The PMI | Africa IRS (AIRS) Project

Indoor Residual Spraying (IRS 2) Task Order Four

MADAGASCAR 2014
END OF SPRAY REPORT

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MADAGASCAR END OF SPRAY REPORT 2014

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ACRONYMS

AIRS	Africa Indoor Residual Spraying
BCC	Behavior Change Communication
BHC	Basic Health Center
CDC	Center for Disease Control and Prevention
CHL	Central Highlands
DEC	Data Entry Clerk
ECO	Environmental Compliance Officer
HLC	Human Landing Catch
IEC	Information, Education, and Communication
IRS	Indoor Residual Spraying
LLIN	Long-Lasting Insecticide-treated Net
M&E	Monitoring and Evaluation
MEP	Monitoring and Evaluation Plan
MSP	Mobile Soak Pit
NMCP	National Malaria Control Program
PMI	President's Malaria Initiative
PPE	Personal Protective Equipment
PSC	Pyrethrum Spray Catch
PSDQA	Post Spray Data Quality Audit
SEA	Supplemental Environmental Assessment
SOP	Spray Operator
USAID	United States Agency for International Development
USG	United States Government
WHO	World Health Organization

EXECUTIVE SUMMARY

Abt Associates supports the implementation of indoor residual spraying (IRS) in Madagascar on a three-year Africa Indoor Residual Spraying (AIRS) project funded by USAID under the President's Malaria Initiative (PMI). The objective of the project is to limit exposure to malaria vectors and reduce the incidence and prevalence of malaria. To achieve this objective, AIRS Madagascar conducted blanket IRS in three districts in the eastern part of Madagascar from September 8 - November 6 targeting 158,006 structures and focal IRS in six districts in the Central Highlands (CHL) from November 3 - December 10 targeting 128,922 structures. Organophosphates were used in the East and carbamates and pyrethroids were used in the CHL.

The following are project achievements and key highlights of the spray campaigns in 2014:

- A total of 274,533 structures were sprayed (149,408 in the East and 125,125 structures in the CHL) out of 286,928 targeted for spraying, resulting in a 96% spray coverage overall.
- A total of 253,410 structures were mobilized and 435,532 IEC materials were distributed.
- AIRS Madagascar trained 3,450 people (1,859 people in the CHL, and 1,591 in the east), 1,514 (43.88%) of whom were women, to implement the 2014 IRS campaign.
- AIRS Madagascar used 30,086 bottles of organophosphates in the East, and 29,493 sachets of carbamate and 32,117 pyrethroid sachets in the CHL.
- During the first week of the IRS campaign in the East and in the CHL, AIRS Madagascar conducted cone bioassay tests to assess whether the quality of the spraying was satisfactory and homogenous. The result indicated that the spray quality, both in the East and in the CHL, was good since the mortality was 100% for all of the structures sampled.
- AIRS Madagascar used mobile soak pits (MSPs) in remote areas to reduce the travel time of spray operators and safely dispose of IRS liquid waste from the field.
- AIRS Madagascar piloted an mHealth system to monitor operational results daily. This information was used to manage problems as they arose and ensure high quality spraying.
- Refusals and scheduling conflicts with farming hindered the progress of spraying in the East so a second round of mobilization was conducted and the campaign was extended by an additional week.

Table 1 below shows the main results obtained during the IRS 2014 campaign.

TABLE 1: SUMMARY OF 2014 IRS CAMPAIGN RESULTS

Result	CHL (Focal)	East Coast (Blanket)	Total
Number of communes covered by PMI-supported IRS in 2014-2015	55	33	88
Insecticide class	Carbamates and pyrethroids	Organophosphates	
Number of structures treated with PMI-supported IRS, in 2014-2015	125,125	149,408	274,533
Number of structures targeted by IRS, with the support of PMI, in 2014-2015	128,922	158,006	286,928
Spray coverage 2014-2015	97,05%	94,56%	95,68%
Population protected by the PMI-supported IRS in 2014-2015	749,965	557,419	1,307,384
Number of people receiving training funded by the US Government (USG) to conduct IRS	440	369	809

1. INTRODUCTION

Malaria prevention and control is a major foreign assistance objective of the U.S. Government (USG). In May 2009, President Barack Obama announced the Global Health Initiative (GHI), a multi-year, comprehensive effort to reduce the burden of disease and promote healthy communities and families around the world. Through the GHI, the United States will help partner countries improve health outcomes, with a particular focus on improving the health of women, newborns, and children. PMI is a core component of the GHI. PMI was launched in June 2005 as a five-year, $1.2 billion initiative to rapidly scale up malaria prevention and treatment interventions and reduce malaria-related mortality by 50 percent in 15 high-burden countries in sub-Saharan Africa. PMI has now been extended with passage of the 2008 Lantos-Hyde Act. Madagascar was identified as one of the African countries to benefit from PMI support. Working to decrease the burden of malaria in Madagascar, the project led IRS campaigns in six districts in the CHL and a pilot campaign in three districts in eastern Madagascar.

1.1 BACKGROUND OF IRS IN MADAGASCAR

PMI has been conducting IRS campaigns in Madagascar since 2008, in line with the National Malaria Control Strategies (2008-2012 and 2013-2017). The National Malaria Control Strategy supports implementation of IRS in 55 districts within the CHL, in "peripheral" districts[1] and in regions extending to the south and west of Madagascar.[2] Up until 2011, all IRS in Madagascar was categorized as blanket spraying," providing IRS to as close to 100% of the eligible structures in targeted districts as possible. This IRS strategy has been successful largely through collaboration between PMI and the Global Fund; both donors have provided strong support towards IRS spray programs throughout Madagascar.

Madagascar's National Strategic Plan states that after completion of four rounds of blanket spraying in the CHL, IRS campaigns in this zone should switch to "focal spraying" in communes that are deemed to have the highest rates of malaria incidence (according to HMIS data). Entomological surveillance would continue in the areas in which IRS was discontinued to monitor malaria transmission and vector density. In accordance with the National Strategic Plan, PMI and the National Malaria Control Program (NMCP) instructed AIRS Madagascar to spray 55 communes with high malaria incidence in six districts in the CHL during the 2014 IRS campaign.

PMI and NMCP also instructed AIRS Madagascar to implement a pilot campaign in eastern Madagascar in 2014. Although the east is primarily a stable malaria transmission zone, the pilot campaign was implemented in this district along with the collection of epidemiological data to help assess the impact of IRS. AIRS Madagascar conducted spray operations in the east from September 8, 2014 to November 6, 2014 and in the CHL from November 3, 2014 to December 10, 2014.

After restrictions regarding collaboration with the Government of Madagascar were lifted in May 2014, AIRS Madagascar was able to successfully organize advocacy workshops in both districts. The renewed relationship has translated to positive results during the two campaigns, despite difficulties encountered in the field.

[1] The peripheral districts are areas bordering the CHL where, because of the variety of altitudes and climates, malaria transmission (whose transmission rates are lower at higher elevations), and malaria seasons are variable.

[2] The area that extends westward includes the districts situated between the West Coast and the peripheral zone of CHL. Spraying has taken place there since 2010.

1.2 AIRS MADAGASCAR'S OBJECTIVES DURING THE 2014 CAMPAIGN

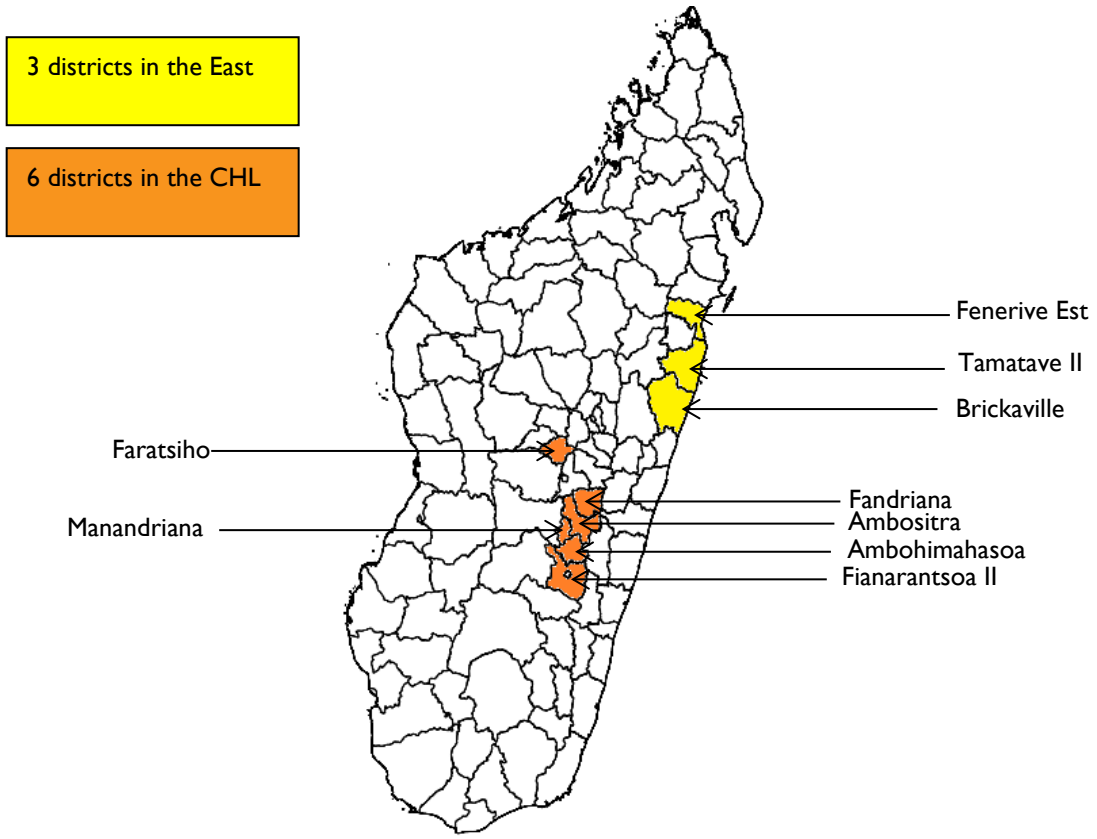
The PMI AIRS Project aims to achieve the goal set by PMI to cover at least 85% of eligible structures found in all communes/districts targeted for spraying. AIRS Madagascar's five main objectives for the 2014 IRS campaign were as follows:

- Improve the capacity of seasonal spray campaign supervisors and government officials to monitor/supervise IRS campaign activities.
- Improve logistics systems to limit stock and supply chain errors and delays in providing needed insecticide and PPE to spray teams.
- Ensure that spraying is completed on-time and before the beginning of the peak transmission season.
- Complete thorough documentation and observation of the implementation of IRS in a zone with perennial malaria transmission (three districts in eastern Madagascar), and share lessons learned regarding the feasibility of completing IRS in a zone with perennial transmission with other malaria stakeholders.

Collect entomological data, as well epidemiological data to assess the quality of spraying and the impact of spraying on entomological and epidemiological indicators.

The following map shows the areas that were sprayed during the 2014 campaign.

FIGURE 1: LOCATION OF SPRAY AREAS COVERED DURING THE 2014 IRS CAMPAIGN



2. Pre-Season IRS Activities

2.1 IRS Campaign Planning

Listed below are the activities undertaken to plan and organize the 2014 IRS campaign.

2.1.1 District and Insecticide Selection

The NMCP held several meetings with the Global Fund and PMI to select the communes and districts to be sprayed by AIRS Madagascar and the Global Fund. In addition, they determined the insecticide to be used in each commune/district. After reviewing entomological surveillance data from the 2013-2014 IRS campaign, they decided that pyrethroids, carbamates and organophosphates would be the insecticide classes used for the 2014 IRS campaign. PMI agreed to use only insecticides in the pyrethroid class in Ambositra, Ambohimahasoa and Faratsiho districts, due to the absence in these three districts of long-lasting insecticide treated nets (which are treated with pyrethroids). The remaining stock of carbamates and pyrethroids was used in Manandriana, Fandriana and Fianarantsoa II districts. Brickaville, Tamatave II and Fenerive Est were sprayed with organophosphates.

2.1.2 Geographical Reconnaissance and Enumeration

In order to prepare for the pilot campaign in the three districts of the east, a geographical reconnaissance was conducted in each intervention zone during May. The results provided an accurate picture of the zone's accessibility and size, and the nature of structures. This crucial activity also helped to establish the final list of intervention communes and to ensure environmental compliance with all activities.

For proper planning of the campaign, a survey was conducted in the new districts:

- In the east: Brickaville, Fenerive Est, and Tamatave II
- In the CHL: Fandriana, Faratsiho, Manandriana, and Fianarantsoa II

AIRS Madagascar conducted a survey of eligible structures to spray in the new spray districts in the east and the CHLs, from June 23, 2014 to July 7, 2014. The project used 1,462 surveyors and 292 supervisors. During enumeration, surveyors collected information on a fokontany level on:

- The number of structures
- The number of beneficiaries
- What structures were constructed out of
- The accessibility of each locality

Before the survey began, District Coordinators trained surveyors and their supervisors on the activity. At the end of the survey, the project found 264,429 structures eligible in the new districts (186,483 in the east and 77,946 in the CHL). Given the difficulties of poor access and organic farming in some areas in the east, 30,445 structures were removed in agreement with health and administrative authorities in the region. Some communes and fokontanys required river crossings and impassable roads. AIRS Madagascar also removed some communes where organic farming is practiced and some farmers refused to prevent the insecticide from contaminating their crops. Please see Annex A for the list of

areas that were removed as targets. Table 2 below shows the communes and approximate populations of districts selected in the CHL and the east that were covered by the 2014-2015 IRS campaign.

TABLE 2: LIST OF COMMUNES AND DISTRICTS COVERED BY THE 2014-2015 IRS CAMPAIGN

Area	District	*Communes* targeted with IRS	Number of *communes*	Total number of eligible structures found by SOPs	Insecticide class
Central Highlands (focal spraying)	Ambohimahasoa	Ambohimahasoa, Fiadanana, Ambohinamboarina, Manandroy, Ankerana, Ambalakindresy, Kalalao, Befeta, Ampitana, Camp Robin, Morafeno	11	24,449	Pyrethroids
	Ambositra	Vohidahy, Ambinanindrano, Ankazoambo, Ambositra II, Ambohimitombo II, Mahazina, Ambohipierenana, Imerin'Imady, Ambatofitorahana I, Ambohimitombo Ladilanana, Kianjandraikefina Ambohimanjaka, Alakamisy Ambohijato, Tsarasaotra, Ilaka Centre, Antoetra, Ivony Miaramiasa	17	24,901	Pyrethroids
	Fandriana	Alakamisy Ambohimahazo, Betsimisotra, Fandriana, Fiadanana, iMito, Mahazoarivo, Miarinavaratra, Milamaina, Sahamadio Fisakana, Sandrandahy, Tatamalaza, Tsarazaza	12	38,372	Carbamates
	Faratsiho	Ambohiborona, Antsampanimahazo, Vinaninony Atsimo	3	13,887	Pyrethroids
	Fianarantsoa II	Alakamisy, Ambohimaha, Ambalakely, Andranomiditra, Ankaromalaza Mifanasoa, Ihazoara, Mahasoabe, Mahazoarivo, Soatanana, Vohimarina, Vohitrafeno	10	24,509	Carbamates
	Manandriana	Anjoman'Ankona, Ambohimahazo	2	2,804	Carbamates
Totals for CHL			**55**	**128,922**	
East Coast (blanket spraying)	Brickaville	Brickaville urban sub, Andovoranto, Vohitranivona, Ambinaninony, Ambalarondra, Anjahamana, Ranomafana East Mahatsara, Ampasimbe	9	41,021	Organophosphates
	Fenerive Est	Vohilengo, Farafangana, Saranambana, Miorimivalana, Fenerive, Ambodimanga II B, Mahambo, Mahanoro, Ambatoharanana, Ampasina Maningory, Vohipeno Ampasimbe Manantsatrana, Antsiatsiaka	12	67,495	Organophosphates
	Tamatave II	Toamasina suburban, Antetezambaro, Amboditandroho, Mahavelona, Andondabe, Ampasimbe Onibe Fanandrana, Ambodilazana, Andranobolalhay, Ampasamadinika,	12	49,490	Organophosphates

Area	District	*Communes* targeted with IRS	Number of *communes*	Total number of eligible structures found by SOPs	Insecticide class
		Sahambala, Ambodiriana			
Total for the East Coast			**33**	**158,006**	
Grand total			**88**	**286,928**	

2.1.3 MICRO-PLANNING

AIRS Madagascar staff held several internal meetings to plan and organize IRS campaigns in the east and in the CHL. This also included indicating the time of preparation of each IRS campaign activity, which was then distributed as a weekly communication to PMI/Madagascar. This communication assured that PMI/Madagascar was aware of the progress made during the IRS campaigns. Following the initial training of trainers for the IRS campaign, AIRS Madagascar's technical staff worked with District Coordinators of IRS in each commune down to the fokontany level.

Renewed and increased collaboration with the Government of Madagascar led to a larger involvement of officials from the NMCP, and decentralized services of the Ministry of Public Health. Members were heavily involved throughout the planning and implementation process, by providing training and leading the supervision of operations. AIRS Madagascar successfully organized two regional advocacy workshops in July 2014 in the east and in October 2014 in the CHL. Workshops completed in the east made it possible to validate the final list of spray locations, including those that had to be removed due to lack of access.

2.2 LOGISTICS NEEDS AND PROCUREMENT

AIRS Madagascar referenced the inventory records from the previous IRS campaign and conducted a logistics needs assessment on April 25, 2014. During the logistics needs assessment the following were considered:

- Available stock of materials, consumables, and equipment;
- Transport arrangements, including vehicle hiring for spray operations and supervision;
- Estimation of insecticide, PPE, and spray equipment required to meet the needs of spraying; and
- Mobilization and distribution of equipment, materials, and supplies

2.2.1 INTERNATIONAL PROCUREMENT

AIRS Madagascar continues to have some stock of personal protective equipment and spray pumps from previous campaigns. The items that needed to be replenished or used for repairs are shown in Table 3 below. Please refer to the table in the Annex B for more information on PPE items purchased, used, and remaining in stock after the IRS campaign. Given that AIRS Madagascar used pyrethroids and carbamates in the CHL and organophosphates in the South during the 2013-2014 IRS campaign, the country had a large stock of insecticides left over for the 2014 -2015 IRS campaign (34,145 sachets of carbamates and 4,468 sachets of pyrethroids). Although carbamates did not have to be purchased, an additional stock of 33,600 sachets of pyrethroids were purchased to cover the needs for insecticide spraying in the CHL. For the pilot campaign on the East Coast, the NMCP and PMI agreed to use organophosphates. To supplement the 38,919 bottles in stock from the last campaign in the South, the AIRS project acquired 5,196 bottles of Actellic CS 300 to cover the needs of the insecticide for the

2014 campaign. In 2015, AIRS will only procure a 2.5% buffer stock of insecticide for new districts and no buffer stock for the old districts.

2.2.2 Warehouses

In order to implement the pilot campaign in the east, a central warehouse was identified in Tamatave to accommodate all equipment and commodities. The equipment and commodities from the central warehouse in Ambovombe South were transferred to this new warehouse, and the warehouse keeper in Ambovombe was assigned to Tamatave to manage the new store. A warehouse in Antananarivo was used to support spray operations in the CHL.

2.3 Human Resource Requirements

2.3.1 Recruitment of Permanent Staff

In 2014, AIRS Madagascar recruited two new permanent staff members as part of its efforts to better organize and supervise the 2014 IRS campaign. They were instrumental in helping the AIRS Madagascar team launch the 2014 campaign, and in carefully monitoring and resolving problems that arise during implementation. The staff members recruited are described below:

- Environmental Compliance Officer (ECO): During the 2013/14 spray campaign in the south, the project did not have an ECO, and experience showed that the ECO role was a key one. Therefore, it was necessary to recruit one for the new campaigns. The ECO directed and coordinated efforts to ensure environmental compliance of all spray activities, including: implementation and supervision procedures; distribution, storage and handling of insecticides; procedures for the disposal of insecticides waste and packaging in accordance with national and international standards; supervision of construction and/or rehabilitation of soak pits and warehouses before spray campaigns, and their proper use; and supervision after the campaigns.
- IT Manager: He ensured the proper management of the project's computer system and assisted the monitoring and evaluation (M&E) team in using the project database.

2.3.2 Hiring of Seasonal Staff

AIRS Madagascar hired 3,358 seasonal workers (1,815 seasonal workers in the CHL, including 1,021 men and 794 women, and 1,543 seasonal workers in the east, including 793 men and 750 women) for the 2014-2015 IRS campaigns. Women accounted for 46.0% of the seasonal staff in the 2014-2015 IRS campaign. The proportion of women recruited significantly increased compared to in the 2013-2014 IRS campaign, where women constituted only 22% of the seasonal staff, but the majority of women hired in 2014-2015 were hired as enumerators, a position that AIRS Madagascar does not hire for every year.

Table 4 shows the distribution of seasonal workers recruited for each position, broken down by gender and spray zone.

TABLE 3: SEASONAL WORKERS HIRED, BY GENDER

Position	CHL		East		Total
	Male	Female	Male	Female	
Logistics Assistant	1				1
Central Financial Assistants					2
District Financial Assistants		5		3	8
Environmental Compliance Assistant	1				1
M&E Assistant	5		3		8
Data Entry Clerks (DECs)	12	5	14	7	38
Sector Manager	22		21	3	46
Warehouse Keepers	7	12	4	8	31
Guardians	27		20		47
Spray Operators (including Team Leaders)	359	14	264	33	670
Supervisors of Enumerators	14	34	20	52	120
Enumerators	45	142	199	205	591
Washers	8	30	–	39	77
Mobilizers – Information, Education and Communication (IEC)	309	477	131	319	1,236
Supervisor of IEC Mobilizers	81	69	72	79	301
Porters	108	6	29	1	144
Spray Pump Technicians	20	–	16	1	37
Total	**1,021**	**794**	**793**	**750**	**3,358**
TOTAL	**1,815**		**1,543**		**3,358**

2.3.3 Payment of Seasonal Workers

AIRS Madagascar continued to pay seasonal staff through a mobile banking system. All seasonal workers, whether they owned a mobile phone or not, were able to use a SIM card in "cash points" located across Madagascar (shops, restaurants, mobile offices, banks and microcredit institutions' branches) to receive in cash the amount credited to their SIM cards. Some of the advantages of the mobile banking system over cash payments included: decreased risk of theft and fraudulent activity, time savings because staff to not have to travel to distribute the money, and improved transparency since all payments are recorded and tracked electronically. The mobile banking system costs only 2-3% of the amount of funds transferred compared to 5-6% for cash payments. AIRS Madagascar estimates a cost savings of about $11,000 in 2014 compared to the previous year.

2.4 Training of Seasonal Staff

AIRS Madagascar organized and hosted 26 training sessions (13 in the CHL, and 13 in the east) for its seasonal staff. The training sessions were designed to ensure that all seasonal workers were trained in their roles and understood how to implement the IRS campaign. The training sessions also presented precautions and emergency measures (such as in case of poisoning with insecticide). All training sessions were conducted by AIRS Madagascar's staff in collaboration with representatives of the Ministry of Health at the national and regional levels. The training sessions in the CHL took place from October to November 2014. In the east, the training sessions were held in August until the first week of November

2014. AIRS Madagascar trained 3,450 people (1,859 people in the CHL, and 1,591 in the east), 1,514 (43.88%) of whom were women, to implement the 2014-2015 IRS campaign.

TABLE 4: NUMBER OF PEOPLE TRAINED, DISAGGREGATED BY SPRAY ZONE

Training	CHL		East		Total
	Male	Female	Male	Female	
Training of Spray Operators	359	14	264	33	670
Training of Trainers	23	0	21	3	47
Training of DECs and M&E Assistants	17	5	17	7	46
Training of Warehouse Keepers	8	12	4	8	32
Maintenance of spray pumps	20	0	16	1	37
IEC Training of Trainers	81	69	72	79	301
IEC mobilization	309	477	131	319	1236
Training of Supervisors of Enumerators	14	34	20	52	120
Training of Enumerators	45	142	199	205	591
Training of Washers	8	30	0	39	77
Training of transporters	108	6	29	1	144
Training of security officers	27	0	20	0	47
Training of health workers	20	24	23	25	92
Training of Financial Assistants	2	5		3	10
Total M/F	1041	818	816	775	3450
Total	**1859**		**1591**		**3450**

It should be noted that in addition to the seasonal staff recruited, public health workers participated in the various trainings. This accounts for the difference between the total number of seasonal staff recruited and the total number of people trained.

2.4.1 IRS Campaign Training

AIRS Madagascar coordinated and led various trainings to equip seasonal staff with the skills and knowledge needed to successfully implement IRS. The trainings covered the following key topics:

- Introduction to malaria control;
- IRS planning and logistics management;
- Spray techniques and processes;
- Environmental compliance and personal safety;
- Advocacy and social mobilization;
- IRS monitoring and evaluation; and
- Supervision of IRS activities.

The following is a short description of the trainings which took place in 2014:

Training of trainers (August 25 to 30, 2014 in the east; October 20 to 25, 2014 in the CHL): AIRS Madagascar staff trained seasonal workers in managerial positions (including Heads of Sectors and M&E Assistants) and trainers from the health system on the following topics: the importance of IRS campaigns in malaria control; spraying techniques; importance of environmental compliance during IRS campaigns; filling in data collection forms; collection of data through mHealth SMS; supervision of spray teams; IEC message communication; and preparation of homes.

Training of SOPs (October 27-31, 2014 in the CHL; September 1-6, 2014 in the east): SOPs were trained on the following topics: the importance of the IRS campaign in malaria control; methods for proper mixing of insecticide; best practices in indoor spraying of eligible structures; correct use of PPE; cleaning spray pumps and waste disposal; filling operator's forms; and communication of IEC messages. In addition, all SOPs received practical training on how to set up and use a soak pit and clean it after use.

Training of M&E Assistants/DECs (October 16-19, 2014 in the CHL; August 19-22, 2014 in the east): The M&E Assistants and DECs worked with the IRS campaign data entry forms, and the system used by AIRS Madagascar to enter spray campaign data in the database. M&E Assistants were also told how to use M&E supervision forms (data collection verification tools, data entry verification tools and error elimination tools).

Training of warehouse keepers (October 17, 2014 in the CHL; August 22 and 23, 2014 in the east): Warehouse keepers were trained on the management of inventories; the importance of filling and maintaining stock cards; and the proper procedures for the storage of PPE and insecticides.

Training in maintenance of spray pumps (October 27-31, 2014 in the CHL; September 1-6, 2014 in the east): All spray pump maintenance technicians learned to identify the various parts of spray pumps and to ensure the maintenance and repair of pumps.

Training of washers (October 27-31, 2014 in the CHL; September 1-6, 2014 in the east): Washers were trained on the proper technique to wash PPE.

Training of public health workers in management of poisoning with insecticide (November 7, 2013 in the CHL; August 24, 2014 in the east): AIRS Madagascar's staff was able to provide training on poison management to physicians at public health centers in intervention districts as well as to private physicians.

Training of Drivers (November 1, 2014 in the CHL; September 6, 2014 in the east): Drivers were advised on their duties and role in helping spray teams perform their work. Drivers learned how to transport and set up mobile soak pits.

Training of IEC Trainers (August 11 to 15, 2014 in the east; October 6 to 11, 2014 in the CHL): IEC supervisors were trained on appropriate messages to be communicated; best practices in conducting door-to-door mobilization; filling data collection forms on the mobilization; and identification of structures eligible for the spray campaign. They also reviewed the methods used to supervise IEC activities and ensure that data collection for the identification of eligible structures was performed correctly.

Training of Mobilizers (October 13 to 18, 2014 in the CHL; August 18 to 22, 2014 in the east): IEC Mobilizers were trained on how to effectively communicate messages and implement best practices for door-to-door mobilization. They were also trained on how to complete mobilization data collection forms and how to mark structures. Additionally, mobilizers in the east were advised to deliver new messages to beneficiaries concerning organophosphate spraying. This was necessary because organophosphates usually leave white streaks and a distinct smell after being sprayed in a structure.

Training of surveyors' supervisors (June 12 to 13, 2014 in the CHL; June 12 to 13, 2014 in the east): The supervisors of surveyors were trained on the following topics: general information about the project, enumeration, structure, types of structures, and using data collection tools.

Training of surveyors (June 16, 2014 in the CHL; June 16, 2014 in the east): Surveyors were trained on the following topics: general information about the project, enumeration, structure, types of structures, and use of data tools collection.

Training of Environmental Compliance (June 17 to 23, 2014 in the East): The previous mobile soak pit design was successfully piloted during the 2013-2014 campaign in Madagascar. In June 2014, the Environmental Compliance and Safety Manager (ECM) did an STTA to Madagascar in order to train the new Environmental Compliance Officer of AIRS Madagascar. The purpose of this training was to underline the Best Management Practices and environmental exigency of the IRS program. During this training, the ECM introduced and manufactured a sample of the new mobile soak pit design and trained the Operations Manager, Environmental Compliance Officer, and two District Coordinators on the manufacturing procedures of this new model.

3. IEC Mobilization

3.1 Mobilization Methodology

AIRS Madagascar organized awareness-raising events before and during the IRS campaigns, working with media channels, producing and distributing various IRS promotional materials, and directly contacting beneficiaries through door-to-door mobilization to inform them of the IRS campaign schedule and its benefits for malaria control. The project adopted the following working methodology to conduct mobilization:

- Reviewed key policy documents (National Malaria Control Strategic Plan, PMI Strategy Papers on IRS messages, etc.).
- Discussed and planned IEC/BCC mobilization activities, in collaboration with the Regional Directorates of Health and the health districts.
- Conducted advocacy meetings with the Health and Administrative Authorities in the regions, districts, communes and fokontanys.
- Trained seasonal staff involved in the implementation of IEC/Behavior Change Communication (BCC) activities (mobilizers and their supervisors).
- Disseminated IEC materials in the intervention communes and fokontanys.
- Conducted door-to-door mobilization.
- Aired radio messages on all radio stations with a wide geographical coverage.
- Organized radio broadcasts with the participation of IEC officials from the public health system to strengthen advocacy at all levels.
- Provided supervisory training and ensured supervision of field mobilization teams.

3.2 Advocacy

To ensure the involvement of local leaders in the spray campaign, AIRS Madagascar led advocacy activities. This also helped the project to minimize refusals of IRS. The activities included:

- Organizing an Inter-regional Advocacy Workshop with the participation of all the Authorities in the project intervention regions and districts (health and administrative authorities) both in the CHL and eastern Madagascar.
- Organizing advocacy actions in the communes and fokontanys before and during IRS campaigns in the following forms: courtesy visits, meetings with authorities, information sessions at different levels (communes and fokontanys) with the involvement of all social actors; and participation in the various official meetings in districts, communes and fokontanys, to strengthen advocacy and IRS messages and especially to share information about the spraying programs in localities.

3.3 Door-to-Door Mobilization

Door-to-door mobilization was implemented from August 25 to September 13, 2014 in the east and from October 20, 2014 to November 8, 2014 in the CHL. Mobilizers and mobilizer supervisors worked under the supervision of District Coordinators and were supported by the IEC/BCC Coordinator and

the Operations Coordinator. There were not enough mobilizers to reach every household in the east, where some fokontanys consist of several hamlets scattered over 20km apart; in such thinly populated communes and fokontanys, the project collaborated with other community workers working in the health sector to reach all of the households. In 2015, AIRS will conduct more in depth planning for mobilization to make sure that there are enough mobilizers to reach all households.

Mobilizer supervisors were local authorities from various sectors (mayors, heads of fokontanys, heads of Basic Health Centers (BHCs), paramedics, and other actors working in social development), whereas the pool of mobilizers were mainly Community Health Workers at the BHCs, who were already working in the field as part of local health activities. The choice of these local actors fostered better acceptance of IEC messages and the spray, as they were delivered by people that were from within the households' communities.

Mobilizers and their supervisors conducted mobilization activities before spraying, and then during spraying by accompanying SOPs in the villages on the spray day. The following four categories of messages were used during mobilization activities:

- Advocacy messages targeting local authorities and leaders
- Messages for communities on the advantage and the effect of IRS
- Messages for families on preparing homes
- Messages for SOPs on approaches they should adopt and precautions they should take during spraying

Next year, AIRS will add messages on the advantages of accepting IRS to prevent malaria in comparison to the minor side effects which households sometimes experience. The team will also standardize mobilization activities with local authorities to reach all households and increase acceptance of IRS. New IEC pamphlets will be distributed before the next spray campaign.

During mobilization, 625 household owners did not accept IRS. The most common reason for not accepting IRS was that they were not at home because they were in the fields working. A second round of mobilization was organized in collaboration with local authorities to emphasize to household owners that they needed to assign an adult to be present in their house to receive IRS. After the second round of mobilization, the number of refusals/non-acceptances dropped to only 32.

Please see below for the mobilization results for the East Coast and CHL.

TABLE 5: MOBILIZATION RESULTS IN THE CHL AND THE EAST

District	Found	Mobilized	Not mobilized	Total	Men	Women	Acceptance	Refusal	IEC materials distributed
Ambohimahasoa	18,010	17,846	164	47,601	20,055	27,546	17,826	184	1,661
Ambositra	18,192	18,146	46	44,986	20,063	24,923	18,123	69	30,241
Fandriana	25,524	25,492	32	60,882	27,851	33,031	25,477	47	50,241
Faratsiho	11,846	11,846	–	26,869	12,209	14,660	11,846	–	21,978
Fianarantsoa II	22,495	22,495	–	52,079	23,228	28,851	22,458	37	37,448
Manandriana	2,801	2,801	–	8,365	3,800	4,565	2,801	–	5,082
Total CHL	**98,868**	**98,626**	**242**	**240,782**	**107,206**	**133,576**	**98,531**	**337**	**146,651**
Brickaville	38,631	38,627	4	79,234	34,217	45,017	38,592	39	76,948
Fenerive Est	76,737	76,686	51	154,149	65,214	88,935	76,609	128	133,455
Toamasina II	39,491	39,470	21	84,262	36,348	47,914	39,370	121	78,476
Total East Coast	**154,860**	**154,784**	**76**	**317,647**	**135,780**	**181,867**	**154,572**	**288**	**288,881**
Grand Total	**253,728**	**253,410**	**318**	**558,429**	**242,986**	**315,443**	**253,103**	**625**	**435,532**

3.4 Other IEC Activities

Door-to-door mobilization was complemented with other IEC activities in the form of mass communication, including the distribution of three types of materials that were used during the 2014 campaign, flyers, brochures, and informative posters. The project distributed 217,766 flyers, 217,766 brochures and 7,176 posters in the CHL and in the east during mobilization. The project also aired radio messages in collaboration with radio stations with broad geographic coverage in the project's intervention regions and districts to strengthen IRS messages and disseminate the spraying schedules. AIRS Madagascar developed and aired specific pre-spray and spray period messages. The team aired 477 radio spots in the east and 497 spots in the CHLs, 974 radio spots in total.

In the district of Toamasina II, the dissemination of IRS messages was integrated into existing health programs on radio stations, which accounts for no radio spots airing being reported and saved approximately $1,000. In the future, AIRS Madagascar will try to replicate this same practice in other areas as well. In general, the number of IRS message airings depended on the number of partner radio stations in the districts. In some cases, radio stations made additional airings as their contribution to malaria control.

4. IRS Campaign Implementation

4.1 IRS Campaign Schedule

Once the SOP training sessions were completed, IRS implemented commenced immediately. The pilot spray campaign in the districts of Tamatave II, Brickaville and Fenerive Est on the East Coast ran from September 8, 2014 to October 29, 2014. Spraying in Tamatave II and Brickaville was extended up to November 6, 2014 in the district of Fenerive Est. In the CHL, the 2014 campaign began on November 3, 2014, and ended on December 10, 2014 after 33 days of work.

4.2 Organization of the IRS Campaign

As the intervention approach applied during the 2013-2014 campaign had proved effective, the project team continued with the same arrangements this past year. Seasonal workers were recruited in their communities with the support of local authorities. At the district and commune level, seasonal staff decisions were made jointly between the district coordinator and local authorities. SOPs continued to work in their districts or in neighboring areas. A risk assessment was conducted and provided the team with the ability to assess local circumstances. This resulted in the removal of some communes from the original list of due issues of access, after consultation with regional and local elected officials.

AIRS Madagascar grouped spray operators in two to four operational sites depending on the size of the district. Each operational site had a soak pit and a warehouse large enough to serve several spray teams. Fifty-seven MSPs were piloted in remote areas in the east and CHL. With these arrangements, it became possible to limit the number of permanent soak pits and warehouses to a total of 27 (17 in the CHL and 10 in the three pilot districts on the East Coast) for the 2014 IRS campaign.

Each morning, every District Coordinator organized breakfast for SOPs before they went to work. Breakfast was an opportunity for the team supervisors and Heads of Sector to communicate recommendations/instructions ensuing from the daily debriefing the day before.

Vehicles were made available to the spray teams to transport them to spray areas and back to the operational sites in the late afternoon, where spray teams conducted progressive rinsing to properly remove liquid waste (rinsing spray pumps and washing PPE, except for overalls, in soak pits). Regarding the data collection, at the end of each day, SOPs handed their completed spray forms to their Team Leaders, who checked and compiled them before submitting them to their Head of Sector. Spray forms were then sent to data entry centers for immediate entry into AIRS Madagascar's database. The number of spray teams and SOPs employed during the 2014 IRS campaign, and the location of soak pits and warehouses, are shown in Tables 7 and 8 below.

TABLE 6: NUMBER OF SPRAY TEAMS PER DISTRICT

Region	District	Number of spray teams	Number of SOPs (A)
CHL	Ambohimahasoa	12	59
	Ambositra	13	65
	Fandriana	17	87
	Faratsiho	7	34
	Fianarantsoa II	12	60
	Manandriana	1	6
	Total for CHL	**62**	**311**
East	Brickaville	13	67
	Fenerive Est	20	100
	Tamatave II	16	81
	Total for the east	**49**	**248**
Total		**111**	**559**

TABLE 7: LOCATION OF SOAK PITS AND WAREHOUSES USED DURING THE 2014- 2015 IRS CAMPAIGN

Spray area	District	Location of soak pits/ warehouses	Number of Soak pits/ warehouses
CHL	Faratsiho	Vinanoniny South, Ambohiborona	2
	Manandriana		
	Fandriana	Fandriana, Sandrandahy, Miarinavaratra, Mahazoarivo	4
	Fianarantsoa II	Alakamisy Ambohimaha, Soatanana, Mahasoabe, Vohimarina	4
	Ambositra	Ambositra, Ilaka Centre, Kianjandrakefina, Ambinandrano	4
	Ambohimahasoa	Ambohimasoa, Camp Robin Ikalalao	3
	Total CHL		**17**
East	Brickaville	Brickaville Centre, Ranomafana East	2
	Tamatave II	Antetezambaro, Foulpointe, Fanandrana, Ambodiriana	4
	Fenrive Est	Fenerive Centre, Ampasina Maningory, Ampasimbe Manatsatrana, Vohilengo, Farafangana	5
	Total east		**10**
Total for CHL and east			**27**

4.3 IRS Campaign Supervision

Supervision of the IRS campaign was provided by AIRS Madagascar's full-time staff as well as seasonal staff. Supervision was strengthened by the use of supervisory checklists that AIRS Madagascar's staff entered into smart phones, and seasonal staff on paper forms. Supervisory checklists provided reminders of key activities to complete each day during the spray campaign, and various policies and standards of the IRS campaign in accordance with PMI's best management practices. The checklists also

assessed the daily performance of SOPs. NMCP, PMI, district medical and administrative authorities were involved in supervision activities.

AIRS Madagascar's staff organized daily conference calls (usually via Skype) to discuss the campaign's progress and the various issues to address.

The supervision system for the 2014 IRS campaign is listed below:

- SOPs were grouped into teams of five. Each team was supervised by a Team Leader. The Team Leader watched and supervised all spraying activities, including the use of PPE, ensuring that structures were properly sprayed and that progressive rinsing of spray pumps and washing of PPE were performed in fixed or mobile soak pits.
- Heads of sector supervised the work of the spray teams in three to five communes (depending on the number of structures to be sprayed and the geographic area to be covered). Heads of sector were in the field every day to oversee all spraying operations in their communes, and to monitor activities at the operational sites before and after the day of spraying to ensure compliance with the project's Best Management Practices and standards set for the IRS campaign.
- AIRS Madagascar District Coordinators oversaw all seasonal staff in their districts and were in charge of ensuring that the spraying was carried out on time. District Coordinators also checked with warehouse keepers that the stocks of PPE and insecticides in the operational sites were sufficient. District Coordinators also communicated with the Operations Manager and Operations Coordinator on a daily basis to discuss daily spray progress and any issues spray teams were faced with in the field, as well as to take note of insecticide and PPE stocks available.
- AIRS Madagascar's staff (including the Chief of Party, the Operations Manager, the Monitoring and Evaluation Officer, etc.) were in the field throughout the IRS campaign, watching spraying operations, ensuring environmental compliance and security of the permanent and seasonal staff, and providing answers to problems and support to the District Coordinators and Heads of Sector. Furthermore, the Operations Manager and the Operations Coordinator carefully tracked the number of structures sprayed by district and the number of insecticide sachets/bottles used, to ensure that adequate stock was available at all time. The use of mHealth greatly facilitated this work during the 2014 campaign.[3]

The Logistics Manager and his assistant were also in the field during the two spray campaigns, organizing the transportation of PPE and insecticides to all operational sites, and liaising with warehouse keepers to assess stocks and needs in each operational site. They also continued strengthening the capacity of warehouse keepers throughout the campaign for a good management of stocks. With the lifting of restrictions on collaboration, the Government of Madagascar's decentralized services were heavily involved in overseeing operations in the three pilot districts on the East Coast as well as in the other CHL districts covered by the 2014 campaign. In each district, an integrated supervision team was set up which included one medical staff, one NMCP representative, one administrative authority and AIRS technical staff . Based on the supervision plan, spray operations supervision was performed and everyone was requested to fill the daily supervision forms. These forms were collected by each District Coordinator and he/she used the information during the daily debrief discussions. In the CHL and the East Coast, approximately 30 government staff were involved in spray operations supervision.

4.4 Farming and Access Challenges

In Fenerive Est, some structures were closed due to agricultural activities. The spray campaign in the east took place during the clove harvest season and this is the main source of revenue for beneficiaries.

[3] mHealth: Data collection system by mobile devices (e.g. SMS) (see detail).

Since many beneficiaries were busy farming, they were not at home to accept IRS. As a result, it became necessary to organize a second round of IEC/BCC and to extend the spray campaign for six additional days to achieve the objectives set.

5. Environmental Compliance

5.1 Environmental Compliance

5.1.1 Letter Report

During the 2013-2014 campaign, AIRS Madagascar operated under a supplemental environmental assessment (SEA), approved by USAID in September 2013, which authorizes the use of three classes of pesticides (pyrethroids, organophosphates, and carbamates) in all regions of Madagascar for the 2013-2018 period. In 2014, carbamates and pyrethroids were used in the Central Highlands and organophosphates were used in eastern Madagascar. AIRS Madagascar submitted the required "Letter Report."

5.2 Difficulties in Ensuring Environmental Compliance in the East

The East Coast is considered the rainiest and wettest region of Madagascar. As a result, in terms of epidemiological profile, malaria transmission is perennial in this area. In addition, communication and travel in the various localities are difficult. The ECO conducted a risk analysis from June 17, 2014 to July 18, 2014 to ensure the safe implementation and environmental compliance of the 2014 IRS campaign.

Four operational sites were initially planned in the district of Brickaville, namely at Brickaville Centre, Ranomafana, Razanaka, and Fetraomby. Pursuant to the risk assessment, only two sites were selected, Brickaville Centre and Ranomafana. Razanaka and its three communes (Fanasana, Lohariandava, and Andekaleka) can be reached only by train. The materials and equipment required for spraying, including insecticides, could therefore not be transported in their own separate wagon, but would have had to be transported by train with other goods, including food commodities, entailing excessive risks of contamination. To reach Fetraomby, one must navigate a river with rapids for seven hours. From Fetraomby to the communes of Maroseranana and Bezamba, one has to walk for 6 to 12 hours. Because of the risks of canoes capsizing, theft and banditry, and lack of local supervision, it was decided not to have an operational site at Fetraomby.

FIGURE 2: RAPIDS AT FETRAOMBY

FIGURE 3: ARRIVAL IN MANAMBOLO, TOAMASINA II

In Toamasina II and Fenerive Est, some intervention communes/fokontanys are located more than five walking hours from an operational site were removed from the list of areas to be sprayed.

Protected areas were identified in the eastern region, and information about the spraying methods and guidelines in areas close to these was communicated to District Coordinators and Heads of Sector. The eastern region also included two organic farming areas, namely a palm tree plantation in Fanandrana and a curcuma plantation in Anivorano Est. These organic farming areas were granted the same consideration as other protected areas. After informing the plantation managers of the exact nature of indoor residual spraying, the project did not spray these areas.

One of the geographical specificities of the East is the presence of numerous streams and rivers. Most of the time, trips to the communes to be sprayed would involving crossing rivers, sometimes by canoes. As the risk of insecticide spills in the rivers are high at these crossings, the Environmental Compliance and Safety Management assessment was performed in June by the Environmental Compliance Manager, the Operation Manager and the Environmental Compliance Officer. This mission aimed to identify and appreciate the different types of causes and consequence that may arise during these displacements. After this mission, the ECM has implemented measures to prevent such incidents, which are listed below:

- Each project staff wore a life jacket.
- Full and empty insecticides bottles were packed in blue and waterproof plastic barrels.
- Other equipment was covered with waterproof tarpaulins.
- The raft or canoe carrying insecticides and IRS equipment did not carry other people or other goods at the same time, except those manning them.
- To avoid contamination, sprayers' boots did not touch the water.
- The crossing must be done under the supervision of the ECO or an Assistant.

FIGURE 4: CROSSING OF RIVERS BY OPERATIONS TEAMS

TABLE 8: LIST OF COMMUNES THAT REQUIRED RIVER NAVIGATION

District	SOP	Commune	River	Duration	Observation
Toamasina II	Toamasina II	Amboditandroho	Pangalane Channel	3h	Calm water
Is Fenerive	Ampasina Maningory	Vohipeno	Maningory	3+h walk for 1 hour	River with rapids

5.3 PRE-SEASON ENVIRONMENTAL COMPLIANCE ASSESSMENTS

To allow effective implementation of the IRS campaign and to adhere to environmental compliance protocols, AIRS Madagascar conducted a pre-season environmental assessment from August 13, 2014 to September 7, 2014 in the east, and from October 7, 2014 to November 2, 2014 in the CHL. The pre-season assessment was conducted as in the past and in other AIRS countries, using smart phones, which had been programmed in advance by uploading environmental assurance checklists. The checklist contained questions to ensure that operational sites, with special emphasis on soak pits and warehouses, were properly set up. They also guided the AIRS Madagascar's staff in checking that all PPE and insecticides were delivered and safely stored in warehouses, and that seasonal staff working in the warehouses or with soak pits had received appropriate training. Smart phones were also used to collect data on the coordinates of each operational site visited in the geographic information system; photos of soak pits and warehouses were taken to show that they were ready. It should be noted that the use of smart phones was enhanced with an option to allow for transportation inspections.

Other pre-season activities included site repairs, the building of soak pits, medical inspections, and transportation checks.

- After the first inspection of the operational sites, it was found that numerous sites needed to be repaired to meet the standards required for IRS. Please see Annex C for the full list of repairs performed.

Building soak pit

Repairing the store room in Mahazoarivo fandriana

- Before the campaign, all seasonal staff underwent medical checkups and women had to pass a pregnancy test.
- The project staff travelled to spray sites by car, by boat or on foot. These means of transportation had to be inspected to ascertain that staff, equipment, and insecticides were safe during trips.

5.4 Environmental Compliance Activities During the Campaign

Inspections and environmental monitoring visits were conducted during the campaign to monitor the progress of IRS and to ascertain whether activities met environmental compliance requirements. AIRS Madagascar's staff conducted inspections to ensure that spraying operations met environmental compliance standards as specified in Best Management Practices. The inspection was carried out using checklists uploaded to smart phones.

AIRS Madagascar's staff assessed the following aspects: use of PPE; progressive rinsing of spray pumps and vehicles used to transport spray teams and insecticides; storage conditions of PPE and insecticides; and adequacy of safety measures applied (for instance, warehouses displaying warning signs). AIRS Madagascar's staff also monitored whether IRS campaign waste was managed and stored properly, that stock cards at warehouses were accurate, and that the SOPs were using the proper technique. In addition, the staff checked that beneficiaries had received clear information about the IRS campaign and knew how to prepare their buildings for spraying. AIRS Madagascar checked the condition of fixed and mobile soak pits, specifically for their flow and drainage. Overall, AIRS Madagascar's staff found that spraying operations were satisfactory and few environmental compliance issues were identified. The non-compliance issues observed by the AIRS Madagascar staff during the 2014-2015 IRS campaign and the measures taken to address them are listed in the table below.

TABLE 9: ENVIRONMENTAL COMPLIANCE ISSUES NOTED DURING SUPERVISIONS

Difficulties	Districts	Measures taken by AIRS
Expired insecticide was transported to the field.	Fandriana, Fianarantsoa II	AIRS Madagascar will manage their insecticide stock more carefully in the future and use the FIFO principle.
Two mobile soak pits were clogged.	Fenerive Est	The persons in charge were requested to wash the two top sponges at the main soak pit.
Too many people were riding in vehicles.	All districts	We asked vehicle drivers to run additional trips with less passengers.
Pocket lamps did not produce strong enough light.	Fianarantsoa II	The batteries were replaced and the bulbs were checked.
Doors and windows were left	Faratsiho	Since SOPs said that lighting was the problem, one

Difficulties	Districts	Measures taken by AIRS
open during spraying.		flashlight was procured and given to each SOP.
Personal effects and furniture were not always removed from the room before it was sprayed.	Fianarantsoa II	Due to security concerns, people were afraid to put their belongings outside. We recommended transferring effects and furniture to rooms that were not going to be sprayed.
One SOP was caught eating while he was wearing PPE.	Faratsiho	The District Coordinator reinforced the message that SOPs are prohibited from eating while wearing their PPE because of the risk of contamination.
The soak pit did not drain rapidly due to the build-up of silt/mud in the soak pit area.	Fenerive	AIRS Madagascar staff asked SOPs to rinse their boots in pails before entering the soak pit area.
Some spray pumps leaked.	Faratsiho, Fandriana, Ambohimahasoa, Toamasina II Fenerive Est	Leaky pumps were collected and either repaired or replaced.
SOPs spray while it is raining.	Ambositra	SOPs were reminded of the safety rules and Sector Heads were required to immediately stop spraying and not resume it until the weather was dry.
People crossed rivers without putting on life jackets.	Fenerive Est	Safety rules were reinforced; and all staff were told that they must bring and wear their life jackets at all times.
SOPs do not wear PPE when they return to soak pits.	Brickaville	Heads of sectors gathered SOPs and reminded them the rules that apply to them. Team Leaders were requested to ensure compliance with the rules.
Kitchen utensils were found in vehicles.	Toamasina II	The utensils were removed and decontaminated at the central soak pit.
SOPs leave their pumps unattended.	Brickaville, Fandriana	We asked Team Leaders to immediately find the owners of the pumps and explained that they were putting at risk people who would find the pump, as well as security agents and the project.
Rain entered a warehouse because a window was not closed.	Ambositra	We asked the warehouse keeper to be more careful in the future.

5.4.1 Mobile Soak Pits

During the 2013-2014 campaigns, Madagascar piloted the use of mobile soak pits because of the difficult environmental conditions and remote areas. The pilot was deemed a success because spray operators didn't have to travel long distances back to the operational site every day. As a result, they weren't as tired and they could spray for longer periods of time during the day. Money was also saved on transportation costs. The project, under the leadership of the Environmental Compliance and Safety Manager, improved the design of the mobile soak pit. While the objectives remained the same, significant changes were made in building materials and weight.

FIGURE 5: MOBILE SOAK PITS

TABLE 10: DIFFERENCES BETWEEN THE OLD AND NEW MOBILE SOAK PITS

	Older models	New models (27+30)
Containers	Small rectangular plastic box (38.5 cm x 25 cm x 23 cm), with a hole in the bottom	Plastic bucket 25l Six holes in the bottom
Weight	+ 15 kg before use + 20kg after rinsing	9 kg before use 12 kg after rinsing
Components	Screens, sawdust, charcoal, stone	Plastic mesh, sponges, and activated charcoal

5.5 Post-Season Environmental Compliance Activities

Post-season environmental inspections took place from November 10 to 15 in the east and from December 15 to 24 in the CHL. They were carried out mainly by the ECO with the support of technical staff. The main objective of the inspection was to ensure that all soak pits and warehouses had been properly closed out. The main findings of the post-spray environmental inspection are as follows:

All the warehouses had been emptied of materials and equipment used during spraying. After these items and insecticides had been removed, warehouses were decontaminated with water mixed with bleach and soap. This decontamination was performed before handing the premises back to their owners. All soak pits were covered with a concrete lid to prevent people from accessing materials making up the soak pits and from interfering with insecticide-waste degradation process in the soak pit.

FIGURE 6: WAREHOUSE DECONTAMINATION

FIGURE 7: SEALING A SOAK PIT

5.5.1 IRS Campaign Waste Disposal

From January 8 to 14, 2015, the Environmental Compliance Officer led the decontamination of waste stored in the central warehouse in Toamasina. The following list explains what the wastes were:

- The black plastic boxes used to manufacture the old mobile soak pit
- Stones and pebbles used as filters for the old mobile soak pit
- White plastic buckets of 25 l used for the manufacture of new models of mobile soak pit
- Sponges that replaced stones and pebbles

AIRS Madagascar will work with Adonis, who currently owns an efficient incinerator in Toamasina and the necessary equipment, to recycle eligible items, such as plastics, metal, and plastic sheet. The transfer of IRS waste to treatment sites will begin in February 2015.

AIRS Madagascar currently owns a stock of worn boots and gloves. The gloves and boots we use contain greater than 1% chlorine. If incinerated, they can create dangerous Persistent Organic Pollutants (POPs) in contravention of international agreements. After treatment of decontamination (washing them with soap and water), AIRS Madagascar provides for such materials to give to an association that collects household waste. Madagascar has 5,951 sachets of pyrethroids left in stock and since they will expire in May, they will be re-tested/certified and shipped to another country which can use them. There are 4,652 sachets of carbamates in stock but 4,631 sachets are expired. We are working to properly dispose of them. There are 14,029 bottles of organophosphate in stock and of those, 5,064 will be re-tested so they can be used during the next spray campaign.

6. Monitoring and Evaluation

6.1 Main Objectives and Methodology

AIRS Madagascar had a number of lessons learned from the 2013-2014 campaign and in accordance with the 2014-2015 work plan, improvements were introduced in the M&E system for the 2014-2015 campaign, with the goal of:

- Ensuring the accuracy of data collected and entered through training and supervision at all levels
- Streamlining and standardizing data processing to minimize errors
- Ensuring data security according to established protocols

M&E activities were led by the M&E Officer and the AIRS Madagascar's Database Manager.

6.2 Data Management and Processing

6.2.1 Data Collection

Data collection followed the protocols described in the 2014-2015 work plan. The data collection forms were developed to ensure the collection of all indicators requested by PMI. Before the beginning of each mobilization and spraying operation, those involved in data collection were trained in the data collection process and in filling forms. Data on mobilization were collected by mobilizers who conducted door-to-door visits, and data on the spray by SOPs. Data collection forms went through several checks before being entered into the database.

6.2.2 Data Entry

AIRS Madagascar used 38 DECs (21 in the east and 17 in the CHL). Each district had its own data entry center, except the district of Manandriana whose data forms were entered by DECs in the District of Ambositra. Each DEC entered the data from the forms into the project's database. At the end of each day, DECs sent a copy of the database in the "cloud" (online SugarSync server) to forward the most recent data. DECs entered first the "TOTAL" for reporting purposes and then the "DETAILS" line by line in order to ensure accuracy of the data entered. The data entry was completed within a week after the end of the campaign.

6.2.3 Storage of Data

All data collection forms were stored in filing cabinets. They were filed by district, commune, and fokontany, and finally by date. At the end of the campaign, the forms were transferred and stored at the central warehouse in Ivato in a secure location with limited access.

At the end of each day, all the files in the database were stored electronically in three different ways:

- In the "Back-up" folder available on the computer of DEC
- On the online SugarSync server
- In a USB key provided to each DEC

6.3 RESULTS

6.3.1 NUMBER OF ELIGIBLE STRUCTURES FOUND AND SPRAYED- COVERAGE

The number of structures found by the operators was 286,922 (128,922 in the CHL and 158,006 in the east), and the number of structures sprayed by operators was 274,533 (125,125 in the CHL and 149,408 in the east). In the East, SOPs sprayed 94.56% of all structures found, and 97.05% of all structures in the CHLs. The total coverage rate achieved was 95.68% as indicated in Table 13. During the last spray campaign in 2013, the coverage rate was 97.85% in the CHL and 99.05% in the South. As mentioned previously, the project met several challenges, especially in the East, which is reflected in the lower coverage rate in that area in 2014.

FIGURE 8: SPRAY COVERAGE IN THE EAST

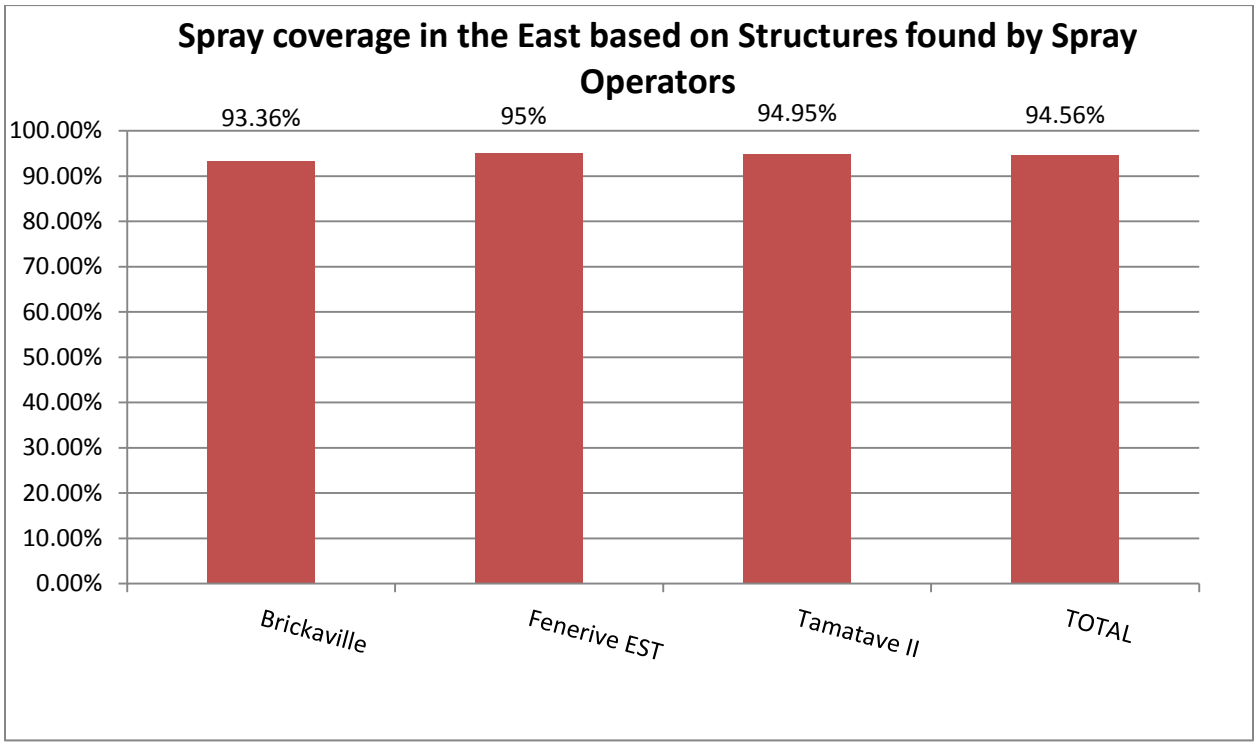
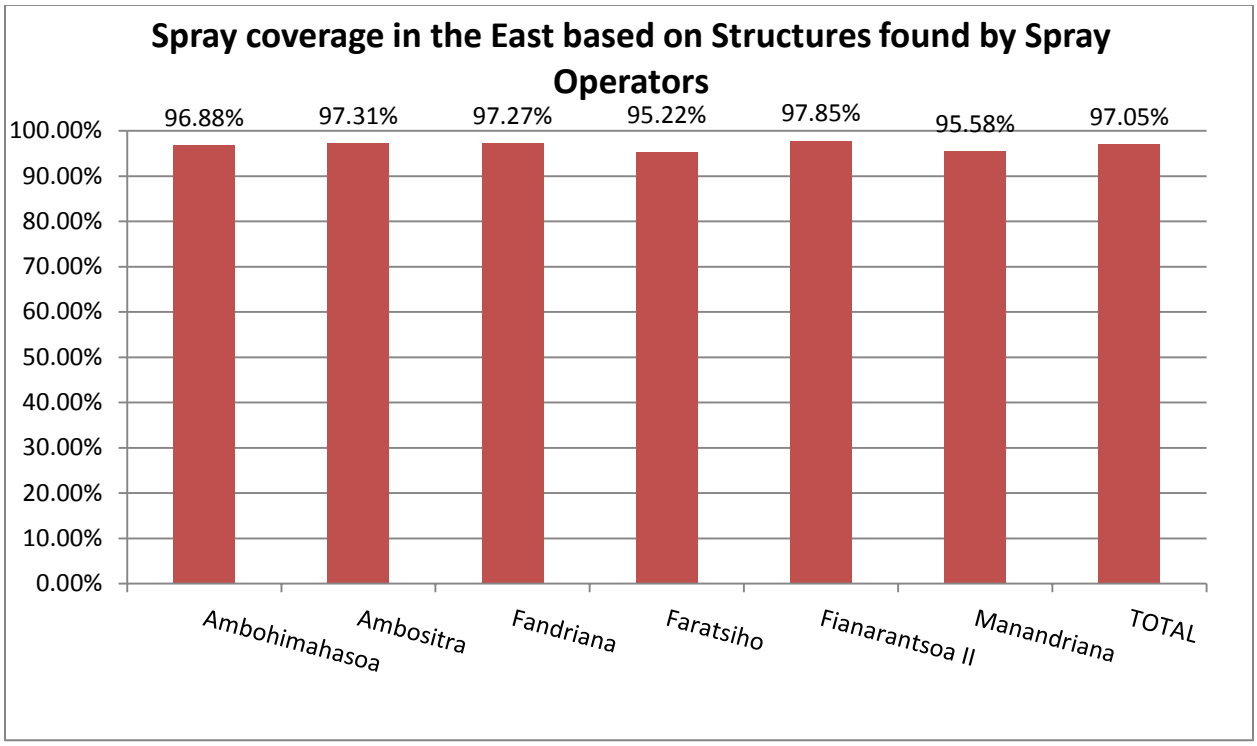


FIGURE 9: SPRAY COVERAGE IN THE CHL



6.3.2 Population Protected

The population in the structures found by the operators was 1,351,737 (765,697 in the CHL and 586,040 in the east). Out of this number, IRS provided protection to 1,307,384 people (96.71%), including 30,371 pregnant women and 175,214 children under 5 years. Details are presented in Table 13.

TABLE 11: SUMMARY OF SPRAY RESULTS

Area	District	Structure found by SOP	Structures Sprayed	Spray coverage	Population protected	# Pregnant Women	# Children <5 years
East	Brickaville	41,021	38,298	93.36%	145,655	4,454	19,170
	Fenerive Est	67,495	64,120	95.00%	241,290	6,393	23,526
	Tamatave II	49,490	46,990	94.95%	170,474	5,818	23,157
TOTAL EAST		**158,006**	**149,408**	**94.56%**	**557,419**	**16,665**	**65,853**
CHL	Ambohimahasoa	24,449	23,686	96.88%	150,687	2,844	21,484
	Ambositra	24,901	24,230	97.31%	143,893	3,238	21,575
	Fandriana	38,372	37,324	97.27%	211,406	3,442	30,073
	Faratsiho	13,887	13,223	95.22%	73,891	1,088	10,295
	Fianarantsoa II	24,509	23,982	97.85%	154,721	2,850	23.718
	Manandriana	2,804	2,680	95.58%	15,367	244	2,216
TOTAL CHL		**128,922**	**125,125**	**97.05%**	**749,965**	**13,706**	**109,361**
TOTAL		**286,928**	**274,533**	**95.68%**	**1 307,384**	**30,371**	**175,214**

6.3.3 Use of Insecticide and Performance of Spray Operators

AIRS Madagascar used 30,086 bottles of organophosphates in the east and used 29,493 sachets of carbamates and 32,117 pyrethroid sachets in the CHL. On average, each SOP sprayed 14.6 structures per day in the east and 13.5 in the CHL. The average number of structures sprayed per day was higher in the east compared with the CHL, due to the smaller size of the structures in the east. One bottle of organophosphate sprayed 4.8 structures in the east, while operators in the CHL could spray 2.1 structures per sachet of carbamates/pyrethroids. Table 14 shows the average numbers of structures covered by a sachet/bottle of insecticide, by district.

TABLE 12: INSECTICIDES USED PER DISTRICT AND SOP'S PERFORMANCE IN THE CHL AND EAST

Zone	District	Structures sprayed	Insecticide used	Average number of structures sprayed by SOP per day	Average number of structures sprayed per bottle/sachet
EAST	Brickaville	38,298	7,026	14.6	5.5
	Fenerive EST	64,120	14,740	14.5	4.4
	Tamatave II	46,990	9,314	14.7	5.0
TOTAL EAST		**149,408**	**31,080**	**14.6**	**4.8**
CHL	Ambohimahasoa	23,686	13,045	13.4	1.8
	Ambositra	24,230	10,894	13.5	2.2
	Fandriana	37,324	14,932	13.9	2.5
	Faratsiho	13,223	5,531	12.1	2.4
	Fianarantsoa II	23,982	15,010	13.8	1.6
	Manandriana	2,680	1,486	14.5	1.8
TOTAL CHL		**125,125**	**60,898**	**13.5**	**2.1**
Grand Total		**274,533**	**91,978**	**14.05**	**3.45**

6.4 Data Quality Assurance

Data quality assurance activities were implemented both for data collection and data entry verification, using the project supervision tools newly developed by AIRS, and standard database audit control. AIRS found that these tools formalized self-audits of the IRS campaign data for better data quality, and reduced the number of errors encountered in the operators' everyday forms as well as in the M&E database. Table 15 below shows the number of forms used for each data quality assurance tool and the percentage of forms audited.

TABLE 13: NUMBER OF SUPERVISORY TOOLS USED IN THE CHL AND THE EAST

Supervision tools for M&E	Number of forms used	Percentage checked
Error Eliminator	3,523	92% of the spray forms
Data Collection Verification (6,834 structures)	459	2.38% of structures found
Data Entry Verification (16,356 rows of data)	1,259	5.7% of the structures found

Data Collection Verification Form

District M&E Assistants, the M&E Manager and the Database Manager used the Data Collection Verification (DCV) tool to interview households to verify spray coverage data. Staff visited and interviewed residents from 6,834 structures (2.38 % of structures found) during the campaign. Common data collection inconsistencies were primarily due to a variance in the population-protected count. Each District M&E Assistant must interview at least 90 structures per week during the spray campaign.

Data Entry Verification Form

The M&E Assistants, M&E Manager and Database Manager used the Data Entry Verification tool to verify that the data entered into the database matched the data on the Daily Spray Operator Forms in conjunction with the database cleaner. Significantly fewer errors were found this year compared to last year as a result of the in-field supervisory verification tools (i.e., Error Eliminator and DCV tools) and the new database data cleaner that was programmed and installed before the campaign began.

At the end of every week, the M&E Assistants would meet with the District Coordinators to discuss the spray progress and the errors found using the data quality assurance tools. Furthermore, the AIRS Madagascar M&E Manager and Database Manager provided feedback regarding errors found on spray operator cards and gave recommendations to the AIRS Madagascar Operations Manager, commune coordinators, and spray team leaders in order to minimize future data errors on the spray operator cards.

6.5 Post Spray Data Quality Audit

The AIRS Madagascar project is conducting an internal audit to validate the coverage rate in both the east and the CHL. The AIRS Madagascar team is collecting data from February 9th through February 13th. A specific report will be completed by March 12 for this activity.

6.6 Pilot Data Collection using mHealth

To monitor real-time spray progress, AIRS Madagascar's automated data collection system, developed by the company Dimagi, used SMS. The system was used as a pilot project in both spray regions during the 2014-2015 campaign. With its first application in the east, the project's technical teams, in coordination with Dimagi, agreed that the Sector Manager would send the daily SMS with the rough operational data. However, as an experiment in the CHLs, team leaders in the district of Faratsiho sent the daily SMS, while Sector Managers were responsible for sending the SMS in the other CHL districts. The AIRS Madagascar team found that having team leaders text in their data at the end of the day while they are writing the same information on the spray performance tracker led to better data and allowed for closer supervision. Because each team was submitting the data, there was less room for mathematical errors and supervisors could more closely track which teams were falling behind their targets. In 2015, AIRS will be implementing the Performance Management Tracker with Dimagi and team leaders will be responsible for SMSing in the operational data.

Dimagi's team came to Tamatave to train AIRS Madagascar's technical staff, including heads of sector and District Coordinators. For the campaign in the CHL, this training was provided by the project's M&E Officer in close collaboration with the team of Dimagi.

Every day before 6 p.m., every Sector Manager sent an SMS summarizing the day's achievements of the teams under his/her supervision.

- The operational data included:
- The name of the commune where teams worked

- The number of SOPs that worked during the day
- The total number of structures found
- The total number of structures sprayed
- The total number of bottles/sachets of insecticide

Each SMS was sent to a GSM gateway managed by the project's IT Officer. Once received by the gateway and validated as containing no error, the information contained in the SMS was transferred and stored on Dimagi's online server. A tracker was developed by the M&E Officer and was forwarded to the project's entire technical team at the end of the day. This important tool allowed daily monitoring of the operators' performance, the level of insecticide consumption, and the spray progress rate. This was especially important in the east where it was logistically difficult to get the spray data collection forms from the sites to the Data Entry Centers on a regular basis. As such, it allowed making daily adjustments, and better organizing the supervision of teams, which resulted in improved outcomes for the 2014.

There were several lessons learned during the two deployments:

- The SMS system should take place shortly before the start of the campaign. If there is a large gap between the training and the start of the campaign, users may need refresher trainings.
- Automating the creation and sending out of the Tracker could prevent errors in aggregating and disseminating the data.
- Linking the SMS system to the AIRS database would allow the AIRS Madagascar team to assess the reliability of the data being texted in.
- Setting up a system that automatically generates and sends and email of the daily record of all SMS sent/received to facilitate and monitor sites sending in data.
- A need for increased training for Team Leaders and Supervisor on how to interpret the data.

6.7 Epidemiological Data Collection

AIRS Madagascar collaborated with PASSOBA to collect six months of epidemiological data. With this data, the AIRS Madagascar team analyzed the rate of confirmed malaria over the total district population in our spray districts in the East, Brickaville, Fenerive Est, and Tamatave II, and in our comparison districts, Soanierana Ivonogo and Varatenina. The absolute number of cases in our spray districts is less than the absolute number of cases during peak malaria season, December through February in 2014/2015 than in the past seasons, December through February 2013/2014.

AIRS Madagascar will collect epidemiological data from the remaining months in order to be able to analyze the trends across twelve months from the treatment and comparison health facilities. The data will be collected from PASSOBA in May once the regional vaccination campaign is complete and the analysis will be shared with PMI by the end of May in a separate epidemiological report.

7. ENTOMOLOGY

Under the supervision of the AIRS Madagascar's Technical Director, the project's four entomological surveillance teams (each consisting of an entomologist and two assistants) performed all entomological surveillance activities. Given that the entomological surveillance is currently under way, and a final entomological report will be submitted in April this section presents a brief summary of some results of entomological surveillance under the 2014 IRS campaign.

7.1 ENTOMOLOGICAL SURVEILLANCE SENTINEL SITES

In April 2014, AIRS Madagascar and the vector control committee of the NMCP selected sentinel sites where entomological surveillance was to be conducted during the 2014 IRS campaign. Furthermore, PMI recommended continuing the monitoring of the residual effect in the sentinel site in the south (Ejeda) to determine when pirimiphos-methyl CS 300 loses its effectiveness. At the end of the period covered by the previous work plan (May 2014), a 100% mortality rate was observed among tested mosquitoes four months after spraying. It was also decided to maintain one of the sentinel sites in the south, though the region is no longer in the PMI/ AIRS Madagascar intervention districts for the 2014 campaign. Because of this decision, some sentinel sites monitored during the 2013-2014 IRS campaign that are not located in the districts supported by PMI in 2014 were not used this year.

Ankafina Tsarafidy (district of Ambohimahasoa) and Vavatenina (district of Vavatenina) were selected as sentinel sites, respectively, for the Central Highlands and the eastern coast. Ankafina Tsarafidy is located in communes that have not been sprayed under the focused spraying system in the CHL, while Vavatenina is located in a district not selected by IRS in 2014 in the east.

All sentinel sites where entomological surveillance was performed during the 2014 IRS campaign are listed in Table 14.

TABLE 14: ENTOMOLOGICAL SURVEILLANCE SITES FOR THE 2014 IRS CAMPAIGN

Intervention zone	District	Sentinel sites	Observations
CHL	Ambositra	Imerina Imady	Old site during the 2013-2014 campaign, pyrethroid spray area.
	Fandriana	Milamaina	New sentinel site in the carbamate spray area.
	Finanaratsoa II	Vohimarina	New sentinel site in the carbamate spray area.
	Ambohimahasoa	Ankafina Tsarafidy	Control sentinel site for CHL.
East	Brickaville	Ambodifaho	Old site during the 2012-2013 campaign, organophosphate spray area.
	Toamasina II	Vohitrambato	New sentinel site in the organophosphate spray area.
	Fenerive Est	Mahambo	New sentinel site in the organophosphate spray area.
	Vavatenina	Vavatenina	New sentinel site in non sprayed area used as a control site.
South	Bekily	Bekily	Old site during the 2013-2014 campaign

Intervention zone	District	Sentinel sites	Observations
			but not located in the intervention districts in 2014.
	Ampanihy	Ejeda	Old site during the 2013-2014 campaign but not in intervention districts in 2014. Site was maintained, however, to monitor the residual effect of pirimiphos-methyl until it loses its effectiveness. Activity ended in October 2014.

7.2 ENTOMOLOGICAL SURVEILLANCE BASELINE STUDY

Baseline entomological data were collected one month before the start of the IRS campaign in two spray zones (in August 2014 on the East Coast and in October 2014 in the CHL). The East Coast has three sites which were used for baseline data collection: Ambodifaho (Brickaville district), Vohitrambato (Toamasina II district), Mahambo (Fenerive Est district and one control site, Vavatenina). The CHL has four sites used for baseline data collection: Milamaina (Fandriana district), Imerina Imady (Ambositra district), Vohimarina (Fianarantsoa II district), and Ankafina Tsarafidy (control site in Ambohimahasoa district). The sampling methods used were Human Land Catch (HLC), Pyrethrum Spray Catch (PSC), and hand collections using an aspirator. In both areas, baseline data indicated that the Anopheles gambiae s.l. was the most common vector species.

In the east:

- *An. gambiae* s.l., *An. funestus* and *An. mascariensis*, the three vectors of malaria in Madagascar, were found in Toamasina II (Vohitrambato), where vector density was relatively the highest. *An. mascariensis* is the most prevalent in number in the baseline data collection (79.6%), followed by *An. gambiae* s.l. (13.6%), and *An. funestus* (6.8%).
- In the other two sites (Brickaville and Mahambo/Fenerive Est), *An. funestus* was absent during this investigation, while *An. gambiae* s.l. and *An. mascariensis* were present.
- At the three sites, the vectors showed exophagic tendency.
- The room vector density was low (0 to 0.3).
- The parity rate was high in Toamasina II and Brickaville but was low in Mahambo/Fenerive Est.

In the CHL:

- *An. gambiae* s.l. was not present in Ankafina Tsarafidy, but accounted for 62.5% of mosquitoes caught in Vohimarina.
- *An. mascariensis* was the second vector species present in Vohimarina, but was absent in the other three sites during this investigation.

Non-anopheline mosquitoes accounted for more than 66.7% all the mosquitoes collected in the east, and 64.2% in the CHL. All vectors have been preserved for further laboratory analysis that included identification of species by PCR and detection of sporozoites by ELISA test.

TABLE 15: BASELINE DATA COLLECTION RESULTS FROM THE THREE DISTRICTS OF THE CHL AND EAST- PRIOR TO SPRAYING

HLC Collection

Sites	Species	HLC In	HLC out	Total	Endo. rate	Exo. rate	MBR in	MBR out
Mahambo Fenerive Est	*An. gambiae* s.l.	3	5	8	44%	56%	0.6	0.8
	An. funestus	0	0	0				
	An. mascariensis	34	36	70	48.6%	51.4%	6.0	6.3
	Other Anopheles	24	60	84				
	Culicidae	68	130	198				
Brickaville Ambodifaho	*An. gambiae* s.l.	8	15	23	34.8%	65.2%	1.3	2.5
	An. funestus	0	0	0				
	An. mascariensis	1	3	4	25%	75%	0.2	0.5
	Other Anopheles	0	5	5				
	Culicidae	320	482	802				
Tamatave II Vohitrambato	*An. gambiae s.l.*	16	24	40	40%	60%	2.7	4
	An. funestus	11	11	22	50%	50%	1.8	1.8
	An. mascariensis	44	212	256	17.2%	82.8%	7.3	35.3
	Other Anopheles	44	5	49				
	Culicidae	83	198	281				
Imerina imady	*An.gambiae* s.l.	5	5	10	50.0%	50.00	0.83	0.83
	An. funestus	0	0	0				
	An. mascariensis	0	0	0				
	Other An.	6	5	11				
	Culicidae	31	42	73				
Fandriana Milamaina	*An. gambiae* s.l.	0	3	3	0%	100%	0.0	0.5
	An. funestus	0	0	0				
	An. mascariensis	0	0	0				
	Other Anopheles	0	8	8				
	Culicidae	0	41	41				

Sites	Species	HLC In	HLC out	Total	Endo. rate	Exo. rate	MBR in	MBR out
Vohima-rina	*An. gambiae* s.l.	8	22	30	26.67	73.33	1.33	3.67
	An. funestus	0	0	0	0.00		0.00	0.00
	An. mascariensis	3	10	13	23.08	76.92	0.50	1.67
	Other Anopheles	0	5	5				
	Culicidae	0	0	0				
Ankafina Tsarafidy	*An. gambiae* s.l.	0	0	0				
	An. funestus	0	0	0				
	An. mascariensis	0	0	0				
	Other Anopheles	0	5	5				
	Culicidae	8	31	39				

PSC and ODC Collection

Sites	Species	PSC #	Ind. Rest. rate	ODC #	# Dissec	# Parous	Parity rate
Mahambo Fenerive Est	*An. gambiae* s.l.	0	0	11	18	5	28%
	An. funestus						
	An. mascariensis	0	0	1`	71	14	20%
	Other Anopheles						
	Culicidae						
Brickaville Ambodifaho	*An. gambiae* s.l.	0	0	0	23	18	78.3
	An. funestus						
	An. mascariensis	0	0	0	4	4	100
	Other Anopheles						
	Culicidae						
Tamatave II Vohitrambato	*An. gambiae* s.l.	2	0.2	4	37	26	70.3
	An. funestus	1	0.1	0	27	20	74.1
	An. mascariensis	3	0.3	10	152	99	65.1
	Other Anopheles	1		4			
	Culicidae	3		9			
Imerina imady	*An. gambiae* s.l.	1	0.1	4	15	11	73.33
	An. funestus						
	An. mascariensis						
	Other An.	0		6			
	Culicidae	1		10			
Fandriana Milamaina	*An. gambiae* s.l.	0	0	0	3	3	100%
	An. funestus						
	An. mascariensis						
	Other Anopheles						
	Culicidae						
Vohimarina	*An. gambiae*	1	0.1	2	33	7	21.21

Sites	Species	PSC #	Ind. Rest. rate	ODC #	# Dissec	# Parous	Parity rate
	An. funestus	0	0	0	0	0	
	An. mascariensis	0	0	0	13	9	69.23
	Other Anopheles			1			
	Culicidae			3			
Ankafina Tsarafidy	*An. gambiae* s.l.						
	An. funestus						
	An. mascariensis						
	Other Anopheles	1	0.1	2			
	Culicidae	3	0.3	2			

7.3 CONE BIOASSAY TEST RESULTS

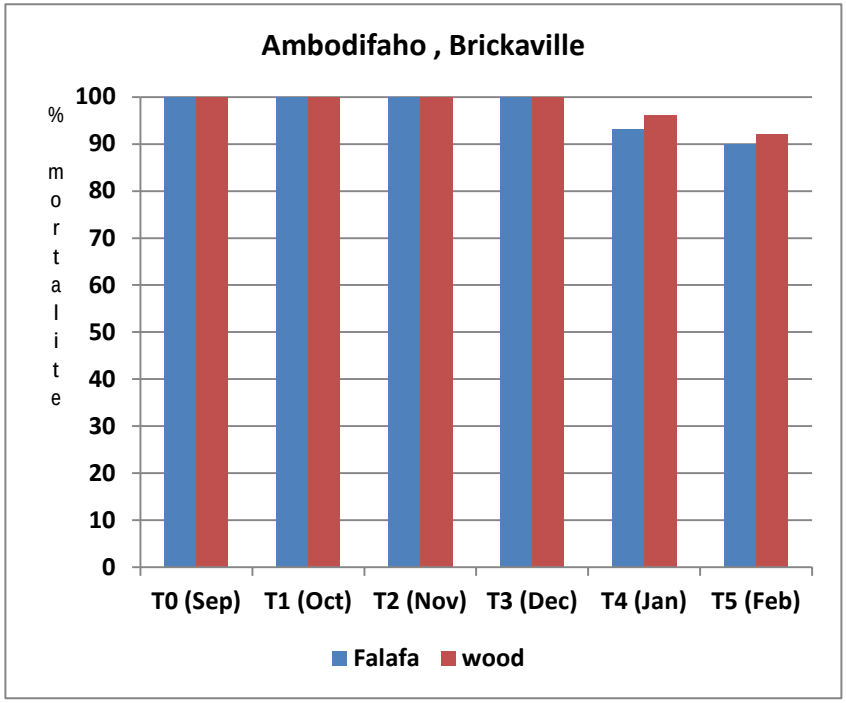
AIRS Madagascar conducted monthly cone bioassay tests, using the WHO procedure to assess the residual effectiveness of insecticides sprayed during the 2013-2014 IRS campaign. The tests were conducted in the following sentinel sites: Ambodifaho (district of Brickaville), Mahambo (district of Fenerive Est) in the east; and Imerina Imady (district of Ambositra) and Vohimarina (district of Fianarantsoa II) in the CHL. Since Madagascar does not have a susceptible mosquito colony (Kisumu strain), all cone bioassay tests were performed with local wild adult mosquitoes reared from field-collected larvae and pupae. The mosquitoes were exposed to the sprayed surfaces for 30 minutes, and the "knock-down" rate was recorded at 30 minutes and 60 minutes post exposure. The vector mortality was observed after a 24- hour recovery period. The residual life of bendiocarb WP 80 (carbamate) was tested in the sentinel site of Vohimarina, deltamethrin WG 250 (pyrethroids) in the sentinel site of Imerina Imady, and pirimiphos-methyl CS 300 (organophosphate) in the sentinel sites of Brickaville and Mahambo, in the east.

At the site of Ambodifaho (Brickaville), most houses have a wall made up of falafa (branches of traveler's palm, scientific name *Ravenala madagascariensis*) or bamboo. At Mahambo (Fenerive Est), the houses are made up of falafa or wood. Thus, in the east, wall surfaces tested are either falafa or bamboo in Brickaville, and wood or falafa in Mahambo (Fenerive Est). In the CHL in Imerina Imady (Ambositra) and Vohimarina (Fianarantsoa II) most walls are made up of mud or brick. However, the residual life of the sprayed insecticide on wooden materials, namely houses' internal doors, was also assessed.

During the first week of IRS campaigns in the east and in the CHL, AIRS Madagascar conducted cone bioassay tests to assess whether the quality of the spraying is satisfactory and homogenous. The result indicated that the spray quality, both in the east and in the CHL, was good, mortality being 100% for all the structures sampled. On the East Coast, three months after spraying, pirimiphos-methyl CS 300 retained a 100% effectiveness in Ambodifaho, Brickaville. However, a slight decrease in effectiveness down to 99.17% was observed in Mahambo, Fenerive Est. Five months after spraying, the effectiveness decrease to 90% on falafa and 92% on wood in Ambodifaho (Brickaville). In Mahambo (Fenerive Est), it dropped to 86% on falafa and 91% on bamboo (Figure 8). In the CHL, deltamethrin and bendiocarb WP 250 WG 80 are 100% effective one month after spraying, as observed in the sites of Imerina Imady, Vohimarina, Ambositra, and Fianarantsoa II. Three months after spraying, the effectiveness of pyrethroids decreased to 95% on mud and 96% on wood in Imerina Imady (Ambositra) and it was 90% on mud and 96% on wood in Vohimarina (Fianarantsoa II) for carbamates (Figure 9).

The residual effectiveness of pirimiphos-methyl CS was monitored from February 2014 to October 2014 for 8 months after spraying. The sprayed insecticide killed 84.2% of the exposed mosquitoes 7 months after spraying. One month later in October, the test mortality decreased to 79.17% on mud walls, which is slightly below the WHO threshold, and to 80% on wood surfaces (Figure 10).

FIGURE 10: RESIDUAL EFFECTIVENESS OBSERVED FOR PIRIMIPHOS-METHYL CS 300 (ORGANOPHOSPHATES) IN THE EAST



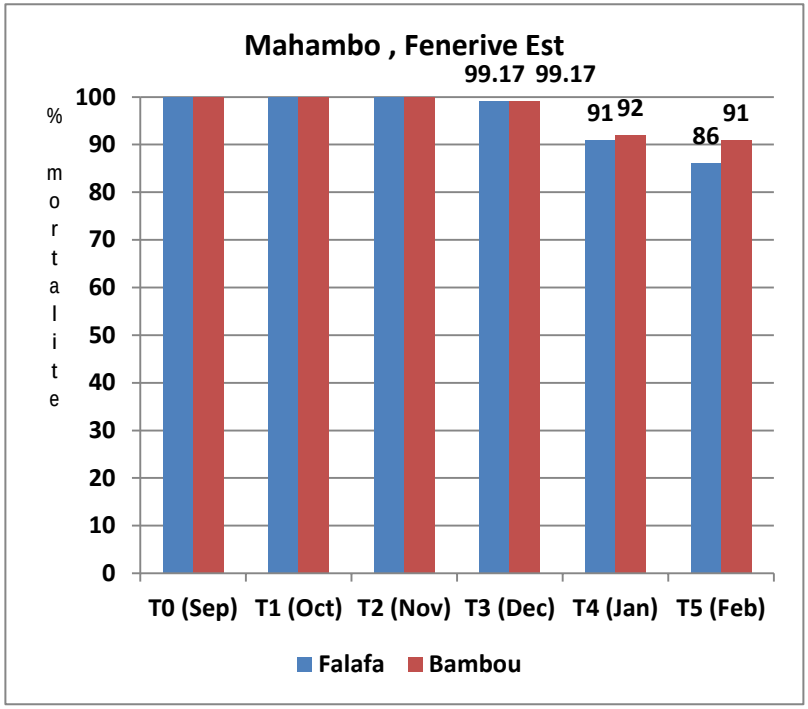


FIGURE 11: RESIDUAL EFFECTIVENESS OBSERVED FOR DELTAMETHRIN WG 250 (PYRETHRINOID) AND BENDIOCARB WP80, RESPECTIVELY IN IMERINA, IMADY, AND VOHIMARINA

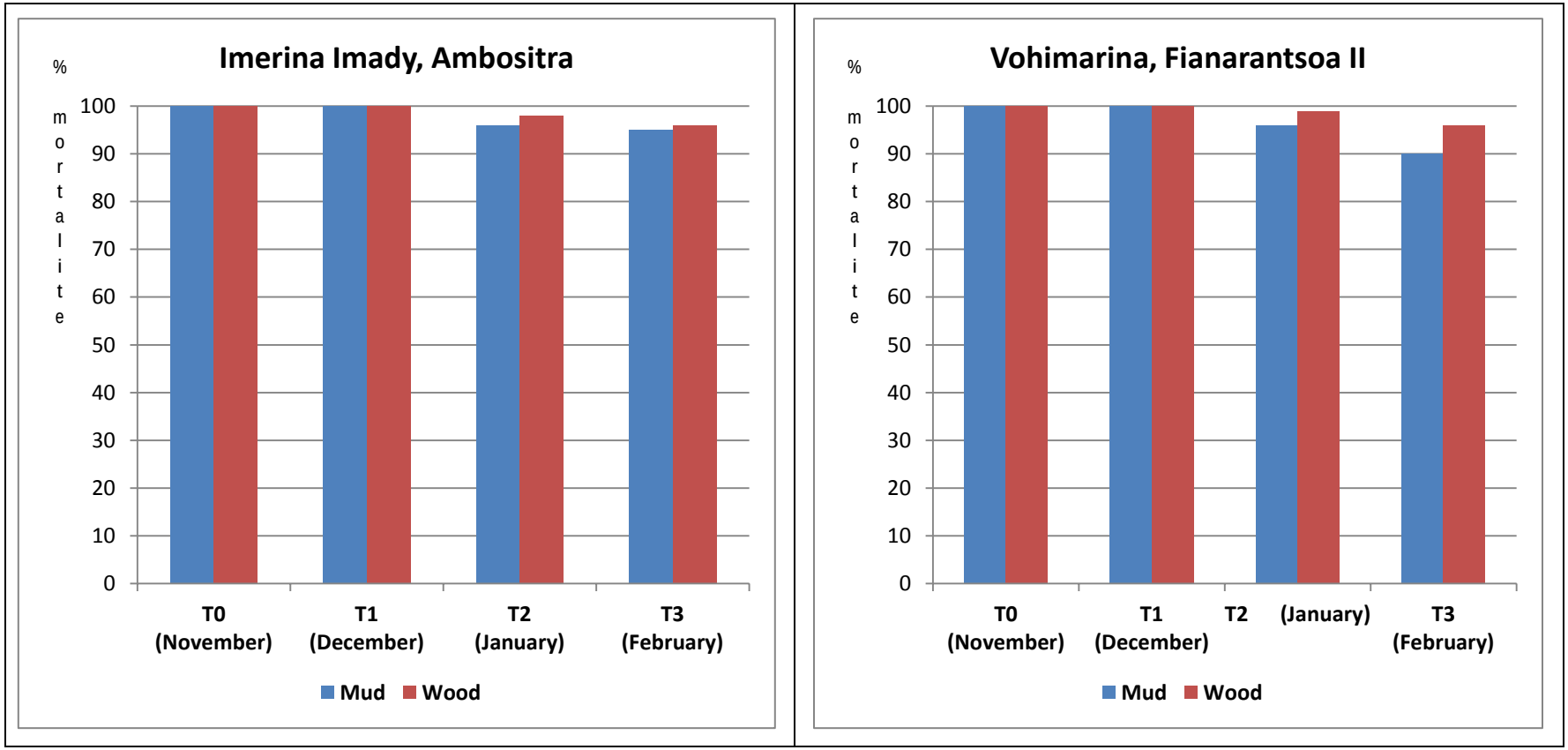
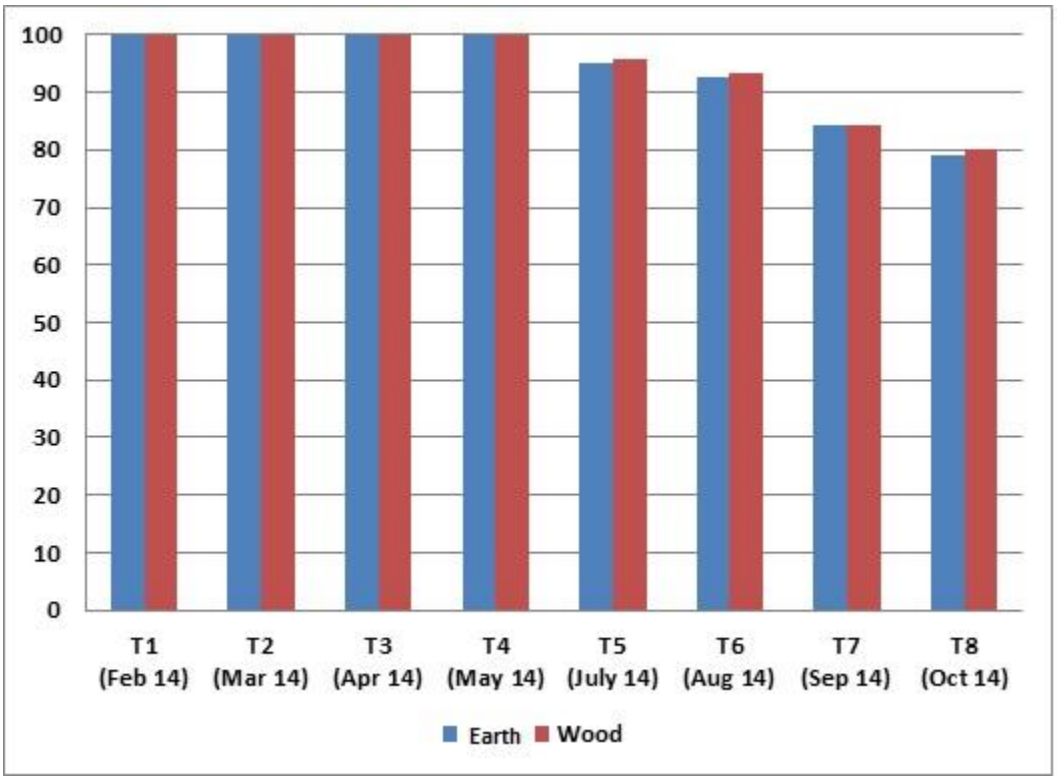


FIGURE 12: RESIDUAL EFFECTIVENESS OBSERVED FOR PIRIMIPHOS-METHYL CS 300 IN THE SOUTH DURING THE 2013-2014 CAMPAIGN



7.4 INSECTICIDE SUSCEPTIBILITY TESTS

Susceptibility testing to inform 2015 IRS campaign was conducted using two methods: WHO test tubes and Centers for Disease Control and Prevention (CDC) bottles. For both methods, adult female mosquitoes aged from two to four days, non-blood fed, and reared from field-collected larvae and pupae were exposed to diagnostic concentrations of insecticides approved by WHO for IRS campaigns during an exposure time recommended for diagnostic purposes. For the WHO tube test, the knockdown rate was observed at 10, 15, 20, 40 and 60 minutes post exposure, and the mortality rate was observed after a 24-hour recovery period. The rate of knockdown was observed every 15 minutes for an hour in the CDC bottle bioassay method and the mortality was measured at 30 minutes for all insecticides, except for DDT which was measured at 45 minutes. WHO's interpretation criteria for susceptibility tests were used in data analysis:

- Susceptibility = mortality rate of the exposed vector above 98%.
- Possible resistance = mortality rate of the exposed vector between 90 and 97%.
- Resistance = mortality rate of the exposed vector below 90%.

Insecticide susceptibility testing was completed in February 2015, according to our work schedule. Susceptibility data was being gathered on the following:

- *Anopheles gambiae* s.l. is fully susceptible to bendiocarb and pirimiphos-methyl in areas where the tests have been completed.

Anopheles gambiae s.l. has developed resistance to:

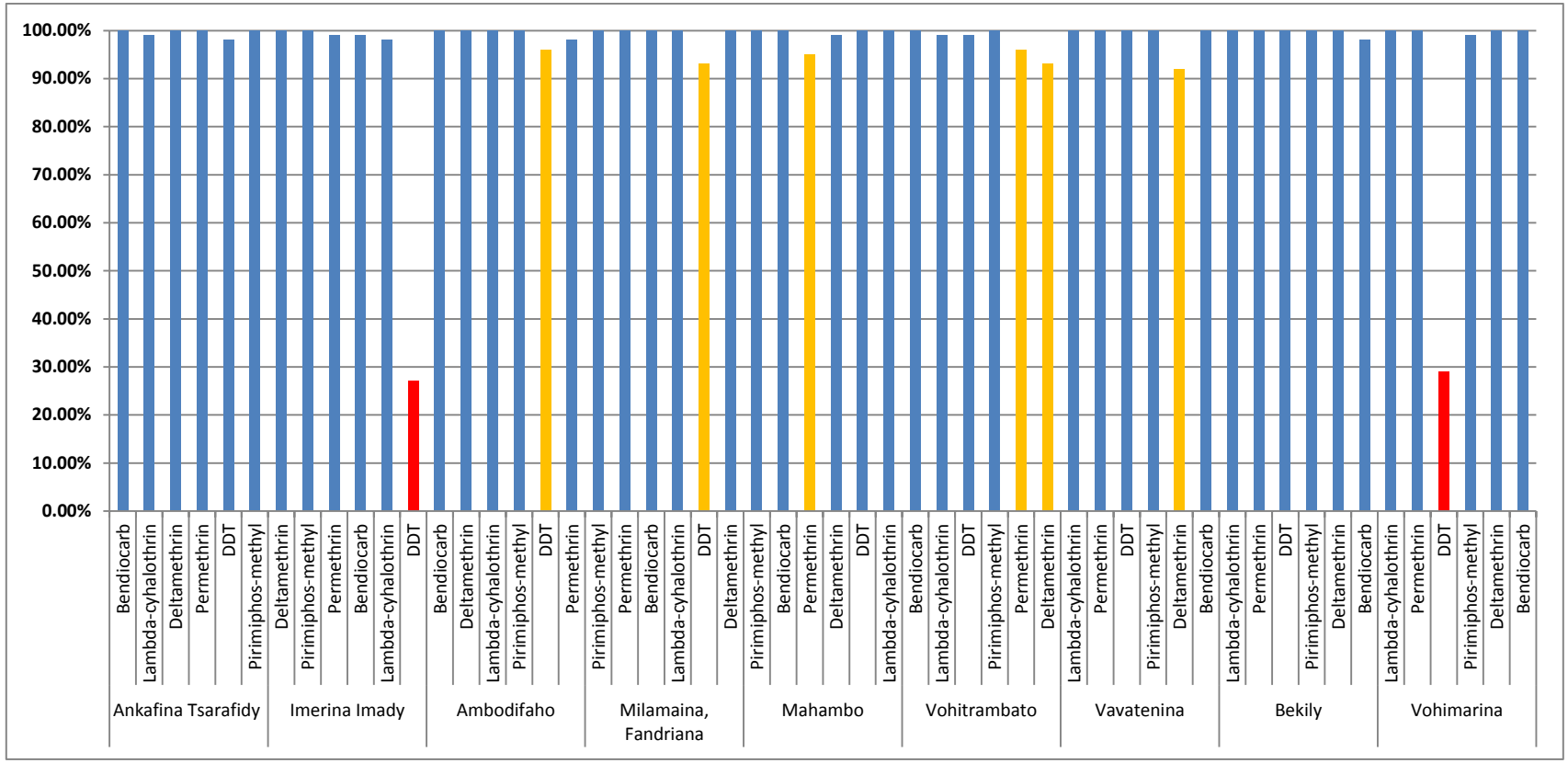
- DDT in Imerina Imady and Vohimarina,
- Permethrin in Mahambo in the east and in Bekily in the south

Possible resistance was observed in the eastern sites for

- deltamethrin in Vohitrambato and Vavatenina
- permethrin in Vohitrambato, Ambodifaho and Vavatenina
- alpha-cypermethrin in Imerina Imady, Bekily and Mahambo

This resistance is probably due to the wider use of Long-Lasting Insecticide-Treated Nets (LLINs) for several years in these sites – with the exception of Imerina Imady, where the NMCP did not conduct LLIN distribution, but rather IRS with alpha-cypermethrin, for several years in the past. The results of the susceptibility tests using the WHO tubes and CDC bottles methods are shown in Figures 13 and 14 below.

FIGURE 13: RESULTS OF INSECTICIDES SUSCEPTIBILITY TESTS USING THE WHO TUBE TEST FOR *ANOPHELES GAMBIAE* S.L.

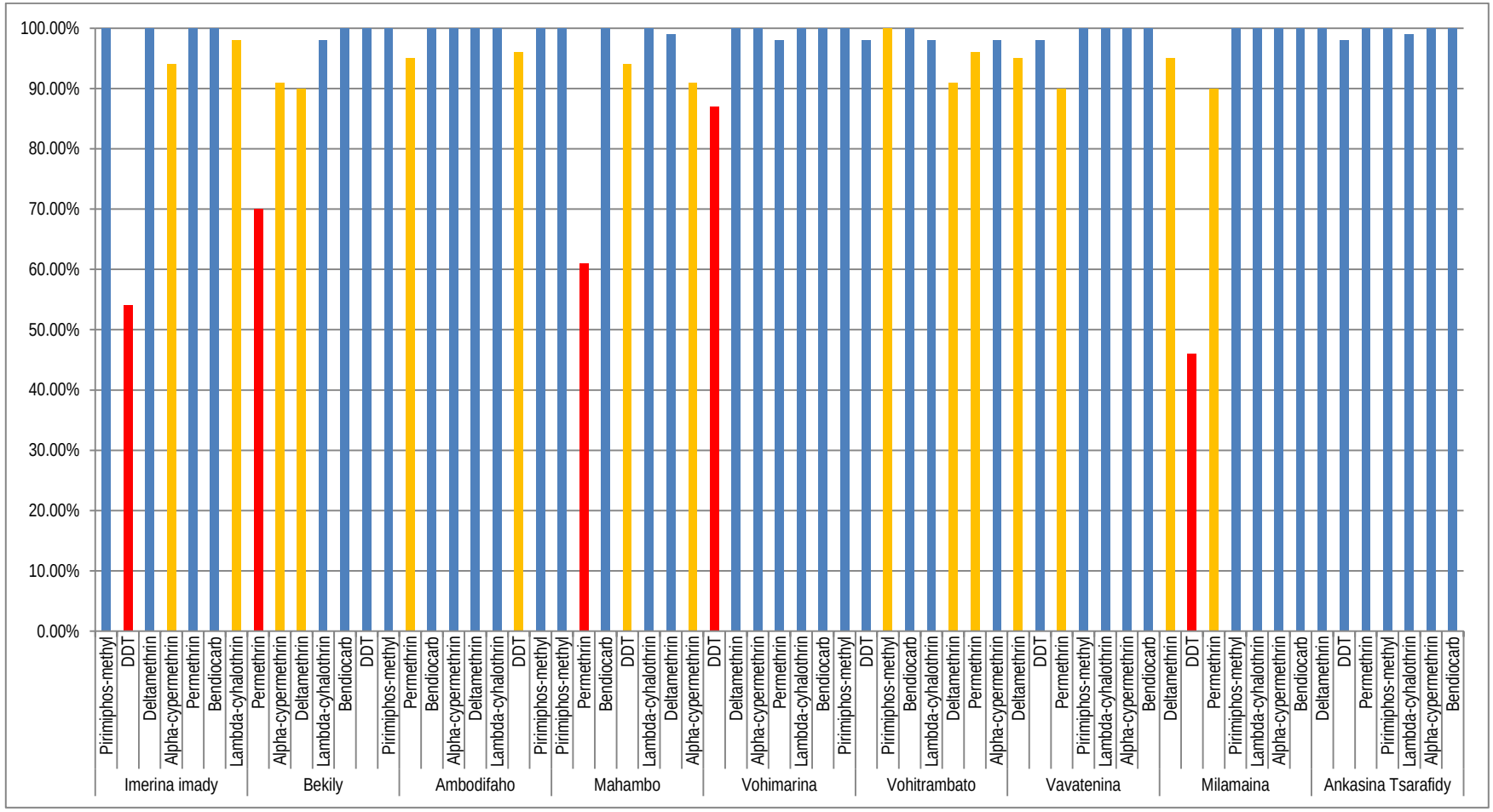


Blue= indicate vector is susceptible to the insecticide tested

Yellow= possible resistance

Red=resistance

FIGURE 14: RESULTS OF INSECTICIDE SUSCEPTIBILITY TESTING USING THE CDC BOTTLE METHOD FOR *ANOPHELES GAMBIAE* S.L.



Blue= indicate susceptibility of the vector to the insecticide tested

Yellow= possible resistance

Red=resistance

7.5 OTHER FINDINGS FROM ENTOMOLOGICAL SURVEILLANCE

- Vector human biting rates were low in the CHL. In most spray areas, the vector biting rates inside houses have decreased post spraying in comparison with the baseline. This could be due to either the killing effect or the repellent effect of the insecticide (Table 16).
    - In areas in the CHL where spraying was done with pyrethroids, human biting rates in the sentinel site of Imerina Imady were 0.8 bite per man per night (b/m/n) indoors before the IRS campaign, and 0.3 two months after the spraying of houses (Table 16).
    - In the areas in the CHL where spraying was done with carbamate, human biting rates in the sentinel site of Vohimarina were 1.3 b/m/n indoors before the IRS, and 0 two months after the spraying (Table 16).
- In the east, where the spraying used organophosphates, this phenomenon was not observed. There was no clear decrease in human biting rates, nor was there a significant difference with data at the control site, Vavatenina (Table 16). This may be due to the warm and humid climate, with rainfall varying across months during the period of investigation.
- The indoor resting density collected using pyrethrum spray catch was very low in all the sentinel sites, both at the baseline and post spraying (Table 17).
- *An. gambiae* s.l. appeared to have exophagic tendency both in the east and in the CHL. Molecular data from last year indicated predominance of *An. arabiensis* among the members of *An. gambiae* s.l. in Madagascar. This species composition might explain the resting tendency observed in *An. gambiae* s.l. (Table 18).

In the east, it is likely that the use of a large number of LLINs contributed to the outdoor bite patterns. The exophagic behavior became more frequent after spraying in the sites in the CHL where there had not been LLIN distribution. The tables below summarize the data collected on aggressive density, density per room, and behavior of *An. gambiae* s.l., during the period of investigation.

TABLE 16: AGGRESSIVE DENSITY OBSERVED DURING INVESTIGATIONS

Sites	Month	Indoor	Outdoor
Ambodifaho	August	1.3	2.5
	September	2.5	2.8
	October	6.8	8.8
	November	7.2	14.2
	December	3.5	4.2
Bekily	December	0.0	0.8
Imerina Imady	October	0.8	0.8
	November	0.3	1.7
	December	0.3	0.7
Mahambo	August	0.7	0.8
	September	0.0	0.5
	October	0.8	1.3
	November	2.3	3.5
	December	1.5	1.5
Milamaina	October	0.0	0.5
	November	0.0	1.8

Sites	Month	Indoor	Outdoor
	December	0.5	0.5
Tsarafidy Ankafina	October	0.0	0.0
	November	0.5	0.5
	December	0.2	0.0
Vavatenina	September	0.5	2.5
	October	0.5	6.7
	November	0.7	4.7
	December	0.0	3.8
Vohimarina	October	1.3	3.7
	November	0.0	0.2
	December	0.0	0.0
Vohitrambato	August	2.7	4.0
	September	0.7	2.7
	October	9.3	18.0
	November	6.7	22.2
	December	5.2	9.0

TABLE 17: DENSITY PER ROOM AFTER PYRETHRUM SPRAY CATCH UNDER MORNING RESIDUAL FAUNA COLLECTION

Area	Sites	August	September	October	November	December
East	Ambodifaho	0	0	0	0	0
	Mahambo	0	0	0	0	0
	Vohitrambato	0.2	0.0	0.2	0.1	0.0
	Vavatenina		0.20	0.1	0.1	0.1
CHL	Imerina Imady			0.1	0.0	0.0
	Milamaina			0	0	0
	Vohimarina			0.1	0	0
	Tsarafidy Ankafina			0	0	0
South	Bekily					0

TABLE 18: ENDOPHAGY RATE OBSERVED DURING THE INVESTIGATIVE PERIOD

Areas	Sites	August	September	October	November	December
East	Ambodifaho	34.78%	46.87%	43.61%	33.59%	45.65
	Mahambo	44%	0%	38.5%	40.0%	50.0%
	Vohitrambato	40	20	34.15	23.12	36.47
	Vavatenina		17	6.98	12.50	0.00
CHL	Imerina Imady			50.0	16.7	33.3
	Milamaina			0%	0%	50%
	Vohimarina			26.67	0	0.00
	Tsarafidy Ankafina			0	50	1.00
South	Bekily					0

8. Post-Season Activities

8.1 IRS Material and Equipment

After completion of the IRS campaign, SOPs, washers, Team Leaders, spray pump technicians, couriers, and District Coordinators brought back all PPE, sachets/bottles of insecticide (used and unused), and all the other IRS products to their assigned storage rooms. All returned items were inspected and recorded on the final stock records. Then, District Coordinators, the Logistics Manager and logistics assistants went to all storage rooms with trucks to recover all PPE, insecticides and other materials, and brought them back to the central warehouses in Antananarivo and Toamasina. This activity lasted from November 3 to 20, 2014, in the east, and from December 12 to 24, 2014, in the CHL.

8.2 Post-Season Inventory

AIRS Madagascar has 5,951 sachets of pyrethroids which will expire in May 2015 and they will be re-tested and sent to another country for use. There are 4,652 sachets of carbamates sachets which expired in July and November 2014 so they will be disposed of properly at an approved facility. Finally, there are 14,028 bottles of organophosphate in stock, of which 13,932 will expire before the next campaign. These bottles will be re-tested and if they pass the test, they can be used next spray campaign. The main reason why AIRS Madagascar has so many bottles of Actellic leftover is that 30,445 structures were removed from the initial target due to access issues and the presence of organic farming zones.

9. Challenges, Lessons Learned, and Recommendations

The following challenges and lessons learned were observed before, during, and after the IRS campaign:

- The current levels of staff and staff organization allowed for close supervision to take place in two different geographical areas at the same time. Reducing the number of SOPs allowed the team to better organize and manage the logistics of spraying.
- The weekly tracking of inventories using an Excel file, and the coding of sachets/bottles of insecticides, helped AIRS Madagascar to reduce losses of commodities to almost zero.
- The use of mHealth, and especially the organization of the "daily debriefing via Skype," were both instrumental in improving operations monitoring and supervision.
- Mobile soak pits allowed AIRS Madagascar to save considerable costs and time. The new model of the mobile soak pit helped to further improve the quality of operators' work.
- AIRS Madagascar staff developed good relations with the NMCP and the local authorities. With the lifting of the restriction on collaboration with the Government of Madagascar, the quality of partnership with the NMCP and other governmental decentralized services was reinforced, through their involvement with the implementation process in the 2014 IRS campaign (i.e., planning, overseeing operations, and active participation in training sessions).
- The approach to beneficiaries living in the district of Fenerive Est needs to be redesigned. They closed structures when it was time to harvest cloves, an important source of income, which meant that the structures could not be sprayed.

Since farming and inaccessibility can potentially be a challenge in implementing IRS in certain areas, AIRS should collaborate with local authorities to identify these issues in the planning and targeting stages of IRS and collectively decide on a solution. The following are recommendations to improve the quality of spraying:

- Establish regular communications with seasonal workers to inform them of pay dates and possible payment delays. Moreover, it would be good for future campaigns to entrust the payment of seasonal staff to more than one mobile service company, depending on network coverage. (Although the mobile banking system has been a good innovation that contributed to reducing costs and risks associated with payment of seasonal staff, it is necessary to improve coordination, organization, and communication.) The company which was used in 2014 had problems internally which led to some delays in payments. AIRS Madagascar will look for a new partner if needed next year.
- Increase the use of mobile soak pits in new districts in future campaigns, for better compliance with environmental requirements and for cost saving.
- Continue the use of mHealth, using as a model the experience in the district of Faratsiho, where Team Leaders were in charge of sending SMS as this allows for closer supervision of spray progress and fewer mathematical errors. If possible, integrate inventory management into the system to better monitor warehouses. mHealth should also take into account IEC activities.

- Strengthen efforts to substantially increase the percentage of women among seasonal workers, particularly in spray teams.
- Revise IEC/BCC mobilization strategies in the district of Fenerive Est. The project should work closely with local leaders since they have the capacity to really motivate people and change their views about IRS.

Annex A. Structures Not Included in Targets

District	Town	Fokontany	# of structures removed from list
Brickaville	Ambohimanana		810
	Andekaleka		1,330
	Fanasana		1,692
	Fetraomby		5,315
	Lohariandava		3,345
	Maroseranana		2,289
	Razanaka		1,910
	Anivorano EST		3,432
	Ambinaninony		9
TOTAL for Brickaville			**20,132**
Fenerive Est	Antsiatsiaka	Ambodimanga 2a	464
TOTAL for Fenerive Est			**464**
Toamasina II	Amporoforo		1,096
	Antenina I, Soanierana Ivongo		1,623
	Fito		1,891
	Mangabe		2,770
	Antetezambaro	Vohitrandina, Sahantaha, Amasina, Ambodisatrana, Tsarahonenana.	415
	Fanandrana	Fanandrana	600
		Ampasinambo	122
		Antananambo	1,022
	Amboditandroho	Ambokarivo	250
		Mahatsara	60

TOTAL for Toamasina II			**9,849**
TOTAL number of structures removed from the list in the east			**30,445**

Annex B. Items Procured Internationally

Item	Stock before the campaign	Quantities purchased	Quantity used	Quantity in stock after the campaign	Notes
Visor bearing	1798	800	2598	2407	
Visor	1839	800	2639	2627	
Gloves for Spray Operators	796	720	1516	33	
Masks	25178	45,000	34222	35956	
Activated charcoal	8	31	27	12	10 kg bag or 310kg
K Othrine insecticide	4468	33600	32117	5951	
Actellic CS 300 insecticide	38919	5196	30086	14029	5064 bottles will expire before the next spray campaign so they will be re-tested. If they past the test, they will be used during the next spray campaign.

Annex C. Site Repairs

Area	District	Operational sites	# of permanent soak pit	# of store rooms	Repairs made
East	Fenerive Est	Vohilengo	1	1	Fence repaired
		Ampasimbe manasatrana	1	1	Fence repaired
		Ampasina Maningoro	1	1	Fence repaired
		Fenerive Centre	2	1	None
	Toamasina II	Foulpointe	1	1	Fence, window screen, and stairway screen repaired
		Ambodiriana	1	1	Fence repaired
		Atetezambaro	1	1	Fence and window screen repaired
		Antanandava	1	1(wareho use)	None
		Fanandrana	1	1	Separation between

					insecticides and other materials
	Brickaville	Brickaville centre	1	1	Fence, window screen and roof repaired
		Ranomafana	1	1	Fence and floor repaired
TOTAL EAST			**12**		
CHL	Faratsiho	Vinaninony Sud	1	1	Fence repaired
		Ambohiborona	1	1	Window screen repaired
	Ambositra	Ilaka centre	1	1	Fence, window screen and roof repaired
		Ambinanirano	1	1	Floor repaired
		Kianja Rakefona	1	1	Fence repaired
		Ambositra centre	1	1	Fence repaired
	Fandriana	Sandradahy	1	1	Fence and stairway repaired
		Fandriana centre	1	1	Separation between insecticides and other materials

		Mahazoarivo	1	1	Fence repaired; Separation between insecticides and other materials
		Miarinavaratra	1	1	Fence and floor repaired; Separation between insecticides and other materials
	Ambohimahasoa	Camp Robin	1	1	Fence repaired
		Ambohimahasoa centre	1	1	Fence repaired
		Ikalalao	1	1	Fence and floor repaired
	Fianarantsoa II	Alakamisy Ambohimahy	1	1	Fence and screen window repaired
		Mahasoabe	1	1	Fence and screen window repaired
		Soatanana	1	1	Fence and screen window repaired
		Vohimarina	1	1	Fence, floor and lighting repaired

TOTAL CHL			**17**		

ANNEX D. NUMBER OF PEOPLE TRAINED

TABLE 19: NUMBER OF PEOPLE TRAINED, DISAGGREGATED BY GENDER

CHL																										
Categories of Persons Trained	Training on IRS Delivery										Other Trainings															
	Training of Trainers: Spray Ops		Spray Operations		Data Entry		Logistics		Technical Maintenance		IEC Mobilization		IEC TOT		Public Health Training		PPEs Washing		Financial training		Enumeration training		Security		Transportation	
	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F
Logistics Assistant							1																			
Financial Assistant																			2	5						
Environmental Compliance Assistant	1																									
M&E Assistant					5	0																				
Data Entry Clerk					12	5																				
Sector Manager	22	0																								
Store Keeper							7	12																		
Store Room Guard																							27	0		
Team Leader			55	7																						
Spray Operator			304	7																						
Washer																	8	30								
IEC Mobilizer											309	477														
IEC Supervisor													81	69												

Enumerator																					45	142				
Enumerator Supervisor																					14	34				
Carrier/Porter																									108	6
Spray Pump Technician									20	0																
Public Health Agent															20	24										
TOTAL M/F	23	0	359	14	17	5	8	12	20	0	309	477	81	69	20	24	8	30	2	5	59	176	27	0	108	6
TOTAL/ training	23		373		22		20		20		786		150		44		38		7		235		27		114	
Grand TOTAL	**1859**																									
Total Number of Women trained in the CHL	**818**																									
Total Number of men trained in the CHL	**1041**																									

EAST																										
Categories of Persons Trained	Categories of Persons Trained										Categories of Persons Trained															
	Training of Trainers: Spray Ops		Spray Operations		Data Entry		Logistics		Technical Maintenance		IEC Mobilization		IEC TOT		Public Health Training		PPEs Washing		Financial training		Enumeration training		Security		Transportation	
	M	**F**	**M**	**F**	**M**	**F**	**M**	**F**	**M**	**F**	**M**	**F**	**M**	**F**	**M**	**F**	**M**	**F**	**M**	**F**	**M**	**F**	**M**	**F**	**M**	**F**
Logistics Assistant																										
Financial Assistant																				3						
M&E Assistant					3																					
Data Entry Clerk					14	7																				
Sector Manager	21	3																								
Store Keeper							4	8																		
Store Room Guard																							20			
Team Leader			34	15																						
Spray Operator			230	18																						
Washer																		39								

IEC Mobilizer											131	319														
IEC Supervisor													72	79												
Enumerator																					199	205				
Enumerator Supervisor																					20	52				
Carrier/Porter																									29	1
Spray Pump Technician									16	1																
Public Health Agent															23	25										
TOTAL M/F	21	3	264	33	17	7	4	8	16	1	131	319	72	79	23	25	0	39	0	3	219	257	20	0	29	1
TOTAL/ training	24		297		24		12		17		450		151		48		39		3		476		20		30	
Grand TOTAL	**1,591**																									
Total Number of Women trained in the East	**696**																									
Total Number of Women Trained in the EAST and CHL	1514																									
Percent Women Trained in the EAST and CHL	43.88%																									
Grand Total Number of People Trained in EAST and CHL	**3,450**																									

ANNEX E. MEP INDICATOR MATRIX

MADAGASCAR MONITORING AND EVALUATION PLAN INDICATOR MATRIX

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[4]	Target[5]	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]	Y1, Y2, Y3	Data source: Project records – ex: international procurement documents, air way bills, commercial invoices Reporting frequency: Each spray season (annual/ semi-annual)	By Spray Campaign	AIRS	N.A.; 80%	0; N/A%	2; 100%	2; 100%	2; 100%	2;100%

[4] Results for Year 1 will be added to the matrix after the completion of the 2012 End of Spray Report.
[5] Targets for Year 2 will be added to the matrix after the 2013 Work plan has been approved.

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[4]	Target[5]	Results	Target	Results
	Calculation: [Numerator ÷ Denominator] x 100										

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[4]	Target[5]	Results	Target	Results
1.1.2 Number and percentage of international procurement orders 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	N.A.; 85%	02; 100%	1; 100%	1; 100%	1; 100%	1; 100%
1.1.3 Number and percentage of local PPE procurement orders that are delivered to the main warehouse 14 days before the start of spray operations	[[Numerator: Number of local PPE procurements delivered 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	N.A; 80%	01; 100%	1; 100%	1; 100%	1; 100%	1; 100%
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:	By Spray Campaign	AIRS	Achieved	Achieved	Achieved	Achieved	Achiev-ed	Achieved

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[4]	Target[5]	Results	Target	Results
			Each spray season (annual/ semi-annual)								
1.2 In-country Logistics, Warehousing, and Training											
1.2.1 Number and percentage of logistics, warehouse managers, and store keepers 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	PMI	179; 100%	156; 100% M: 118 Wmn:38	45	41; 100% M: 25 F: 16	27	31: 100% M:11 F: 20

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[4]	Target[5]	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: inventroy control cards Reporting frequency: Each spray season (annual/ semi-annual)	By Spray Campaign	AIRS	N.A.	84; 53%	45; 85%	41; 100%	27; 100%	27: 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	AIRS	Completed	Complet-ed	Complet-ed	Complet ed	Complet ed	Completed

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[6]	Target[7]	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	Completed	Complet-ed	Complet-ed	Complet ed	Complet ed	Completed
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[8]	Milestone: (Completed/Not Completed)	Y1, Y2, Y3	Data source: Project records – submitted SEAs/ letter reports Reporting frequency: Each spray campaign	By Spray Campaign	AIRS	Completed	Complet-ed	Complet-ed	Complet ed	Complet ed	Completed
2.2.2 Number and percentage of soak pits and warehouses/storerooms inspected and certified by an environmental officer/AIRS Environmental Compliance Officer	[Numerator: Number of soak pits and/or storehouses inspected and certified by AIRS Environmental Compliance Office] [Denominator: Total number of project soak pits and/or storehouses]	Y1, Y2, Y3	Data source: Project records – Reports submitted by environmental officers Reporting frequency: Each spray season	By Spray Campaign By soakpits and warehouses/ storerooms	AIRS	N.A. 100% inspected and approved prior to spraying	WH: 125 (84.46%) Soak Pit: 159 (74.53%) Secondary Soak Pit: 600 (19.03%)	100% WH: 45 Soak Pit 45 Mobile Soak Pit	Total:148 ; 100% WH: 41 Soak Pit: 41 Mobile Soak Pit:	Total: 105; 100% WH: 27 Soak Pit: 27 Mobile	Total: WH:27 Soak Pit: 27 Mobile Soak Pit: 57

[6] Results for Year 1 will be added to the matrix after the completion of the 2012 End of Spray Report.
[7] Targets for Year 2 will be added to the matrix after the 2013 Work plan has been approved.
[8] In Year 1, SEAs were due 30 days prior to the commencement of spraying and letter reports were to be submitted 14 days prior to the commencement of spraying. 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.

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[6]	Target[7]	Results	Target	Results
prior to spraying	Calculation: [Numerator ÷ Denominator] x 100								66	Soak Pit: 51	
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	AIRS	N.A.	N/A	N/A	N/A	N/A	92 M: 43 F: 49 53.3%
2.2.4 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, store keepers, etc.	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, store keepers, etc.	Y1, Y2, Y3	Data source: Project records – Training reports Reporting frequency: Each spray season	By Spray Campaign By Gender	AIRS	3,027	4638 M: 3261 F: 1377	1104	1,107 M: 973 F: 134	986	1009 M: 848 F: 161
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	151	30	N/A-30	11 M:8 F: 3	TBD	92
2.2.6 Number of adverse reactions to insecticide exposure documented	Total number of incidents of insecticide exposure reported that resulted in a referral for	Y1, Y2, Y3	Data source: Incident report forms that are required for each incidence of insecticide	By Spray Campaign By	AIRS	0	2 (Washers & SO)	0	0	0	0

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[6]	Target[7]	Results	Target	Results
	medical care		exposure Reporting frequency: Each spray season	residential/occupational exposure							
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	AIRS	0	01 Motorbike, 03 Vehicles	0	1 Vehicle	0	0
2.3 Support Entomological Monitoring Activities and Insecticide Resistance Strategies											
2.3.1 Number of sentinel sites 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	10	10	10	10	8	TBD
2.3.2 Number and percentage of entomological monitoring sentinel sites measuring all five primary PMI entomological indicators	[Numerator: Number of entomological monitoring sites measuring all five primary PMI entomological indicators] [Denominator: Number of entomological monitoring sentinel sites] Calculation: [Numerator ÷ Denominator] x 100	Y1, Y2, Y3	Data source: Entomological reports Reporting frequency: Annually	By Spray Campaign	AIRS	5; 50%	5;50%	5	5; 50%	4; 50%	TBD
2.3.3 Number and	[Numerator: Number of	Y1, Y2, Y3	Data source:	By Spray	AIRS	10;	10: 100%	10	10; 100%	8; 100%	TBD

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[6]	Target[7]	Results	Target	Results
percentage of entomological monitoring sites measuring at least one secondary PMI indicator	entomological monitoring sites measuring at least one secondary PMI indicator] [Denominator: Number of entomological monitoring sites] Calculation: [Numerator ÷ Denominator] x 100		Entomological reports Reporting frequency: Annually	Campaign		100%					
2.3.4 Number and percentage of insecticide resistance testing sites that tested at least one insecticide from each of the four classes of insecticides recommended for malaria vector control	[Numerator: Number of insecticide resistance testing sites that tested at least one insecticide from each of the four classes of insecticides recommended for malaria vector control.] [Denominator: Number of insecticide resistance testing sites] Calculation: [Numerator ÷ Denominator] x 100	Y1, Y2, Y3	Data source: Entomological reports Reporting frequency: Annually	By Spray Campaign By Type of Insecticide	AIRS	8;100%[9]	8: 100%6	8; 100%6	8; 100%	8; 100%	TBD

[9] 100% to test: Pyrethroid, Carbamate, Organophosphate, Organochloring

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[6]	Target[7]	Results	Target	Results
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	PMI	5	5	5	5	TBD	TBD
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	PMI	15	14	15	Will be complete d in May	TBD	TBD
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 Spray Campaign By Type of Insecticide	PMI	48[10]	93[11]	104	488	488	TBD

[10] Type of Insecticide: Deltamethrin: 8, Permethrine: 8, Lambda cyhalothrine: 8, Bendiocarb: 8, Fenithrothion: 8, DDT: 8
[11] **CDC bottle**: Deltamethrine: 8, Permethrine: 8, Lambda cyhalothrine: 7, Bendiocarb: 8, Fenithrothion: 6, DDT: 6, Alphacypermethrine: 7
WHO tube test:: Deltamethrine: 8, Permethrine: 3, Lambda cyhalothrine: 8, Bendiocarb: 8, Fenithrothion: 8, DDT: 8

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[6]	Target[7]	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: District coordinatoor reports Invoice Reporting frequency: Per Spray Campaign	By Spray Campaign	AIRS	140	342	TBD 160	1,033	567	974
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	424,000	155,324	801,052 Leaflet: 396,101 Brochure39 6,101[12] Poster: 8850	592,796 Leaflet: 294,101 Brochure : 294,101 Poster: 4,594	TBD	435,532 Leaflet: 217,766 Brochure: 217,766 Poster: 7,176
2.4.3 Number of people reached with IRS messages via door-to-door mobilization	Total number of adults reached with IRS message during pre-spray community, door-to-door mobilization	Y1, Y2, Y3	Data source: Mobilization Data Collection Forms Reporting frequency: Daily per mobilization conducted	By Spray Campaign By Gender	AIRS	N.A.	1,613,491 M : 896,645 F : 716,846	TBD 1,588,180 M: 884,875 W: 703,305	996,213 M: 462,351 F: 533,862	1,620,88 3	558,429 M:242,986 F: 315,443

[12] Brochure 1,100,080 ; Pamphelets: 546265; Poster: 6800; SOP Brochure 750

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[6]	Target[7]	Results	Target	Results
2.5 Spray Targeted Structures According to Technical Specifications											
2.5.1 Number of structures targeted for spraying[13]	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	PMI	410,000	380,072[14]	396,101	347,776 CHL: 83,897 South: 263,879	270,428	286,928 EAST:158,006 CHL: 128,922
2.5.2 Number of structures sprayed with IRS[15]	Total number of structures sprayed in targeted districts	Y1, Y2, Y3	Data source: Daily Spray Operator Forms Reporting frequency: Daily per spray campaign	By Spray Campaign	PMI	348,500 (85% of 410,000)	371,391	336,686	343,470 CHL: 82,091 South: 261,379	229,864	274,533 EAST:149,408 CHL: 125,125
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] Calculation: [Numerator ÷ Denominator] x 100	Y1, Y2, Y3	Data source: Daily Spray Operator Forms Reporting frequency: Daily per spray campaign	By Spray Campaign	PMI	85%	Total: 97.7% CHL : 96.1% South:98.2%	85%	98.76% CHL: 97.85% South: 99.05%	85%	95,68% EAST: 94,56% CHL: 97,05%

[13] The yearly targets for this indicator are from the applicable workplan. The yearly results are the number of structures found by Spray Operators during the spray campaign.
[14] Due to insecurity, AIRS Madagascar had to remove 15,623 structures from their target number of structures.
[15] The target per year for this indicator is based on 85% of the number of structures to be targeted as noted in the applicable workplan.

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[6]	Target[7]	Results	Target	Results
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	PMI	1,881,647	1,781,981[16] Pregnant Women: 60,146 Children under 5: 371,701	1,828,869	1,588,138 Pregnant women: 64,792 Children under 5: 296,395	1,676,688	1,307,384 Pregnant women: 30,371 Children under 5: 175,214
Component 3: Provide ongoing monitoring and evaluation and quality control measures											
3.1 Submit Monitoring and Evaluation Plan (MEP) to PMI-Madagascar	Milestone: (Completed/Not Completed)	Y1, Y2, Y3	Data source: Project records Reporting frequency: Semi-annual		AIRS	Com-pleted	Com-pleted	Completed	Completed	Com-pleted	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 Madagascar has been chosen to carry out the PSDQA in Year 3	N.A.	N.A.	N.A. – AIRS Madagascar has been chosen to carry out the PSDQA in Year 3	Completed	Completed
3.3 Submit a country-specific Eligible Structure Definition Document to local PMI advisors and	Milestone: (Completed/Not Completed)	Y1	Data source: Project records Reporting frequency: Semi-annually		AIRS	Com-pleted	Com-pleted	N.A.	N.A.	N.A.	Completed

[16] Due to insecurity, AIRS Madagascar had to remove 57,171 people protected from their target.

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[6]	Target[7]	Results	Target	Results
NMCP											
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	Complet -ed	Complet-ed	N.A.	N.A.	N.A.	N.A.
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	5 (2 Environ-mental Compliance Officer checklists, 3 M&E Tools;)	5 (2 Environ-mental Compli-ance Officer checklists, 3 M&E Tools;)	TBD9 (6 Environ-mental Compli-ance Officer checklists, 3 M&E Tools;)	4 (3 M&E Tools, 1 Storekee per Guide)	TBD	4 (3 M&E Tools, 1 Storekeepe r Guide)
4.2 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.	N.A.	1	N.A.	TBD	N.A.

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[6]	Target[7]	Results	Target	Results
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.	N.A.	1	TDB	TDB	TBD
Component 5 (Cross-cutting): Capacity Building, Knowledge Transfer, Gender Inclusion											
5.1 Capacity Building[17] (Gender Inclusion)											
5.1.1 Number of people trained in IRS implementation	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 entry clerks, IEC mobilizers, drivers, washers, porters, pump technicians, security guards, etc.	Y1, Y2, Y3	Data source: Project records – Training reports Reporting frequency: Semi-annually	By Spray Campaign By Gender Percentage of Women Trained	PMI	2,894	3357 M: 3120 W: 237 W: 7.05%	840 M:772 W:68	834 M: 786 F: 48 5.8%%	666	809 M: 710 F:99 12%
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	Y1, Y2, Y3	Data source: Project records – Training reports Reporting frequency:	By Spray Campaign By Gender	AIRS	14,507	14818 M: 11230 W: 3588	1940 M: 1455 W: 485	2,241 M: 1,758 F: 483	4,224	3,450 M: 1936 F: 1514

[17] See Annex B for the breakdowns of the training targets as presented in the 2012 AIRS Madagascar workplan.

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[6]	Target[7]	Results	Target	Results
	districts. This figure includes all cadre that serve a role in IRS.		Semi-annually	By Role (e.g., spray operator, store keeper) Percentage of women trained			 24.21%		21.6%		43.88%
5.1.3 Number of personnel trained as IRS implementation trainers	Total number of personnel trained in Training of Trainers (TOT) 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	71	78 M:71 W: 7 9%	96 M:88 W: 8	60 M: 59 F:1	43	47 M: 44 F:3 6.8%
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[18], Y2[19], 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)	AIRS	N.A.	NA	N.A.	N.A.	TBD	92 M:43 F:49 53.3%

[18] AIRS Madagascar was not allowed to work with the Malagasy government per USG regulations.
[19] AIRS Madagascar was not allowed to work with the Malagasy government per USG regulations.

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[6]	Target[7]	Results	Target	Results
5.1.5 AIRS conducted a capacity assessment	AIRS Madagascar 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	N.A.	NA	NA	NA	NA	NA
5.1.6 Number of capacity-building Memoranda of Understanding (MOUs) signed by AIRS, NMCP, and partners/ institutions	Total number of MOUs on provision of local capacity building finalized and signed between AIRS, the NMCP, and other local partners and institutions	Y1, Y2, Y3	Data source: Project records – MOUs Reporting frequency: Semi-annually	By Spray Campaign	AIRS	N.A.	NA	NA	N.A.	NA	N.A.

ANNEX F. IEC MESSAGES

IRS MESSAGES CONVEYED BY IEC/BCC MOBILIZERS

I. OBJECTIVE: Households prepare for IRS and agree to receive SOPs and let them inside their homes.

II. MESSAGES

Messages for Advocacy ***(to community leaders)***

- Inform the public in advance of the schedule and goal of IRS.
- Get involved in mobilization
- Facilitate the operation with the community (programming, consultation, etc.)

IEC messages:

–To families:

- **Prepare for spraying:**
  - ✓ Prepare 10 liters of water for preparing the product.
  - ✓ Remove food, clothing, cooking utensils, drinking water, furniture, etc..
  - ✓ Keep animals in a safe place and far enough away from home.
  - ✓ Remove anything that is hanging on the walls.
  - ✓ Put heavy furniture in the middle of the house.
  - ✓ Leave a space in the house to all SOPs to spray all the walls.

- **Receive SOPs:**
  - ✓ Give water to the SOPs.
  - ✓ Show SOPs the rooms to be sprayed.
  - ✓ Let SOPs work unhindered.
  - ✓ Stay out of the house.

- **After spraying:**
  - ✓ Do not wash the walls after spraying.
  - ✓ Close all doors for 2 hours before opening.
  - ✓ Leave the doors open for 30 minutes to allow air to flow.
  - ✓ Clean the house.
  - ✓ Throw in the latrines or bury dead mosquitoes or other insects, as well as dust.
  - ✓ Wash hands with soap.
  - ✓ Wait 6-9 months to paint the walls depending the insecticides used.

–To the community:

- IRS is free.
- IRS protects the family and the entire region.

IRS MESSAGES CONVEYED BY IEC/BCC MOBILIZERS
• IRS reduces mortality of pregnant women and children under 5 years. • IRS protects the house for 3 to 6 months. • IRS is safe for people and pets if all conditions are met. • IRS is very effective if all structures are sprayed. **Messages to SOPs:** • Facilitate the process by working with the community. • Wear personal protective equipment (PPE). • Ensure the effectiveness and quality of spraying. • Do not cover the walls after spraying and for at least 6 months.