **(S)**	100 (102/102) (S)	100 (88/88) (S)
5	Malathion	93.7 (87/93) (POR)	73 (73/100) (R)	93 (91/98) (POR)	89.3(67/75) **(R)**	89 (89/100) **(R)**	100 (101/101) (S)	95.5 (84/88) (POR)
6	Pirimiphos-methyl	100 (100/100) (S)	100 (100/100) (S)	100 (103/103) (S)	100 (75/75) **(S)**	100 (100/100) **(S)**	100 (99/99) (S)	100 (100/100) (S)
7	Propoxur	100 (100/100) (S)	100 (100/100) (S)	100 (101/101) (S)	99 (99/100) (S)	98 (98/100) **(S)**	100 (102/102) (S)	100 (88/88) (S)
8	Bendiocarb	100 (100/100) (S)	86.4 (76/88) (R)	100 (101/101) (S)	87 (87/100) (R)	96 (96/100) (POR)	100 (105/105) (S)	92 (80/88) (POR)
9	Permethrin	31.3 (25/80) (R)	16(16/100) (R)	3(3/101) (R)	66/66/100) **(R)**	10 (10/100) **(R)**	19.1 (18/94) (R)	28.4(25/88) (R)
10	Etofenprox	24(23/95) (R)	55 (55/100) (R)	28.7 29/101) (R)	22.6(17/75) **(R)**	19 (19/100) **(R)**	86.6(87/100) (R)	11.4 (10/88) (R)
11	Alpha-cypermethrin	32.2(31/96) (R)	35 (35/100) (R)	5 (5/100) (R)	61(61/100) **(R)**	77 (77/100) **(R)**	72.5(75/103) (R)	14.7 (13/88) (R)

‡*PMI project districts
‡ Districts in Oromia region

1.4 TECHNICAL SUPPORT TO THE FMOH

As a member of the Malaria Control Support Team and the Technical Advisory Committee to the National Malaria Control Program, AIRS Ethiopia contributed to the development of a new malaria national strategic plan (2014–2020). In addition, AIRS Ethiopia is also a member of the national vector control working group and remains continuously engaged in consultations on vector control policies and strategies, development of guidelines, training and technical support. The project participated in AIRS/FMOH joint supervision in eight districts including PMI and non-PMI districts in Oromia region and districts from other regions to assess the implementation of malaria prevention and control activities and current malaria situation.

In April 2014, the AIRS team provided logistical support to the FMOH and participated in the World Malaria Day events.

2. Pre-Spray Activities

2.1 Comprehensive IRS training and Planning

In July, the project held two sessions of comprehensive IRS training. A total of 247 health personnel – malaria focal persons (MFPs), social behavioral change communication (SBCC) staff, district office heads, and others – from selected districts and Oromia zonal and regional health offices participated. The first session, in Nekemte town, was for participants from East Wollega, West Wollega, and West Shoa zones. The second session, in Jimma town, was for participants from Jimma, Ilu Aba Bora, and Kellem Wollega zones. The training included operational planning for the 2014 IRS campaign: the participants developed detailed action plans including schedules for supervision visits and calendars for the spraying. They also agreed on the logistics, transportation requirements, type and number of spray actors to be involved, and the mechanism that would be used for capacity building.

2.2 Logistics Needs Assessment and Procurement

AIRS Ethiopia conducted a logistics needs assessment at the end of last year's spray operation in October 2013. The findings were discussed with representatives from all targeted districts. The assessment included review of the current stock of equipment, personal protective equipment (PPE), and insecticides. As part of the review, the participants analyzed conditions and availability of soak pits and storage facilities at the district level.

Based on the information from each district, the AIRS Ethiopia team performed a detailed analysis to determine the total number of spray pumps, PPE, and other IRS materials required for the IRS activities in 2014.

Most of the PPE and spray pumps used during the 2013 IRS campaign remained in good condition and were available for use in all 36 districts. AIRS Ethiopia also recorded the quantities of damaged or non-reusable PPE, and developed a list of PPE that AIRS needed to procure.

Overall, AIRS Ethiopia made local and international procurements using an open tender process and collecting bids/quotes on commodities to be purchased. A full list of all PPE and materials procured for the 2014 IRS campaign is found in Table A-1in Annex A.

The team also established the number and type of vehicles required for each district's IRS operations based on the number of structures to be sprayed per district and the topography of the areas. AIRS Ethiopia conducted a competitive bidding process to acquire vehicles and selected two local companies to supply the transportation.

2.3 Human Resource Requirements

AIRS Ethiopia used the number of sprayed structures in 2013 to calculate the number of seasonal workers needed for 2014. The district stakeholders agreed that, in accordance with previous IRS Ethiopia campaigns, the team leaders (TLs) and squad leaders (SLs), supervisors, and mobilizers would be recruited from among health professionals working in the project-targeted districts and zones. In places with a shortage of district health staff, agreement was reached to recruit unemployed high school or higher-education graduates from the same districts. Therefore, all districts identified and hired their

TLs, SLs, and other spray actors based on each person's capacity and their interest to participate in the IRS operation (Table 5).

TABLE 5. DISTRICT HEALTH STAFF AND TEMPORARY WORKERS HIRED, 2014 CAMPAIGN

District	Team leaders			Squad leaders			Spray operators			Porters			Washers			Security guards			Water fetchers			Store assistants			Data entry clerks			Drivers		
	Male	Female	Total	Male	Female	Total	Male	Female	Total	Male	Female	Total	Male	Female	Total	Male	Female	Total	Male	Female	Total	Male	Female	Total	Male	Female	Total	Male	Female	Total
Diga	1	0	1	5	0	5	22	0	22	1	4	5	0	1	1	1	0	1	1	0	1	1	0	1	1	0	1	2	0	2
Sasiga	CB IRS			0	19	19	36	0	36	0	9	9	0	0	0	10	0	10	0	0	0	1	0	1	1	0	1	1	0	1
Gida Ayana	2	0	2	7	3	10	41	1	42	3	7	10	0	3	3	2	0	2	2	0	2	1	0	1	1	0	1	5	0	5
Boneya Boshe	2	0	2	6	0	6	24	0	24	1	5	6	0	2	2	2	0	2	2	0	2	1	0	1	1	0	1	2	0	2
Wama Hagalo	2	0	2	9	0	9	36	0	36	9	0	9	0	2	2	2	0	2	2	0	2	1	0	1	1	0	1	3	0	3
Guto Gida	1	1	2	6	1	7	27	1	28	5	2	7	0	2	2	2	0	2	2	0	2	0	1	1	1	0	1	3	0	3
Gobu Sayo	1	0	1	6	0	6	24	0	24	1	5	6	1	1	2	2	0	2	2	0	2	1	0	1	0	1	1	3	0	3
Limu	2	0	2	6	0	6	24	0	24	0	6	6	0	2	2	2	0	2	2	0	2	1	0	1	1	0	1	3	0	3
Wayu Tuka	2	0	2	8	1	9	35	1	36	0	9	9	0	2	2	2	0	2	2	0	2	1	0	1	1	0	1	4	0	4
Manasibu	CB IRS			8	42	50	99	0	99	23	2	25	0	0	0	26	0	26	0	0	0	1	0	1	0	1	1	1	0	1
Kondala	2	0	2	9	0	9	38	0	38	9	0	9	0	3	3	3	0	3	3	0	3	1	0	1	1	0	1	5	0	5
Begi	2	0	2	9	0	9	36	0	36	9	0	9	0	3	3	3	0	3	3	0	3	1	0	1	1	0	1	5	0	5
Guliso	2	0	2	5	2	7	28	0	28	7	0	7	0	2	2	2	0	2	1	1	2	1	0	1	1	0	1	4	0	4
Kiltu Kara	1	1	2	6	0	6	24	0	24	3	3	6	0	2	2	2	0	2	2	0	2	1	0	1	1	0	1	2	0	2
Nejo Rural	2	0	2	8	2	10	40	0	40	0	10	10	0	3	3	3	0	3	3	0	3	0	1	1	1	0	1	4	0	4
Babo Gambel	2	0	2	8	1	9	35	1	36	8	1	9	0	3	3	3	0	3	3	0	3	0	1	1	1	0	1	4	0	4
Dendy	2	0	2	2	5	7	28	0	28	6	1	7	0	2	2	2	0	2	0	2	2	1	0	1	1	0	1	4	0	4
Danno	2	0	2	5	3	8	32	0	32	1	7	8	0	2	2	2	0	2	2	0	2	0	1	1	1	0	1	4	0	4
Nonno	2	0	2	6	2	8	31	1	32	7	1	8	0	2	2	2	0	2	1	1	2	1	0	1	1	0	1	4	0	4
Ilu Galan	3	0	3	11		11	44	0	44	1	10	11	0	3	3	3	0	3	3	0	3	1	0	1	1	0	1	5	0	5

District	Team leaders			Squad leaders			Spray operators			Porters			Washers			Security guards			Water fetchers			Store assistants			Data entry clerks			Drivers		
	Male	Female	Total	Male	Female	Total	Male	Female	Total	Male	Female	Total	Male	Female	Total	Male	Female	Total	Male	Female	Total	Male	Female	Total	Male	Female	Total	Male	Female	Total
Bako Tibe	CB IRS			6	22	28	56	0	56	14	0	14	0	0	0	15	0	15	0	0	0	1	0	1	1	0	1	2	0	2
Sekoru	2	0	2	10	0	10	40	0	40	10	0	10	0	2	2	2	0	2	1	0	1	0	1	1	1	0	1	4	0	4
Omo Nada	3	1	4	15	1	16	64	0	64	16	0	16	0	4	4	4	0	4	1	3	4	1	0	1	1	0	1	7	0	7
Tiro Afeta	3		3	13	0	13	53	0	53	12	1	13	0	3	3	3	0	3	2	0	2	1	0	1	1	0	1	6	0	6
Kersa	CB IRS			0	40	40	80	0	80	20	0	20	0	0	0	18	3	21	0	0	0	1	0	1	0	1	1	1	0	1
Seka Chekorsa	3	0	3	11	0	11	44	0	44	11	0	11	1	2	3	3	0	3	3	0	3	1	0	1	0	1	1	5	0	5
Shebe Sombo	2		2	7	1	8	32	0	32	8	0	8	1	1	2	2	0	2	2	0	2	1	0	1	0	1	1	4	0	4
Lalo Kile	2	0	2	0	8	8	30	0	30	5	3	8	0	2	2	2	0	2	2	0	2	1	0	1	1	0	1	3	0	3
Dale Sadi	2		2	0	8	8	32	0	32	5	3	8	0	2	2	2	0	2	1	1	2	0	1	1	1	0	1	4	0	4
Dale Wabara	3		3	7	3	10	40	0	40	10	0	10	0	3	3	3	0	3	3	0	3	1	0	1	1	0	1	4	0	4
Hawa Galan	CB IRS			8	34	42	88	0	88	22	0	22	0	0	0	21	1	22	0	0	0	1	0	1	1	0	1	2	0	2
Seyo	2	0	2	8	0	8	32	0	32	8	0	8	0	2	2	2		2	2	0	2	0	1	1	1	0	1	5	0	5
Chewaka	CB IRS			5	50	55	112	0	112	21	7	28	0	0	0	11	17	28	0	0	0	1	0	1	1	0	1	2	0	2
Borecha	2	0	2	10	0	10	40	0	40	8	2	10	0	3	3	3	0	3	3	0	3	1	0	1	1	0	1	3	0	2
Dhedessa	2	0	2	7	0	7	28	0	28	7	0	7	0	2	2	2	0	2	2	0	2	1	0	1	1	0	1	3	0	4
Bedele	1	0	1	5	0	5	20	0	20	5	0	5	0	1	1	1	0	1	0	1	1	1	0	1		1	1	2	0	2
Total	**60**	**3**	**63**	**242**	**248**	**490**	**1495**	**5**	**1500**	**276**	**98**	**374**	**3**	**67**	**70**	**170**	**21**	**191**	**58**	**9**	**67**	**29**	**7**	**36**	**30**	**6**	**36**	**125**	**0**	**125**

Note: CB IRS=community-based IRS

2.4 IRS CAMPAIGN TRAINING

AIRS Ethiopia is committed to building the capacity of national, regional, and district staff to implement, monitor, and evaluate quality spray operations. As part of this commitment, AIRS is striving to develop a cadre of well-trained spray operators (SOPs) who are technically proficient in insecticide application techniques, and are able to communicate effectively with beneficiaries in the communities and follow environmental compliance (EC) procedures.

The project conducted regional comprehensive IRS trainings of trainers (TOTs) for the zonal and district staff in July. The TOT participants then conducted a six-day training for SOPs, reserve SOPs (porters), and SLs in their districts. They also conducted orientations for the HEWs, washers, storekeepers' assistants, and guards on issues related to spray operations, mobilization, EC, and safety and security. Orientation was provided for drivers at the central level. AIRS Ethiopia conducted training for district storekeepers. The storekeeper training was part of the aforementioned comprehensive IRS training in July in Nekemte and Jimma and focused on stock-card management, storage of insecticides, and other IRS equipment, receipt, and storage of IRS waste from the field, and warehouse security. AIRS Ethiopia also trained nurses and health officers in the IRS target districts on pesticide poison management. Additionally, the AIRS M&E team trained 40 data entry clerks (DECs) and hired 36 of them with the remaining four kept in reserve in case replacements were needed.

Table 6 provides a breakdown of all trainings, by type of training, and sex and number of participants. Table 7 provides information on participants trained to deliver IRS with U.S. Government (USG) funds, a PMI indicator. Women's participation increased from 26.9 percent in 2013 (n= 1,072) to 33.5 percent (n=1,472) in 2014. For SOPs, porters, SLs and washers, screening for pregnancy and fitness are done before training. All women trained are also hired by the project in both campaigns with the exception of DECs. AIRS Ethiopia hired six women out of seven trained.

TABLE 6. ETHIOPIA 2014 PMI IRS TRAINING PARTICIPANT DATA

No	Trainings	Participants	# Trained		
			M	F	Total
	A. National Level				
1	TOT on community-based IRS	Health professionals from region, zone, and districts	142	4	146
2	CDC Bottle Bioassay field training for regional experts	Health professionals	20	1	21
	B. Regional Level				
3	Comprehensive TOT on IRS - Regional	MFPs, SBCC, Storekeepers, District Heads, TLs, and EC Supervisors	228	19	247
4	DECs	Data tech from project zones	33	7	40
5	Pesticide poison management	Clinicians from district health facilities	76	26	102
6	TOT on spray pump use and maintenance	Vector control expert from regions	26	1	27
	C. District Level				
7	Spray operations, mobilization, and EC				
	7.1 *SBCC, mobilization, and enumeration*	HEWs from kebeles	37	968	1,005
	7.2 *Spray operation and communication*	*SLs*	242	248	490
	7.3 *Spray operation and communication*	*SOPs*	1,495	5	1,500
	7.4 *Spray operation and communication*	*Porters**	276	98	374
	7.5 *Washing and environmental compliance*	*Washers*	3	67	70

No	Trainings	Participants	# Trained		
			M	F	Total
	7.6 *Transport safety*	*Drivers*	141	0	141
	7.7 *Fire safety and operation site security*	*Guards*	170	21	191
	7.8 *EC, stock management, and fire safety*	*Storekeepers' assistants*	29	7	36
Total			**2,918**	**1,472**	**4,390**

*Porters are trained as SOPs

TABLE 7. ETHIOPIA 2014 DATA FOR PMI INDICATOR "NUMBER OF PEOPLE TRAINED WITH USG FUNDS TO DELIVER IRS"

Type of Training	Males	Females	Total
IRS delivery TOT*	396	24	420
Spray operations**	2,013	351	2,364
Clinical	76	26	102
Total	**2,485**	**401**	**2,886**

* Sum of national and regional TOT participants.

** Sum of district-level trainings 7.2–7.4 in Table 6.

2.5 Assistance to 24 Graduated Districts

In April 2014, AIRS Ethiopia arranged a two-day micro-planning meeting for district MFPs, district health managers, zonal MFPs, and zonal health office heads. As shown in Table 8, 55 health staff and managers from 24 graduated districts and five zonal health offices attended the meeting.

The objectives of the meeting were to:

- Identify areas for 2014 spray operation based on morbidity data from the previous year;
- Estimate the number of unit structures to be sprayed; and
- Identify any resource gaps that AIRS Ethiopia could support.

At the planning meetings, the following key factors were identified:

- The 24 graduated districts have 749 villages (kebeles) with a total population of 2,978,925, out of which 606 villages are malarious with 2.5 million population at risk;
- 449 villages with 555,301 unit structures and 1,879,201 people were identified for the 2014 spray campaign;
- The total insecticide requirement was calculated to be 177, 014 sachets of bendiocarb and 114,636 sachets of propoxur, to be supplied by the government.
- AIRS Ethiopia will replace non-functional spray pumps and PPE.

TABLE 8. MICRO-PLANNING MEETING PARTICIPANTS, 24 GRADUATED DISTRICTS

Areas	Total	MFP			Health Office Head/ Deputy			Total		
		M	F	Total	M	F	Total	M	F	Total
Districts	24	18	5	23	20	2	22	38	7	45
Zones	5	5	0	5	3	0	3	8	0	8
ORHB	2							2	0	2
Total		**23**	**5**	**28**	**23**	**2**	**25**	**46**	**7**	**55**

3. COMMUNICATION

The primary objective of the AIRS Ethiopia communication activities was to ensure successful spray rounds by promoting near-universal coverage, and communicating information on timely vacating of premises, avoidance of re-plastering of sprayed walls during the peak malaria season, and adherence to safety precautions.

Because IRS has been practiced in Ethiopia on a national scale for more than five decades, acceptance of IRS has been high and the majority of the population is very familiar with the safety requirements and procedures before and after IRS. Thus, AIRS Ethiopia used community outreach approaches as a communication strategy during the 2014 spray operation. The project engaged all female HEWs in the 36 project districts as mobilizers during the communication campaign. HEWs received a one-day orientation on how to conduct community outreach and on specific IRS messages that need to be delivered to beneficiaries in their respective districts. HEWs then used their training to sensitize people during community meetings, and in churches, mosques, and schools. Door-to-door mobilization and radio were not used. Table 9 shows the data that the District Health Communication Officers recorded during the IRS outreach work prior to the spray campaign.

TABLE 9. TOTAL ADULTS REACHED WITH COMMUNITY OUTREACH EVENTS

Area	Males	Female	Total
Total outreach events in the 36 districts	534,967	457,946	992,913
Outreach in the 6 CB IRS districts	72,365	78,372	150,737

The high IRS acceptance/coverage in the targeted communities indicated that these communication approaches are productive.

On April 25, as a member of the national malaria support team, AIRS Ethiopia participated in the annual celebration of World Malaria Day. In relation to marking the event, the AIRS team provided support to health education on IRS using a mobile van.

4. Spray Activities

4.1 Spray Operations

In Ethiopia, PMI is implementing the IRS program in close collaboration with the government. In 2013, through AIRS, PMI provided all technical (training, monitoring, entomology, etc.) and logistical (store, soak pit, PPE, equipment supply, insecticide, consumables, transport, etc.) support required for the operation in 36 districts. The FMOH through the zonal and district offices recruited all spray personnel (SOPs, TLs and SLs, mobilizers, coordinators, supervisors, storekeepers, etc.). The numbers of the spray operation teams were based on the number of structures found during last year's IRS campaign and the target number of structures provided by the government for the villages added to target areas in 2014. Distribution of spray actors was shown above in Table 4.

Spraying started on August 13, 2014, and ended on September 25, 2014. Not all districts started spray operations on the same day – one zone with seven districts delayed the start by nine days because of competing work priorities of the zonal and district health staff. The length of the spray campaign for each district is shown in Table B-1 of Annex B. The average number of operational days was 30.5. The project used two models of IRS to deliver the service to the 36 project districts: district-based IRS (DB IRS) and CB IRS. The latter was delivered through the national health extension program.

At total of 670,303 structures were found by SOPs during the 2014 spray campaign across all the 36 districts, of which a total of 667,236 structures were sprayed, for a total spray coverage of 99.5 percent. In total, SOPs found 313,072 living/sleeping structures and sprayed 311,127 (99.4 percent) of them.

In the DB IRS model, spray teams stayed in camps organized in each district next to the operation sites that included soak pits; some also had a small temporary store. On a daily basis, MFPs and team leaders deployed the spray operations squads to the program-supported villages. One SL (a district health staff or a high school graduate recruited as a temporary employee) had four SOPs and one porter under his/her command.

In all project sites, zonal and district MFPs are responsible for supervision of the daily IRS operations in their respective areas. The AIRS Ethiopia team provided the district and zonal health teams with supervisory checklists to meet and ensure an objective assessment on spray quality, EC, stock management, and so forth. Through continuous supervision, the health teams, AIRS Ethiopia, and AIRS home office staff observed some minor performance issues including the following:

1. Errors in recording stocks, and tracking empty and full sachets;
2. Mathematical errors during the data entry;
3. Errors in SOP form recording; and
4. Failure of some newly recruited SOPs to maintain the required distance and speed when spraying.

Most errors were corrected immediately; others were rectified shortly after being detected.

To ensure close and consistent supervision of the campaign, AIRS Ethiopia assigned all technical staff to specific districts. Prior to the spray campaign, the AIRS team did internal "self-retraining" on all IRS processes, standards, and requirements so they would be ready to conduct comprehensive supervision when out in the field. Each component leader also provided a checklist for each area of supervision.

Each AIRS technical expert supervised 5–9 districts as shown in Table 10. As part of the supervision, they provided on-the-spot trainings, and took corrective actions for any problems encountered. They were also responsible for monitoring and adjustment of spray performance and EC in their respective districts. The AIRS team closely worked with the government supervisors. As a result, the contribution from the supervisors at all levels was very valuable, particularly at the initial stage of the spray operations, to address problems promptly.

TABLE 10. EC ASSESSMENT AND SUPERVISION SCHEDULE

Supervisor	District	August			September			
		Week			Week			
		1&2	3	4	1	2	3	4
M&E Manager/ Database Manager	Limu	Pre EC assessment						
	Dega	Pre EC assessment						
	Sasiga	Pre EC assessment						
	Gida Ayana	Pre EC assessment						
	Guto Gida	Pre EC assessment						
	Wayu Tuka	Pre EC assessment						
	Gubu Sayo	Pre EC assessment						
	Boneya Boshe	Pre EC assessment						
	Wama Hagelo	Pre EC assessment						
	Chewaka	Pre EC assessment						
Technical Manager	Nonno	Pre EC assessment						
	Dendi	Pre EC assessment						
	Bako Tibe	Pre EC assessment						
	Danno	Pre EC assessment						
	Ilu Galan	Pre EC assessment						
EC Officer	Begi	Pre EC assessment						
	Kondala	Pre EC assessment						
	Babo Gambel	Pre EC assessment						
	Mana Sibu	Pre EC assessment						
	Kiltu Kara	Pre EC assessment						
	Nejo	Pre EC assessment						
	Guliso	Pre EC assessment						
Operations Manager	Bedele	Pre EC assessment						
	Didesa	Pre EC assessment						
	Borecha	Pre EC assessment						
	Kersa	Pre EC assessment						
	Sokoru	Pre EC assessment						
	Seka	Pre EC assessment						
	Shebe	Pre EC assessment						
	Omo Nada	Pre EC assessment						
	Tiro Afeta	Pre EC assessment						
Operation	Hawa gelan	Pre EC assessment						

Supervisor	District	August			September			
		Week			Week			
		1&2	3	4	1	2	3	4
Coordinator	Seyo	Pre EC assessment						
	Dale Webera	Pre EC assessment						
	Dale Sadi	Pre EC assessment						
	Lalo Kile	Pre EC assessment						
Regional Health Bureau	All districts							
Zonal Health Bureau	All districts in zone							
District Health Bureau	All villages in districts							
M&E team	All districts							
Chief of Party	All districts							

4.2 COMMUNITY-BASED IRS

The CB model of IRS was implemented in one district from each of the six zones in the Oromia region supported by PMI, the same as in 2013.

The project held a seven-day district-level training to refresh the skills of HEWs in the six selected districts to serve as SLs. The districts had a total of 118 villages targeted for IRS. The trained HEWs, in collaboration with their village leaders, then selected five literate community members (total 590) and trained them for six days on spray operations and communication. Four of the community members worked as SOPs and one served as a porter or SOP replacement in their villages. Table 11 shows 2014 spray performance for each CB IRS district.

TABLE 11. SPRAY OPERATION PERFORMANCE IN CB IRS

Zones	District	Structures Found	Structures Sprayed	Spray Coverage	Population Protected	Pregnant Women	Child <5
East Wollega	Sasiga	17,562	17,562	100.0%	40,364	569	5,937
Ilu Aba Bora	Chewaka	32,041	32,036	100.0%	82,440	1,971	14,590
Jimma	Kersa	27,624	27,506	99.6%	75,265	823	10,718
Kellem Wollega	Hawa Galan	31,441	31,437	100.0%	68,294	1,230	11,457
West Shewa	Bako Tibe	19,370	19,355	99.9%	44,433	472	5,535
West Wollega	Manasibu	32,426	32,417	100.0%	76,139	747	8,733
TOTAL		**160,464**	**160,313**	**100.0%**	**386,935**	**5,812**	**56,970**

The spray operations in the six CB IRS districts took on average 20 working days. The district MFPs required only one vehicle per district to do logistics and spray supervision. Other district and health center officers used the health office motorbikes for supervision and data collection. There was no need to deploy vehicles to support SOPs in the CB IRS model because they lived in nearby villages and went home at the end of each spray day. Before going home for the night, SOPs, porters, and HEWs would

remove their PPE and shower to prevent contamination from their work clothes. For the second year in a row, the project conducted an evaluation (including a cost analysis) for PMI that compared CB IRS districts with similar districts implementing the DB IRS model. Results will be reported separately.

4.3 Logistics and Stock Management

For the 2014 campaign, AIRS Ethiopia had one rented central warehouse and two ORHB-owned stores that the project helped to rehabilitate. All are located about 30 km outside of Addis Ababa. In the rented warehouse, the project stored bendiocarb. In one ORHB-owned store, AIRS Ethiopia kept all non-insecticide IRS supplies, and in the other, it collected insecticide-contaminated waste. Insecticides and IRS supplies are temporarily kept in these stores before being distributed to districts. All stores are managed by one full-time storekeeper hired by the project and regularly supervised by the logistics coordinator. AIRS Ethiopia received a total of 49,980 kg (4,165 boxes or 499,800 sachets) of bendiocarb insecticide (Ficam) in two shipments for the 2014 spray operation in 36 districts.

AIRS Ethiopia also rehabilitated district warehouses in all 36 operation sites. These warehouses belong to the district health offices. The storekeepers managing them are permanent employees of the district health offices. They received a per diem allowance from the project for the duration of the spray campaign to handle the IRS inventory.

Prior to the campaign, AIRS Ethiopia dispatched required equipment and materials from the central warehouses to the district ones. For the PPE and equipment, the project used dispatching slips (notes) that were signed by the receiving stores as proof of delivery. Government vouchers with the seal of the district health office were collected as proof of receipt.

Upon receiving the insecticides from the district stores, TLs filled out and signed daily insecticide tracking forms, and then issued sachets to the SLs with a similar insecticide tracking form. At the end of each spray day, porters or SLs would turn in the used (empty) and unused sachets to the TL, who returned them to the store. The storekeeper recorded the full sachets on the stock card, updated the balance, and returned the unused sachets to the full stock. Used sachets were recorded on the daily utilization record form that tracks each store's empty sachets and utilization trend. This reconciliation process enabled the storekeepers to ensure an effective daily inventory and to alert AIRS program staff of discrepancies between the stock and the records.

During the operation, the storekeepers also recorded daily minimum and maximum temperatures readings.

5. Environmental Compliance

The AIRS Ethiopia program implemented the spray campaign mindful of recommendations from the 2013 Supplemental Environmental Assessment. The assessment proposed the use of three classes of WHO-approved pesticides – pyrethroids, carbamates, and organophosphates – for IRS activities in Oromia region of Ethiopia, and will be valid for a period of five years, 2013–2017. Bendiocarb (carbamate) was used throughout this year's spray operations; no change of pesticides was made from last year.

The AIRS Ethiopia annual Letter Report describing the preparations and conditions for this year's IRS was submitted June 16, 2014. Because there was no change to the insecticide proposed for use, the report was for informational purposes only.

5.1 Pre-Season Environmental Compliance Assessments

Two pre-season environmental compliance assessments (PSECA) were conducted for all 36 project districts using the checklists installed in smartphones. The first-round PSECA was performed well ahead of the TOT, which allowed the district staff to be told of any EC gaps they needed to address. Areas that required the contribution of AIRS project office were also identified. Tables 12 and 13 list the gaps identified.

TABLE 12. KEY GAPS IDENTIFIED, FIRST-ROUND PSECA, DISTRICT STORES

District Store	Zone						Total
	West Wollega	Kellem Wollega	East Wollega	West Shewa	Ilu Aba Bora	Jimma	
How many double locks are required for the door?	8	0	6	1	3	0	18
How many double locks are required?	14	10	15	10	4	10	63
How many "Danger" signs with skull and crossbones are needed?	0	0	2	1	0	3	6
How many laminated correct pesticides and safety sheets are required?	7	0	34	4	0	2	47
How many health and safety procedure sheets are needed for stores and vehicles?	37	22	49	27	7	29	171
How many emergency response procedure sheets are required?	7	3	49	23	4	6	92
How many spill response procedure sheets are needed?	7	0	49	24	0	6	86
How many fully stocked first aid kits are needed?	7	0	27	3	0	0	37
How many dose of Athropine and /or charcoal antidotes to pesticides are required?	35	20	45	20	0	0	120
How many pregnancy test kits are needed?	140	60	117	60	0	0	377

TABLE 13. KEY GAPS IDENTIFIED, FIRST-ROUND PSECA, SOAK PITS

Soak Pits	Zones						Total
	West Wollega	Kellem Wollega	East Wollega	West Shewa	Ilu Aba Bora	Jimma	
How many soak pits are in a critically-sensitive area (e.g., flood prone) and/ or overgrown with vegetation?	1	0	0	0	0	0	1
How many soak pits need vegeation cleared?	16	10	17	10	9	12	74
How many soak pits need maintenance of fence, gate, lock?	17	7	17	9	6	12	68
How many washing areas need repair of slope, leak, or cracks?	0	10	17	0	0	0	27
How many soak pits need lines to dry clothes?	1	10	0	7	0	0	18
How many soak pits are totally missing the skull and cross-bones danger signs (excluding those that didn't post on the fence)?	0	2	2	1	1	5	11
How many soak pits need a temporary shower built?	17	10	17	6	6	10	66

Note: Poor road conditions prevented AIRS supervisors from visiting five soak pit sites (in Dano, Boneya, Seka, Dhidhesa, and Borecha districts); reports from the districts described their needs for maintenance and they were managed accordingly.

In the second round of PSECA, conducted one week before spray operations began, the team verified that all needs had been addressed by stakeholders and that the districts were ready for the spray operations.

5.1.1 New spray areas/Operational sites/Major construction

The project did not add new spray operation areas this year. Apart from the maintenance of previously used soak pits and temporary bathrooms, AIRS Ethiopia did not perform major construction before the 2014 spray season.

5.1.2 Soak Pits/Effluent Disposal

To ensure safe disposal of effluent waste, AIRS Ethiopia prepared 181 (61in district-based IRS areas and 120 in CB IRS areas) soak pits (Figure 2). For efficiency in an effort of such scale, the project used polyethylene plastic sheets as ground cover in place of cement for the washing/rinsing areas of the soak pits. The project carried out maintenance activities in all the 181 soak pits.

FIGURE 2. SOAK PIT FENCE MAINTENANCE USING LOCAL MATERIAL (BAMBOO), BEGI DISTRICT

5.1.3 STORES

There were 36 existing district stores. Project staff and government counterparts frequently inspected them for stock management and EC. The project equipped the stores with fire extinguishers, shelves, pallets, first aid kits, dust bins, emergency kits, and thermometers to ensure health and environmental safety during the spray campaign.

5.1.4 MEDICAL CLEARANCES - FITNESS AND PREGNANCY TESTING

Because female workers could be exposed to pesticide, IRS regulations prohibit enrolling pregnant women. In observance of this regulation, about 250 women were given pregnancy tests; all tested negative. The fitness of each SOP and SL was also evaluated during the recruitment and training process. In addition, the team leaders inspected the physical condition of each SOP during morning mobilization each day.

5.1.5 MANAGEMENT OF INSECTICIDE ADVERSE EFFECTS TRAINING AND ANTIDOTE SUPPLY

Along with IRS TOT training, the project trained 102 clinical practitioners on incidental poisoning management. Districts were notified of the need to have available the recommended antidotes (atropineor, diazepam). AIRS made sure that at least one of the antidotes was available in the health facility near the district store.

5.2 MID- AND POST-SPRAY ENVIRONMENTAL INSPECTIONS

All AIRS Ethiopia technical team members were involved in EC inspections. The team members divided the six zones and 36 project districts among themselves to conduct supervision and pre-, mid-, and post-spray inspections of the spray campaign in all districts.

During the supervision and environmental inspection visits, the team used AIRS checklists to observe soak pits, bathrooms, insecticide storage conditions, community involvement, house preparation, information, education and communication (IEC), and performance of spray operators. District and zonal MFPs were actively involved as supervisors on behalf of district health offices. Four major

inspections – Morning Mobilization and Transport Vehicle Inspection (Figure 3), Home Owner Preparation and Spray Operator Performance, Storekeeper Performance, and End of Day Cleanup – were performed according to schedule by the supervisor deployed to the site. Where possible, supervisors provided corrections on the spot. At the end of each inspection, district health teams supervising IRS held a general discussion on the status, achievements, shortcomings, and constraints found, and forwarded the recommendations for further corrective actions to district offices.

FIGURE 3. SOPS PROPERLY EQUIPPED AND MOBILIZED FOR THE DAY, SEYO DISTRICT

The AIRS Ethiopia project team made the general observation that the quality of spray operations and IRS infrastructure in 2014 has improved tremendously from previous IRS campaigns. During the inspections, the team witnessed many IRS best practices being used properly and regularly. The districts have openly embraced the practices and performed most very well. Among further improvements needed, the team noted that the excellent recording and tracking of insecticide should be applied to other IRS materials in the district stores. The stock management, although good, would be better if all records were updated regularly. Overall, spray actors used PPE appropriately. This year, SLs used helmets and face shields to observe spraying techniques inside houses. The inspection report with specific findings and recommendations is in Annex C. It is followed by the tables (C-1 through C-6) reporting summary of each of the four main supervisory checklists (morning mobilization, household preparation, SOP performance, and end-of-day cleanup) and daily performance of storekeepers and environmental compliance inspections completed by various supervisors during the campaign.

5.2.1 RECURRENT ISSUES

Data for the summary mid- and post-spray inspection report in Annex C was captured by the smartphone system. Problems found repeatedly included:

- Poor network coverage (to address the issue: DECs in districts with poor network were provided

with transport to travel to the nearest centers with better network to transmit data.);

- Poor roads preventing access to spray sites due to rains (To address the issue the team tried to spray sites more easily accessible first and spray less accessible areas towards the end of the rainy season/campaign, in September.);
- Complaining rental car drivers, whose payments were controlled by the rental car manager (To address the issue AIRS Ethiopia met with the rental company leadership to discuss the situation and changed the payment policy.);
- Rooms not ready when SOPs arrived (In next year's campaign, the project will use porters to go ahead of the spray teams and make households prepare the rooms.); and
- Disorganized temporary stores, and crowding of SOPs at district soak pits at the end of spray operations (To address the issue SOPs were made to take turns to avoid crowding at soak pit sites and temporary non-insecticide stores were instructed to organize and label items.)

5.2.2 Incidents

No site reported chemical exposure during the spray operations. The only injury reported was from Shebe-Sombo district (Jimma), where the district focal person had his hand fractured in a car accident.

5.3 Post-Spray Demobilization and Waste Disposal

5.3.1 Closure of Storerooms and Soak Pits

The IRS commodities were collected and returned to the permanent district stores at the end of spray operations. Furthermore, the soak pits and the stores were closed and secured after cleaning.

5.3.2 Solid Waste Disposal

At the end of the spray operations, AIRS Ethiopia collected solid wastes, including empty sachets and used masks, for incineration at the central level. At no additional cost, the project used the long-base vehicles hired for the IRS campaign to bring the waste (estimated at 255 sacks) from the districts on their way back to Addis Ababa. The incineration process started in the second week of October. Ethiopia is using two incinerators to dispose of contaminated solid waste and is planning to complete the incineration in the next two to three months.

5.4 Trial of Mobile Soak Pit Technology

AIRS Ethiopia tested a new mobile soak pit (MSP) technology in three districts. The MSPs are intended for use by a small number of SOPs (5–10) when they work remotely – in areas far from the main operational site and/or hard to reach by vehicle. Porters carry the MSP to the site. The MSP allows the team to manage the liquid waste at the site, so they do not have to return to the primary soak pit site each day. The MSP was tested for efficiency and effectiveness of filtration capacity, done through chemical analysis, and for the operational convenience in a real spray setting.

AIRS Ethiopia introduced trainers to the MSP at the IRS TOT. In addition to a presentation, the team demonstrated how to set up an MSP in full detail (Figure 4). Trainees pointed out several unanticipated limitations:

- Filtration capacity is minimal (possibly due to the improper installation or use of the filter);
- Washers and guards must accompany the spray team to the remote site; and
- The MSP and its accessories pose an extra load for the spray team to carry.

FIGURE 4. INSTALLATION OF MOBILE SOAK PIT IN SHEBOKA HEALTH CENTER, BAKO DISTRICT

Among the three test districts, Bako and Manasibu, both CB IRS districts, used the MSP for a few days and provided further feedback. The third site preferred to use the existing fixed soak pits only. The two districts installed the MSP adjacent to the primary soak pit. Installation in areas remote from the primary soak pits was minimal for the following reasons:

- Districts demanded having guards and washers for each MSP and this was not acceptable as it increases the cost. (The protocol for MSP use may not have been well understood. The MSP is not meant to require guards or washers.)
- The MSP assembly kit, which weighs about 10kg, and wooden stand to support the plastic screen were too heavy to carry. (It should be noted that this weight has not been considered excessive in other countries. In some cases, the MSP is carried on the porter's head, in others, in a sling.)

In the end, the organizers of the MSP test have shared their experience as follows:

- Preparation of the slope to one side rather than doing it to the center from all directions is less difficult for users;
- Reducing the weight of the kit and its accessories is recommended;
- The "X"-shape cut of the floor plastic sheet was not trusted to show the percolation rate of the pit; hence in one site, they preferred changing it to a circular shape.

6. Post-Spray Activities

6.1 Post-spray Conference

AIRS Ethiopia conducted a post-spray meeting in Jimma town on October 27–28 to review the implementation of the 2014 spray campaign. A detailed report on the conference and lessons learned discussed is in Annex D. A day and a half of the two-day meeting was spent reviewing the eight M&E and EC tools used in the 2014 AIRS campaign as part of the skill transfer and capacity-building efforts.

The participants recognized the importance of data quality in making evidence-based decisions and delivering a high-quality spray operation. They provided important feedback that will be helpful in improving the tools. The AIRS team documented the recommendations and suggestions. The M&E and EC teams of the project will work with the district malaria teams and AIRS home office to review the comments in respect to relevance, client requirements, and simplicity for documenting data, and refine the tools.

6.2 Demobilization and Logistics

AIRS Ethiopia ensured that all spray equipment, including spray pumps, PPE, plastic sheets, tents, and mattresses, were properly cleaned and returned to district stores. Post-spray inventory of all IRS-related materials was completed by the end of October. The inventory results showed that all non-consumable IRS equipment and materials were returned from operation sites; no loss or damage was reported. It is important to note that after the materials are dispatched to the districts, they are considered to be government property and, therefore, are recorded and documented by the district health offices. The storekeepers are responsible for dispatch and collection of the items after the operation. The government has a system for making staff pay for items lost or damaged when in their possession.

During the post-spray inventory, the team conducted an assessment of the tents in all 36 districts. The team counted a total of 360 tents and confirmed that 100 tents were severely outdated and need to be replaced.

7. ENTOMOLOGY

The 2014 work plan of AIRS Ethiopia included a number of entomological monitoring activities to be implemented in collaboration with the ORHB, the FMOH, and Jimma and Mekelle universities. The university experts participated in entomological activities that included insecticide resistance monitoring, vector behavior, density assessment and insecticide decay rate studies. The AIRS entomology team also carried out the same activities but in different sentinel sites. The bulk of the work was done from July to October 2014. Findings on the entomological indicators collected follows.

7.1 INSECTARY

PMI/AIRS Ethiopia supports the ORHB's well-functioning insectary in Nazareth. PMI earlier rehabilitated and equipped the insectary. Under the AIRS Ethiopia project, PMI provides regular support for procurement and care of lab animals for mosquito feeding, maintenance of insectary equipment, and payment of temporary staff. The insectary is a reliable source of susceptible mosquitoes for all entomological monitoring activities undertaken by the AIRS team. The insectary also is a learning center, serving as the site for local and international trainings on entomology.

Jimma University has also established an insectary for a susceptible *An. arabiensis* colony with support from PMI.

7.2 DETERMINATION OF QUALITY OF SPRAYING AND PERSISTENCE

The AIRS Ethiopia team conducted cone bioassay tests for quality check and decay rate in four sites; two DB IRS and two CB IRS districts. One CB IRS district and one DB IRS district were selected for the bioassay test.

The AIRS Ethiopia team performed the tests in 12 houses per site purposefully selected to represent houses sprayed by different SOPs and wall types. A total of 48 houses were sampled from the four sites. This is a change from last year, when the test was done with susceptible and wild mosquitoes in the same house and only five houses per site were sampled. This year's bioassay increased the sample size and sampled different types of walls. Table 14 shows the sampling used.

TABLE 14. HOUSES SAMPLED FOR THE WALL BIOASSAY TEST

District	IRS	Mosquito Type	Type and # of Structures			
			Mud	Dung	Painted	Total
Kersa	CB IRS	Wild	2	2	2	6
		Susceptible	2	2	2	6
Bako-Tibe	CB IRS	Wild	2	2	2	6
		Susceptible	2	2	2	6
Seka-Chokorsa	DB IRS	Wild	2	2	2	6
		Susceptible	2	2	2	6
Gobu-Seyo	DB IRS	Wild	2	2	2	6
		Susceptible	2	2	2	6

Total	**16**	**16**	**16**	**48**

The tests were carried out using known susceptible mosquito colonies reared in the Adama Malaria Reference Training Center insectary and wild mosquitoes reared from larvae or pupae (2–3-day-old sugar-fed adult *An. gambiae* s.l.).

Mortality of the exposed mosquitoes was 100 percent in 43 of the 48 houses sampled for quality check and cone bioassay tests conducted 1–5 days after spray (Table 15). There was no difference between wild and susceptible mosquitoes and CB and DB IRS districts. Five houses gave less than 100 percent mortality. Further investigations showed that these five houses have mud walls. Though the wall type may have affected the bioavailability of the insecticide, the AIRS team organized retraining of the teams and squads in the two districts and strengthened the supervision activities by assigning the technical manager of the project to these areas during the entire spray campaign.

TABLE 15. RESULTS OF WALL BIOASSAY FOR QUALITY CHECK AND DECAY RATE

District	Site	Type of Colony	Percent Mortality (N)					
			1-5 days after spray (T0)			One month after spray (T1)		
			Dung	Mud	Painted	Dung	Mud	Painted
Kersa	Siba (CB IRS)	Wild	-	100 (120)	100 (60)	-	75.8 (60)	98.3 (60)
		Susceptible	-	100 (120)	100 (60)	-	97.5 (60)	100 (60)
Bako-Tibe	Denbi Dima (CB IRS)	Wild	100 (90)	71.2 (90) 100 (90)*	100 (90)	100 (88)	33.7 (89)	100 (90)
		Susceptible	100 (90)	98.9 (90) 100 (90)*	100 (90)	100 (86)	74.7 (91)	100 (80)
Seka Chekorsa	Bore Tika (DB IRS)	Wild	-	100 (120)	100 (60)	-	87.5 (60)	93.3 (60)
		Susceptible	-	100 (120)	100 (60)	-	100 (60)	100 (60)
Gobu-Seyo	Gambela-Tere (DB IRS)	Wild	100 (90)	100 (90)	100 (90)	100 (60)	27.1 (60)	100 (60)
		Susceptible	100 (90)	64.5 (90) 100 (90)*	100 (90)	100 (81)	46.3 (80)	100 (76)

*Test repeated after re-spraying.

7.3 Monitoring Vector Density and Behavior

Three sites were selected for vector density and behavior monitoring where pre- and post-spray data collection was conducted. The sites were selected from Gobu-Seyo and Seka Chekorsa Districts (intervention sites) and from Ilu Gelan District (a control/unsprayed site). An assessment was conducted before the spraying began and repeated one month after spray. Preliminary results for one intervention site and one control site are presented in this section. Data collection and analysis from the second intervention site were not ready at the time of submission of this report. The project will submit a comprehensive report once all data are analyzed.

7.3.1 Pyrethrum Spray Collection

Indoor resting density of female *An. gambiae* s.l. mosquitoes collected from 20 houses using the Pyrethrum Spray Collection (PSC) method decreased from 56 (2.8 per house per day) before spray to 15 (0.75 per house per day) after spray in the intervention site, Gobu-Seyo; this number increased twofold, from 23 to 63 (from 1.2 to 3.2 per house per day), in the control site. All mosquitoes from PSC catches were classified for their abdominal stages (unfed, fed, half-gravid, and gravid). There were more gravid and half-gravid than fed mosquitoes before spray in Gobu-Seyo as shown in Figure 5. The

proportion was reversed after spray, when more fed than gravid were found (Figure 6). This may indicate a change in resting behavior after spray or the impact of IRS as the insecticide might have killed mosquitoes that stayed longer on the sprayed surface (both gravid and half-gravid).

Higher numbers of fed than gravid were also found resting indoors in the control (unsprayed) site in both rounds of collections. One explanation of this is exophilic behavior as the expectation is to have more half- and full-gravid mosquitoes than fed mosquitoes collected indoors if the vector is endophilic. The finding could also be the effect of weather and other human activities. The result is expected given *An. arabiensis* is the sole member of species complex found in most parts of the country. Detailed analysis of these data will be included in a separate entomological report.

FIGURE 5. INDOOR RESTING COLLECTION OF MOSQUITOES: BEFORE AND AFTER IRS IN GOBU SAYO DISTRICT (INTERVENTION SITE)

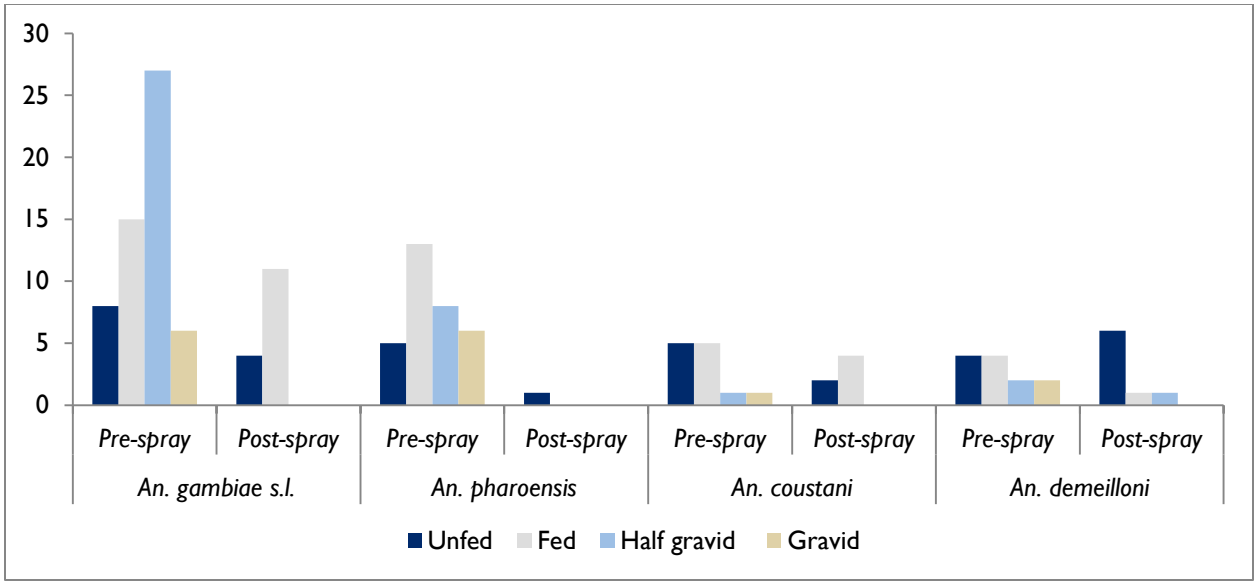
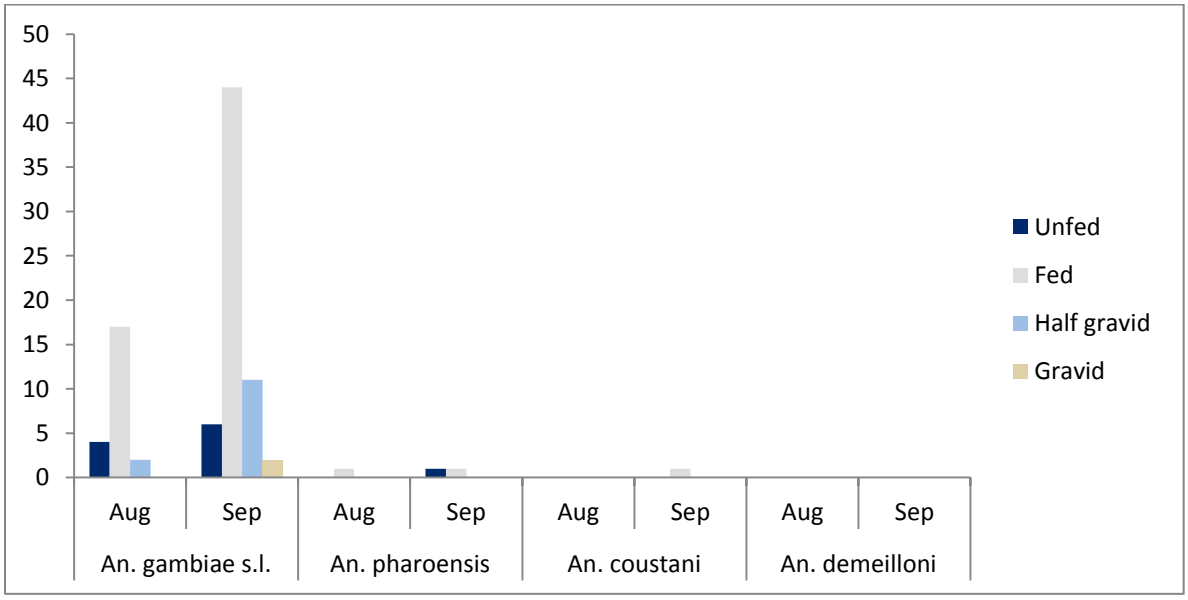


FIGURE 6. INDOOR RESTING COLLECTION OF MOSQUITOES: AUGUST AND SEPTEMBER COLLECTION IN ILU GELAN DISTRICT (CONTROL SITE)



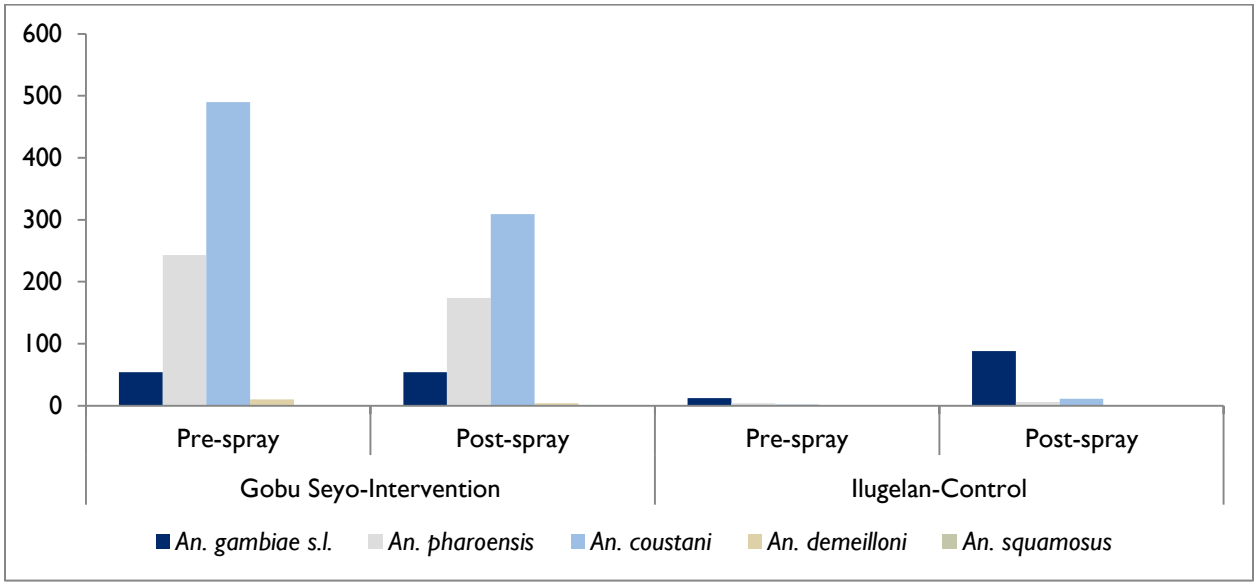
Aug= Pre spray; Sep=Post Spray

7.3.2 HUMAN LANDING CATCHES

Human Landing Catches (HLC) were undertaken before and one month after the spray. Two collectors (one sitting indoors and the other outdoors) spent the whole night (6 p.m. to 6 a.m.), exchanging places every hour. Two houses from each site were selected for the sampling and two collectors spent two consecutive nights in each. In the intervention site, Gobu Sayo, the team collected the same number of *An. gambiae* s.l. (54); which is 6.75 bites/person/night, before and one month after the spray. In contrast, in the control site, 12 (1.5 bites/person/night) were collected before spray and 88 (11bites/person/night) after spray, an increase of more than seven times. The post-spray month of September is when the vector population is expected to peak; the fact that there was no change in Gobu Sayo indicates the spraying had a positive impact on vector numbers.

Figures 7–11 illustrate the results of the eight man-night HLC collections for the intervention and control villages. Total landing catches are shown in Table 16.

FIGURE 7. HLC: BEFORE AND AFTER SPRAY, INTERVENTION AND CONTROL SITES



The number of vectors collected before and after spray in 2014 was too low in the intervention site to make meaningful conclusions on preference of biting site by the vector. In the control village, where the higher number of vectors was collected after spray, there was clear indication that the vector prefers to land on human baits sitting outdoors, a sign of exophagic habits. However, because people spend more time indoors than outdoors, most of the vector-human contact occurs indoors, which means people can still be protected by IRS and bed nets; both will remain effective. The data also show no clear biting time preference, though more mosquitoes were collected during the first half of the night (6–12 pm) than the second (12–6am), 68 vs 39 in Gobu Sayo and 60 vs 39 in Ilu Gelan.

The HLC time was extended by two hours up to 8 a.m.; two *An. gambiae* s.l. mosquitoes were caught trying to bite between 6 a.m and 8 a.m.

FIGURE 8. BITING TIME: BEFORE SPRAY, GOBU SAYO (INTEVENTION)

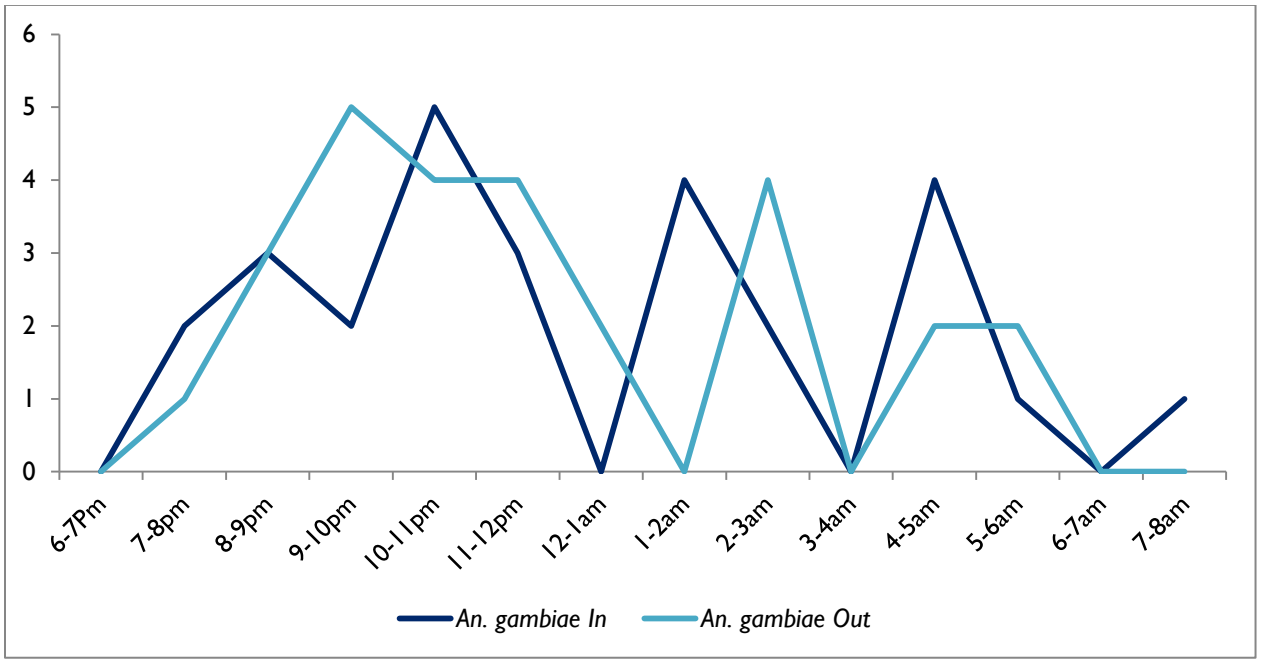


FIGURE 9. BITING TIME: AFTER SPRAY, GOBU SAYO (INTEVENTION)

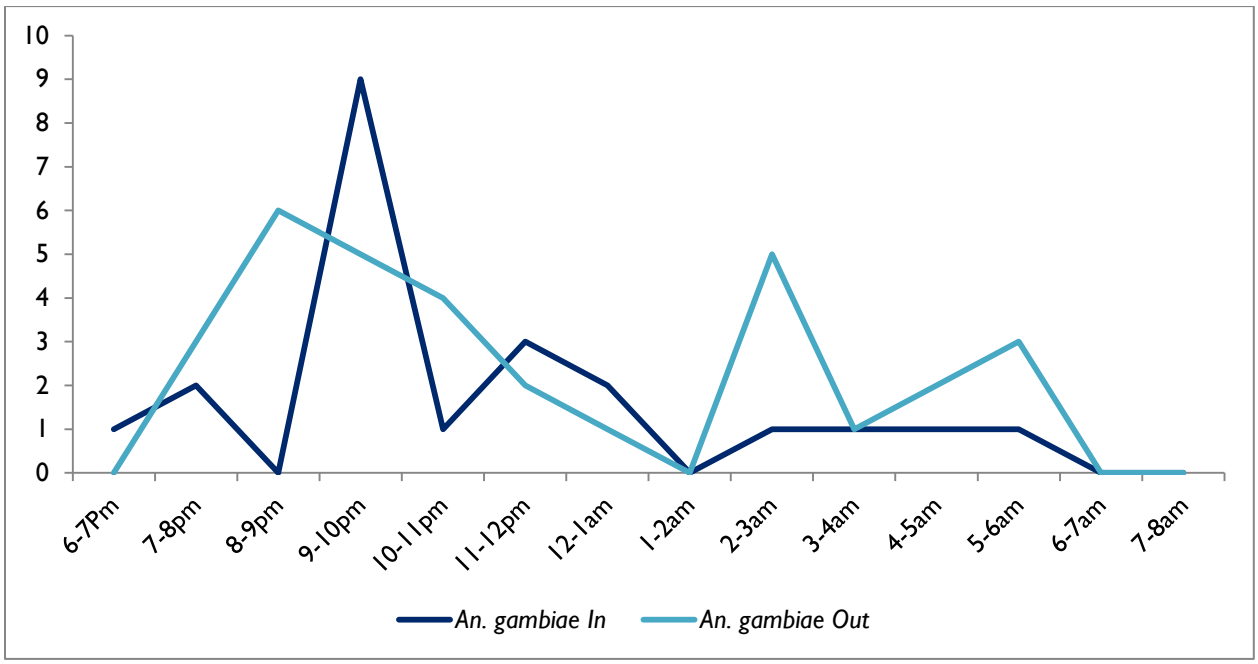


FIGURE 10. BITING TIME: ILU GELAN IN AUGUST (CONTROL)

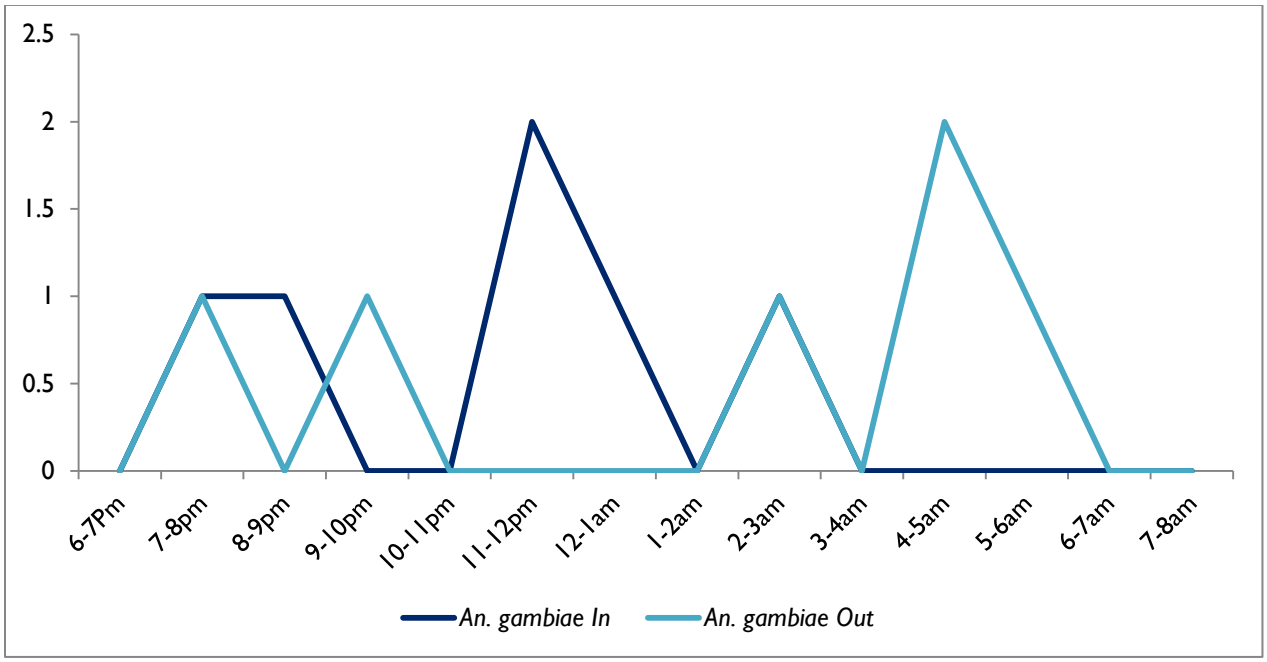


FIGURE 11. BITING TIME: ILU GELAN IN SEPTEMBER (CONTROL)

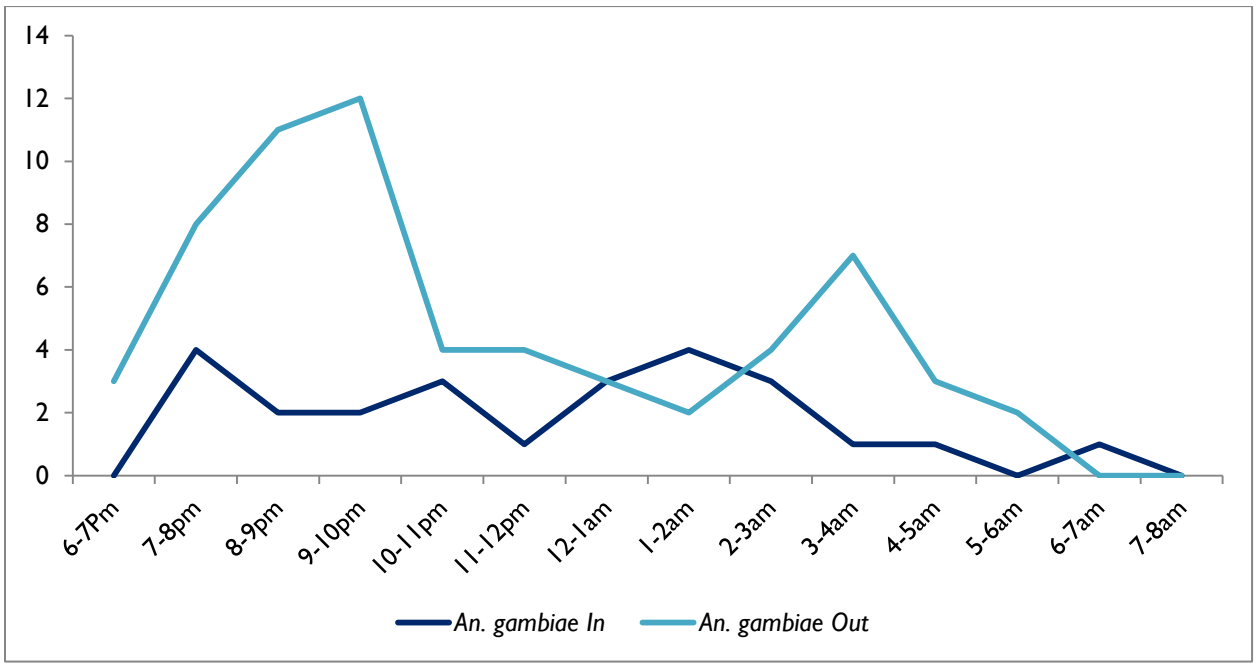


TABLE 16. TOTAL LANDING CATCHES OF *AN. GAMBIAE* S.L.

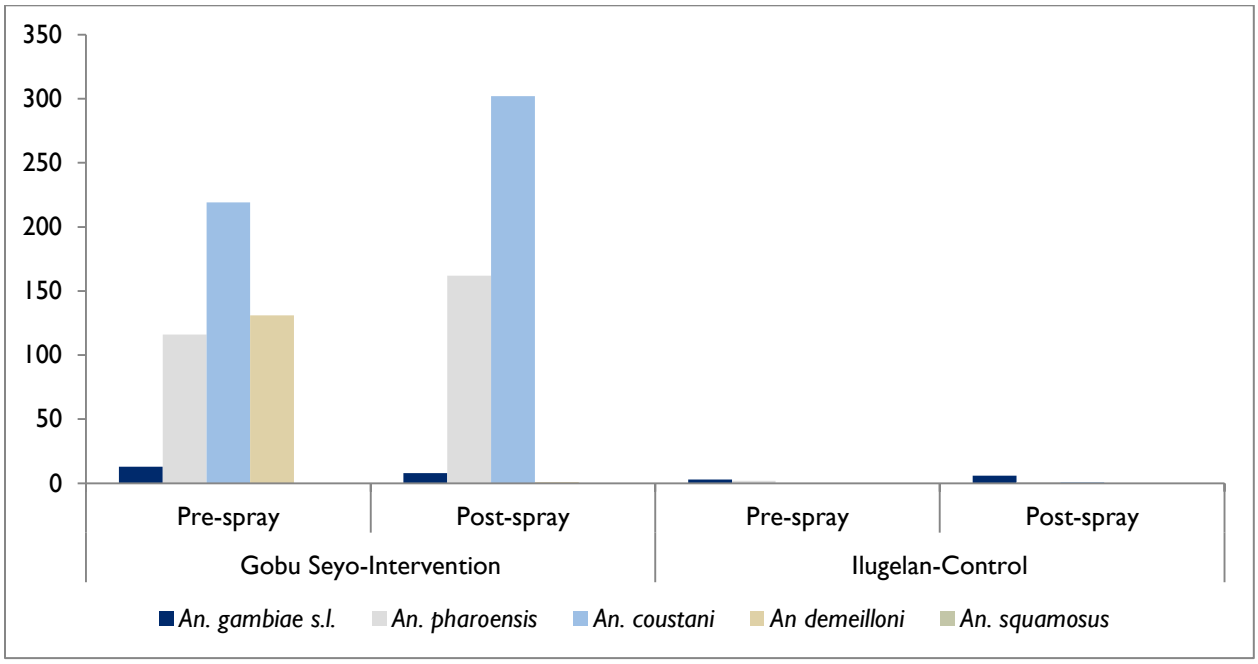
Time	Gobu Sayo		Ilu Gelan	
	Pre	Post	Pre	Post
6-12 p.m.	32	36	6	54
12-6 a.m.	21	18	6	33
6-8 a.m.	1	0	0	1

Note: Data collected in four man-nights; one human bait indoors and one outdoors.

7.3.3 CDC LIGHT TRAPS

Center for Disease Control and Prevention (CDC) light trap collection was undertaken in two houses for two nights in each. Too few *An. gambiae* s.l. were collected to make meaningful comparisons between pre- and post-spray densities. A decrease in the numbers of *An. demeilloni* and an increase in the numbers of *An. coustani* were observed in post-spray collections (Figure 12).

FIGURE 12. INDOOR CDC LIGHT TRAP COLLECTION BEFORE AND AFTER SPRAY IN INTERVENTION SITE, AUGUST AND SEPTEMBER IN CONTROL SITE



7.3.4 PARITY RATE

Ovary dissection was performed on all unfed female mosquitoes captured during the pre- and post-spray HLC collections to determine the rate of parity (Table 17). Before spray, 87 percent of dissected vectors were parous in the intervention village and 100 percent in the control. After spray, these figures were 70.4 percent and 81.9 percent, respectively. The decrease in the control village might be attributable to environmental factors. There are also mosquito nets distributed in the area but no new nets were given in September. The project collected net possession data during the PSC collection in 20 houses, which show that 18 had at least one net in August (pre-spray) and 19 in September (post-spray).

TABLE 17. PROPORTION OF PAROUS AND NULLIPAROUS *AN. GAMBIAE* S.L. BEFORE AND AFTER SPRAY IN INTERVENTION SITE, AUGUST AND SEPTEMBER IN CONTROL SITE

Site	*An. gambiae* s.l.	
	Pre N(%)	Post N(%)
Gobu Sayo	47/54 (87)	38/54 (70.4)
Ilu Gelan	12/12 (100)	72/88 (81.9)

7.4 INSECTICIDE SUSCEPTIBILITY

In 2012 and 2013, the AIRS team conducted insecticide susceptibility studies in five fixed sites using WHO tube assays. The activity was planned to continue in the same five sites as well as in three additional sites. The level of vector resistance to various insecticides approved by the World Health Organization Pesticide Evaluation Scheme (WHOPES) for IRS use was tested in 2014.

The test was completed in five (three original and two new) of the eight sites and the results are shown in Table 17. The test in two (one old and one new) sites is underway. It is uncertain if the test can be done in Halaba, the eighth site, due to a low number of larvae.

The test results showed the vector is highly resistant to DDT, lambda-cyhalothrin, deltamethrin, permethrin, alpha-cypermethrin, and etofenprox (Table 18). For malathion, the vector was found possibly resistant in three sites, resistant in one site, and susceptible in one site. The vector is susceptible to propoxur, fenitrothion, and pirimiphos-methyl in all sites, susceptible to bendiocarb in three of five sites, and resistant and possibly resistant in the two others.

TABLE 18. 2014 INSECTICIDE RESISTANCE RESULTS IN FIVE FIXED SITES

No.	Insecticide	% mortality (dead/exposed)				
		Region: Oromia District: Chewaka Site: Chewaka	Region: Oromia Dsitrict: Omonada Site: Osso Billi	Region : Afar District: Amibara** Site: Sedi	Region: Gambela District: Lare** Site: Kurgeng	Region: Oromia District: Zwai Dugda Site: Burka
1	DDT	6 (6/100) (R)	6.8 (6/88) (R)	18.8 (19/101) (R)	12.5 (11/88) (R)	6.2 (6/97) (R)
2	Lambda-cyhalothrin	11.2 (11/97) (R)	39 (39/100) (R	46.2 (43/92) (R)	14.7 (13/88) (R)	4.3 (4/94) (R)
3	Deltamethrin	45.5 (42/97) (R)	42 (42/100) (R)	45.4 (45/99) (R)	18.1 (15/83) (R)	21 (21/196) (R)
4	Fenitrothion	100 (100/100) (S)	100 (100/100) (S)	100 (102/102) (S)	100 (88/88) (S)	100 (106/106) (S)
5	Malathion	93.7 (87/93) (POR)	73 (73/100) (R)	100 (101/101) (S)	95.5 (84/88) (POR)	93 (91/98) (POR)
6	Pirimiphos-methyl	100 (100/100) (S)	100 (100/100) (S)	100 (99/99) (S)	100 (100/100) (S)	100 (103/103) (S)
7	Propoxur	100 (100/100) (S)	100 (100/100) (S)	100 (102/102) (S)	100 (88/88) (S)	100 (101/101) (S)
8	Bendiocarb	100 (100/100) (S)	86.4 (76/88) (R)	100 (105/105) (S)	92 (80/88) (POR)	100 (101/101) (S)
9	Permethrin	31.3 (25/80) (R)	16(16/100) (R)	19.1 (18/94) (R)	28.4(25/88) (R)	3(3/101) (R)
10	Etofenprox	24(23/95) (R)	55 (55/100) (R)	86.6(87/100) (R)	11.4 (10/88) (R)	28.7 29/101) (R)
11	Alpha-cypermethrin	32.2(31/96) (R)	35 (35/100) (R)	72.5(75/103) (R)	14.7 (13/88) (R)	5 (5/100) (R)

**new fixed sites added in 2014

7.5 MOLECULAR AND ELISA TESTS

7.5.1 PRE-SPRAY SPOROZOITE ELISA TEST

Overall, 687 anopheline mosquitoes belonging to three species (*An. gambiae* s.l., *An. pharoensis,* and *An. coustani*) were tested before spray operations for *Plasmodium* circumsporozoite protein (CSP). Of 175 *An. gambiae* s.l. samples collected from the Seka Chekorsa site, two specimens were positive for *P. falciparum* and three for *P. vivax* circumsporozoite protein, giving a sporozoite rate of 1.14 percent and 1.7 percent, respectively. Moreover, a single *An. coustani* specimen was positive for *P. vivax* (not confirmed by PCR). None of the samples collected from Gobu Sayo site were positive for *Plasmodium* circumsporozoite protein (Table 19).

TABLE 19. SPOROZOITE RATES OF ANOPHELINE MOSQUITOES COLLECTED FROM SEKA CHEKORSA DISTRICT, SOUTHWESTERN ETHIOPIA, AND GOBU SAYO

Site	Anopheline Species	Number Tested	Number Positive		
			Pf	Pv210	Pv247
Jimma; Seka Chekorsa (Bore Tika)	*An. gambiae* s.l.	175	2 (1.14%)	0 (0)	3 (1.7%)
	An. coustani	140	0	1 (0.7%)	0
	An. pharoensis	48	0	0	0
East Wollega, Gobu Sayo (Gambella Tere)	*An. gambiae* s.l.	54	0	0	0
	An. coustani	270	0	0	0

Note: Mosquitoes from Ejaji (control site) not processed because of the small numbers collected pre-spray

7.5.2 POST-SPRAY SPOROZOITE ELISA

A total of 493 anopheline mosquito specimens collected from three different sites after spray operations were tested for *plasmodium* circumsporozoite proteins. About 54 percent of the analyzed specimens were *An. coustani* and the remaining 46 percent were *An. gambiae* s.l. None of the analyzed specimens were positive for *plasmodium* circumsporozoite proteins (Table 20). The absence of *plasmodium*-infected anopheline mosquitoes was probably due to IRS conducted a week before mosquito sampling.

TABLE 20. SPOROZOITE RATES OF ANOPHELINE MOSQUITOES COLLECTED FROM THREE SITES ONE MONTH AFTER SPRAY OPERATIONS

Site	Anopheline Species	Number Tested	Number Positive		
			Pf	Pv210	Pv247
Jimma; Seka Chekorsa (Bore Tika)	*An. gambiae* s.l.	80	0	0	0
	An. coustani	156	0	0	0
East Wollega, Gobu Sayo (Gambella Tere)	*An. gambiae* s.l.	57	0	0	0
	An. coustani	110	0	0	0
West Shewa Ejaji (Ilugelan)	*An. gambiae* s.l.	90	0	0	0
Overall	*An. gambiae* s.l.	227	0	0	0
	An. coustani	266	0	0	0

7.5.3 BLOOD MEAL ELISA

AIRS Ethiopia conducted a survey in the Seka Chekorsa site (Jimma zone) to estimate the blood meal source of the main vector collected from structures occupied by humans only, animals only, and humans and animals mixed. The team sampled five structures of each type. The team used the PSC technique to collect knocked-down mosquitoes in accordance with the WHO-recommended standard procedure for this sampling method. Collection was done once, in the morning, from 5:45 a.m. to 8:00 a.m. Collected mosquitoes were counted, morphologically identified, labeled, and transported to Jimma University lab for blood meal source determination using ELISA.

A total of 596 *An. gambiae* s.l. specimens were tested for vertebrate host blood source (human, bovine, and ovine). *An. gambiae* s.l. showed opportunistic feeding behavior, feeding on all three sources. A higher proportion of *An. gambiae* s.l. specimens collected from human dwellings was positive for human blood meal (at a human blood index of 52.7 percent) than those collected from the animal shed and mixed dwelling (Table 21). Interestingly, none of the specimens collected from the cowshed was found to have human blood.

TABLE 21. BLOOD MEAL SOURCE OF *AN. GAMBIAE* S.L. COLLECTED FROM HUMAN HABITATION, ANIMAL SHED, AND MIXED HABITATION,

Type of Dwelling	No. of Mosquitoes Processed	Blood Meal						
		Human Only	Bovine Only	Goat Only	Human + Bovine	Human + Goat	Bovine + Goat	Human + Bovine + Goat
Human only	182	96 (52.7)	2 (1.1)	1 (0.5)	19 (10.4)	23 (12.6)	24 (13.2)	17 (9.3)
Animal Shed	205	0 (0)	30 (14.6)	24 (11.7)	38 (18.5)	41 (20.0)	50 (24.4)	22 (10.7)
Mixed	209	7 (3.3.)	72 (34.4)	16 (7.7)	26 (12.4)	24 (11.5)	38 (18.2)	26 (12.4)

Key: Number in brackets indicates percentage

7.5.4 MOLECULAR IDENTIFICATION OF *AN. GAMBIAE* S.L.

Mosquito samples collected from Bore Tika site were assayed at the Molecular Biology Laboratory of Jimma University following the standard protocol (Scot et al[1]. 1993). All of the 48 *An. gambiae* s.l. samples tested were identified as *An. arabiensis*.

[1] Scott JA, Williams G, Collins FH: Identification of single specimens of the *Anopheles gambiae* complex by the polymerase chain reaction. Am J Trop Med Hyg 1993, 49:520-529

7.6 Practical Field Training on CDC Bottle Bioassay Tests

USAID/PMI in collaboration with the U.S. CDC Atlanta and the FMOH conducted national-level practical field training on CDC bottle assay testing in the Adama Malaria Control Training Center for 22 health professionals from five regions (Table 22). These health professionals had received training in basic entomological monitoring in November 2013.

TABLE 22. DISTRICT HEALTH STAFF TRAINED ON CDC BOTTLE ASSAY

Region	Number of:		Training Date
	Districts	Trainees	
Oromia	7	7	April 28-May 3, 2014
SNNP	7	7	May 19-24, 2014
Amhara	5	5	May 26-31, 2014
B/Gumuz	2	2	
Tigray	1	1	
Total	22	22	

The actual CDC bottle assay tests were delayed due to late arrival of insecticides from CDC. The insecticides arrived in Ethiopia in October and the tests are expected to be done in November and December, depending on the availability of mosquitoes.

7.7 Malaria Decision Support System

The second workshop for the AIRS Ethiopia project team was conducted April 22–25, 2014, to enhance the capacity of the team to manage the database from the Ethiopia office. The workshop aimed to build the capacity of the entomology team to enter and design necessary queries and the information technology (IT) team to develop a dynamic report and schematic map from the queries. The training was successful; the entomology team can now import data by using the template designed to ease data entry and to edit reports already in the system.

The AIRS Ethiopia team still lacks the skills needed to independently create and customize reporting templates. Additional training is needed on the following topics:

- Detailed procedures on complex report design and editing existing reports from the application called "BIRT";
- Importing Geography/GIS file to DDMS;
- Defining/creating data entry screen or editing the existing entry screens;
- Creating dataset with different data types;
- Detailed steps on the query design and editing;
- Basic information about the back-end database structure; and
- Trouble shooting of possible errors.

8. MONITORING AND EVALUATION

8.1 APPROACH AND KEY OBJECTIVES

The overarching M&E approach of AIRS Ethiopia was to combine local lessons learned with successful aspects of other M&E systems to:

- Emphasize accuracy of both data collection and data entry through comprehensive trainings and supervision at all levels;
- Facilitate data use in both field and office settings through participatory project design and implementation;
- Streamline and standardize the data information flow to minimize errors and facilitate timely reporting; and
- Ensure IRS data security and storage for future reference through establishment and enforcement of proper protocols.

8.2 DATA COLLECTION AND DATA QUALITY ASSURANCE PROTOCOLS

Data were collected using standardized data collections forms designed to capture all core PMI indicators. AIRS Ethiopia has five main forms to capture all AIRS process indicators at different levels: 1) Training Participant Registration Form, 2) Daily Spray Operator Form, 3) Squad Leaders Daily Summary Form, 4) Team Leaders Daily Summary Form, and 5) District Malaria Focal Person Daily Summary Form. For M&E spray data entry purposes, AIRS Ethiopia uses only the Daily Spray Operator Form, as it is the primary data source. The three data summary forms are used by district operations supervisors to manage team and squad performance on a daily basis. Table E-1 in Annex E presents the use of each form.

The AIRS project used three paper-based data quality assurance tools (the Error Eliminator (EE) Form, Data Collection Verification (DCV) Form, and Data Entry Center Supervision Checklist) to ensure proper supervision of data collection and data entry. These tools are fully described in Table E-2 in Annex E.

Additionally, AIRS Ethiopia used the AIRS Access Database Cleaning/Reporting Tool. The tool is a database that links to the AIRS database backend (i.e., the spray data) and has two functions: generating district-level reports and data cleaning. The district-level reports provide spray progress to date, per day, per week, per squad, per administrative level (district, village), per spray operator, etc. These various reports require no computer knowledge or individual analysis. Hence, they can be used by AIRS operations team members or government supervisors to get updates and respond to spray coverage issues in real time. The data-cleaning function is used by DECs for data verification and daily data cleaning. The M&E team and spray supervisors can also use the cleaning function to perform data verification (e.g., looking up the spray data for a specific day, SOP, or structure).

During regional and zonal TOTs, the M&E team emphasized definitions of key IRS terms and reporting indicators, compliance with M&E protocols, and proper data collection. They also trained field staff and supervisors on supervisory roles and responsibilities and data security. The M&E team was fully engaged in supervising field work during spray operations. While observing data collection and entry in the field, the team identified issues and was able to correct errors on the spot.

One of the key tools for providing corrections in the field was the DCV form, which was used by AIRS staff and government supervisors to capture issues and guide feedback during spray operations. The most common issues found during use of the DCV form are summarized in Table 23.

TABLE 23. USE OF DCV FORM: COMMON ISSUES AND CORRECTIVE ACTIONS

Errors/Issues Observed	Corrective Actions Taken
Unmarked structures SLs did not consistently mark structures with chalk.	The M&E team and supervisors advised SLs, TLs, and field supervisors and provided on-the-spot correction and training.
Missing IRS card numbers Some households did not have their IRS cards from 2012 and 2013 campaigns.	The team provided reserve IRS cards during spray operations to be distributed to households needing replacement IRS cards. Additionally, the SOPs were told to emphasize to households the importance of keeping their IRS cards in a safe place.
Unsprayed structures Unsprayed structures that were initally overlooked by SOPs were found in few villages.	The M&E team and supervisors worked to arrange revisits to these areas so that the missed structures could be covered.
IRS cards not updated SLs were not updating the 2014 section of the IRS cards with 2014 spray information: date of spray, name and code of SOP, total # of eligible structures found and sprayed.	Orientation was provided to SLs to remind them to update IRS cards correctly.
Spraying ineligible structures A few ineligible structures were sprayed.	SLs and TLs were retrained on the identification of eligible unit structures.

See Table E-3 in Annex E for a summary of AIRS Ethiopia's tools for addressing core areas of data quality concern.

8.3 DATA ENTRY

AIRS employed 36 DECs, one per district. The 2014 AIRS Ethiopia database along with the reporting/cleaning tool was installed on every DEC's laptop together with a separate program to synchronize the data and use cloud technology for storage.

AIRS piloted a client server data entry system in East Wollega zone. At the zonal health office, three DEC computers were networked to a single SQL server. As we have used in other AIRS countries, a single laptop was set-up as an SQL server that was loaded with the necessary applications, database and system configurations to support multi-users. The server functioned as a central data bank for the client machines connected with it. In this way the users, Data Entry Clerks, entered data on their server-connected laptops that was then stored in a single backend on the server and all data back-ups and transfer procedures were performed from the server. This system facilitates data aggregations and transfer and more centralized supervision of Data Entry Clerks.

Data entry was carried out at two levels, first by "totals" (for quick reporting and feedback) then by "details," i.e., by each structure captured on the Daily Spray Operator Form, for more accurate data entry and verification purposes.

8.4 DATA STORAGE

The Daily Spray Operator forms are stored in binders at the district level. The forms were filed by date and team to provide a uniform organizational system and facilitate easy reference.

At the end of every day, all data were backed up electronically, first, into a back-up folder on the data entry laptop; second, into a cloud back-up system (Sugar Sync); and third, into an external memory drive that was provided to each DEC.

8.5 Data Cleaning

The M&E Manager, Database Manager, and IT Specialist facilitated data cleaning at the district level, which involved the following:

- Ensuring that all Daily Spray Operator forms are entered correctly by the double entry method (by totals and by details);
- Ensuring that all necessary corrections are made so that the totals and aggregate details per form are in agreement;
- Checking and removing duplicate records; and
- Identifying and entering missing records.

Data cleaning was done using a Microsoft Access-based IRS Cleaning/Reporting tool. The DECs cleaned spray data daily throughout the spray campaign, with final data cleaning completed 20 days after the end of the spray campaign.

8.6 Reporting of Spray Data

Spray data were collected and entered into the database on a daily basis. SLs collected the data while TLs checked and verified data. Further checks were completed by MFPs, IEC specialists, and district EC Officers. District DECs checked the completeness and accuracy of daily spray data variables before entering the data into the database. Weekly IRS Progress Reports were shared with the AIRS home office and PMI. Internally, the Ethiopia M&E team provided comprehensive spray updates twice a week to facilitate timely corrective actions.

All AIRS Ethiopia performance indicators are presented in a M&E Plan matrix in Annex F. Details of some key IRS indicators, such as number of structures sprayed, people protected, and insecticide-treated net availability and use, are provided in the following sections of the report.

8.6.1 Number of Structures Found, Sprayed, and Spray Coverage

At total of 670,303 structures were found by SOPs during the 2014 spray campaign across all the 36 districts, of which a total of 667,236 structures were sprayed, for a total spray coverage of 99.5 percent. District-level data are presented in Table 23. In total, SOPs found 313,072 living/sleeping structures and sprayed 311,127 (99.4 percent) of them. AIRS Ethiopia used five types to categorize the various types of structures eligible for spray. Table 24 presents the spray data disaggregated by type.

8.6.2 Population Protected

A total of 1,647,099 people were protected through the AIRS program in 2014, out of which 23,919 were pregnant women and 230,862 were children under 5. Thus, the vulnerable groups accounted for 15.5 percent of the total population protected via IRS.

8.6.3 Insecticide Consumption

During the 2014 spray campaign a total of 312,382 sachets (2603.2 boxes) of bendiocarb were consumed. SOPs sprayed 2.1 unit structures with one sachet. No missing empty sachets were reported;

all empty sachets were transported from the districts to Addis Ababa and destroyed using project incinerators.

For the 2014 IRS campaign, PMI procured a total of 499,800 sachets (4,165 boxes) and transferred them to AIRS Ethiopia in two installments. With a balance of 713 boxes transferred from 2013, the project started the 2014 campaign with a total of 4,878 boxes of bendiocarb at hand. The project now has an inventory of 2,275 boxes of bendiocarb in the central store. All bendiocarb left over from the 2013 campaign was sprayed in 2014 on a first-in-first-out basis. All 2,275 boxes of bendiocarb will be used to spray 28 districts in the 2015 campaign. No additional bendiocarb will be procured in 2015. Eight out of 36 districts will be sprayed with Actellic CS.

TABLE 24. SUMMARY OF 2014 SPRAY RESULTS

Zone	District	Structures Found	Sprayed					Total Population	% Population Protected
			Structures Sprayed	Spray Coverage	Population Protected	Pregnant Women	Child <5		
East Wollega	**East Wollega**	134,767	134,394	99.7%	294,537	4,322	40,221	295,590	99.6%
	Boneya Boshe	11,126	11,080	99.6%	20,039	256	2,848	20,143	99.5%
	Dega	13,304	13,279	99.8%	33,474	516	5,041	33,550	99.8%
	Gida Ayana	20,243	20,235	100.0%	43,097	417	5,310	43,110	100.0%
	Gobu Sayo	11,910	11,906	100.0%	25,291	227	3,179	25,291	100.0%
	Guto Gida	16,406	16,164	98.5%	36,551	784	4,588	37,285	98.0%
	Limmu	11,593	11,572	99.8%	23,839	288	2,693	23,899	99.7%
	Sasiga	17,562	17,562	100.0%	40,364	569	5,937	40,364	100.0%
	Wama Hagalo	17,215	17,208	100.0%	37,848	682	6,420	37,864	100.0%
	Wayu Tuka	15,408	15,388	99.9%	34,034	583	4,205	34,084	99.9%
Ilu Aba Bora	**ILU Aba Bora**	77,610	77,404	99.7%	173,768	4,611	30,504	174,374	99.7%
	Bedele	10,143	10,119	99.8%	25,489	657	4,352	25,578	99.7%
	Borecha	22,313	22,313	100.0%	36,600	1,373	6,489	36,600	100.0%
	Chewaka	32,041	32,036	100.0%	82,440	1,971	14,590	82,470	100.0%
	Dedesa	13,113	12,936	98.7%	29,239	610	5,073	29,726	98.4%
Jimma	**Jimma**	145,026	144,515	99.6%	393,078	4,683	53,840	394,679	99.6%
	Kersa	27,624	27,506	99.6%	75,265	823	10,718	75,459	99.7%
	Omonada	32,984	32,693	99.1%	96,995	1,291	13,348	98,030	98.9%
	Seka Chekorsa	22,699	22,698	100.0%	53,486	740	7,352	53,486	100.0%
	Sekoru	20,599	20,599	100.0%	60,951	663	8,480	60,951	100.0%
	Shabe Sombo	16,665	16,663	100.0%	36,854	430	4,534	36,868	100.0%
	Tiro Afeta	24,455	24,356	99.6%	69,527	736	9,408	69,885	99.5%

Zone	District	Structures Found	Sprayed					Total Population	% Population Protected
			Structures	Spray Coverage	Population Protected	Pregnant Women	Child <5		
Kellem Wollega	**Kellem Wollega**	96,435	96,378	99.9%	206,371	2,469	27,481	206,528	99.9%
	Dale Sadi	17,522	17,520	100.0%	30,820	212	4,130	30,828	100.0%
	Dale Wabara	18,836	18,826	99.9%	38,481	381	4,739	38,534	99.9%
	Hawa Galan	31,441	31,437	100.0%	68,294	1,230	11,457	68,307	100.0%
	Lalo Kile	13,380	13,339	99.7%	26,783	231	2,808	26,866	99.7%
	Seyo	15,256	15,256	100.0%	41,993	415	4,347	41,993	100.0%
West Shewa	**West Shewa**	85,503	84,726	99.1%	209,333	2,362	28,205	211,540	99.0%
	Bako Tibe	19,370	19,355	99.9%	44,433	472	5,535	44,467	99.9%
	Danno	19,205	19,079	99.3%	50,518	425	7,045	50,950	99.2%
	Dendi	12,639	12,069	95.5%	33,241	344	4,145	34,785	95.6%
	Ilu Galan	19,561	19,497	99.7%	41,520	485	5,973	41,712	99.5%
	Nonno	14,728	14,726	100.0%	39,621	636	5,507	39,626	100.0%
West Wollega	**West Wollega**	130,962	129,819	99.1%	370,012	5,472	50,611	373,376	99.1%
	Babo Gamebel	19,277	19,270	100.0%	56,086	751	7,272	56,127	99.9%
	Begi	16,790	16,790	100.0%	51,398	885	9,416	51,398	100.0%
	Guliso	12,206	11,906	97.5%	33,242	215	3,286	34,386	96.7%
	Kiltu Kara	12,162	12,021	98.8%	33,213	150	2,560	33,544	99.0%
	Kondola	18,571	18,570	100.0%	72,492	2,403	15,326	72,492	100.0%
	Manasibu	32,426	32,417	100.0%	76,139	747	8,733	76,175	100.0%
	Nejo Rural	19,530	18,845	96.5%	47,442	321	4,018	49,254	96.3%
Grand Total		**670,303**	**667,236**	**99.5%**	**1,647,099**	**23,919**	**230,862**	**1,656,087**	**99.5%**

TABLE 24. SUMMARY OF STRUCTURES FOUND AND SPRAYED BY TYPE AND ROOM COVERAGE

Zone	District	Sleeping/Living Structure			Kitchen		Animal Shed		Latrine		Other Structure		Not Categorized			
		Found	Sprayed	% of Sleeping/ Living Structures Sprayed	Found	Sprayed	Found	Sprayed	Found	Sprayed	Found	Sprayed	Found	Sprayed	Total found	Total sprayed
East Wollega	**East Wollega**	**59,276**	**59,078**	**99.7%**	**39,266**	**39,188**	**20,825**	**20,793**	**11,699**	**11,635**	**3,700**	**3,699**	**1**	**1**	**134,767**	**134,394**
	Boneya boshe	3,901	3,877	99.4%	2,062	2,058	4,874	4,856	249	249	40	40	0	0	11,126	11,080
	Dega	6,736	6,716	99.7%	4,992	4,988	961	961	446	445	169	169	0	0	13,304	13,279
	Gida Ayana	10,011	10,008	100.0%	6,952	6,948	2,152	2,152	961	961	167	166	0	0	20,243	20,235
	Gobu Sayo	4,614	4,614	100.0%	3,680	3,677	3,137	3,136	63	63	415	415	1	1	11,910	11,906
	Guto Gida	6,693	6,564	98.1%	4,137	4,091	1,126	1,122	4,378	4,315	72	72	0	0	16,406	16,164
	Limmu	5,790	5,778	99.8%	3,753	3,747	1,417	1,414	623	623	10	10	0	0	11,593	11,572
	Sasiga	8,516	8,516	100.0%	3,805	3,805	1,224	1,224	3,773	3,773	244	244	0	0	17,562	17,562
	Wama Hagalo	6,760	6,757	100.0%	4,837	4,834	2,511	2,510	753	753	2,354	2,354	0	0	17,215	17,208
	Wayu Tuka	6,255	6,248	99.9%	5,048	5,040	3,423	3,418	453	453	229	229	0	0	15,408	15,388
Ilu Aba Bora	**Ilu Aba Bora**	**34,606**	**34,469**	**99.6%**	**14,624**	**14,587**	**22,820**	**22,791**	**3,130**	**3,129**	**2,429**	**2,427**	**1**	**1**	**77,610**	**77,404**
	Bedele	5,603	5,584	99.7%	1,140	1,139	2,745	2,743	589	589	65	63	1	1	10,143	10,119
	Borecha	6,628	6,628	100.0%	5,167	5,167	6,517	6,517	2,294	2,294	1,707	1,707	0	0	22,313	22,313
	Chewaka	16,723	16,718	100.0%	5,878	5,878	9,241	9,241	136	136	63	63	0	0	32,041	32,036
	Dedesa	5,652	5,539	98.0%	2,439	2,403	4,317	4,290	111	110	594	594	0	0	13,113	12,936
Jimma	**Jimma**	**74,747**	**74,411**	**99.6%**	**31,698**	**31,608**	**26,682**	**26,625**	**434**	**434**	**11,465**	**11,437**	**0**	**0**	**145,026**	**144,515**
	Kersa	14,122	14,072	99.6%	7,437	7,390	5,603	5,582	102	102	360	360	0	0	27,624	27,506
	Omonada	16,422	16,205	98.7%	6,123	6,095	5,766	5,741	83	83	4,590	4,569	0	0	32,984	32,693
	Seka chekorsa	10,522	10,522	100.0%	5,769	5,769	3,780	3,780	112	112	2,516	2,515	0	0	22,699	22,698
	Sekoru	11,701	11,701	100.0%	3,988	3,988	3,410	3,410	1	1	1,499	1,499	0	0	20,599	20,599
	Shabe Sombo	8,148	8,146	100.0%	4,201	4,201	3,626	3,626	66	66	624	624	0	0	16,665	16,663
	Tiro Afeta	13,832	13,765	99.5%	4,180	4,165	4,497	4,486	70	70	1,876	1,870	0	0	24,455	24,356
Kellem Wollega	**Kellem Wollega**	**37,142**	**37,112**	**99.9%**	**26,386**	**26,373**	**21,631**	**21,627**	**8,974**	**8,966**	**2,302**	**2,300**	**0**	**0**	**96,435**	**96,378**
	Dale sadi	5,769	5,767	100.0%	3,659	3,659	4,480	4,480	3,001	3,001	613	613	0	0	17,522	17,520
	Dale wabara	7,439	7,429	99.9%	6,037	6,037	3,551	3,551	1,177	1,177	632	632	0	0	18,836	18,826
	Hawa Galan	12,932	12,929	100.0%	9,310	9,309	7,659	7,659	1,430	1,430	110	110	0	0	31,441	31,437
	Lalo Kile	4,169	4,154	99.6%	2,812	2,800	3,497	3,493	2,420	2,412	482	480	0	0	13,380	13,339
	Seyo	6,833	6,833	100.0%	4,568	4,568	2,444	2,444	946	946	465	465	0	0	15,256	15,256
West Shewa	**West Shewa**	**41,829**	**41,286**	**98.7%**	**22,336**	**22,213**	**17,780**	**17,689**	**1,482**	**1,481**	**2,073**	**2,054**	**3**	**3**	**85,503**	**84,726**
	Bako Tibe	8,709	8,700	99.9%	5,272	5,269	4,363	4,361	349	349	677	676	0	0	19,370	19,355
	Danno	10,031	9,930	99.0%	5,785	5,768	2,907	2,900	202	202	280	279	0	0	19,205	19,079
	Dendi	6,939	6,555	94.5%	2,644	2,545	2,873	2,795	18	18	165	156	0	0	12,639	12,069
	Ilu Galan	8,276	8,228	99.4%	4,618	4,614	5,901	5,898	209	208	554	546	3	3	19,561	19,497
	Nonno	7,874	7,873	100.0%	4,017	4,017	1,736	1,735	704	704	397	397	0	0	14,728	14,726

Zone	District	Sleeping/Living Structure			Kitchen		Animal Shed		Latrine		Other Structure		Not Categorized			
		Found	Sprayed	% of Sleeping/ Living Structures Sprayed	Found	Sprayed	Found	Sprayed	Found	Sprayed	Found	Sprayed	Found	Sprayed	Total found	Total sprayed
	West Wollega	**65,472**	**64,771**	**98.9%**	**37,420**	**37,066**	**18,263**	**18,238**	**5,717**	**5,664**	**4,090**	**4,080**	**0**	**0**	**130,962**	**129,819**
	Babo Gamebel	11,934	11,928	99.9%	3,372	3,371	3,181	3,181	680	680	110	110	0	0	19,277	19,270
	Begi	8,121	8,121	100.0%	6,330	6,330	1,355	1,355	10	10	974	974	0	0	16,790	16,790
	Guliso	5,946	5,703	95.9%	3,986	3,939	1,151	1,145	57	56	1,066	1,063	0	0	12,206	11,906
	Kiltu Kara	5,512	5,449	98.9%	4,108	4,039	2,532	2,523	4	4	6	6	0	0	12,162	12,021
	Kondola	12,844	12,844	100.0%	2,259	2,258	2,524	2,524	17	17	927	927	0	0	18,571	18,570
West Wollega	Manasibu	13,104	13,097	99.9%	12,133	12,131	5,567	5,567	1,012	1,012	610	610	0	0	32,426	32,417
	Nejo Rural	8,011	7,629	95.2%	5,232	4,998	1,953	1,943	3,937	3,885	397	390	0	0	19,530	18,845
Grand Total		**313,072**	**311,127**	**99.4%**	**171,730**	**171,035**	**128,001**	**127,763**	**31,436**	**31,309**	**26,059**	**25,997**	**5**	**5**	**670,303**	**667,236**

8.6.4 Availability and Use of Mosquito Nets

Across the 36 districts, households reported having a total of 421,794 mosquito nets available at the time the SOP visited during the 2014 spray campaign. In total, 17,393 pregnant women were reported as having slept under a mosquito net the night prior to the SOP's visit. Additionally, 169,763 children under 5 years of age were reported as having had slept under a mosquito net the previous night. See Table 25 for mosquito net indicators presented by zones and districts.

TABLE 25. NUMBER AND USE OF MOSQUITO NETS

Zone	District	Total # of Mosquito Nets Found	# of Pregnant Women Sleeping Under Mosquito Nets	# of Children <5 Sleeping Under Mosquito Nets
East Wollega	East Wollega	50,683	2,134	21,964
	Boneya Boshe	7,220	229	2,612
	Dega	172	0	0
	Gida Ayana	3,832	165	2,401
	Gobu Sayo	3,294	128	1,833
	Guto Gida	5,358	418	3,214
	Limmu	249	5	68
	Sasiga	15,399	525	5,483
	Wama Hagalo	14,927	651	6,161
	Wayu Tuka	232	13	192
IluAba Bora	ILU Aba Bora	54,000	4,114	27,348
	Bedele	8,391	628	4,281
	Borecha	13,882	1,357	6,411
	Chewaka	26,972	1,753	13,454
	Dedesa	4,755	376	3,202
Jimma	Jimma	140,920	4,118	49,308
	Kersa	24,780	713	9,407
	Omonada	35,059	1,139	12,480
	Seka Chekorsa	21,763	722	7,231
	Sekoru	22,340	590	7,743
	Shabe Sombo	13,371	360	4,182
	Tiro Afeta	23,607	594	8,265
Kellem Wollega	Kellem Wollega	4,840	238	1,822
	Dale Sadi	140	5	103
	Dale Wabara	11	2	6
	Hawa Galan	73	11	57
	Lalo Kile	841	103	442
	Seyo	3,775	117	1,214
West Shewa	West Shewa	59,422	1,865	24,433
	Bako Tibe	13,345	378	4,782
	Danno	8,853	372	6,326
	Dendi	14,904	338	4,123
	Ilu Galan	16,864	426	5,749

Zone	District	Total # of Mosquito Nets Found	# of Pregnant Women Sleeping Under Mosquito Nets	# of Children <5 Sleeping Under Mosquito Nets
	Nonno	5,456	351	3,453
West Wollega	West Wollega	111,929	4,924	44,888
	Babo Gamebel	19,870	687	7,003
	Begi	21,099	869	9,232
	Guliso	38	1	15
	Kiltu Kara	10,960	134	2,237
	Kondola	23,061	2,266	14,349
	Manasibu	25,718	744	8,651
	Nejo Rural	11,183	223	3,401
Grand Total		**421,794**	**17,393**	**169,763**

8.6.5 SOP Performance and Sachet Usage Indicators

Table 26 provides detailed insecticide usage and SOP performance per district.

TABLE 26. INSECTICIDE USE AND SPRAY OPERATOR PERFORMANCE

Zone	District	SOP Performance	Sachet Use and Distribution		
		Average # of Unit Structures per SOP per Day	Sachets Used	Average # of Sachets per SOP per Day	Average # of Structures Sprayed/ Sachet
East Wollega	East Wollega	16.8	59,473	7.4	2.3
	Boneya boshe	16.5	4,950	7.4	2.2
	Dega	20.2	5,719	8.7	2.3
	Gida Ayana	15.8	9,384	7.3	2.2
	Gobu Sayo	16.0	5,880	7.9	2.0
	Guto Gida	20.2	5,967	7.5	2.7
	Limmu	15.7	4,587	6.2	2.5
	Sasiga	19.4	6,537	7.2	2.7
	Wama Hagalo	15.4	8,747	7.9	2.0
	Wayu Tuka	14.3	7,702	7.1	2.0
Ilu Aba Bora	Ilu Aba Bora	17.2	36,917	8.2	2.1
	Bedele	17.0	5,189	8.7	2.0
	Borecha	18.1	11,565	9.4	1.9
	Chewaka	17.1	14,127	7.5	2.3
	Dedesa	15.9	6,036	7.4	2.1
Jimma	Jimma	16.5	76,135	8.7	1.9
	Kersa	16.1	14,790	8.7	1.9
	Omonada	16.4	18,987	9.5	1.7
	Seka Chekorsa	17.9	11,645	9.2	1.9
	Sekoru	17.3	10,446	8.8	2.0
	Shabe Sombo	17.6	7,808	8.2	2.1
	Tiro Afeta	14.9	12,459	7.6	2.0

Zone	District	SOP Performance	Sachet Use and Distribution		
		Average # of Unit Structures per SOP per Day	Sachets Used	Average # of Sachets per SOP per Day	Average # of Structures Sprayed/ Sachet
Kellem Wollega	Kellem Wollega	17.1	43,619	7.8	2.2
	Dale Sadi	19.4	7,994	8.9	2.2
	Dale Wabara	17.8	9,241	8.8	2.0
	Hawa Galan	17.3	14,082	7.8	2.2
	Lalo Kile	15.2	5,877	6.7	2.3
	Seyo	15.7	6,425	6.6	2.4
West Shewa	West Shewa	15.9	42,302	7.9	2.0
	Bako Tibe	15.9	8,873	7.3	2.2
	Danno	17.0	9,709	8.7	2.0
	Dendi	14.4	6,157	7.4	2.0
	Ilu Galan	14.8	9,682	7.3	2.0
	Nonno	17.6	7,881	9.4	1.9
West Wollega	West Wollega	17.7	53,936	7.4	2.4
	Babo Gamebel	19.6	7,379	7.5	2.6
	Begi	15.6	8,541	7.9	2.0
	Guliso	16.0	4,591	6.2	2.6
	Kiltu Kara	18.0	5,259	7.9	2.3
	Kondola	17.5	6,695	6.3	2.8
	Manasibu	19.0	14,082	8.3	2.3
	Nejo Rural	17.1	7,389	6.7	2.6
Grand Total		16.9	312,382	7.9	2.1

9. EPIDEMIOLOGY ANALYSIS

The AIRS team carried out an analysis to determine whether the FMOH system of routinely collecting the number of malaria cases reported by health facilities can be used to assess whether changes in IRS implementation can lead to changes in malaria trends. Primarily, this study sought to learn whether the change in insecticide (to bendiocarb) is associated with a change in the number of malaria cases as reported by health facilities. Given the strong entomological data indicating vector resistance to deltamethrin and the effectiveness of bendiocarb, the study team explored whether entomological results translate to decreases in malaria cases presenting at health facilities when an area switches to bendiocarb. Secondarily, this analysis examined if the change in implementation, from government- to PMI-supported IRS, is associated with malaria cases as reported by health facilities. To this end, we summarized the data by year of switch to bendiocarb and by year of switch to PMI-supported IRS, examined the completeness of the data, and investigated the trends in the data. We additionally analyzed the data using statistical regression models. To further inform the validity of the findings, we also explored whether results from the regression models can be obtained by a 'false' treatment, sensitivity analysis. To do this, we adjusted the year of the 'change' (whether for insecticide or implementation partner) to be 'treated' (falsely) in the year before the change actually occurred.

Overall, this analysis demonstrated that the Ethiopian government health system data are generally incomplete and of poor quality. With this in mind, it is difficult to have confidence in the models used for analysis. Likewise, the graphing of trends in an effort to illustrate changes over time also suffers because of lack of consistently reported data.

Additionally, the number of cases of confirmed malaria (the indicator determined to be the most suitable to use for analysis) per person per month is very low, less than two per 1,000 people. Thus, either malaria infection rates are low in Ethiopia or care-seeking for malaria is low. This may influence our ability to detect changes in trends because smaller numbers are more apt to be influenced by random chance.

Similarly, simultaneous changes in both insecticide and implementer make establishing trends associated with either problematic; it is not clear if associations found are due to the change to bendiocarb or PMI support. However, the results of the statistical models do suggest that one or the other is associated with lower incidence of confirmed malaria cases.

These results lead us to conclude that analyses of retrospectively collected government data such as those explored in this document are not suitable for assessing IRS implementation, even as a first-look 'plausibility' analysis. It is our recommendation that this type of data collection and analysis should not be continued in the future in Ethiopia unless there is evidence that reporting practices at health facilities have improved.

Given the current state of health facility data, if AIRS is tasked with pursuing epidemiological work in Ethiopia, we would propose the following strategies be employed:

- Select health facilities should be targeted for prospective data collection. These health facilities could be chosen based on their capacity, reporting record, data quality, historical malaria case load, location in regard to entomological sentential sites, and so forth. AIRS Ethiopia could support the selected health facilities, taking on a role similar to what is carried out under the AIRS Mozambique and AIRS Angola Enhanced Surveillance activities. A staffer could be assigned to provide supportive supervision and feedback to health facilities regarding data collection and quality and collect data

from the health facilities on a monthly basis.

- AIRS should collaborate with other projects that support malaria data collection. AIRS Ethiopia could seek out an M&E project implementer or a local program that is already working in malaria data collection and identify any synergies in the two projects' work and geographic project areas. If AIRS is able to identify a project that is already able to support consistently high-quality malaria data collection and that geographically coincides with the PMI-supported IRS areas, these data could be accessed and used for future analysis.
- One project that might be an appropriate partner is the PMI-supported Malaria Epidemic Detection Surveillance Initiative. The project works to collect quality prospective data in the Oromia region; however, at this time, the districts in which the project works do not correspond with the PMI-supported IRS districts. In the future, perhaps coverage areas between the two projects could be aligned.
- If data collection through health facilities is deemed inappropriate given capacity issues, with guidance from PMI, the AIRS project could collaborate with a PMI implementer to conduct school-based serology studies. The studies could be carried out during the peak transmission season to better inform IRS operations.

10. CAPACITY BUILDING

AIRS Ethiopia completed the country IRS capacity assessment and developed a Capacity-Building Action Plan. AIRS Ethiopia jointly with the National Malaria Control Program (NMCP) and PMI reviewed the results of the capacity assessment and discussed areas in which the project could support the NMCP to enhance in-country IRS competency. The three areas chosen for capacity-building assistance are EC, entomological monitoring, and spray operations implementation. Main activities include trainings on specific subjects such as CDC bottle assay techniques for health officers from 24 high malaria risk districts in six regions; EC IRS standards; and spray pump care and maintenance to malaria control staff from the 36 districts. All activities will be completed by the end of the calendar year. A detailed description of the activities is provided in the Action Plan and can be shared upon request. More capacity-strengthening activities are described in Section 2.5. Support to 24 Graduated Districts.

In addition, the AIRS Ethiopia team led most of the technical sessions at the FMOH-organized training on IRS for 146 staff selected from districts of all regions in the country. The focus of the IRS sessions was on IRS. The project also provided partial financial support to the training.

The AIRS team provided training on entomology and vector control, with a focus on IRS to 242 staff selected from districts of all regions in the country. This was part of a month-long training on "Planning and Management of Malaria Control Programs" organized by FMOH in two rounds and supported by the Global Fund. The aim was to train health staff from the regional, zonal, and district levels on technical issues of malaria prevention and control as well as planning and management of the program at different levels of the health system. The project team prepared the modules on entomology and vector control and delivered them as part of the trainings for seven days each during both rounds. The project also provided the equipment for practical trainings on mosquito collection and identification, wall bioassays, and susceptibility tests.

11. Lessons Learned and Recommendations

1. Some operational sites were inaccessible at the beginning of the campaign due to heavy rains and bad roads. Some districts had to work from accessible operational sites until road conditions improved or they were forced to walk long distances.
2. Competing priorities of health offices delayed the start of spray operations in some districts, in particular in seven districts in West Wollega zone, where the start was delayed nine days. The project had a series of communications and meetings with the PMI mission, ORHB, and West Wollega zone health office on the issue. This effort emphasized how very important timing is in IRS. Despite the nine-day delay, the district health office and AIRS team made an effort to complete the operation on schedule. This final district completed its campaign in 35 calendar days as originally planned.
3. Network connectivity was intermittent in several districts, and this delayed some of the IRS campaign data reporting. In some cases, DECs drove to towns where connectivity was better to send reports. In other cases, the M&E team called DECs, who provided the district-level data by running the local report and verbally providing the figures to the M&E or Database Manager.
4. Collection and analysis of boot size data from the 2013 spray personnel and making use of the data to inform procurement significantly minimized size mismatches in 2014. TLs and district IRS coordinators reported very few complaints about boot size. To address even these few cases, the project encouraged the workers to buy their own boots that met IRS specifications.
5. Involvement of district health office and district technical staff in rehabilitation of soak pits proved to be a good practice to increase district ownership for the work among the officers.
6. Misunderstanding between the contracted car rental company managers and their car drivers deployed in the field created problems with drivers threatening to stop work in some districts. The problem was about the drivers asking for more money for fuel and the rental agencies trying to control fuel usage. Most of the cars lacked a functioning odometer, which would have made the control process easier. One district stopped operations for two days due to such a disagreement and the project charged to the car rental company the cost of all spray staff wages in the district for the two days.
7. Storage spaces at the health posts in the communities did not meet required size standards but due to lack of other available space, the project used them for storing IRS materials during the spray period. AIRS ensured that all community-based stores are safe and locked. AIRS Ethiopia will advocate for the construction of mini-stores at the village level for the CB IRS.

ANNEX A: 2014 IRS PROCUREMENT

TABLE A-1. PPE AND OTHER SUPPLIES PROCURED

Items	30 Districts (DB IRS)	6 Districts (CB IRS)	24 Graduated Districts	Non PMI Districts
International Procurement				
Spray pump	72	0	0	0
Spare part kit	36	30	0	0
Tip T-jet nozzle	2000	456	1578	0
Face shield	1100	0	350	2500
Helmet/Hard hat	0	124	0	2500
Gumboots / Pair	500	200	1594	0
N95 respirator /mask/each	40,000	16,000	47,850	75,000
Rubber Gloves /Pair	10,000	3024	6376	3,300
Strainers / each	3,000			
Nozzle / pair	72			
Bendiocarb (Ficam)	49,980 kg (4165 boxes) (499,800 sachets); Procured directly by PMI.			
Local Procurement				
Plastic sheet (2X3M)	100	50	0	100
Overalls	800	0	1594	800
Padlock	72	118	0	72
Funnel	200	400	0	200
Basin 40 Lit	72	118	0	72
Polyethylene sheet (2M X 3.5M)	0	36		0
Jug 2 Liter	200	118	0	200
Warning Sign / Store	5	0	0	5
Warning Sign/Soak	15	20	0	15
Chalk (Box of 50)	65	15	0	0
Female size boots	0	236	0	0
Soap toilet	38,300	17,700	0	0
Soap laundry	9,250	2,520		
Dustbin	30	6		
Flashlight	315			
Candle / box of 8	820			

Items	30 Districts (DB IRS)	6 Districts (CB IRS)	24 Graduated Districts	Non PMI Districts
Bucket 20 lit	0	354	0	0
Toolkit	85			
Apron	63	0	0	0
IRS card	28,000	5,000	0	0

ANNEX B: LENGTH OF SPRAY OPERATION

TABLE B-1. START AND END DATE OF 2014 SPRAY OPERATION BY DISTRICT

	District	Start of IRS Operation	End of IRS Operation	Total Operation Days
		DB IRS		
1	Limu	13/8/14	18/9/14	37
2	Dega	13/8/14	17/9/13	36
3	Gida Ayana	13/8/14	18/9/14	37
4	Guto Gida	14/8/14	18/9/14	36
5	Wayu Tuka	13/8/14	17/9/14	36
6	Gubu Sayo	13/8/14	18/9/14	37
7	Boneya Boshi	13/8/14	16/9/14	35
8	Wama Hagelo	13/8/14	18/9/14	37
9	Nonno	13/8/14	16/9/14	35
10	Dendi	13/8/14	16/9/14	35
11	Danno	14/8/14	24/9/14	42
12	Ilu Galan	13/8/14	17/9/14	36
13	Begi	22/8/14	25/9/ 14	35
14	Kondala	22/8/14	25/9/ 14	35
15	Babo Ganbel	22/8/14	24/9/ 14	34
16	Kiltu Kara	22/8/14	24/9/14	34
17	Nejo	22/8/14	24/9/14	34
18	Bedele	13/8/114	17/9/14	36
19	Didesa	13/8/14	19/9/14	38
20	Borecha	13/8/14	17/9/14	36
21	Sokoru	13/8/14	17/9/14	36
22	Seka	13/8/14	17/9/14	36
23	Shebe	13/8/14	17/9/14	36
24	Omo Nada	13/8/14	16/9/14	35
25	Tiro Afeta	13/8/14	16/9/14	35

	District	Start of IRS Operation	End of IRS Operation	Total Operation Days
26	Guliso	23/8/14	23/9/14	33
27	Seyo	13/8/14	18/9/14	37
28	Dale Webera	13/8/14	16/9/14	35
29	Dale Sadi	14/8/14	19/9/14	37
30	Lalo Kile	13/8/14	19/9/14	38
		CB IRS		
31	Sasiga	13/8/14	23/9/14	40
32	Bako Tibe	13/8/14	20/9/14	33
33	Kersa	13/8/14	17/9/14	36
34	Chewaka	16/8/14	20/9/14	35
35	Hawa Gelan	13/8/14	18/9/14	37
36	Mana Sibu	22/8/14	22/9/14	34

ANNEX C: INSPECTION REPORTS AND SUPERVISION RESULTS

2014 MID- AND POST-SPRAY INSPECTION REPORTS

INTRODUCTION

The Africa Indoor Residual Spraying (AIRS) Ethiopia project conducted 2014 spray operations from August 13 to September 25 in 36 PMI-supported districts. The average number of operational days was 30.5. The project used two models of IRS campaign to deliver the service to the 36 project districts: district-based IRS (DB IRS) and community-based IRS (CB IRS) delivered through the national health extension program.

The entire AIRS Ethiopia technical team, including Spray Operations Coordinator, Operations Manager, Technical Manager, M&E Manager, and Database Manager, was involved in environmental compliance inspections. The team members divided six zones and 36 project districts among themselves to conduct supervision and pre-, mid-, and post-spray inspection of the spray campaign to all districts.

During the supervision and environmental inspection visits, the team used AIRS project-wide checklists to observe soak pits, bathrooms, insecticide storage conditions, community involvement, house preparation, IEC, and performance of SOPs.

During the 2014 spray round inspections, District Malaria Focal Persons and Zonal Malaria Focal Persons were actively involved as supervisors on behalf of district health offices. At the end of each inspection, district health teams supervising IRS held a general discussion on the status, achievements, shortcomings, and constraints and then forwarded the recommendations to district offices for corrective actions to be taken.

OBJECTIVES OF INSPECTIONS

The objective of conducting mid- and post-spray environmental compliance activities during the 2014 IRS operation in Ethiopia was to:

- Ascertain the level to which the Ethiopian IRS operation is compliant with USAID's Pesticide Procedures specified in Federal Regulations 22CFR216, the Ethiopia IRS PERSUAP/SEA, and the IRS guidelines;
- Work with the district, zonal, and regional health offices and Federal Ministry of Health to observe progress of IRS activities, and determine and document whether the recommendations and procedures established during the previous inspections are being followed;
- Assess the logistics systems to ensure that adequate supplies exist and that processes to prevent pilferage ("leakage")/misuse of insecticides outside of AIRS spray campaign are in place;
- Ensure that the safe use of the insecticide including handling of the chemicals, safe distribution, and other safety procedures are maintained;

- Evaluate stock and inventory management system in the district stores; and
- Observe SOPs' compliance with best IRS management practices in project spray sites.

GENERAL OBSERVATION

Overall in DB IRS, the 61 soak pit sites with cement wash areas and standard fences, most of which are enclosed by chicken-wire fencing, were refurbished before the spray. In six CB IRS districts, the team prepared 107 small, community-sized soak pits and replenished 13 larger soak pits that the project used before one in each sprayed village. All project-supported districts have proper stores in which to keep insecticides and other IRS materials. Insecticide-contaminated wastes such as empty sachets, used masks, torn gloves, and contaminated boxes have been collected and are being stored in the same stores. All empty sachets and used masks have been collected and placed in the central store near Addis Ababa, and incineration has started.

MID-INSPECTION OBSERVATIONS

Most districts properly followed procedures established for tracking the insecticide usage. The storekeepers have numbered all sachets and distributed them to each spray team by serial number.

All districts had good and working soak pits in all the sites including the temporary soak pits in CB IRS districts.

All district stores had appropriate shelves and racks on which the stock is neatly stored and easy to manage.

The insecticide and other IRS materials were properly kept in separate rooms to prevent insecticide contamination.

The majority of home owners removed their belongings including food items from the houses before spraying. One challenge in this regard was rain; when it was too wet outside to keep the household items there, tenants moved them to the center of the largest room.

The AIRS team provided all districts with plastic sheets to cover household items that were kept inside during spraying.

AREAS FOR IMPROVEMENT

WOMEN'S PARTICIPATION

Women's participation increased from 11.6 percent of total spray actors in 2013 to 16.9 percent in 2014. The project increased the number of female porters and squad leaders.

Recommendations

- The project needs to do more sensitization and improve the working conditions of women to increase their participation.

TENTS FOR CAMPING

In many DB IRS districts, some spray team members have to look for a place to sleep in the nearest towns rather than sleeping in the tents during spraying, because most tents available in the districts for IRS are damaged and leak water when it rains.

Recommendations

- The project needs to inventory all tents, identify needs, and procure the required tents for the 2015 spray campaign.
- After the 2014 spray campaign ended in October, the team conducted inventory and assessment of the tents in the 36 districts. The team counted a total of 360 tents and confirmed that 100 tents were severely damaged and need to be replaced.

INSECTICIDE TRACKING

Insecticide tracking and management was in order in all of the visited districts except one (Dano). No recorded dispatch of insecticide to the Dano team leaders could be found by the AIRS team when it compared the physical count with the inventory records. This was because the storekeeper had a family issue that required him to be off duty for a few days while his assistant managed the stock – a violation of the project storekeeper's code of conduct, which does not allow anyone but the storekeeper to manage the inventory records. The IRS district team reconciled the quantities in the stock count and the recording books after confirming the quantities with the team leaders who received the insecticide. The IRS district coordinator and AIRS zone supervisor issued a warning to the storekeeper on the performance and insecticide management compliance.

Recommendations

- Insecticide tracking sheets need to be completed daily;
- AIRS supervisors need to visit stores several times during the spray campaign to make sure storekeepers comply with best practice in insecticide management.

POST-SPRAY ACTIVITIES AND INSPECTIONS

All contaminated IRS wastes (empty sachets, used masks) from most districts were collected and returned to the central warehouses.

All PPE including coveralls were properly washed and stored in the district stores.

Spray pumps and remaining spare parts were correctly handled and stored.

AIRS team completed stock inventory in all districts.

Remaining insecticide from the spray round inventory was completed and stored safely in the district stores.

Polyethylene used as ground cover on soak pit sites was correctly washed and stored in district stores.

Plastic sheets were properly collected from SOPs, washed and stored properly.

Recommendations

- District stores should be regularly cleaned and maintained in off-spray season.
- Temperature recording should be continued for the chemical safety of insecticide.

CONCLUSION

There is tremendous improvement in the quality of spray operations and IRS infrastructure achieved in 2014. During the inspections, the AIRS team observed many best practices applied properly and regularly during the spray operations. The districts have embraced the IRS best practices and mostly performed very well during 2014 spray season.

TABLE C-1. SUMMARY OF SPRAY OPERATOR MORNING MOBILIZATION INSPECTIONS

Operation Sites	Spray operators eaten breakfast and had water prior to donning PPE?	Is helmet missing?	Is Visor/ Face Shield missing?	Is overall missing?	Are boots missing?	Is mask missing?	Are gloves missing?	Any spray operators eating or drinking after donning PPE?	Team Leaders inspection of SOs?	Spray pumps filled using contents of drums 1, 3, and 5 and 7 from the previous day's progressive rinse?	Barrels 1, 3, 5 and 7 empty when SOs depart for the field?
Gida_Ayana	Yes	No	No	No	No	No	No	No	No	Yes	No
Nejo	Yes	No	No	No	No	No	No	No	Yes	Yes	Yes
Borecha	Yes	No	No	No	No	No	No	No	Yes	Yes	Yes
Dedesa	Yes	No	No	No	No	No	No	No	Yes	Yes	Yes
Gida_Ayana	Yes	No	No	No	No	No	No	No	Yes	Yes	Yes
Wayu_Tuka	Yes	No	No	No	No	No	No	No	Yes	Yes	Yes
Diga	Yes	No	No	No	No	No	No	No	Yes	Yes	Yes
Sayo	No	No	No	No	No	No	No	No	No	Yes	Yes
Sayo	Yes	No	No	No	No	No	No	No	Yes	Yes	Yes
Dale_Sadi	Yes	No	No	No	No	No	No	No	Yes	Yes	Yes
Diga	Yes	No	No	No	No	No	No	No	Yes	Yes	Yes
Gobu_Sayo	Yes	No	No	No	No	No	No	No	Yes	Yes	Yes
Kiltu_Kara	Yes	No	No	No	No	No	No	No	Yes	Yes	Yes
Bako_Tibe	Yes	No	No	No	No	No	No	No	Yes	Yes	Yes
Bako_Tibe	Yes	No	No	No	No	No	No	No	Yes	Yes	Yes
Dendi	Yes	No	No	No	No	No	No	No	Yes	Yes	Yes
Dano	Yes	No	No	No	No	No	No	No	Yes	Yes	Yes
Illu_Gelan	Yes	No	No	No	No	No	No	No	Yes	Yes	Yes
Bako_Tibe	Yes	No	No	No	No	No	No	No	Yes	Yes	Yes
Bako_Tibe	Yes	No	No	No	No	No	No	No	Yes	Yes	Yes
Gobu_Sayo	Yes	No	No	No	No	No	No	No	Yes	Yes	Yes
Bako_Tibe	No	No	No	No	No	No	No	No	Yes	Yes	Yes
Bako_Tibe	Yes	No	No	No	No	No	No	No	Yes	Yes	Yes
Dano	Yes	No	No	No	No	No	No	No	Yes	Yes	Yes
Sokoru	Yes	No	No	No	No	No	No	No	Yes	Yes	Yes
Seka_Chekorsa	Yes	No	No	No	No	No	No	No	Yes	Yes	Yes
Guto_Gida	Yes	No	No	No	No	No	No	No	Yes	Yes	Yes
Gida_Ayana	Yes	No	No	No	No	No	No	No	Yes	Yes	Yes
Illu_Gelan	Yes	No	No	No	No	No	No	No	Yes	Yes	Yes
Bako_Tibe	Yes	No	No	No	No	No	No	No	Yes	Yes	Yes
Sayo	Yes	No	No	No	No	No	No	No	Yes	Yes	Yes
Guliso	Yes	No	No	No	No	No	No	No	Yes	Yes	Yes
Nejo	Yes	No	No	No	No	No	No	No	Yes	Yes	Yes
Begi	Yes	No	No	No	No	No	No	No	Yes	Yes	Yes

TABLE C-2. HOME OWNER PREPARATION SUPERVISION RESULTS

Operation Sites	Date of Inspection	Resident informed in advance about spray event?	All personal belongings, food items, animals/sick persons removed from the structure?	All items that cannot be removed properly covered?	Any rooms used as food stores?	Was food removed before spraying?	Were the eaves of the house sprayed?	Were items stored on porches, roofs and exterior of the walls removed?	Animals kept outside and for 2.5 hrs. afterwards?	Mixing of insecticide witnessed by the household?	Any reported accidents or complaints of pesticide exposure from residents?
Omo_Nada	8/12/2014	Yes	Yes	Yes	No		Yes	Yes	Yes	Yes	No
Tiro_Afeta	8/14/2014	Yes	Yes	Yes	No		Yes	Yes	Yes	Yes	No
Kersa	8/15/2014	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No
Seka_Chekorsa	8/16/2014	Yes	Yes	Yes	No		Yes	Yes	Yes	Yes	No
Diga	8/14/2014	Yes	Yes	Yes	No		Yes	Yes	Yes	Yes	No
Sasisga	8/15/2014	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No
Hawa_Gelan	8/17/2014	Yes	Yes	Yes	Yes	Yes	No		Yes	Yes	No
Menesibu	8/21/2014	Yes	Yes	Yes	No		Yes	Yes	Yes	Yes	No
Sokoru	8/23/2014	Yes	Yes	Yes	No		Yes	Yes	Yes	Yes	No
Bedele	8/19/2014	Yes	Yes	Yes	No		Yes	Yes	Yes	Yes	No
Borecha	8/20/2014	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No
Dedesa	8/21/2014	Yes	Yes	Yes	No		Yes	Yes	Yes	Yes	No
Kersa	8/22/2014	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No
Kersa	8/24/2014	Yes	Yes	Yes	No		Yes	Yes	Yes	Yes	No
Shebe_Sombo	8/22/2014	Yes	Yes	Yes	No		No		Yes	Yes	No
Tiro_Afeta	8/23/2014	Yes	Yes	Yes	No		No		Yes	Yes	No
Gobu_Sayo	8/18/2014	Yes	Yes	Yes	No		Yes	Yes	Yes	Yes	No
Gida_Ayana	8/23/2014	Yes	Yes	Yes	No		Yes	Yes	Yes	Yes	No
Guto_Gida	8/21/2014	Yes	Yes	Yes	No		Yes	Yes	Yes	Yes	No
Limu	8/22/2014	Yes	Yes	Yes	No		Yes	Yes	Yes	Yes	No
Sasisga	8/20/2014	Yes	Yes	Yes	No		Yes	Yes	Yes	Yes	No
Sasisga	8/20/2014	Yes	Yes	Yes	No		Yes	Yes	Yes	Yes	No
Sasisga	8/20/2014	Yes	Yes	Yes	No		Yes	Yes	Yes	Yes	No

Operation Sites	Date of Inspection	Resident informed in advance about spray event?	All personal belongings, food items, animals/sick persons removed from the structure?	All items that cannot be removed properly covered?	Any rooms used as food stores?	Was food removed before spraying?	Were the eaves of the house sprayed?	Were items stored on porches, roofs and exterior of the walls removed?	Animals kept outside and for 2.5 hrs. afterwards?	Mixing of insecticide witnessed by the household?	Any reported accidents or complaints of pesticide exposure from residents?
Shebe_Sombo	8/28/2014	Yes	Yes	Yes	No		Yes	Yes	Yes	Yes	No
Kersa	8/29/2014	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No
Sayo	8/21/2014	Yes	Yes	Yes	No		Yes	Yes	Yes	Yes	No
Hawa_Gelan	8/17/2014	Yes	Yes	Yes	No		No		Yes	Yes	No
Chewaka	8/16/2014	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No
Sasisga	9/3/2014	Yes	Yes	Yes	No		Yes	Yes	Yes	Yes	No
Wama_Agalo	8/29/2014	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No
Gobu_Sayo	8/28/2014	Yes	Yes	Yes	No		Yes	Yes	Yes	Yes	No
Wama_Agalo	8/29/2014	Yes	Yes	Yes	No		Yes	Yes	Yes	Yes	No
Gobu_Sayo	8/28/2014	Yes	Yes	Yes	No		Yes	Yes	Yes	Yes	No
Diga	9/4/2014	Yes	Yes	Yes	No		Yes	Yes	Yes	Yes	No
Menesibu	8/28/2014	Yes	Yes	Yes	No		Yes	Yes	Yes	Yes	No
Menesibu	8/31/2014	Yes	Yes	Yes	No		Yes	Yes	Yes	Yes	No
Bedele	9/2/2014	Yes	Yes	Yes	No		Yes	Yes	Yes	Yes	No
Kersa	9/5/2014	Yes	Yes	Yes	No		Yes	Yes	Yes	Yes	No
Bako_Tibe	8/12/2014	Yes	Yes	Yes	No		Yes	Yes	Yes	Yes	No
Bako_Tibe	8/13/2014	Yes	Yes	Yes	No		Yes	Yes	Yes	Yes	No
Bako_Tibe	8/12/2014	Yes	Yes	Yes	No		No		Yes	Yes	No
Bako_Tibe	8/14/2014	Yes	Yes	Yes	No		Yes	Yes	Yes	Yes	No
Bako_Tibe	8/14/2014	Yes	Yes	Yes	No		Yes	Yes	Yes	Yes	No
Bako_Tibe	8/14/2014	Yes	Yes	Yes	No		Yes	Yes	Yes	Yes	No
Bako_Tibe	8/15/2014	Yes	Yes	Yes	No		Yes	Yes	Yes	Yes	No
Dendi	8/21/2014	Yes	Yes	Yes	No		Yes	Yes	Yes	Yes	No
Bako_Tibe	8/22/2014	Yes	Yes	Yes	No		Yes	Yes	Yes	Yes	No

Operation Sites	Date of Inspection	Resident informed in advance about spray event?	All personal belongings, food items, animals/sick persons removed from the structure?	All items that cannot be removed properly covered?	Any rooms used as food stores?	Was food removed before spraying?	Were the eaves of the house sprayed?	Were items stored on porches, roofs and exterior of the walls removed?	Animals kept outside and for 2.5 hrs. afterwards?	Mixing of insecticide witnessed by the household?	Any reported accidents or complaints of pesticide exposure from residents?
Dano	8/23/2014	Yes	Yes	Yes	No		Yes	Yes	Yes	Yes	No
Nono	8/23/2014	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No
Bako_Tibe	8/25/2014	Yes	Yes	Yes	No		Yes	Yes	Yes	Yes	No
Bako_Tibe	8/26/2014	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No
Dendi	8/28/2014	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No
Bako_Tibe	8/29/2014	Yes	Yes	Yes	No		Yes	Yes	Yes	Yes	No
Bako_Tibe	8/31/2014	Yes	Yes	Yes	No		Yes	Yes	Yes	Yes	No
Nono	9/1/2014	Yes	Yes	Yes	No		Yes	Yes	Yes	Yes	No
Illu_Gelan	8/28/2014	Yes	Yes	Yes	No		Yes	Yes	Yes	Yes	No
Hawa_Gelan	9/3/2014	Yes	Yes	Yes	No		No		Yes	Yes	No
Dale_Wabera	9/7/2014	Yes	Yes	Yes	No		Yes	Yes	Yes	Yes	No
Shebe_Sombo	9/14/2014	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No
Bako_Tibe	9/14/2014	Yes	Yes	Yes	No		Yes	Yes	Yes	Yes	No
Bako_Tibe	9/15/2014	Yes	Yes	Yes	No		Yes	Yes	Yes	Yes	No
Hawa_Gelan	9/15/2014	Yes	Yes	Yes	No		Yes	Yes	Yes	Yes	No
Dale_Wabera	9/15/2014	Yes	Yes	Yes	No		Yes	Yes	Yes	Yes	No
Hawa_Gelan	9/15/2014	Yes	Yes	Yes	No		Yes	Yes	Yes	Yes	No
Begi	9/20/2014	Yes	Yes	Yes	No		Yes	Yes	Yes	Yes	No
Chewaka	8/26/2014	Yes	Yes	Yes	No		Yes	Yes	Yes	Yes	No

TABLE C-3. SUMMARY OF SPRAY OPERATOR PERFORMANCE SUPERVISION RESULTS

Operation Sites	Date of Inspection	Residents instructed about time of entrance to the house?	Have residents been informed on safety related to IRS?	If there are people who cannot be moved, is the HH being sprayed?	Residents informed of the waste disposal system?	Residents been informed on the care of the sprayed wall?	SOPs in full PPE?	Is the tank shaken to mix the contents before pressurizing?	Is the spray pump pressurized up to the recommended limit?	Are there any leaks from the pump?	Does the operator service the pump before proceeding?	SOPs spraying with the tip of the nozzle 45 cm away from the wall?	Is there a 5 cm overlap with each successive swath?	SOs spraying all the recommended surfaces?	SOPs spray non eligible structures?	Any of the SOs observed smoking, drinking or eating during the day?
Omo_Nada	8/12/2014	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	No		Yes	Yes	Yes	No	No
Tiro_Afeta	8/14/2014	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	No		Yes	Yes	Yes	No	No
Kersa	8/15/2014	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	No
Seka_Chekorsa	8/16/2014	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	No		Yes	Yes	Yes	No	No
Diga	8/14/2014	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	No
Sasisga	8/15/2014	Yes	Yes	No	Yes	No	Yes	Yes	Yes	No		Yes	Yes	Yes	No	No
Hawa_Gelan	8/17/2014	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	No		Yes	Yes	Yes	No	No
Menesibu	8/21/2014	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	No		Yes	Yes	Yes	No	No
Sokoru	8/23/2014	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	No		Yes	Yes	Yes	No	No
Bedele	8/19/2014	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	No		Yes	Yes	Yes	No	No
Borecha	8/20/2014	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	No		Yes	Yes	Yes	No	No
Dedesa	8/21/2014	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	No		Yes	Yes	Yes	No	No
Kersa	8/22/2014	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	No		Yes	Yes	Yes	No	No
Kersa	8/24/2014	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	No		Yes	Yes	Yes	No	No
Shebe_Sombo	8/22/2014	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	No		Yes	Yes	Yes	No	No
Tiro_Afeta	8/23/2014	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	No		Yes	Yes	Yes	No	No
Gobu_Sayo	8/18/2014	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	No		Yes	Yes	Yes	No	No
Gida_Ayana	8/23/2014	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	No		Yes	Yes	Yes	No	No
Guto_Gida	8/21/2014	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	No

Operation Sites	Date of Inspection	Residents instructed about time of entrance to the house?	Have residents been informed on safety related to IRS?	If there are people who cannot be moved, is the HH being sprayed?	Residents informed of the waste disposal system?	Residents been informed on the care of the sprayed wall?	SOPs in full PPE?	Is the tank shaken to mix the contents before pressurizing?	Is the spray pump pressurized up to the recommended limit?	Are there any leaks from the pump?	Does the operator service the pump before proceeding?	SOPs spraying with the tip of the nozzle 45 cm away from the wall?	Is there a 5 cm overlap with each successive swath?	SOs spraying all the recommended surfaces?	SOPs spray non eligible structures?	Any of the SOs observed smoking, drinking or eating during the day?
Limu	8/22/2014	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	No		Yes	Yes	Yes	No	No
Sasisga	8/20/2014	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	No		Yes	Yes	Yes	No	No
Sasisga	8/20/2014	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	No		Yes	Yes	Yes	No	No
Sasisga	8/20/2014	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	No		Yes	Yes	Yes	No	No
Shebe_Sombo	8/28/2014	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	No		Yes	Yes	Yes	No	No
Kersa	8/29/2014	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	No		Yes	Yes	Yes	No	No
Sayo	8/21/2014	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	No		Yes	Yes	Yes	No	No
Hawa_Gelan	8/17/2014	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	No		Yes	Yes	Yes	No	No
Chewaka	8/16/2014	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	No		Yes	Yes	Yes	No	No
Sasisga	9/3/2014	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	No		Yes	Yes	Yes	No	No
Wama_Agalo	8/29/2014	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	No		Yes	Yes	Yes	No	No
Gobu_Sayo	8/28/2014	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	No		Yes	Yes	Yes	No	No
Wama_Agalo	8/29/2014	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	No		Yes	Yes	Yes	No	No
Gobu_Sayo	8/28/2014	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	No		Yes	Yes	Yes	No	No
Diga	9/4/2014	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	No		Yes	Yes	Yes	No	No
Menesibu	8/28/2014	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	No		Yes	Yes	Yes	No	No
Menesibu	8/31/2014	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	No		Yes	Yes	Yes	No	No
Bedele	9/2/2014	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	No		Yes	Yes	Yes	No	No
Kersa	9/5/2014	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	No		Yes	Yes	Yes	No	No
Bako_Tibe	8/12/2014	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	No		Yes	Yes	Yes	No	No
Bako_Tibe	8/13/2014	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	No		Yes	Yes	Yes	No	No

Operation Sites	Date of Inspection	Residents instructed about time of entrance to the house?	Have residents been informed on safety related to IRS?	If there are people who cannot be moved, is the HH being sprayed?	Residents informed of the waste disposal system?	Residents been informed on the care of the sprayed wall?	SOPs in full PPE?	Is the tank shaken to mix the contents before pressurizing?	Is the spray pump pressurized up to the recommended limit?	Are there any leaks from the pump?	Does the operator service the pump before proceeding?	SOPs spraying with the tip of the nozzle 45 cm away from the wall?	Is there a 5 cm overlap with each successive swath?	SOs spraying all the recommended surfaces?	SOPs spray non eligible structures?	Any of the SOs observed smoking, drinking or eating during the day?
Bako_Tibe	8/12/2014	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	No		Yes	Yes	Yes	No	No
Bako_Tibe	8/14/2014	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	No		Yes	Yes	Yes	No	No
Bako_Tibe	8/14/2014	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	No		Yes	Yes	Yes	No	No
Bako_Tibe	8/14/2014	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	No		Yes	Yes	Yes	No	No
Bako_Tibe	8/15/2014	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	No		Yes	Yes	Yes	No	No
Dendi	8/21/2014	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	No		Yes	Yes	Yes	No	No
Bako_Tibe	8/22/2014	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	No		Yes	Yes	Yes	No	No
Dano	8/23/2014	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	No		Yes	Yes	Yes	No	No
Nono	8/23/2014	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	No		Yes	Yes	Yes	Yes	No
Bako_Tibe	8/25/2014	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	No		Yes	Yes	Yes	No	No
Bako_Tibe	8/26/2014	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	No		Yes	Yes	Yes	No	No
Dendi	8/28/2014	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	No		Yes	Yes	Yes	No	No
Bako_Tibe	8/29/2014	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	No		Yes	Yes	Yes	No	No
Bako_Tibe	8/31/2014	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	No		Yes	Yes	Yes	No	No
Nono	9/1/2014	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	No		Yes	Yes	Yes	No	No
Illu_Gelan	8/28/2014	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	No		Yes	Yes	Yes	No	No
Hawa_Gelan	9/3/2014	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	No		Yes	Yes	Yes	No	No
Dale_Wabera	9/7/2014	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	No		Yes	Yes	Yes	No	No
Shebe_Sombo	9/14/2014	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	No		Yes	Yes	Yes	No	No
Bako_Tibe	9/14/2014	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	No		Yes	Yes	Yes	No	No
Bako_Tibe	9/15/2014	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	No		Yes	Yes	Yes	No	No

Operation Sites	Date of Inspection	Residents instructed about time of entrance to the house?	Have residents been informed on safety related to IRS?	If there are people who cannot be moved, is the HH being sprayed?	Residents informed of the waste disposal system?	Residents been informed on the care of the sprayed wall?	SOPs in full PPE?	Is the tank shaken to mix the contents before pressurizing?	Is the spray pump pressurized up to the recommended limit?	Are there any leaks from the pump?	Does the operator service the pump before proceeding?	SOPs spraying with the tip of the nozzle 45 cm away from the wall?	Is there a 5 cm overlap with each successive swath?	SOs spraying all the recommended surfaces?	SOPs spray non eligible structures?	Any of the SOs observed smoking, drinking or eating during the day?
Hawa_Gelan	9/15/2014	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	No		Yes	Yes	Yes	No	No
Dale_Wabera	9/15/2014	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	No		Yes	Yes	Yes	No	No
Hawa_Gelan	9/15/2014	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	No		Yes	Yes	Yes	No	No
Begi	9/20/2014	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	No		Yes	Yes	Yes	No	No
Chewaka	8/26/2014	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	No		Yes	Yes	Yes	No	No

TABLE C-4. SUMMARY OF END-OF-DAY CLEANUP SUPERVISION RESULTS

Site of Inspection	Date of Inspection	PPE worn on the way back from operation site?	Have there been any accidents?	Have any SOs complained of irritation (throat, skin, etc.)?	Team Leaders supervising the cleaning and wash-up?	Workers wash their face and hands with soap?	Washing area sloped enough for drainage?	Are all SOPs in the soak pit area wearing full PPE?	Any eating or drinking before removing PPE and washing?	All pesticide remaining in pumps emptied into the #1 drum?	Do the #2, 4 and 6 drums have sufficient water for today's cleanup?	Is the soak pit absorbing all the effluent waste?	Are spray pumps hung upside down to dry?	Barrels closed and Washed spray pumps ready for next day?	Additional Comments
Tiro_Afeta	8/14/2014	yes	no	no	yes	yes	yes	yes	no	yes	yes	yes	yes	yes	well organized
Kersa	8/15/2014	yes	no	no	yes	yes	yes	yes	no	yes	yes	yes	yes	yes	do it always
Guto_Gida	8/13/2014	yes	no	no	yes	yes	yes	yes	no	yes	no	yes	yes	yes	It is ok
Wayu_Tuka	8/14/2014	yes	no	no	yes	yes	yes	yes	no	yes	yes	yes	yes	yes	It is good
Gida_Ayana	8/16/2014	no	no	no	yes	yes	yes	yes	no	yes	yes	yes	yes	yes	
Bako_Tibe	8/15/2014	yes	no	no	yes	yes	yes	yes	no	yes	yes	yes	yes	yes	
Gobu_Sayo	8/15/2014	yes	no	no	yes	yes	yes	yes	no	yes	yes	yes	yes	yes	
Menesibu	8/21/2014	yes	no	no	yes	yes	yes	yes	no	yes	yes	yes	yes	yes	Quite good
Dedesa	8/21/2014	yes	no	no	yes	yes	yes	yes	no	yes	yes	yes	yes	yes	promptly do procedure
Kersa	8/22/2014	yes	no	no	yes	yes	yes	yes	no	yes	yes	yes	yes	yes	clean pump with towel
Gida_Ayana	8/21/2014	yes	no	no	yes	yes	yes	yes	no	yes	yes	yes	yes	yes	
Wayu_Tuka	8/17/2014	yes	no	no	yes	yes	yes	yes	no	yes	yes	yes	yes	yes	
Omo_Nada	8/27/2014	yes	no	no	yes	yes	yes	yes	no	yes	yes	yes	yes	yes	no
Dale_Wabera	8/22/2014	yes	no	no	yes	yes	yes	yes	no	yes	yes	yes	yes	yes	Good. Data is by squad
Dale_Sadi	8/22/2014	yes	no	no	yes	yes	yes	yes	no	yes	yes	yes	yes	yes	Good. Data is by squad
Sayo	8/21/2014	yes	no	no	yes	yes	yes	yes	no	yes	yes	yes	yes	yes	Data by squad
Dale_Sadi	8/22/2014	yes	no	no	yes	yes	yes	yes	no	yes	yes	yes	yes	yes	Data is by squad
Dale_Wabera	8/13/2014	yes	no	no	yes	yes	yes	yes	no	yes	yes	yes	yes	yes	Good

Site of Inspection	Date of Inspection	PPE worn on the way back from operation site?	Have there been any accidents?	Have any SOs complained of irritation (throat, skin, etc.)?	Team Leaders supervising the cleaning and wash-up?	Workers wash their face and hands with soap?	Washing area sloped enough for drainage?	Are all SOPs in the soak pit area wearing full PPE?	Any eating or drinking before removing PPE and washing?	All pesticide remaining in pumps emptied into the #1 drum?	Do the #2, 4 and 6 drums have sufficient water for today's cleanup?	Is the soak pit absorbing all the effluent waste?	Are spray pumps hung upside down to dry?	Barrels closed and Washed spray pumps ready for next day?	Additional Comments
Sayo	8/17/2014	yes	no	no	yes	yes	yes	yes	no	yes	yes	yes	yes	yes	Data is filled by squad.
Gobu_Sayo	8/28/2014	yes	no	no	yes	yes	yes	yes	no	yes	yes	yes	yes	yes	
Diga	9/4/2014	yes	no	no	yes	yes	yes	yes	no	yes	yes	yes	yes	yes	
Menesibu	8/28/2014	yes	no	no	yes	yes	yes	yes	no	yes	yes	yes	yes	yes	Good
Menesibu	8/31/2014	yes	no	no	yes	yes	yes	yes	no	yes	yes	yes	yes	yes	Good
Nejo	9/1/2014	yes	no	no	yes	yes	yes	yes	no	yes	yes	yes	yes	yes	Very good
Omo_Nada	8/30/2014	yes	no	no	yes	yes	yes	yes	no	yes	yes	yes	yes	yes	
Kersa	8/30/2014	yes	no	no	yes	yes	yes	yes	no	yes	yes	yes	yes	yes	
Dendi	8/21/2014	yes	no	no	yes	yes	yes	yes	no	yes	yes	yes	yes	yes	
Illu_Gelan	8/22/2014	yes	no	no	yes	yes	yes	yes	no	yes	yes	yes	yes	yes	
Bako_Tibe	8/22/2014	yes	no	no	yes	yes	yes	yes	no	yes	yes	yes	yes	yes	
Bako_Tibe	8/22/2014	yes	no	no	yes	yes	yes	yes	no	yes	yes	yes	yes	yes	
Bako_Tibe	8/22/2014	yes	no	no	yes	yes	yes	yes	no	yes	yes	yes	yes	yes	
Bako_Tibe	8/22/2014	yes	no	no	yes	yes	yes	yes	no	yes	yes	yes	yes	yes	
Nono	8/23/2014	yes	no	yes	yes	yes	yes	yes	no	yes	yes	yes	yes	yes	
Bako_Tibe	8/24/2014	yes	no	no	yes	yes	yes	yes	no	yes	yes	yes	yes	yes	
Bako_Tibe	8/25/2014	yes	no	no	yes	yes	yes	yes	no	yes	yes	yes	yes	yes	
Bako_Tibe	8/25/2014	yes	no	no	yes	yes	yes	yes	no	yes	yes	yes	yes	yes	
Illu_Gelan	8/28/2014	yes	no	yes	yes	yes	yes	yes	no	yes	yes	yes	yes	yes	
Dano	9/1/2014	yes	no	no	yes	yes	yes	yes	no	no	yes	yes	yes	yes	
Illu_Gelan	9/12/2014	yes	no	no	yes	yes	yes	yes	no	yes	yes	yes	yes	yes	
Kondala	9/19/2014	yes	no	no	yes	yes	yes	yes	no	yes	yes	yes	yes	yes	Good

TABLE C-5. SUMMARY OF STOREKEEPER PERFORMANCE SUPERVISION RESULTS

Operation Sites	Date of Inspection	Do people entering the pesticide storage area wear masks?	Do people wear masks, gloves, boots and overalls when handling pesticides?	Do warehouse teams eat inside the warehouse?	Are there soap and water basins available for washing hands?	Is the current pesticide Material Safety Data Sheet (MSDS) posted?	Are storekeepers familiar with the symptoms of pesticide poisoning?	Do storekeepers know where the nearest health facility is located?	Antidotes for the pesticide in use provided to the health facility?	Are there records of pregnancy testing available?	Thermometer for monitoring temperature in the storage facility?	Is there any evidence of pesticide leakage?	Pesticide stored no more than 2 m high and off of the ground?	Insecticide & contaminated waste stored away from other materials?	Number of sachets/bottles counted and recorded before distribution to SO?	Is there a system of recording stock cards?	Are the stock cards up to date?	Waste (especially, used packaging and dust masks) recorded?	Is there an adequate filing system?	Using the stock cards, can the storekeeper indicate the quantity and age of remaining stock?
Babo_Gambela	9/20/2014	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Bako_Tibe	8/22/2014	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Bedele	9/16/2014	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Begi	8/25/2014	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Boneya_Boshe	9/3/2014	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Borecha	8/20/2014	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	No	Yes	Yes	No	Yes	Yes
Chewaka	8/16/2014	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Dale_Sadi	8/17/2014	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Dale_Wabera	8/26/2014	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Dano	9/1/2014	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Dedesa	9/16/2014	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Dendi	8/28/2014	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Diga	9/4/2014	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Gida_Ayana	9/4/2014	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Gobu_Sayo	9/2/2014	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Guliso	9/16/2014	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Guto_Gida	9/1/2014	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Operation Sites	Date of Inspection	Do people entering the pesticide storage area wear masks?	Do people wear masks, gloves, boots and overalls when handling pesticides?	Do warehouse teams eat inside the warehouse?	Are there soap and water basins available for washing hands?	Is the current pesticide Material Safety Data Sheet (MSDS) posted?	Are storekeepers familiar with the symptoms of pesticide poisoning?	Do storekeepers know where the nearest health facility is located?	Antidotes for the pesticide in use provided to the health facility?	Are there records of pregnancy testing available?	Thermometer for monitoring temperature in the storage facility?	Is there any evidence of pesticide leakage?	Pesticide stored no more than 2 m high and off of the ground?	Insecticide & contaminated waste stored away from other materials?	Number of sachets/bottles counted and recorded before distribution to SO?	Is there a system of recording stock cards?	Are the stock cards up to date?	Waste (especially, used packaging and dust masks) recorded?	Is there an adequate filing system?	Using the stock cards, can the storekeeper indicate the quantity and age of remaining stock?
Hawa_Gelan	9/3/2014	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Illu_Gelan	8/28/2014	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Kersa	8/24/2014	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Kiltu_Kara	9/17/2014	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Kondala	9/19/2014	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Lalo_Kilie	9/15/2014	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Limu	9/6/2014	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Menesibu	8/22/2014	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Nejo	9/17/2014	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Nono	9/1/2014	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Omo_Nada	8/23/2014	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Sasisga	8/20/2014	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Sayo	9/14/2014	No	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Seka_Chekorsa	9/14/2014	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Shebe_Sombo	9/14/2014	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Sokoru	9/12/2014	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Tiro_Afeta	8/23/2014	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Wama_Agalo	8/29/2014	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Wayu_Tuka	9/12/2014	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

TABLE C-6. SUMMARY OF POST-SPRAY ENVIRONMENTAL COMPLIANCE INSPECTIONS

Operation Sites	Is this a temporary store?	Is there a full-time year-round storekeeper?	Will pesticides be stored here in the off-season?	How much pesticide will be stored? (In Sachet)	Are guards at facility 24-hours a day?	All IRS items, signs, insecticides and wastes removed from store?	Pesticide storage area washed with soap and water?	Soak pit covered and gates locked?	Soak pit and its surroundings left clean?	Date soak pit and surroundings will be cleared:	Would you recommend re-using this store next year?
Beadle	No	No	No		Yes	Yes	Yes	Yes	Yes	9/17/2014	Yes
Borecha	No	No	No		Yes	Yes	Yes	Yes	Yes	9/16/2014	Yes
Menesibu	No	Yes	Yes	406	Yes	Yes	Yes	Yes	Yes	9/17/2014	Yes
Dedesa	No	No	No		Yes	Yes	Yes	Yes	Yes	9/20/2014	Yes
Omo_Nada	No	No	No		Yes	Yes	Yes	Yes	Yes	9/16/2014	Yes
Sokoru	No	No	No		Yes	Yes	Yes	Yes	Yes	9/16/2014	Yes
Dendi	No	Yes	Yes	83	Yes	Yes	Yes	Yes	Yes	9/15/2014	Yes
Nono	No	Yes	Yes	315	Yes	Yes	Yes	Yes	Yes	9/15/2014	Yes
Illu_Gelan	No	Yes	Yes		Yes	Yes	Yes	Yes	Yes	9/18/2014	Yes
Bako_Tibe	No	Yes	Yes	13	Yes	Yes	Yes	Yes	Yes	9/20/2014	Yes
Dano	No	Yes	Yes	209	Yes	Yes	Yes	Yes	Yes	9/23/2014	Yes
Nejo	No	Yes	Yes	1,627	Yes	Yes	Yes	Yes	Yes	9/23/2014	Yes
Diga	No	Yes	Yes	120	Yes	Yes	No	Yes	Yes	9/21/2014	Yes
Wayu_Tuka	No	Yes	No		Yes	Yes	No	Yes	Yes	9/20/2014	Yes
Gobu_Sayo	No	Yes	Yes	500	Yes	Yes	Yes	Yes	Yes	9/20/2014	Yes
Dale_Wabera	No	Yes	Yes	201	Yes	Yes	Yes	Yes	Yes	9/24/2014	Yes
Dale_Sadi	No	Yes	Yes	5	Yes	Yes	Yes	Yes	Yes	9/23/2014	Yes
Guliso	No	Yes	Yes	480	Yes	Yes	Yes	Yes	Yes	9/23/2014	Yes
Babo_Gambela	No	Yes	Yes	938	Yes	Yes	Yes	Yes	Yes	9/23/2014	Yes
Begi	No	Yes	Yes	315	Yes	Yes	Yes	Yes	Yes	9/28/2014	Yes
Sayo	No	Yes	Yes	240	Yes	Yes	Yes	Yes	Yes	9/24/2014	Yes
Lalo_Kilie	No	Yes	Yes	682	Yes	Yes	Yes	Yes	Yes	9/24/2014	Yes
Hawa_Gelan	No	Yes	Yes	5	Yes	Yes	Yes	Yes	Yes	9/21/2014	Yes
Kiltu_Kara	No	Yes	Yes	59	Yes	Yes	Yes	Yes	Yes	9/23/2014	Yes
Kondala	No	Yes	Yes	1,613	Yes	Yes	Yes	Yes	Yes	9/26/2014	Yes
Boneya_Boshe	No	Yes	Yes	177	Yes	Yes	Yes	Yes	Yes	9/23/2014	Yes
Gida_Ayana	No	Yes	Yes	695	Yes	Yes	Yes	Yes	Yes	9/22/2014	Yes
Wama_Agalo	No	Yes	Yes	840	Yes	Yes	Yes	Yes	Yes	9/23/2014	Yes
Guto_Gida	No	Yes	Yes	872	Yes	Yes	Yes	Yes	Yes	9/23/2014	Yes
Limu	No	Yes	Yes	1,031	Yes	Yes	Yes	Yes	Yes	9/23/2014	Yes
Sasisga	No	Yes	Yes	2,217	Yes	Yes	Yes	Yes	Yes	9/23/2015	Yes
Chewaka	No	Yes	Yes	92	Yes	Yes	Yes	Yes	Yes	9/23/2014	Yes
Kersa	No	Yes	Yes	162	Yes	Yes	Yes	Yes	Yes	9/23/2014	Yes
Seka_Chekorsa	No	Yes	Yes		Yes	Yes	Yes	Yes	Yes	9/23/2014	Yes

Operation Sites	Is this a temporary store?	Is there a full-time year-round storekeeper?	Will pesticides be stored here in the off-season?	How much pesticide will be stored? (In Sachet)	Are guards at facility 24-hours a day?	All IRS items, signs, insecticides and wastes removed from store?	Pesticide storage area washed with soap and water?	Soak pit covered and gates locked?	Soak pit and its surroundings left clean?	Date soak pit and surroundings will be cleared:	Would you recommend re-using this store next year?
Shebe_Sombo	No	Yes	Yes	157	Yes	Yes	Yes	Yes	Yes	9/23/2014	Yes
Tiro_Afeta	No	Yes	Yes	11	Yes	Yes	Yes	Yes	Yes	9/23/2014	Yes
TOTAL				**14,065**							

ANNEX D: REPORT ON 2014 POST IRS EVALUATION MEETING

The project organized a post-spray meeting to evaluate the implementation of the 2014 IRS campaign and document lesson learned from the process. The meeting was held in Jimma on October 27-28, 2014. The participants were malaria focal persons (MFPs) and district health office heads from the 36 project districts, MFPs from the six project zonal health offices, representative from the Oromia Regional Health Bureau (ORHB), head of the National Malaria Control Program (NMCP), team leader of PMI Ethiopia, and AIRS Ethiopia office staff. A total of 88 participants attended the meeting.

TABLE D-1: 2014 POST IRS EVALUATION MEETING PARTICIPANTS

#	Areas	Professional category	Sex			Remarks
			M	F	Total	
1	Project districts	MFP	34	2	36	
		Health office head/deputy	32	2	34	2 absents
2	Project zones	MFP	5	1	6	
3	ORHB	Malaria expert	1	0	1	
4	FMOH	NMCP head	0	1	1	
5	PMI/USAID	PMI Team Leader	1	0	1	
6	AIRS staff	Technical staff	8	1	9	
	Total		81	7	88	

Main agenda items were the following:

- Remarks by AIRS, PMI, NMCP, and ORHB representatives;
- Presentations on project implementation and current malaria situation by six zonal MFPs and six districts health offices;
- Presentation on technical components of IRS (Spray Operations, EC, Entomology, Logistics, M&E, Finance and Administration) by AIRS staff; and
- Discussion of each item.

The presentation and discussions indicate that:

1. The operation was successful with high coverage achieved;
2. The regional, zonal, and district health offices greatly appreciate PMI/USAID support for the program;
3. The supervision at all levels was effective in ensuring the quality and EC activities of the project;
4. The incidence of malaria is much lower than expected for the season in most project districts; and
5. The project helped strengthen the capacity of the health offices to undertake high-quality spray operations and environmental compliance activities.

Challenges and lessons learned:

- Problems with road access and network connectivity.
    - This is expected to improve in the coming years.
- The project made the effort to collect data on needed boot sizes and procure accordingly, but this again was an issue in some districts. The quality of the boots was also a concern in some districts.
    - In cases of incorrect size, spray actors were asked to buy their own boots. This practice is expected to continue.
- Poor IRS card retention rate by households created some delays during spray operations.
    - The project may have to introduce a permanent numbering mechanism or print more IRS cards every year to avoid the shortage.
- Oromia credit and saving banks were late making payments to IRS implementers in some districts.
    - The project believed there was a lot of improvement in 2014 except in two districts; this will be discussed with the bank or an alternative means of payment will be sought.
- Efficiency of rental vehicles on difficult roads, shortage of fuel, and behavior of some rental vehicle drivers was an issue in few cases.
    - The problem is recurrent due to the shortage of rental vehicles on the market. However, the rental car company that failed to provide fuel on time was penalized and more stringent control mechanisms will be introduced in the future.

FIGURE D-1. AIRS TEAM, NMCP HEAD, AND PMI TEAM LEADER AT IRS EVALUATION MEETING, JIMMA

ANNEX E: DATA COLLECTION AND QUALITY ASSURANCE TOOLS

TABLE E-1. ETHIOPA IRS 2014 DATA COLLECTION TOOLS

Data Collection Tool	Useage
Training Participants Registration Form	Used by lead trainer at training workshops to capture category and number of people trained disaggregated by male and female.
Daily Spray Operator Form	Used by squad leaders (SLs) during spray operations to capture structures found, structures sprayed and unsprayed, population protected and unprotected, mosquito net and insectcide information. This tool also captures geography, spray actors' names and codes, household names, IRS numbers, structures type, etc.
Daily Squad Leader Summary Form	Used by SLs to summarize the daily data from each Daily Spray Operator Form for which they are responsible.
Daily Team Leader Summary Form	Used by team leaders (TLs) to summarize the daily data from each SL for which they are responsible. This tool is used to manage squad performance on a daily basis.
Dailiy District Malaria Focal Person Summary Form	Used by district MFP during spray operations to summarize the daily data from each TL whom they supervise. This tool is mainly used to manage team performance on a daily basis.

TABLE E-2. DATA QUALITY ASSURANCE TOOLS

Data Quality Assurance Tool	Purpose and Usage
Error Eliminator (EE) Form	Purpose: • To check the completeness and correctness of data collected in the field. • To highlight common data collection errors so they can be quickly identified with corrections being made and retraining provided by the supervisor. Used in the field post-data collection by: • TLs on daily basis to check 50% of the forms filled by the spray operators (SOPs) under their supervision. • Information, education and communication (IEC) supervisor each day to check 37.5% of the forms filled by SOPs under his/her supervision. • District MFP each day checks 12.5% of the forms filled by SOPs under his/her supervision.

Data Quality Assurance Tool	Purpose and Usage
Data Collection Verification (DCV) Form	Purpose: • To check the accuracy of data collected in the field, i.e., ensure that the data written on the Daily Spray Operator Forms match the information reported by households and/or the data recorded on the IRS Cards disseminated to households. Used during field audits by: • AIRS M&E and Database Managers • AIRS Operations Manager • AIRS Spray Operations Coordinator • Zonal District MFPs • District Heads and Deputies • District Environmental Compliance Experts
Data Entry Site Supervision Checklist	Purpose: • To check the application of data entry and documentation protocols and provide on-the-spot support to data entry clerks (DECs) Used during visits to data entry centers by: • M&E Manager • Database Manager • IT Specialist

TABLE E-3. DATA QUALITY ASSURANCE AND CONTROL

Quality Assurance/ Quality Control Issue	Method/Tools for Quality Assurance
Spray data integrity	• Used standardized data collection forms • Comprehensive training for spray data capture and protocols • Multiple levels of supervision • SOPs are supervised directly by their SL and TL. ▪ Supervisors monitor TLs and verify Daily Spray Operator Forms. ▪ TLs, and IEC and EC experts monitor and verify data capture by SLs. ▪ District MFL verifies and run random spot checks on data collection. • Use of EE and DCV forms to ensure complete and accurate data collection
Spray data entry and management	• Data entry training for all DECs and spray supervisors • Prompt field data entry and transfer; data collection forms arrive at data entry sites daily and data entry is done on a daily basis • Data verification via double-data entry system ▪ Initial data entry of totals per data collection form ▪ Follow-up entry of detailed data, i.e., per individual household • Use of Microsoft Access-based IRS Cleaning/Reporting tool to clean data on a daily basis • Database designed with locks and validation checks
Data security	• Paper data collection forms stored systematically in binders and filed at district level for permanent reference • Database designed with passwords to restrict unauthorized entry • Databases backed up daily on the data entry server laptop, on Sugar Sync, and on external pen drives every day

ANNEX F: ETHIOPIA MONITORING AND EVALUATION PLAN INDICATOR MATRIX

Updated Nov 11, 2014

Performance Indicator	Indicator Definition	Project Year(s) Reporting	Data Source(s) and Reporting Frequency	Disaggregate	PMI/ AIRS Indicator	Annual Targets and Results					
						Year 1		Year 2		Year 3	
						Target	Results	Target	Results	Target	Results
Component 1: Establish cost-effective supply chain mechanisms including procurement, distribution and storage of IRS-related commodities and execute all aspects of logistical plans for IRS-related activities.											
1.1 Procurement											
1.1.1 Number and percentage of international insecticide procurement orders delivered in country, at port of entry, at least 30 days prior to the start of spray operations	[*Numerator:* Number of international insecticide procurements delivered in country, at port of entry, at least 30 days prior to the start of spray operations] [*Denominator:* Total number of international insecticide procurements] *Calculation:* [Numerator ÷ Denominator] x 100	Y1, Y2, Y3	*Data source*: Project records – ex: international procurement documents Air Ways Bill (AWB), commercial invoices *Reporting frequency*: Each spray season (annual/ semi-annual)	By Spray Campaign	AIRS	N.A.[2]	N.A.	N.A.[3]	N.A.	N.A.[4]	N/A

[2] Insecticide procured by PMI.
[3] Insecticide procured by PMI.
[4] Insecticide procured by PMI.

Performance Indicator	Indicator Definition	Project Year(s) Reporting	Data Source(s) and Reporting Frequency	Disaggregate	PMI/ AIRS Indicator	Annual Targets and Results					
						Year 1		Year 2		Year 3	
						Target	Results	Target	Results	Target	Results
1.1.2 Number and percentage of international procurement orders (POs) for equipment, including PPE, received at port of entry 30 days prior to start of spray operations.	[*Numerator:* Number of international procurements for equipment, including PPE, at port of entry, 30 days prior to start of spray operations] [*Denominator*: *Total number of* international procurements for equipment, including PPE.*]* *Calculation:* [Numerator ÷ Denominator] x 100	Y1, Y2, Y3	*Data source:* Project records *Reporting frequency*: Each spray season (annual/ semi-annual)	By Spray Campaign	AIRS	6; 85%	5 of 6 POs were delivered 30 days prior to start of spray operations (83.3%)	1 order; 100%	1 order, for 8 items: 1.Gloves 2.Boots 3.Respiratory masks 4.Hard hats 5.Faceshields 6.Spray pumps 7.Spare pump parts 8.Nozzles; 100%	1 order 100%	1 order, for 8 items: 1.Gloves 2.Boots 3.Respiratory masks 4.Hard hats 5.Faceshields 6.Spray pumps 7.Spare pump parts 8.Nosil tips; 100%
1.1.3 Number and percentage of local PPE procurement orders that are delivered to the central warehouse 14 days before the start of spray operations	[*[Numerator:* Number of local PPE procurements delivered to the main warehouse 14 days before the start of spray operations] [*Denominator*: *Total number of local PPE procurements.]* *Calculation:* [Numerator ÷ Denominator] x 100	Y1, Y2, Y3	*Data source:* Project records – ex: such as delivery notes, goods receiving notes, inventory control cards *Reporting frequency*: Each spray season (annual/ semi-annual)	By Spray Campaign	AIRS	1 for both Spray Rounds (100%)	<u>Round1</u>: N.A. PPE already in stock <u>Round 2</u>: 1for coveralls received at least 14 days before the start of spray operations (100%)	1 order; 100%	1 order for coveralls (100%)	1order; 100%	1 order; 100 % (for coveralls)

Performance Indicator	Indicator Definition	Project Year(s) Reporting	Data Source(s) and Reporting Frequency	Disaggregate	PMI/ AIRS Indicator	Annual Targets and Results					
						Year 1		Year 2		Year 3	
						Target	Results	Target	Results	Target	Results
1.1.4 Successfully completed spray operations without an insecticide stock-out	Milestone: (Achieved/Not Achieved)	Y1, Y2, Y3	*Data source:* Project records – *ex:* inventory control cards *Reporting frequency*: Each spray season (annual/ semi-annual)	By Spray Campaign	AIRS	Achieved	Achieved	Achieved	Achieved	Achieved	Achieved
1.2 In-country Logistics, Warehousing, and Training											
1.2.1 Number and percentage of logistics and warehouse managers trained in IRS supply chain management	*[Numerator:* Total number of logistics and warehouse managers trained in IRS supply chain management using AIRS Project resources.] *[Denominator:* Total number of AIRS logistics and warehouse managers.] *Calculation*: [Numerator ÷ Denominator] x 100	Y1, Y2, Y3	*Data source*: Routine training records *Reporting frequency*: Semi-annually	By Spray Campaign By Gender Per CB district (in Y2)	PMI	36 district storekeepers (100%)	Total: 36 (100%) (32 male, 4 female) Round 1: 19 (16 male, 3 female) Round 2: 17 (16 male, 1 female)	36 (100%)	36; 100% (33 male; 3 female; 8.3% female) CB IRS districts[5]: 6 store-keepers; 100% trained; (5 male, 1 female: 17% female)	36 (100%)	35 out of 36, (97.2 % 30 male, 5 female) 14.2% female CB IRS districts: 5 out 6 (83.3%) 4 male, 1 female[6] 20% female

[5] CB IRS: Kersa: 1 Male; Chewaka: 1 Male: Sasiga: 1 Female; Hawa Galan: 1 Male; Manasibui: 1 Male; Bako Tibe: 1 Male

[6] CB IRS : 6 personnel: Sasiga 1 Female; Kersa: 1Male; Chewaka: 1 Male: Hawa Galan: 1 Male; Manasibui: 1 Male; Bako Tibe: 1 Male

Performance Indicator	Indicator Definition	Project Year(s) Reporting	Data Source(s) and Reporting Frequency	Disaggregate	PMI/ AIRS Indicator	Annual Targets and Results					
						Year 1		Year 2		Year 3	
						Target	Results	Target	Results	Target	Results
1.2.2 Number and percentage of base stores where physical inventories are verified by up-to-date stock records	*[Numerator:* Number of base stores where physical inventories are verified by up-to-date stock records] [*Denominator*: *Total number of base stores audited.] Calculation:* [Numerator ÷ Denominator] x 100 *(See PIRS for details on sample size for operational audits)*	Y2, Y3	*Data source:* Project records - ex: inventory control cards *Reporting frequency*: Each spray season (annual/ semi-annual)	By Spray Campaign Per CB district (in Y2)	AIRS	N.A.	N.A.	36; 85%	36 district[7] and 3 central stores (100%) CB IRS: 6 stores, 100%,	39 (36 district stores and 3 central) 100%	38100% (36 district stores and 2 central wareho use[8]) CB IRS 6 stores[9], 100%
1.2.3 Submit up-to-date inventory records to AIRS Home Office 30 days after the end of each spray campaign	Milestone: (Completed/Not completed)	Y2, Y3	*Data source:* Project records - ex: warehouse inventory control cards *Reporting frequency*: Each spray season (annual/ semi-annual)	By Spray Campaign Per CB district (in Y2)	AIRS	N.A.	N.A.	Comple ted	Complete d; 36, 30 DB and 6 CB[10] districts	Comple ted	Comple ted; 36, 30 DB and 6 CB[11] districts

[7] CB IRS: Kersa 1, Chewaka 1, Sasiga 1, Bako Tibe 1, Hawa Galan 1, Manasibu 1
[8] In 2014, all items are stored in two warehouses at the central level
[9] Kersa 1, Chewaka 1, Sasiga 1, Bako tibe 1, Hawa Galan 1, Manasibu 1
[10] Kersa 1, Chewaka 1, Sasiga 1, Bako tibe 1, Hawa Galan 1, Manasibu 1
[11] Kersa 1, Chewaka 1, Sasiga 1, Bako tibe 1, Hawa Galan 1, Manasibu 1

Performance Indicator	Indicator Definition	Project Year(s) Reporting	Data Source(s) and Reporting Frequency	Disaggregate	PMI/ AIRS Indicator	Annual Targets and Results					
						Year 1		Year 2		Year 3	
						Target	Results	Target	Results	Target	Results
Component 2: Implement safe and high-quality IRS programs and provide operational management support											
2.1 Planning and Design of IRS Programs											
2.1.1 Annual IRS country work plan developed and submitted on time	Milestone: (Completed/Not completed)	Y1, Y2, Y3	*Data source:* Project records *Reporting frequency*: Annually		AIRS	Com-pleted	Com-pleted	Com-pleted	Com-pleted	Comple ted	Complet ed
2.2 Support of Safety and Health Best Practices and Compliance with USAID and Host Country Environmental Regulations											
2.2.1 SEA/letter report submitted on time[12]	Milestone: (Completed/Not completed)	Y1, Y2, Y3	*Data source*: Project records – submitted SEAs/ letter reports Reporting frequency: Each spray campaign	By Spray Campaign	AIRS	Complet ed	Complete d	Comple ted	Complete d	Comple ted	Complet ed
2.2.2 Number and percentage of soak pits and warehouses/storerooms inspected and certified prior to spraying	[Numerator: Number of soak pits and warehouses/storerooms inspected and certified by AIRS Environmental Compliance Officer] [Denominator: Total number of project soak pits and/or storehouses] Calculation: [Numerator ÷ Denominator] x 100	Y1, Y2, Y3	Data source: Project records – Reports submitted by environmental officers Reporting frequency: Each spray season	By Spray Campaign By soak pits and storerooms/ warehouses Per CB district (in Y2)	AIRS	#N.A for soak pits[13]; 1 central warehous e; 36 district storeroo ms 100% inspected	Total: 74 soak pits; 1 central warehous e; 36 storeroom s; 100% inspected prior to spraying Round 1: 41soak	179 soak pits; 1 central wareho use; 36 storero oms; 100% inspecte d prior to	Total: 175 out of 181(97%)[14] soak pits; 36 warehous es (100 %) and 1Central Warehous e (100%)	74 soak pits; 3 central wareho use and 36 store rooms; 100% inspecte d prior to spraying	DB IRS:56 out of 61 soak pits 90.2%[15]; 2 central warehous es[16] and 36 store rooms; 100% inspected

[12] In Year 1, SEAs were due 30 days prior to the commencement of spraying and letter reports were to be submitted 14 days prior. In Year 2 and Year 3, due dates agreed upon with Washington-PMI will be noted in each country-specific Monitoring and Evaluation Plan to assess indicator 2.2.1.
[13] The number of soak pits was not finalized during work planning.
[14] Due to heavy rains that made roads impassable during the inspection time, AIRS Ethiopia was unable to inspect 6 soak pit areas prior to spray. These soak pits were inspected after the start of spray operations.
[15] Same as above
[16] In 2014 all items are stored in two warehouses at central level.

Performance Indicator	Indicator Definition	Project Year(s) Reporting	Data Source(s) and Reporting Frequency	Disaggregate	PMI/ AIRS Indicator	Annual Targets and Results					
						Year 1		Year 2		Year 3	
						Target	Results	Target	Results	Target	Results
						and approved prior to spraying	pits; 19 district store-rooms Round 2: 33 soak pits; 17 district store-rooms	spraying	CB IRS districts: 120 soak pits out of 120, 100% inspected Inspected; 6 ware-houses, 100 % inspected		CB IRS districts: 120 soak pits inspected 100%; 6 stores 100% inspected
2.2.3 Number of government environmental and health officers trained in IRS environmental compliance	Total number of government environmental and health officers trained in IRS environmental compliance using AIRS Project resources	Y1, Y2, Y3	*Data source:* Project training reports Reporting frequency: Semi-annually	By Spray Campaign By Gender Per CB district (in Y2)	AIRS	248[17]	Total: 255[18]; Round1: 149[19] (142 males,7 female); Round 2: 106 (100 males,6 female)	285	224; 214 male, 10 female; 4.5% female CB IRS district[20] 33; 32 male and 1 female; 3% female	224	247; 228 male, 19 female; 7.7% female CB IRS: 35[21]; (33 male, 2 female; 5.7% female)

[17] Summary of national and regional-level TOT for comprehensive IRS trainees; 50 and 198 trainees respectively; See Annex B, Table 2 in the AIRS Ethiopia MEP for training plan details.
[18] Summary of national and regional-level TOT for comprehensive IRS trainees; 50 and 198 trainees respectively; See Annex B, Table 3 in the AIRS Ethiopia MEP for 2012 training results.
[19] National-level trainees were included in Round 1 trainings.
[20] Year 2 result: CB IRS districts segregation: Kersa 6, Bako Tibe 5, Chewaka 7, Sasiga 4, Manasibu 5 and Hawa Galan 6.
[21] Year 3 result: CB IRS districts segregation: Kersa 6, Bako Tibe 5, Chewaka 6, Sasiga 5, Manasibu 6 and Hawa Galan 7

Performance Indicator	Indicator Definition	Project Year(s) Reporting	Data Source(s) and Reporting Frequency	Disaggregate	PMI/ AIRS Indicator	Annual Targets and Results					
						Year 1		Year 2		Year 3	
						Target	Results	Target	Results	Target	Results
2.2.4 Number of spray personnel trained in environmental compliance and personal safety standards in IRS implementation	Total number of spray personnel who attend a training in environmental compliance and personal safety standards in IRS implementation using AIRS Project resources, includes all staff who received environmental compliance training - spray operators, team leaders, washpersons, storekeepers, etc.	Y1, Y2, Y3	Data source: Project records – Training reports Reporting frequency: Each spray season	By Spray Campaign By Gender Per CB district (in Y2)	AIRS	N.A.[22]	Total: 2,031[23] Round 1: 884; (879 male, 5 female) Round 2: 1,147 (1,120 male, 27 female)	Total: 2,124[24]	2,586; 2251 male, 335 female[25]; 13.0% female CB IR districts[26]: 863, 645 male, 218 female; 25% female	2,586	2,717[27]; 2,273 male, 444 female, 16.3% female CB IRS districts: 863[28]; 636 male, 227 female; 26.3% female
2.2.5 Number of health workers receiving insecticide poisoning case management training	Total number of clinical personnel trained in insecticide poisoning case management using AIRS Project resources	Y2, Y3	Data source: Project records – Training reports Reporting frequency: Each spray season	By Spray Campaign By Gender	AIRS	158 (3 persons from 36 districts + 50 at	Total: 120 Round 1: 97[29] (61 males, 36	108 (3 persons from 36 districts)	103 (85 male, 18 female; 17.5% female)	108 (3 persons from 36 districts)	102; 76 male, 26 female; 25.5% female)

[22] Specific target was not set at time of work planning.
[23] Summation of Spray Operators (1255), Squad Leaders (315), Team Leaders (74), porters (315), storekeepers (36), store assistants (36); See Annex B, Table 3 for 2012 training results.
[24] Summation of Spray Operators (1255), Squad Leaders (315), Team Leaders (74), porters (315), storekeepers (36), store assistant (36), and washers (93).
[25] Summation of Spray Operators (1,492; 1490 male, 2 female), Squad Leaders (492; 254 male, 238 female), Team Leaders and Supervisors (86; 85 male, 1 female), porters (373; 361 male, 12 female); store keepers (36; 33 male, 3 female), store assistants (38; 28 male, 8 female), and washers (71; 0 male, 71 female).
[26] Summation of Spray Operators (472; 472 male, 0 female), Squad Leaders (237; 23 male, 214 female), Supervisors (23; 23 male, 0 female), porters (119; 117 male, 2 female); store keepers (6; 5 male, 1 female), store assistants (6; 5 male, 1 female), and washers (71; 0 male, 71 female).
[27] Overall Summation of Spray Operators (1,500; 1495 male, 5 female), Squad Leaders (490; 242 male, 248 female), District Supervisors (247; 228 male, 19 female), porters (374; 276 male, 98 female); store assistants (36; 29 male, 7 female) and washers (70; 3 male, 67 female).
[28] CB Summation of Spray Operators (471; 471 male, 0 female), Squad Leaders (234; 27 male, 207 female), CB IRS Supervisors (35; 33 male, 2 female), porters (118; 100 male, 18 female); store assistants (5; 5 male, 0 female).
[29] Round 1 trainings included training of national-level personnel.

Performance Indicator	Indicator Definition	Project Year(s) Reporting	Data Source(s) and Reporting Frequency	Disaggregate	PMI/ AIRS Indicator	Annual Targets and Results					
						Year 1		Year 2		Year 3	
						Target	Results	Target	Results	Target	Results
				Per CB district (in Y2)		national-level)	female) Round 2: 23 (18 males, 5 female)		CB IRS districts[30]: 17; 16 male, 1 female; 6% female		CB IRS 18; 11 male, 7 female;38. 9% female
2.2.6 Number of adverse reactions to pesticide exposure documented	Total number of incidents of pesticide exposure reported that resulted in a referral for medical care	Y1, Y2, Y3	Data source: Incident report forms that are required for each incidence of pesticide exposure Reporting frequency: Each spray season	By Spray Campaign By residential/ occupational exposure Per CB district (in Y2)	AIRS	0	0	0	0	0	0
2.2.7. Number of vehicular accidents reported	Total number of vehicular accidents reported	Y1, Y2, Y3	Data source: Vehicular incident report forms that are required for each accident Reporting frequency: Each spray season	By Spray Campaign Per CB district (in Y2)	AIRS	0	0	0	1 Guliso district which implement ed DB IRS	0	1 Shebe Sombo district
2.3 Support Entomological Monitoring Activities and Insecticide Resistance Strategies											
2.3.1 Number of entomological sentinel sites[31] supported by the AIRS project	Total number of entomological sentinel sites supported by the AIRS project	Y1, Y2, Y3	Data source: Entomological reports Reporting frequency: Annually	By Spray Campaign	AIRS	3	3	3	3	3	3
2.3.2 Number and percentage of entomological	*[Numerator:* Number of entomological	Y1, Y2, Y3	Data source: Entomological reports	By Spray Campaign	AIRS	3 (100%)	3(100%)	3 (100%)	3 (100 %)	3 (100%)	3 (100%)

[30] Kersa (3 Male, 0 Female); Bako Tibe (3 Male, 0 Female); Chewaka (2 Male, 0 Female); Sasiga (3 Male, 0 Female); Manasibu (2 Male, 1 Female); Hawa Galan (3 Male, 0 Female).

[31] These sentinel sites collect data on mosquito behavior.

Performance Indicator	Indicator Definition	Project Year(s) Reporting	Data Source(s) and Reporting Frequency	Disaggregate	PMI/ AIRS Indicator	Annual Targets and Results					
						Year 1		Year 2		Year 3	
						Target	Results	Target	Results	Target	Results
monitoring sentinel sites measuring all five primary PMI entomological indicators	monitoring sites measuring all five primary PMI entomological indicators] *[Denominator:* Number of entomological monitoring sentinel sites] *Calculation:* [Numerator ÷ Denominator] x 100		*Reporting frequency:* Annually								
2.3.3 Number and percentage of entomological monitoring sites measuring at least one secondary PMI indicator	*[Numerator:* Number of entomological monitoring sites measuring at least one secondary PMI indicator] *[Denominator:* Number of entomological monitoring sites] *Calculation:* [Numerator ÷ Denominator] x 100	Y1, Y2, Y3	Data source: Entomological reports Reporting frequency: Annually	By Spray Campaign	AIRS	3 (100%)	3(100%)	3 (100%)	3 (100%)	3 (100%)	3 (100%)
2.3.4 Number and percentage of insecticide resistance testing sites that tested at least one insecticide from each of the four classes[32] of	*[Numerator:* Number of insecticide resistance testing sites that tested at least one insecticide from each of the four classes of insecticides	Y1, Y2, Y3	Data source: Entomological reports Reporting frequency: Annually	By Spray Campaign By Type of Insecticide	AIRS	5	5 sites; All 4 classes of insecticides tested at all 5 sites;	5 (100%)	5 sites; All 4 classes of insecticides tested at all 5 sites;	8(100%)	7 sites[33]; 87.5%

[32] The 4 classes of insecticide are1) carbamates, 2) organochlorides, 3) organophosphates, and 4) pyrethroids.
[33] 3 sites added in 2014 (Afar, Tigray, Gambela).

Performance Indicator	Indicator Definition	Project Year(s) Reporting	Data Source(s) and Reporting Frequency	Disaggregate	PMI/ AIRS Indicator	Annual Targets and Results					
						Year 1		Year 2		Year 3	
						Target	Results	Target	Results	Target	Results
insecticides recommended for malaria vector control	recommended for malaria vector control.] *[Denominator:* Number of insecticide resistance testing sites] *Calculation:* [Numerator ÷ Denominator] x 100						100%		100%		
2.3.5 Number of wall bioassays conducted within 2 weeks of spraying to evaluate the quality of IRS	Total number of wall bioassay studies conducted in established sentinel sites to evaluate quality of IRS spraying activities	Y1, Y2, Y3	Data source: Entomological reports Reporting frequency: Per spray campaign	By Spray Campaign Per CB district (in Y2)	PMI	30 (3 sentinel sites with 10 houses each)	Round 1: 10 (1 sentinel sites with 10 houses) Round 1: 20 (2 sentinel sites with 10 houses each[34])	20 (2 sentinel sites with 10 houses each)	80[35]; 60 in CB IRS districts [36] and 20 DB IRS districts	48	48[37] houses tested CB IRS 24 houses

[34] 1 sentinel site was located in Kersa, the site of the community based IRS pilot.
[35] 8 sentinel sites; 1 in each of the 6 CB IRS districts and as well as a site in Omo Nada and a site in Gobu Sayo districts. Each sentinel site contains 5 houses and each house had two different wall bioassay test conducted, one with wild reared mosquitoes and one with lab reared susceptible mosquitoes.
[36] 10 wall bioassays in each of the 6 community based districts (Kersa, Bako Tibe, Chewaka, Sasiga, Manasibu and Hawa Galan 10 tests.
[37] 4 sites (2 CB IRS district, (Bako Tibe and Kersa) and 2 DB IRS district, (Seka Chekorsa and Gobu Sayo) 6 wild and 6 susceptible mosquitos tested for each site

Performance Indicator	Indicator Definition	Project Year(s) Reporting	Data Source(s) and Reporting Frequency	Disaggregate	PMI/ AIRS Indicator	Annual Targets and Results					
						Year 1		Year 2		Year 3	
						Target	Results	Target	Results	Target	Results
2.3.6 Number of wall bioassays conducted after the completion of spraying at monthly intervals to evaluate insecticide decay	Total number of wall bioassay studies conducted at monthly intervals in established sentinel sites to evaluate the rate of insecticide decay on sprayed surfaces	Y1, Y2, Y3	*Data source:* Entomological reports Reporting frequency: Per spray campaign	By Spray Campaign Per CB district (in Y2)	PMI	120; 30 houses tested at months 0.1. 2. 3	Total: 120 Round 1: 40 (10 houses tested at months 1, 2, 3, 4) Round 2: 80 (10 houses tested in 2 sites at months 1,2,3,4)	60; 20 houses tested at months 1, 2, 3	100 tests Total; 10 houses in 2 sites for 5 months (1,2,3,4,5) CB districts[38]: 50 tests (10 tests for months 1, 2, 3, 4 and 5)	80	In process 48[39] completed
2.3.7 Number of vector susceptibility tests for different insecticides conducted in selected sentinel sites	Total number of vector susceptibility tests conducted to gauge the effectiveness of individual insecticides proposed for use in spray operations	Y1, Y2, Y3	Data source: Entomological reports Reporting frequency: Per spray campaign	By Type of Insecticide	PMI	20	56 tests conducted in 5 sites[40]	20	62[41]	35	In process 66[42] completed

[38] In Kersa District, 10 wall bioassays were conducted on a monthly basis after the completion of spraying for 5 months to evaluate insecticide decay.
[39] Expected result=192; (4 sites*12 houses)* 4 months
[40] Permethrin=1; Propoxur=11; Malathion=5; Lambdacyhalothrin=1; Fenitrothion=8; Etofenoprox=2; DDT=5; Bendiocarb=8; Deltamethrin=11; Alpha-cypermethrin=2; Prymiphos-methyl=2
[41] 62 tests; Permethrin=3, Propoxur=7, Malathion=7, Lambdacyhalothrin=5, Fenitrothion=6, Etofenprox=3, DDT=7, Bendiocarb=7, Deltamethrin=7, Alpha-cypermethrin=3, Prymiphos-methyl=7
[42] Expected result 88 tests ,11 insecticide per 8 sites

Performance Indicator	Indicator Definition	Project Year(s) Reporting	Data Source(s) and Reporting Frequency	Disaggregate	PMI/ AIRS Indicator	Annual Targets and Results					
						Year 1		Year 2		Year 3	
						Target	Results	Target	Results	Target	Results
2.4 Conduct Communications Activities and Community Mobilization											
2.4.1 Number of radio spots and talk shows aired	Total number of radio spots and talk shows aired in target spray districts to stress the safety and benefits of IRS, ensure successful spray coverage, timely vacating of premises and adherence to IRS safety precautions by community members	Y1, Y2, Y3	Data source: Project records Reporting frequency: Semi-annually	By Spray Campaign	AIRS	N.A.	0	2 radios spots in Amharic and Oromiffa	2 languages, 40 spots each, 80 spots total	N.A. Radio spots will not be used in Year 3	N.A.
2.4.2 Number of IRS print materials disseminated	Total number of IRS educational materials developed, printed and distributed to community members in target spray districts using AIRS Project resources	Y1, Y2, Y3	Data source: Project records Reporting frequency: Semi-annually	By Spray Campaign By Type of printed material and message(s)	AIRS	N.A.[43]	Total: 304,000; 300,000 flyers; 4,000 posters Round 1: 158,651; 157,651flyers; 1000 posters; Round 2: 145,349; 142,349 flyers; 3000 posters	N.A.	N.A.	N.A.	N.A.
2.4.3 Number of people reached with IRS messages via door-to-	Total number of adults reached with IRS message during pre-spray	Y1, Y2, Y3	Data source: Mobilization Data Collection Forms	By Spray Campaign	AIRS	750,000 (50% of the	Total: 803,130 (366,091	N.A	N.A.	N.A.	N.A.

[43] Specific target was not set at time of work planning.

Performance Indicator	Indicator Definition	Project Year(s) Reporting	Data Source(s) and Reporting Frequency	Disaggregate	PMI/ AIRS Indicator	Annual Targets and Results					
						Year 1		Year 2		Year 3	
						Target	Results	Target	Results	Target	Results
door mobilization	community, door-to-door mobilization		Reporting frequency: Daily per mobilization conducted	By Gender		target population of 1,500,000 million)	male, 437,039 female) <u>Round 1</u>: 437,677 (203,644 male, 234,033 female); <u>Round 2</u>: 365,453 (162,447 male, 203,006 female)				

Performance Indicator	Indicator Definition	Project Year(s) Reporting	Data Source(s) and Reporting Frequency	Disaggregate	PMI/ AIRS Indicator	Annual Targets and Results					
						Year 1		Year 2		Year 3	
						Target	Results	Target	Results	Target	Results
2.5 Spray Targeted Structures According to Technical Specifications											
2.5.1 Number of structures targeted for spraying[44]	Total number of structures found in targeted spray districts by Spray Operators	Y1, Y2, Y3	Data source: Daily Spray Operator Forms Reporting frequency: Daily per spray campaign	By Spray Campaign Per CB district (in Y2)	PMI	Total: 490,000 in 36 districts; 26 graduating and 10 new; Technical support for	Total: 554,063 in the 36 districts that were graduating or new; Round 1: 269,057; Round 2:	Total: 550,000 unit structures in 36 districts; Technical support to IRS operatio	638,173[45] Total CB districts: 140,976	640,000	670,303 Total [46]CB districts 160,464

[44] The yearly targets for this indicator are from the applicable work plan, in this way the variation in targeted spray areas from year-to-year can be taken into account. The yearly results are the number of structures found by Spray Operators during the spray campaign.

[45]

CB Districts	Total # of Eligible Structures Found by SOPs		Total # of Eligible Structures Sprayed		% of Total Structures Sprayed		Population Protected		Pregnant Women Protected		Children Under 5 Protected	
	2013	2014	2013	2014	2013	2014	2013	2014	2013	2014	2013	2014
Kersa	26,761	27,624	26,587	27,506	99.3%	99.6%	75,380	75,265	930	823	10,754	10,718
Chewaka	27,201	32,041	27,196	32,036	100.0%	100.0%	77,979	82,440	1,913	1,971	13,443	14,590
Hawa Galan	27,048	31,441	26,988	31,437	99.8%	100.0%	67,226	68,294	1,518	1,230	11,102	11,457
Sasiga	14,923	17,562	14,892	17,562	99.8%	100.0%	41,524	40,364	540	569	5,589	5,937
Manasibu	28,444	32,426	28,386	32,417	99.8%	100.0%	66,233	76,139	690	747	8,981	8,733
Bako Tibe	16,599	19,370	16,582	19,355	99.9%	99.9%	44,795	44,433	370	472	5,370	5,535
Total	140,976	160,464	140,631	160,313	99.8%	99.9%	373,137	386,935	5,961	5,812	55,239	56,970

[46]See footnote 50 for 2014 CB IRS districts segregation.

Performance Indicator	Indicator Definition	Project Year(s) Reporting	Data Source(s) and Reporting Frequency	Disaggregate	PMI/ AIRS Indicator	Annual Targets and Results					
						Year 1		Year 2		Year 3	
						Target	Results	Target	Results	Target	Results
						spraying of up to 512,357 additional structures in 24 gradua-ted districts	285,006 Graduated districts: 520,149	ns in 24 graduated districts spraying approximately 500,000 structu-res			
2.5.2 Number of structures sprayed with IRS[47]	Total number of structures sprayed in targeted districts where spraying was conducted	Y1, Y2, Y3	Data source: Daily Spray Operator Forms Reporting frequency: Daily per spray campaign	By Spray Campaign Per CB district (in Y2)	PMI	Total in36 districts: 416,500 24 Gradua-ted districts: 435,503	Total in36 districts: 547,421; Round 1: 265,106; Round 2: 282,315 24 Graduated districts: 428,459	467,500	635,528 CB districts: 140,631[48]	544,000	667,236 CB districts 160,313[49]
2.5.3 Percentage of total structures targeted for spraying that were sprayed with a residual insecticide (Spray Coverage)	[Numerator: Total number of structures sprayed in targeted districts] [Denominator: Total number of structures in targeted areas found by spray operators]	Y1, Y2, Y3	Data source: Daily Spray Operator Forms Reporting frequency: Daily per spray campaign	By Spray Campaign Per CB district (in Y2)	PMI	85% per campaign	Total: 99.8%; Round 1: 98.8 %; Round 2: 99.1% Graduated	85%	99.6% CB districts: 99.8%[50]	85%	99.5% CB districts 99.9

[47] The target per year for this indicator is based on 85% of the number of structures to be targeted as noted in indicator 2.5.1.
[48] See footnote 50 for 2013 CB IRS district breakdown.
[49] See footnote 50 for 2014 CB IRS district breakdown.
[50] See footnote 46 for 2013 CB IRS district breakdown.

Performance Indicator	Indicator Definition	Project Year(s) Reporting	Data Source(s) and Reporting Frequency	Disaggregate	PMI/ AIRS Indicator	Annual Targets and Results					
						Year 1		Year 2		Year 3	
						Target	Results	Target	Results	Target	Results
	Calculation: [Numerator ÷ Denominator] x 100						districts: 82%				
2.5.4 Number of people residing in structures sprayed (Number of people protected by IRS)	Total number of people residing in structures sprayed (Actual numbers are collected during spray operations; population estimates are not used.)	Y1, Y2, Y3	Data source: Daily Spray Operator Forms Reporting frequency: Daily per spray campaign	By Spray Campaign By Number of pregnant women By Number of children <5 years old Per CB district (in Y2)	PMI	1,500,000	Total: 1,506,273; Round 1: 698,898, including 12,571pregnant women and 105,769 children under 5; Round 2: 807,375, including 10,737 pregnant women and 120,106 children under 5 Graduated districts: 1,433,812	1,500,000	1,629,958 including 25,211 pregnant women and 240,558 children under 5 CB districts: [51] 373,137 including 5,961 pregnant women and 55,239 children under 5	1,629,958	1,647,099 Including 23,919 pregnant women and 230,862 children under 5 CB districts 52 386,935 including 5,812 pregnant women and 56,970 children under 5

[51] See footnote 46 for 2013CB IRS district breakdown.
[52] See footnote 46 for 2014 CB IRS district breakdown.

Performance Indicator	Indicator Definition	Project Year(s) Reporting	Data Source(s) and Reporting Frequency	Disaggregate	PMI/ AIRS Indicator	Annual Targets and Results					
						Year 1		Year 2		Year 3	
						Target	Results	Target	Results	Target	Results
Component 3: Provide ongoing monitoring and evaluation and quality control measures											
3.1 Submit Monitoring and Evaluation Plan (MEP) to PMI-Ethiopia[53]	*Milestone:* (Completed/Not completed)	Y1, Y2, Y3	Data source: Project records Reporting frequency: Semi-annual		AIRS	Completed	Completed	Completed	Completed	Completed	Completed
3.2 Submit a post-spray data quality audit (PSDQA) report to the AIRS M&E specialist in the home office within 60-180 days of completion of spray operations	*Milestone*: (Completed/Not completed)	Y1, Y2, Y3	Data source: Spray operations reports Reporting frequency: Per spray campaign	By Spray Campaign	AIRS	N.A. – AIRS Ethiopia has been chosen to carry out the PSDQA in Year 2	N.A.	Completed	Completed	N.A.	N.A.
3.3 Submit a country-specific Eligible Structure Definition Document to local PMI advisors and NMCP	*Milestone:* (Completed/Not completed)	Y1	Data source: Project records Reporting frequency: Semi-annually		AIRS	Completed	Completed	N.A.	N.A.	N.A.	N.A.
3.4 Supply chain review conducted by RTT	Milestone: (Completed/Not Completed)	Y1, Y2	Data source: RTT supply chain review reports Reporting frequency: Semi-annually	By Spray Campaign	AIRS	Completed	Completed	N.A.	N.A.	N.A.	N.A.

[53] MEP matrix updated and submitted with Year 2 and Year 3 work plans and end of spray reports.

Performance Indicator	Indicator Definition	Project Year(s) Reporting	Data Source(s) and Reporting Frequency	Disaggregate	PMI/ AIRS Indicator	Annual Targets and Results					
						Year 1		Year 2		Year 3	
						Target	Results	Target	Results	Target	Results
Component 4: Contribute to Global IRS Policy-Setting and Country-Level Policy Development of Evidence-Based IRS; Disseminate Experiences and Best Practices											
4.1 Number of guidelines/checklists/tools related to IRS operations developed or refined with project support	Total number of implementation guidelines, process checklists and program tools related to IRS operations developed or refined using the technical and/or financial resources of the AIRS Project	Y1, Y2, Y3	Data source: Project records – Activity reports Reporting frequency: Semi-annually	By Guideline/ checklist/tool	AIRS	N.A.	8[54]	7	7[55]	TBD	0
4.2 Number of articles/best practices documents published	Total number of articles or other best-practice documents that have been published in relevant journals or through PMI/USAID communications vehicles	Y2, Y3	Data source: Project records – Activity reports Reporting frequency: Semi-annually	By Spray Campaign By IRS Technical Area	AIRS	N.A.	N.A.	TBD	1[56]	TBD	In process
4.3 Number of best practice presentations given at national/ regional/international workshops and conferences	Total number of project-related oral and poster presentations delivered in national, regional and/or international meetings related to IRS.	Y2, Y3	Data source: Project records – Activity reports Reporting frequency: Semi-annually	By IRS Technical Area	AIRS	N.A.	1. Ethiopia Presentation by Dr. Yemane on CB IRS in Kersa district	TBD	2[57]	1	1[58] (100%)

[54] 1) Mobilization Supervision Checklist; 2) Spray Operation Supervision checklist; 3) Field Data Verification Checklist; 4) Record and System Assessment Checklist; 5) Indicator Definition Guideline; 6) Mobilization Data Collection Tools; 7) Spray Operations Data Collection Tools; 8) Spray Operations Daily tracker

[55] 1) Mobile Environmental Compliance Forms via smart-phone application, 2) Error Eliminator, 3) Data Collection Verification Form, 4) Data Entry Verification Form, 5) IRS Supervision Checklist, 6) Data Entry Center Supervision Checklist, 7) AIRS Access Database Cleaning/Reporting Tool

[56] Article on AIRS/PMI collaboration with Jimma University on molecular entomological capacity building published at http://www.africairs.net/2013/09/jimma-university-becomes-first-institution-in-ethiopia-to-carry-out-molecular-entomology/

[57] Presentations on CB IRS in Kersa District by Dr. Yemane in Durban, South Africa at the 2013 Multilateral Initiative on Malaria Conference and by Dereje at the 2013 American Society of Tropical Medicine and Hygiene (ASTMH) Conference, Washington, DC.

[58] Presentation by Dr. Yemane entitled: "Post blood meal resting density of *An. gambiae* s.l. in different structures in Ethiopia" presented in Nairobi Kenya.

Performance Indicator	Indicator Definition	Project Year(s) Reporting	Data Source(s) and Reporting Frequency	Disaggregate	PMI/ AIRS Indicator	Annual Targets and Results					
						Year 1		Year 2		Year 3	
						Target	Results	Target	Results	Target	Results
Component 5 (Cross-cutting): Capacity Building, Knowledge Transfer, Gender Inclusion											
5.1 Capacity Building (Gender Inclusion)											
5.1.1 Number of people trained in IRS implementation[59]	Total number of personnel trained in IRS implementation using AIRS Project resources. This figure only includes spray personnel such as spray operators, team leaders, supervisors, clinicians; it excludes data	Y1, Y2, Y3	Data source: Project records – Training reports Reporting frequency: Semi-annually	By Spray Campaign By Gender Percentage of Women Trained Per CB district	PMI	2,166[60]	Total: 2260[61] (2177 male, 83 female; 3.7% female) Round 1:	2361	2,684 (2,404 male, 280 female; 10.4% female) CB IRS districts[62]:	2,684	2886[63]; 2485 male and 401 female; 13.9% female CB IRS[64]

[59] This indicator is sometimes termed "Number of people trained to deliver IRS."
[60] Summation of planned training numbers for TOT trainings at national (50), regional (198), zonal and district levels (50), and spray personnel trainings - spray operators (1480) and team and squad leaders (388). See Annex B, Table 2 for training plan details.
[61] See Annex B Table 4 of AIRS Ethiopia MEP, for training details.
[62]

CB District	2013			2014		
	Male	Female	TOTAL	Male	Female	TOTAL
Kersa	109	43	152	88	41	129
Bako	86	20	106	67	25	92
Chewaka	152	54	206	126	50	176
Sasiga	51	17	68	42	21	63
Manasibu	136	47	183	115	43	158
Hawa Galan	126	37	163	104	36	140
TOTAL	**660**	**218**	**878**	**542**	**216**	**758**

[63] See Annex D Table 9 of AIRS Ethiopia MEP, for 2014 Training Result
[65] See Footnote 63 For 2014 CB IRS districts.

Performance Indicator	Indicator Definition	Project Year(s) Reporting	Data Source(s) and Reporting Frequency	Disaggregate	PMI/ AIRS Indicator	Annual Targets and Results					
						Year 1		Year 2		Year 3	
						Target	Results	Target	Results	Target	Results
	clerks, IEC mobilizers, drivers, washers, porters, pump technicians, security guards, etc.			(in Y2)			1058 (1,011 male, 47 female; 4.4% female) Round 2: 1202 (1,166 male, 36 female; 3.0% female)		878 (660 male, 218 female; 25% female)		Districts: 758; 542 male and 216 female 28.5% female
5.1.2 Number of people trained to deliver or support IRS in target districts	Total number of people trained using AIRS Project resources to implement/support elements of IRS in target districts. This figure includes all cadres that serve a role in IRS.	Y1, Y2, Y3	Data source: Project records – Training reports Reporting frequency: Semi-annually	By Spray Campaign By Gender By Role (e.g., spray operator, storekeeper) Percentage of women trained	AIRS	4269[65]	Total: 4,213[66]; (3,221 male, 992 female; 23.5% female) Round 1: 2,005 (1,533 male, 472	3953	Total 3,987; (2,915 male, 1,072 female; 26.9% female) CB districts[67]:	3,987	4390; (2918 male, 1472 female; 33.5% female) CB districts

[65] From 2012 AIRS Ethiopia work plan budget.
[66] See Annex B, Table 3 in the AIRS Ethiopia MEP for 2012 training results.
[67] CB IRS districts segregation Kersa 175, Bako tibe 123, Chewaka 237, Sasiga 80, Manasibu 213, and Hawa Galan188

Performance Indicator	Indicator Definition	Project Year(s) Reporting	Data Source(s) and Reporting Frequency	Disaggregate	PMI/ AIRS Indicator	Annual Targets and Results					
						Year 1		Year 2		Year 3	
						Target	Results	Target	Results	Target	Results
				Per CB district (in Y2)			female; 23.5% female) Round 2: 2,208 (1688 male, 520 female; 23.6% female)		1026 Total; 806 male and 220 female; 21.4% female		1028[68] Total; 770 male and 258 female 25.1%
5.1.3 Number of personnel trained as IRS implementation trainers	Total number of personnel trained in Training of Trainers for IRS delivery	Y1, Y2, Y3	Data source: Project records – Training reports Reporting frequency: Semi-annually	By Spray Campaign By Gender Percentage of women trained	AIRS	270[69]	Total: 255[70](242 male,13 female; 5.1% female) Round 1:	285	268 (249 male, 19 female; 7.1% female) CB districts [71]:	268	420; 396 male and 24 female, 5.7% female

District	Year	Kersa		Bako Tibe		Chewaka		Sasiga		Manasibu		Hawa Galan		TOTAL		
		Male	Female	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female	Grand Total
5.1.2	2013	134	43	104	21	185	54	64	18	166	47	153	37	806	220	1026
	2014	129	45	102	25	164	74	56	31	166	46	153	37	770	258	1028
5.1.3	2013	7	0	6	0	7	1	5	0	6	0	7	0	38	1	39
	2014	6	0	6	0	7	0	5	1	7	0	7	1	38	2	40
5.1.4	2013	6	0	5	0	6	1	4	0	5	0	6	0	32	1	33
	2014	6	0	5	0	6	0	4	1	6	0	6	1	33	2	35

[68] See Footnote 72 for 2014 CB districts segregation.
[69] From 2012 AIRS Ethiopia work plan budget.
[70] Summation of national (32) and regional-level (223) TOT on Comprehensive IRS. See Annex B, Table 3 in the AIRS Ethiopia MEP for details on 2012 training results.
[71] See Footnote 48.

Performance Indicator	Indicator Definition	Project Year(s) Reporting	Data Source(s) and Reporting Frequency	Disaggregate	PMI/ AIRS Indicator	Annual Targets and Results					
						Year 1		Year 2		Year 3	
						Target	Results	Target	Results	Target	Results
				Per CB district (in Y2)			149 (142 male, 7 female; 4.7% female) Round 2: 106 (100 male, 6 female; 6% female)		39 Total 38 male and 1 female; 3% female		CB IRS districts 40 total; 38 male and 2 female; 5% female
5.1.4 Number of government environmental and/or health officials trained in IRS oversight	Total number of national and sub-national/district government environmental and/or health officials who are trained in oversight of IRS implementation using AIRS Project resources	Y1, Y2, Y3	Data source: Project records – Training reports Reporting frequency: Semi-annually	By Spray Campaign By Gender Percentage of Women Trained Type of government official (e.g., environmental/health) Per CB district (in Y2)	AIRS	160	Total: 160[72] (158 male, 2 female; 1.3% female) Round 1: 87 (86 male,1 female; 1.1% female) Round 2: 73 (72 male, 1 female; 1.4% female)	160	224 (214 male, 10 female; 5.4% female) CB districts [73]: 33 total; 32 male and 1 female; 3% female	224	247; 228 male and 19 female; 7.6% female CB districts 35 total; 33 male and 2 female, 5.7% female

[72] 255 government personnel received comprehensive TOT with only 160 of them to serving as IRS implementation supervisors. The remainder served in other roles such as mobilization supervision, etc.
[73] See Footnote 48.

Performance Indicator	Indicator Definition	Project Year(s) Reporting	Data Source(s) and Reporting Frequency	Disaggregate	PMI/ AIRS Indicator	Annual Targets and Results					
						Year 1		Year 2		Year 3	
						Target	Results	Target	Results	Target	Results
5.1.5 AIRS Ethiopia conducted a capacity assessment	AIRS Ethiopia program conducted an assessment of IRS capacity among national and sub-national/district government health officials	Y1, Y2	Data source: Project records – Capacity assessment reports Reporting frequency: Semi-annually		AIRS	Completed	Pending	Completed	Completed	N.A.	N.A
5.1.6 Number of capacity-building MOUs signed by AIRS, NMCP and partners/ institutions	Total Memoranda of Understanding (MOU) on provision of local capacity building finalized and signed between AIRS, the National Malaria Control Program, and other local partners and institutions	Y1, Y2, Y3	Data source: Project records – MOUs Reporting frequency: Semi-annually	By Spray Campaign	AIRS	N.A.	N.A.	1[74]	2[75]	N.A.	N.A

[74] MOU planned with Jimma University to enhance local capacity for entomological research.
[75] MOU for entomological capacity building signed with Jimma and Mekelle Universities.