



**PMI | Africa IRS (AIRS) Project**  
Indoor Residual Spraying (IRS 2) Task Order Four

**MOZAMBIQUE**  
**END OF SPRAY REPORT 2013**

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# MOZAMBIQUE END OF SPRAY REPORT 2013

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# ACRONYMS

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<b>AIRS</b>	Africa-wide Indoor Residual Spraying
<b>DPS</b>	Provincial Directorate of Health
<b>ICC</b>	Inventory Control Cards
<b>ID</b>	Identification
<b>IEC</b>	Information, Education and Communication
<b>IRS</b>	Indoor Residual Spraying
<b>M&amp;E</b>	Monitoring and Evaluation
<b>MICOA</b>	Ministry of Environmental Affairs
<b>MINAG</b>	Ministry of Agriculture
<b>MOH</b>	Ministry of Health
<b>NMCP</b>	National Malaria Control Program
<b>ODK</b>	Open Data Kit
<b>PMI</b>	President's Malaria Initiative
<b>PPE</b>	Personal Protective Equipment
<b>SDSMAS</b>	<i>Serviços Distrital da Saúde Mulher e Acção Social</i> /District Services for Health, Women and Social Welfare
<b>SEA</b>	Supplemental Environmental Assessment
<b>US</b>	Health Center
<b>USAID</b>	United States Agency for International Development
<b>WHO</b>	World Health Organization

# MOZAMBIQUE END OF SPRAY REPORT 2013

The views expressed in this document do not necessarily reflect the views of the United States Agency for International Development or the United States Government.

# EXECUTIVE SUMMARY

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In August 2011, Abt Associates was awarded a three-year Africa-wide Indoor Residual Spraying project (AIRS), IRS 2 Task Order 4, funded by USAID under the President's Malaria Initiative. The mandate of the project is to limit exposure to malaria and reduce the incidence and prevalence of malaria in up to 17 countries in sub-Saharan Africa. The key objectives of the program in Mozambique are to reduce malaria-associated morbidity and mortality in select districts in Zambézia province and establish a model IRS program that will set national performance standards.

Abt implements the project in close collaboration with Mozambique's National Malaria Control Program (NMCP), the Provincial Health Directorate in Zambézia province, the District Health Directorates in the select districts, the Ministry of Environmental Affairs (MICOA) and the Ministry of Agriculture (MINAG).

The project's main achievements in 2013 are listed below:

**TABLE 1: AIRS MOZAMBIQUE AT A GLANCE**

Number of provinces/districts covered by PMI-supported IRS in 2013	4 districts in Zambézia province (Milange, Morrumbala, Mocuba, and Quelimane)
Insecticide	Pyrethroid
Number of structures sprayed by PMI-supported IRS in 2013	414,232
Number of structures targeted by PMI-supported IRS in 2013 (found by Spray Operators)	464,295
2013 spray coverage	89.2%
Population protected by PMI-supported IRS in 2013	2,181,896 (including 139,499 pregnant women and 379,982 children under 5)
Dates of PMI-supported IRS campaign	7 October – 10 December 2013
Length of IRS campaign	47 days in Mocuba, 48 days in Milange and Morrumbala and 55 days in Quelimane
Number of people trained with US government funds to deliver IRS <sup>1</sup>	1,128 <sup>2</sup>

As part of entomological monitoring, AIRS conducted baseline and monthly monitoring activities. To determine quality of spraying, the project conducted quality assurance tests in 15 houses. The test results for average 24-hour mortality were 100% for the month of October, using standard World Health Organization (WHO) cone assays.

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<sup>1</sup> This is based on the PMI indicator definition. It includes only spray personnel such as spray operators, team leaders, supervisors, and clinicians. It excludes data clerks, drivers, washers, porters, pump technicians, and security guards.

<sup>2</sup> 1,097 spray operators, plus 31 supervisors and government staff that attended the full IRS Training of Trainers.



# I. INTRODUCTION

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## I.1 PROJECT OBJECTIVES IN 2013

Specific objectives for 2013 of the AIRS Mozambique program included the following:

- Cover at least 85 percent of the 458,218<sup>3</sup> targeted and eligible structures found in four selected districts of Zambezia (Milange, Morumbala, Quelimane and Mocuba), and protect as many as 1,814,881 lives from malaria transmission in the target areas.
- Continue entomological monitoring in collaboration with *Instituto Nacional de Saúde* / Centers for Disease Control and Prevention (INS/CDC).
- Assess and improve national and local capacity in organizing, planning, implementing, and evaluating IRS campaigns.
- Identify cost and operation-efficiency to streamline the IRS campaign, lower cost of implementation, and limit stock and supply chain error.
- Improve environmental compliance with respect to implementation of IRS.

## I.2 SPRAY SITES

Zambézia province (Figure 1), located in central Mozambique, has a total population of 4,563,018<sup>4</sup> and is divided into 17 districts. AIRS Mozambique is spraying in 4 of the 17 districts—Milange, Morrumbala, Mocuba, and Quelimane highlighted in blue in Figure 1 below. In these districts, AIRS Mozambique has established 20 operational sites with washing areas, soak pits, and refurbished stores and also has a central warehouse in Quelimane.

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<sup>3</sup> Note that this figure was 358,559 in the submitted WP 2013 and was revised per discussions with the NMPC and DPS.

<sup>4</sup> Projection from 2007 population census.



## 2. PRE-SPRAY ACTIVITIES

### 2.1 MICRO-PLANNING

The micro-planning meeting took place in July 2013. AIRS Mozambique staff facilitated the meeting and worked closely with MOH NMCP officials, the Provincial Health Directorate (DPS), the District Health Directorates (SDSMASs), as well as PMI. The staff prepared a detailed roll-out strategy and action plan, which contained personnel requirements and selection criteria as well as logistics and transportation requirements. It was during this meeting that the issue of partial spraying of Mocuba and Quelimane was raised, and after further discussions with the NMCP and PMI, it was decided to spray 100% of all four districts. This was a sign of collaboration at all levels and put the campaign on solid footing in terms of relationships amongst key stakeholders.

### 2.2 LOGISTICS NEEDS AND PROCUREMENT

The logistics needs assessment started with the development of the 2013 IRS work plan. Table A-1 in the annex shows the key commodities the project procured internationally and domestically for the spray operation. Data from the 2012 campaign was used to determine, in collaboration with the DPS and SDSMASs, the number of operational base stores, soak pits, and spray teams needed for the spray operation in each district. A total of 20 stores and 20 soak pit locations were established for the 142 spray teams in the four districts. In addition to the 20 stores at the base level, AIRS Mozambique has a central warehouse located in Quelimane, bringing the total to 21 stores.

### 2.3 HUMAN RESOURCE REQUIREMENTS

The project deployed 1,264 seasonal workers, 23.81% of whom were female, for the IRS spray campaigns in the four districts as shown in Table 2 below.

**TABLE 2: NUMBER AND GENDER OF HIRED SEASON STAFF**

Type of Personnel	No. of Males	No. of Females	Total
Spray operator	646	203	849
Team leaders	114	28	142
Base supervisors	20	0	20
District Supervisors	6	2	8
IEC supervisors	2	2	4
Pump technicians	21	0	21
Storekeepers	24	1	25
Washers	19	51	70
Security	42	0	42
Drivers	45	0	45
M&E supervisors	4	0	4
Data entry clerk	20	14	34

<b>Total</b>	<b>963</b>	<b>301</b>	<b>1,264</b>
<b>Percentage</b>	<b>76%</b>	<b>24%</b>	<b>100%</b>

Workers were recruited at the community level in September 2013 for the spray campaign. Abt District Coordinators and District Health technicians contacted the community leaders in the targeted communities in order to obtain a list of pre-selected candidates for the position of SOP. A job description was established by AIRS Mozambique, and the community leaders used this guidance for pre-selection. The pre-selected candidates then conducted a writing test and health check-up, including a pregnancy test for female candidates (see Table 3 below for results), and those that passed were invited to participate in the training. The project added a 10% buffer to the number of spray operators invited for training to account for expected workforce attrition and to allow the best candidates to be offered positions.

**TABLE 3: PRE-SPRAY PREGNANCY TEST RESULTS**

<b>Morrumbala:</b>		
	Total tested	35
	Total positive	0
<b>Mocuba:</b>		
	Total tested	108
	Total positive	4
<b>Milange:</b>		
	Total tested	45
	Total positive	1
<b>Quelimane:</b>		
	Total tested	45
	Total positive	1

## 2.4 TRAINING

AIRS Mozambique conducted a series of trainings between July and September 2013 in preparation for the campaign. Trainings took place in each of the four districts; AIRS Mozambique staff were trained in their respective districts depending on the type of training. The training involved classroom and practical lessons in IRS techniques. Table 4 below describes the trainings conducted.

**TABLE 4: TRAINING DESCRIPTION**

Type of training	From	To	Venue	Brief Description
Training of Trainers	8/26/2013	8/30/2013	Mocuba	Training topics included: IRS concept, supervision of IRS, IRS spray technique, stock control of insecticide, data recording, pump maintenance, IRS spray schedule management, environmental compliance for IRS, proper use of Personal Protective Equipment (PPE), and general personal and community safety for IRS.

Spray operators	9/9/2013	9/24/2013	4 districts	The training program lasted five days for the old candidates who have participated in the previous campaigns and ten days for new candidates; the curriculum covered both lectures and practical exercises. The lecture portion included topics such as spraying techniques; insecticide (K-Othrine, Pali); health and environmental protection; care of IRS equipment; pump parts; and data collection reporting. The practical exercises consisted mainly of spray techniques, preparation, dilution and mixing of insecticide, and progressive rinsing.
Washers	7/9/2013	7/22/2013	4 districts	Trained in proper use of PPE, progressive rinsing, and health and environmental compliance procedures.
Stock-keepers	7/9/2013	7/22/2013	4 districts	Training included supply chain system, stock card use and recording, delivery note, inventories, and proper storage and handling of insecticide, as well as health and environmental risks of lost inventory.
Data entry and management	7/11/2013	7/13/2013	Quelimane	The training addressed AIRS Access Database orientation, data entry and cleaning, report generation, filing of data collection forms, data security, computer use and care, IRS forms, and communication flow for IRS.
Environmental compliance	8/26/2013	8/27/2013	Mocuba	The objective of the training was to familiarize Health, Environment and Agriculture staff with Best Management Practices for IRS. The training included discussion groups on environmental compliance for IRS.

Pump technicians	9/9/2013	9/24/2013	4 districts	Training curriculum included pump parts and functions, care and maintenance of PPE and other equipment, and first aid. The pump technicians were trained by the district team that had participated in the Training of Trainers.
Drivers	9/19/13	9/26/13	4 districts	Drivers that would transport insecticide were trained on methods and protocol for safe driving, handling insecticides, and what to do in an emergency situation when transporting insecticides. Drivers were also trained on insecticide-related security issues, handling vehicle contamination, methods for cleaning vehicles after transporting insecticide, and handling insecticide run-off.

Guards were subjected to one-day trainings where they were explained their responsibilities for their sites. The training was held at the spraying site and was not an organized training.

In total, the project trained 1,368 persons, as reported in Table 5 below.

**TABLE 5: AIRS MOZAMBIQUE IRS TRAINING MATRIX**

Categories of Persons Trained	Training on IRS Delivery										Other Trainings						TOTAL	
	Training of Trainers		Spraying Operations		Data Capture		Logistics Training		Technical Maintenance		Base Security		Washing		Transport Security			
	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F
NMCP - District	3																3	0
Ministry of Environmental Affairs (MICOA)	3	1															3	1
Ministry of Agriculture (MINAG)	4																4	0
District Coordinators	3	1															3	1
District Supervisors	6	2															6	2
IEC Coordinators	2	2															2	2
Data Clerks					23	14											23	14
M&E Supervisors	4																4	0
Spray Operators			866	231													866	231

Warehouse Keepers							24	1								24	1	
Pump Technicians									21	0						21	0	
Washers												19	51			19	51	
Drivers														45	0	45	0	
Guards										42	0					42	0	
TOTAL Male/Female	25	6	866	231	23	14	24	1	21	0	42	0	19	51	45	0	1065	303
<b>TOTAL TRAINED</b>	<b>31</b>		<b>1097</b>		<b>37</b>		<b>25</b>		<b>21</b>		<b>42</b>		<b>70</b>		<b>45</b>		<b>1368</b>	

**TABLE 6: MOZAMBIQUE 2013 TRAINING DATA, PMI INDICATOR –  
“TRAINED TO DELIVER IRS WITH USG FUNDS”**

Type of Training <sup>5</sup>	Males	Female	Total
IRS Delivery TOT	25	6	31
Spray Operations	866	231	1,097
<b>Total</b>	<b>891</b>	<b>237</b>	<b>1,128</b>

## 2.5 ENVIRONMENTAL COMPLIANCE

A Supplemental Environmental Assessment (SEA) for IRS in Mozambique was approved by USAID in September 2011, authorizing the use of pyrethroids, carbamates, and organophosphates in eight districts of Mozambique, including the four that were sprayed in 2013. This SEA, which expires in August 2015, contains the Environmental Mitigation and Monitoring Plan, which documents the environmental compliance requirements and activities for the Mozambique IRS project. A letter report was submitted to USAID on July 16, 2013..

AIRS’s Mozambique’s Environmental Compliance Officer (ECO), in close collaboration with provincial health, environment, and agricultural departments, conducted an assessment of environmental compliance in all 21 stores and 20 soak pits prior to IRS operations. The ECO also developed an environmental compliance monitoring plan and a checklist for the insecticide storage facilities, soak pits and spray staff, and beneficiary compliance with environmental health and safety standards.

During the pre-spray period, the project established the following to comply with local and international environmental standards:

- All soak pits were constructed to meet international standards and recommendations, and were ready to be used for spray operations.
- All specified materials in the soak pits (sawdust, charcoal, and stone) were layered according to prescribed dimensions.
- All stores were renovated to meet PMI standards and readied for spray operations.
- Monitoring systems to track used insecticide sachets were established, all storekeepers were trained

<sup>5</sup> No clinicians were trained by AIRS Mozambique in 2013 because they had already been trained in the previous campaign and there was no change on the staff.

on the proper management of the stores, and washers were trained on how to properly wash IRS equipment

- One new storeroom and one new rinsing site were constructed in Pinda spray site, Morrumbala District according to local and international environmental standards.

### 3. COMMUNICATIONS ACTIVITIES

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Community sensitization and awareness are key to a successful IRS campaign. During the 2013 campaign, rather than leading a house-to-house mobilization campaign prior to spray, the AIRS Mozambique Operations team collaborated with the DPS, SDSMASs, and community leaders in the target districts for community sensitization activities. Through local leaders, AIRS Mozambique was able to carry out community meetings to impart IRS messages in all 34 targeted localities. Additionally, AIRS selected community leaders to carry out house-to-house interpersonal communication efforts in their local communities to ensure that households had received key IRS messages and were aware of the timing of the spray.

Sensitization activities began two weeks prior to the campaign and included radio spots in 7 languages and meetings with the communities and their leaders. These meetings took place a day or two before spray day in the targeted areas. The purpose of these meetings was to inform communities of the immediate visit by spray operators and educate the beneficiaries on proper preparation of their homes, environmental protection, and the importance of IRS and how it reduces malaria transmission.

In addition to verbal messages, other materials were developed and disseminated by community leaders during the spray campaign. Table 7 shows the types and numbers of communication materials produced and distributed.

**TABLE 7: IRS CAMPAIGN COMMUNICATION MATERIALS**

<b>Item</b>	<b>No. Distributed</b>
T-shirt	2,598
Hat	2,396
Brochures	18,000

**TABLE 8: IRS CAMPAIGN COMMUNICATION ACTIVITIES**

<b>Activity</b>	<b>Frequency</b>
Community meetings (34 localities x 2 meetings)	68
Radio spots (before and during spray)	1,650 spots
IRS launch	4 (1 per district)

On October 14, 2013, AIRS Mozambique assisted the provincial health directorate with the main launch ceremony, which was held in Namuinho, Quelimane District. The main launch was presided over by the Administrator, representing the Governor. Note that the official launch coincided with the date of the national IRS campaign launch; however, the spray activities commenced on October 7<sup>th</sup> in Zambezia province.

## 4. SPRAY ACTIVITIES

### 4.1 SPRAY OPERATIONS

IRS operations began in the four districts on October 7 and lasted for 47 - 55 working days (depending on the district / rains), ending on December 10.

**TABLE 9: NUMBER OF SPRAY DAYS PER DISTRICT**

District	End Date	Number of days of spray operations
Quelimane	December 10, 2013	55
Mocuba	November 29, 2013	47
Morrumbala	November 30, 2013	48
Milange	November 30, 2013	48

Daily spray operations took place in all 20 spray sites simultaneously, except for three days when some sites experienced rain. At the start of the campaign, AIRS senior staff, together with the Province Malaria Program Managers, were positioned at strategic points in the targeted districts to supervise the first day of the event and respond to urgent requests. Throughout the campaign, DPS, SDSMAS and Health Center supervisors observed the spray activities and were provided with checklists. In addition, PMI officials from USAID Washington, DC visited the spray operations during the first week of the spray campaign.

Based on the number of structures to be sprayed per district, teams were located at the 20 spray bases. Each team consisted of one team leader and six spray operators. The distribution of spray teams by base is shown in Table 10.

**TABLE 10: DISTRIBUTION OF SPRAY TEAMS BY SPRAY BASE SITES**

District	Spray sites (bases)	Nr of spray operators	Nr of teams
Quelimane	Quelimane	90	15
	Mocuba Sede	115	19
Mocuba	Mugeba	52	9
	Muaquiua	21	4
	Namanjavira	57	10
	Munhiba	32	5
	Milange Sede	128	22
Milange	Licro	20	3
	Coromana	39	7
	Molumbo	50	8
	Dulanha	22	4

	Majaua	29	5
	Morrumbala Sede	56	9
	Muandua	30	5
	Sabe	14	2
<b>Morrumbala</b>	Megaza	15	2
	Pinda	20	3
	Chire	27	5
	Derre	24	4
	Guerissa	6	1
<b>Total</b>		<b>849</b>	<b>142</b>

Daily spray activities started at 6:00 a.m. and ended around 1:00 p.m. As was the case last year, in some bases the spray schedule was set according to the communities' daily routines. For example, the spray teams had to occasionally stay beyond 2:00 p.m. to spray structures owned by farmers who left home for field work early in the morning and did not come back until after 1:00 p.m.

Spray operators collected spray data using the Daily Spray Operator Form, and their team leaders collected and verified the data and then deposited the forms at the bases. The forms were delivered to the district level from the base sites by hired staff with motorbikes. In parallel, base supervisors and stock-keepers completed the Performance Tracking Sheet, which was designed to provide an operational-level evaluation for the sites' progress. This information was reported directly to each District Coordinator through a cellphone on a daily basis. Then each District Coordinator reported the information to the Operations Manager, who compiled and reported the information to the Operations Director on a weekly basis. This system allowed immediate measures to be taken as necessary. Supervision and monitoring were prioritized throughout the spray period, and included representatives from many government agencies, as shown in Table 11.

**TABLE 11: SUPERVISION AND MONITORING BY PARTNERS**

<b>Organization</b>	<b>Number of People</b>	<b>Average Number of Days</b>
NMCP (National level)	2	7
NMCP (Province level)	9	16
PMI	2	4
MOH (District level)	20	33
Ministry of Agriculture (Province level and District level)	5	15
Ministry for Environmental Coordination (Province and District level)	5	15

A second round of pregnancy tests were conducted in October and an attempt was made to find jobs for those three women who tested positive; however there were no jobs available at that time that did not have a risk for insecticide exposure. Per the MOH policy, the women were paid for the days worked during the campaign. See Table 12 for the results below.

**TABLE 12: MID-SPRAY PREGNANCY TEST RESULTS**

<b>Morrumbala:</b>	
Total tested	30

	Total positive	0
<b>Mocuba:</b>		
	Total tested	102
	Total positive	2
<b>Milange:</b>		
	Total tested	44
	Total positive	1
<b>Quelimane:</b>		
	Total tested	44
	Total positive	0

## MID-TERM MEETING

On November 7<sup>th</sup>, the DPS held a very productive and positive mid-term spray meeting, including participants from all districts, as well as MICOA. The following key recommendations were highlighted by the DPS:

1. The mid-spray meeting next year should be earlier, for example during week three, not week five, of the campaign.
2. The DPS and AIRS Mozambique teams need to evaluate criteria of base creation and use this to assess whether there is a need to create a base in Alto Benfica (Mocuba District) for the 2014 campaign.
3. The process of vehicle procurement needs to be more transparent next year. To respond to this recommendation, in December 2013, AIRS Mozambique sent the donor Abt procurement rules to the DPS for analysis.
4. The recruitment of warehouse assistants needs to be more transparent amongst the SDSMAS staff, as there were concerns of nepotism expressed by the MICOA representative.
5. The SDSMAS Quelimane and AIRS Mozambique teams should work together on an assessment regarding the refusal rate in Quelimane and develop strategies to address this.

## 4.2 LOGISTICS AND STOCK MANAGEMENT

Like last year, the project used inventory control cards (ICC) to record each item in the central warehouse and 20 peripheral storerooms. At the storerooms, issues and receipts of items were recorded on the stock cards with details of transactions and quantities involved. The ICC for the insecticide stock in every storeroom was closely monitored. Storekeepers updated the cards daily with the movement of stock in or out of the storage facility.

Prior to dispatch of commodities from the central warehouse to the storerooms, a distribution spreadsheet was designed, tracking the flow of the commodities from the central warehouse to the district level and from this point to peripheral storerooms. This spreadsheet also showed the number of teams at each spray site. A dispatch book was designed to control all IRS commodities going in and out at the central and district warehouses. All insecticide boxes were numbered according to their final destination, so each district received boxes of insecticides with different marked numbers. A dispatch note was used to track distribution from the warehouse to the operational store, which returned a signed copy as proof of delivery. The quantities of each item received were entered on the items' ICCs.

In addition to tracking insecticide use via the Daily Spray Operator Forms, all insecticide was also tracked at the storeroom level. In the base storerooms, insecticide sachets were issued only to team leaders who completed and signed the issue forms. The storekeeper would immediately enter this on

the ICC to obtain the stock balance record. At the end of each spray day, spray operators turned in their used and unused sachets to the team leader, who collected them and submitted them to the storekeeper, who in turn, recorded the full sachets on the stock card as a positive adjustment, updated the stock balance, and returned the unused sachets to the full stock. The used/empty sachets were recorded on the Daily Utilization Record Form that tracks each store's empty sachets and utilization trend. This reconciliation process enabled the storekeepers to ensure a valid daily inventory and to alert AIRS Mozambique program staff of discrepancies between the stock and the records.

### 4.3 ENVIRONMENTAL COMPLIANCE SUPERVISION

To ensure that environmental standards and regulations were adhered to, the AIRS Mozambique project worked closely with local government institutions mentioned in Table II above throughout the operation. Environmental compliance inspections were jointly carried out to evaluate mitigation measures put in place. Such measures included the mandatory use of PPE by all personnel with potential contact with pesticide, the use of well-constructed soak pits to manage the effluent waste generated before and after the day's activities, poison warning signs on soak pits and storerooms, and posted emergency and spill procedures in stores and vehicles.

During inspections, spray personnel were observed to be wearing prescribed PPE and using proper techniques for cleaning of equipment and disposal of wastes. There were no spills of insecticides observed during the supervision visits, no reports of negative impacts on the environment or beneficiaries, and no spray operators reported health problems (or adverse effects) as a result of misuse of insecticide. The inspection teams were satisfied with the environmental compliance practices and measures in place and the general practice in the field.

### 4.4 INCIDENTS

There was one report of potential insecticide exposure when three spray operators were identified in Morrumbala attempting to steal eight sachets of insecticide. There were two vehicle accidents that were reported in the weekly reports during the campaign in Milange and Mocuba, one in each district. In Milange, there was one SOP death not associated with the previously mentioned vehicle accidents, which occurred on November 18<sup>th</sup> resulting from a fall from a vehicle during which a spray pump hit the SOP in the head. Next year the AIRS project will include a separate training module on safety and security specifically focused on transporting SOPs. The drivers receive a safety and security course prior to them receiving their licenses; however, a refresher course is necessary. The AIRS project will also consider a method of fastening the pumps on the benches.

# 5. POST-SPRAY ACTIVITIES

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## 5.1 CLOSING OF IRS OPERATIONS

### POST-SPRAY INSPECTION

The 2013 IRS operations officially ended on December 10, 2013. Immediately after the campaign came to an end, the environmental post-spray evaluation was implemented in the four districts in coordination with the Ministries of Health, Agriculture and Environment. The evaluation consisted of verifying the complete closure of latrines, rinsing areas, soak pits and washing areas, including the gates of the site in general, and ensuring that all environmental standards were followed during the movement of insecticide and empty sachets. The Open Data Kit (ODK) system forms on the smartphone were used to evaluate the level of accomplishment.

### POST-SPRAY EVALUATION MEETING

The post-spray evaluation took place February 14th, 2014, with all the covered district staff participating (supervisors, medical officers and District Health Directors). The focus of the conference was to report results, document challenges encountered during the spray operations, discuss lessons learned, and make recommendations for the next (2014) spray cycle.

The meeting agenda had two broad sessions: a plenary session with presentations by all categories of participants, and then breakout meetings for four working groups. During the breakout meetings, participants discussed the following topics:

- Renovation of spray base sites
- Recruitment of IRS personnel
- Training
- Mobilization, with a separate discussion on the Quelimane Refusal Rate study
- Campaign implementation
- Supervision
- Lessons learned
- IRS closure
- Preventing poor spray quality
- Preventing pilferage of IRS materials
- Adhering to environmental compliance

## 5.2 LOGISTICS

Following completion of spray operations, stocks of insecticide were moved from the 20 operational centers to the central warehouse in Quelimane. AIRS Mozambique transported used insecticide sachets and masks, unused sachets, pumps, and other commodities to the central warehouse facility. Progressive

rinsing barrels and washing buckets were also collected and stored in the central warehouse. The inventory shown in Table A-2 in the annex will be maintained and monitored until the next spray round.

### 5.3 WASTE DISPOSAL

Solid waste from the campaign, including packaging materials, and used disposable nose masks, was collected from all district warehouses to the central facility for incineration purposes. The incineration process took place in Nioadala District during the first two weeks of February 2014. A post-spray environmental compliance assessment was completed and documented. The safety signs at the soak pit doors are in place and there is plant growth around the soak pits, which do not show signs of polluted soil or contamination. The soak pits were covered with plastic to prevent additional plant growth that would impair the performance of the soak pit in subsequent campaigns.

## 6. ENTOMOLOGY

AIRS Mozambique worked closely with the NMCP and the DPS to conduct entomological monitoring. The NMCP and DPS technicians, as well as the AIRS Mozambique Entomologist and Entomological Assistant, were engaged in the collection and the monitoring activities. For monitoring vector behavior, density, composition, and seasonality, four sentinel sites were selected (Milange, Morrumbala, Mocuba, and Maganja da Costa). Three sites in intervention areas were selected, and one site in a comparable non-intervention district (Maganja da Costa) was selected.

### 6.1 MONITORING VECTOR DENSITY, DISTRIBUTION, AND SEASONALITY AND BEHAVIOR

The first entomological data collection on vector density, distribution, and seasonality and behavior was done three months before the start of spray operations. Subsequent monthly post-spray entomological monitoring activities were continued and will be conducted on a monthly basis up to end of the project period.

#### 6.1.1 PYRETHRUM SPRAY COLLECTION

A total of 397 female adult malaria vector mosquitoes (*An. gambiae* s.l. and *An. funestus* group) were collected in all areas by Pyrethrum Spray Collection from July to November 2013. Of the total of 397 mosquitoes collected in the four sites, 321 were *Anopheles funestus* s.l. (80.9%) and 76 (19.1%) were *An. gambiae* s.l. In each site, collection was done in a total of ten houses every month. Table 13 presents the densities and number of mosquitoes collected per species in the intervention and control sites. A total of 1,210 culicine mosquitoes were also collected from all the sites through pyrethrum spray collections. No other anopheline mosquitoes were collected in all the sites during this period.

**TABLE 13. RESTING DENSITY IN FOUR SENTINEL SITES, JULY TO NOVEMBER 2013  
(NUMBERS IN PARENTHESIS ARE DENSITY PER ROOM)**

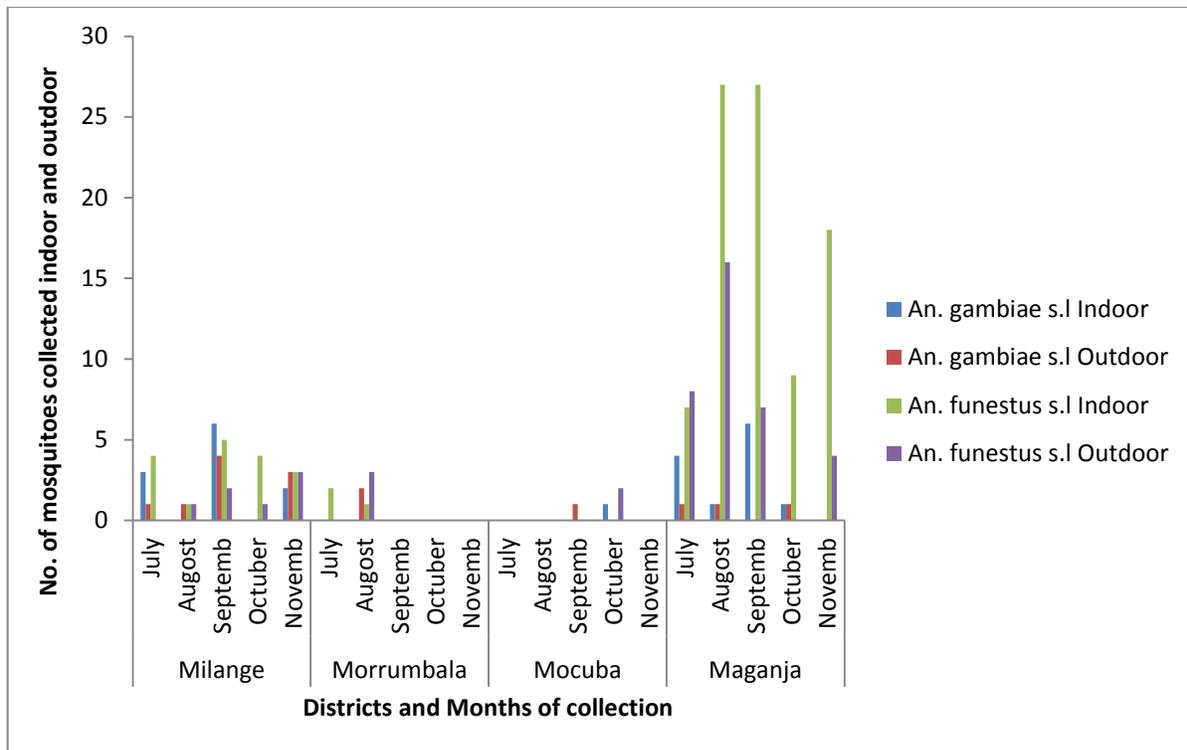
Month	Intervention (3 sites)		Control (1 site)		Total	
	<i>An. gambiae</i> s.l	<i>An. funestus</i> s.l	<i>An. gambiae</i> s.l	<i>An. funestus</i> s.l	<i>An. gambiae</i> s.l	<i>An. funestus</i> s.l
July	30 (1)	423 (1.40)	2 (0.2)	79 (7.9)	32	121
August	0 (0)	2 (0.07)	10 (1)	114 (11.4)	10	116
September	0 (0)	5 (0.17)	25 (2.5)	30 (3)	25	35
October	0 (0)	0 (0)	4 (0.4)	68 (6.8)	4	68
November	2 (0.07)	2 (0.07)	3 (0.3)	18 (1.8)	5	20

#### 6.1.2 HUMAN LANDING CATCHES

Human landing collections were carried out in two structures (homes) per village in four villages (Samora Machel in Mocuba, Coqueiro in Morrumbala, 12 de Outubro in Milange, and Motinho in Maganja da Costa). Night long (6 p.m. – 6 a.m.) mosquito collections were carried out to monitor

vector feeding times and location. Two collectors were assigned to sit indoors and another two outdoors for nightly collections on three consecutive nights per month (July to November). A total of 194 adult malaria vector mosquitoes were collected using Human Landing Catches. Human Landing Catches showed that *Anopheles gambiae* s.l. and *Anopheles funestus* tend to feed mainly indoors in the control area where there is no IRS. In Milange intervention area where a relatively higher biting rate is reported, both species tended to feed mainly indoors before the IRS intervention. However, an increase in exophagy was observed in November following the IRS operation in the area. The biting rate was generally low in the other intervention sites (Morrumbala and Mocuba).

**FIGURE 2: HUMAN LANDING CATCH OF ANOPHELES SP, JULY–NOVEMBER 2013**



Results from field surveys showed variations on vectors biting rates between intervention and control areas. Generally, in intervention areas the biting rates of malaria vectors were lower as compared to the control area. Out of the total of 194 malaria vector mosquitoes, 20.1% were *Anopheles gambiae* s.l. and 79.9% were *Anopheles funestus* s.l.

Monthly monitoring of the biting rate and vector density will continue in both the intervention and control villages to assess the impact of IRS intervention in the area.

## 6.2 CONE/WALL BIOASSAY TESTS

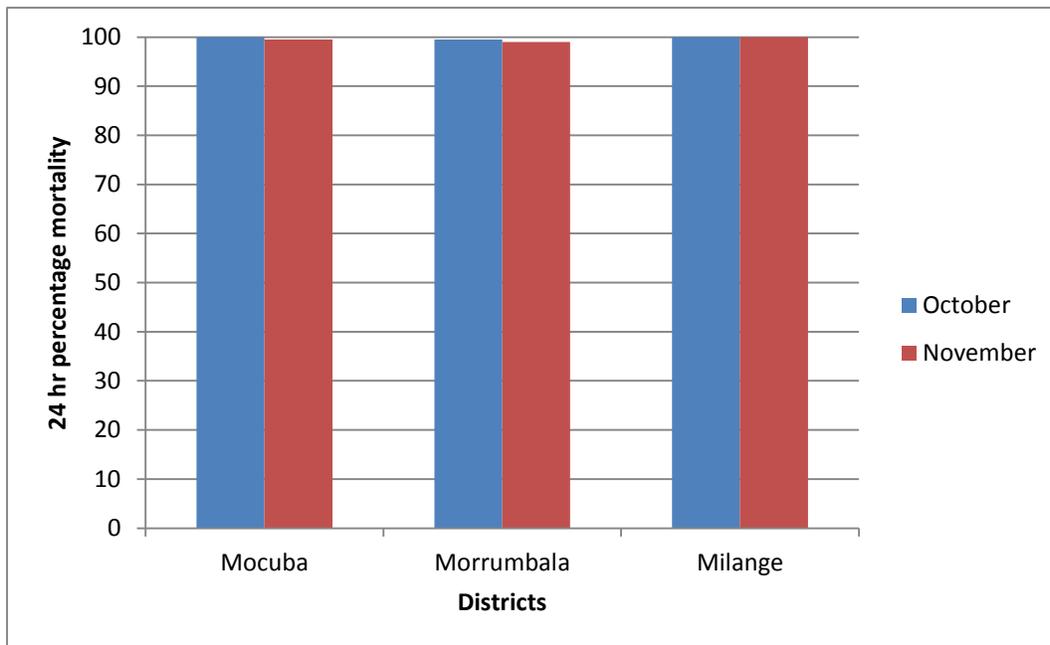
### 6.2.1 DETERMINATION OF QUALITY OF SPRAYING AND DECAY RATE OF INSECTICIDE SPRAYED

The standard WHO cone bioassays were used to evaluate the quality of the spray operation. The bioassay tests were conducted 24 hours after spraying and one month after spraying in Samora Machel,

12 de Outubro, and Coqueiro villages in the districts of Mocuba, Milange, and Morrumbala respectively. The wall bioassay tests showed high mortality rates (100%) of susceptible mosquitoes (*Anopheles arabiensis*) exposed to deltamethrin-sprayed walls in Milange (12 de Outubro) 24h after spray and one month after spraying. In Mocuba (Samora Machel) 100% mortality was observed for the 24h post-IRS test, and mortality was 99.5% one month after spraying. In Morrumbala (Coqueiro) the mortality rates for 24h post-IRS and one month after IRS were 99.5% and 99%, respectively. The knockdown after 30 minutes exposure time showed little variation between the districts and surfaces.

Figure 3 shows the residual efficacy of insecticide sprayed from the monthly cone bioassay tests on the wall surfaces of 15 structures in three districts, namely Morrumbala, Mocuba, and Milange. In each district 5 structures were used for the cone bioassay tests. In each house a total of four tests were conducted at the heights of 0.5, 1, 1.5 and 2 meters above the ground, all conducted on mud wall surfaces.

**FIGURE 3: PERCENTAGE MORTALITY FROM THE CONE BIOASSAY TESTS IN THREE DISTRICTS TARGETED FOR IRS IN ZAMBÉZIA PROVINCE, OCTOBER–NOVEMBER 2013**



# 7. MONITORING AND EVALUATION

## 7.1 KEY OBJECTIVES AND APPROACH

AIRS Mozambique used the local lessons learnt from the previous implementer, combined with lessons learned from the 2012 campaign and successful aspects of AIRS M&E systems in other countries, to adjust Mozambique's M&E system to:

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

## 7.2 DATA COLLECTION AND MANAGEMENT

Data was collected using standardized data collections forms designed to capture all core PMI indicators. All data collection was preceded by training on data capture. During spray operations, all spray data was collected by spray operators and subsequently verified by spray supervisors.

In 2013, the AIRS project introduced three standardized data quality assurance tools - the Error Eliminator (EE), Data Collection Verification (DCV), and the Data Entry Verification (DEV) forms - to improve supervision, and ultimately the quality, of data collection and data entry.

**TABLE 14: MOZAMBIQUE IRS 2013 DATA COLLECTION TOOLS**

DATA COLLECTION TOOL	USED BY WHO AND WHEN
<b>Training Participants Registration Form</b>	Used by lead trainer at training workshop to capture category and number of people trained disaggregated by male and female.
<b>Daily Spray Operator Form</b>	Used by spray operators during spray operations to capture structures and rooms found and sprayed, and population protected.
<b>Daily Team Leader Form</b>	Used by spray operator's team leader during spray operations to summarize information on the Daily Spray Operators Forms.

**TABLE 15: DATA QUALITY ASSURANCE TOOLS**

Data Quality Assurance Tool	Purpose, Used by who and when
Error Eliminator (EE) form	Purpose: <ul style="list-style-type: none"> <li>• To check the completeness and correctness of data collected in the field.</li> <li>• To highlight common data collection errors so they can be quickly identified with corrections being made and re-training provided by the</li> </ul>

	<p>supervisor.</p> <p>Used by:</p> <ul style="list-style-type: none"> <li>• Team leaders on daily basis to check 100% of the forms filled by the Spray Operators under their supervision (EE was printed on the backside of the Daily Team Leader form).</li> <li>• Supervisors, District Spray Operations Coordinator, District M&amp;E Coordinators, Operations Manager and M&amp;E Manager also used the Error Eliminator when visiting the field.</li> </ul>
<p>Data Collection Verification (DCV ) form</p>	<p>Purpose:</p> <ul style="list-style-type: none"> <li>• Used during random household visits to check the accuracy of data collected in the field– i.e., to ensure that the data written on the Daily Spray Operator Forms matches the information reported by households and/or the data recorded on the IRS Cards disseminated to households.</li> </ul> <p>Used by:</p> <ul style="list-style-type: none"> <li>• Database Coordinators, District M&amp;E Assistants predominately.</li> <li>• Database Manager and the M&amp;E Manager.</li> <li>• A total of 2,731 structures were visited using the DCV form. See Table 17.</li> </ul>
<p>Data Entry Verification (DEV) form</p>	<p>Purpose:</p> <ul style="list-style-type: none"> <li>• To verify data entry accuracy, i.e. ensure the data in the database matches the data as noted on the data collection form. Using the DEV form, supervisors check, field by field, the information on randomly picked cards from the files and the information in the corresponding database entries to ensure that they matched. Any corrections needed are noted on the DEV form for the Data clerk</li> </ul> <p>Used by:</p> <ul style="list-style-type: none"> <li>• Database Coordinators, District M&amp;E Assistants Database Manager and the M&amp;E Manager during their visit to a data entry center.</li> <li>• A total of 3,958 lines (3,318 Detail lines and 640 Total lines) of data were verified using the DEV form. See Table 17.</li> </ul>

Supervision of the data collection process was carried out at various levels through field visits.

**TABLE 16: NUMBER OF STRUCTURES VISITED USING THE DCV FORM**

District	# Structures visited using the DCV form
Milange	628
Mocuba	613
Morrumbala	644
Quelimane	846
<b>Grand Total</b>	<b>2,731</b>

**TABLE 17: USE OF DCV FORM; COMMON ISSUES FOUND AND CORRECTIVE ACTIONS TAKEN**

Errors/Issues Observed	Corrective Actions Taken
<p><b>Missing IRS card numbers</b> It was found that some households did not have IRS cards when interviewed. This was particularly an issue for unsprayed structures due to absence of a household member during the original spray period or in the case of refusal.</p>	<p>Morning and afternoon assemblies at the bases were held to address spray operators. They were reminded to leave the IRS cards behind for all unsprayed structures and to provide IRS cards for unsprayed structures even when households refuse treatment. Additionally, Spray Operators were told to emphasize to households the importance of keeping their IRS cards in a safe place. <sup>6</sup></p>
<p><b>Inaccurate reporting of population data</b> The total population data was found to be incorrect at times because of the confusion Spray Operators had in providing total male and female population figures per structure (including both adults and children). As in other countries, there were challenges in collecting the correct data on the number of children under 5 living in each structure.</p>	<p>Supervisors brought this issue to the attention of Spray Operators and Team Leaders at morning assemblies, reminding them how to ask for the population data when interviewing the household.</p>
<p><b>Unsprayed structures found</b> Unsprayed structures that were initially overlooked by Spray Operators were found in a few villages.</p>	<p>M&amp;E team and supervisors worked to arrange revisits to these areas so that the missed structures could be covered.</p>
<p><b>IRS cards not updated</b> It was found that Spray Operators were not completing the 2013 section of the IRS cards with 2013 spray information: date of spray, code of SOP and signature of SOP, etc.</p>	<p>Orientation was provided to Spray Operators to remind them to complete the 2013 section of IRS cards.</p>

<sup>6</sup> This noted, the AIRS program recognizes that Spray Operators in all countries have struggled with properly documenting unsprayed structures and it will continue to be an issue reinforced in TOT and Spray Operator training.

### 7.2.1 DATA ENTRY

The AIRS Mozambique M&E team worked with Abt's internal Client Technology Center to develop a Microsoft Access-based database system. The project procured additional laptops, adding to the stock of data entry clerk laptops that were available from 2012. The AIRS Mozambique database was installed on the laptops that were slated to be used for data entry. Thirty-four data entry clerks were employed at four data entry sites, one site in each district, with four to eleven data entry clerks assigned per site depending on the amount of data a district collected per day.

Data were entered simultaneously at each of the four districts. The database was designed to allow two levels of data entry; *totals* and *details* data. *Totals* data was meant to facilitate quick reporting for program decisions while *Details* data was used for the final End of Spray Report.

This database system used a server system for a single data storage site at each of the 4 data entry centers and a cloud-based file transfer system to compile data from all 4 data entry centers to create IRS progress reports at the national level.

### 7.2.2 DATA STORAGE

Paper data forms are stored in three-ring binders. Spray data were filed by date and base name. At the end of every day, all databases were backed up electronically. Backup was performed in three different ways: first, into a backup folder on the district data entry server; second into a cloud back-up system (Sugar Sync); and third onto an external flash drive that was provided to each District M&E Assistant.

### 7.2.3 DATA QUALITY AND CONTROL

Data cleaning was done at the district-level during and after spray. It involved the following:

- Ensuring that all data cards were entered correctly (by the double entry method (both by *Totals* and by *Details*).
- Making necessary corrections to ensure that the *Totals* and *Details* data entry were in agreement.
- Checking and removing duplicate records.
- Identifying and entering missing records.

Data cleaning was done using a Microsoft Access-based IRS Cleaning/Reporting tool. The Data Entry Clerks and M&E Assistants cleaned spray data daily throughout the spray campaign with final data cleaning completed in less than 14 days after the spray campaign was completed in each district.

Data entry verification was done using the Data Entry Verification form (DEV). This involved ensuring that information in the database accurately reflected the information on the Daily Spray Operator Forms. Using the DEV form, supervisors checked, field by field, the information on randomly picked cards from the files and the information in the corresponding database entries to ensure that they matched. Any corrections needed were noted on the DEV form for the Data Entry Clerk. For spray data, the verifications noted in Table 19 were made in each district. A total of 3,958 lines (3,318 Detail lines and 640 Total lines) of data were verified using the DEV form.

**TABLE 18: RESULTS ON USE OF THE DATA ENTRY VERIFICATION FORM**

Data Entry Center/District	Morrumbala	Milange	Mocuba	Quelimane	Total
# of Detail Lines in database	110,724	152,516	151,604	51,154	<b>465,998</b>
# of Detail Lines checked	663	640	649	1366	<b>3,318</b>
# Detail Lines Requiring Correction	0	15	10	1	<b>26</b>
% of Detail Lines Checked	0.60%	0.42%	0.43%	2.67%	<b>0.71%</b>
# of Total Lines in database	8,539	12,399	11,539	4,368	<b>36,845</b>
# of Total Lines checked	46	82	231	281	<b>640</b>
# Total Lines Requiring Correction	0	4	15	0	<b>19</b>
% Total Lines Checked	0.54%	0.66%	2.00%	6.43%	<b>1.74%</b>

Table 18 above captures the lines manually checked with the Data Entry Verification (DEV) Form to ensure that the data in the database matched the data on the paper forms. In Year 2 of the AIRS project, with the implementation of the Database Cleaning Tool, this form was kept as a manual checkup and the number of lines checked in Mozambique is appropriate given that they were daily using the Database Cleaning Tool to ensure that *Totals* and *Details* data coincided, which necessitates cross-checking with paper Daily Spray Operator Forms.

Note that only 26 out of the 3,318 *Detail* lines checked required correction and only 19 out of the 640 *Total* lines required correction. This was due to the fact that the Database Cleaning Tool was enabling DEC and M&E staff to correct errors in a very timely manner, thus few were detected by the DEV form. With the success of the Database Cleaning Tool, we believe it is appropriate to phase out the use of the DEV form in Year 3. The AIRS double data entry system combined with the Database Cleaning Tool made it possible for all data to be cleaned so that *Totals* and *Details* data coincided prior to producing the final data for the AIRS Mozambique EOSR.

**TABLE 19: METHODS FOR QUALITY ASSURANCE**

Quality Control Issue	Method/Tools for Quality Assurance
<b>Spray Data Integrity</b>	<ul style="list-style-type: none"> <li>▪ Used standardized data collection forms</li> <li>▪ Comprehensive training on data capture</li> <li>▪ Multiple levels of supervision                             <ul style="list-style-type: none"> <li>➢ Spray operators are supervised by their team leaders, who monitor data capturing and verify collected data.</li> <li>➢ Supervisors monitor team leaders and verify spray operator and team leader spray data collection forms.</li> <li>➢ Database coordinators, District M&amp;E Assistants, and the M&amp;E manager monitor and verify data capture by spray operators, team leaders, and supervisors.</li> <li>➢ Database coordinators, District Coordinator and IEC District Supervisor verify and spot-check data collection by mobilizers.</li> </ul> </li> <li>▪ Structure spot checks using the Data Collection Verification (DCV) Form to cross-check daily spray data captured by spray operators.</li> </ul>

	<ul style="list-style-type: none"> <li>▪ Database designed with locks and logic checks.</li> <li>▪ Use of Error Eliminator and Data Collection Verification forms to ensure complete and accurate data collection.</li> </ul>
<b>Spray Data Entry and Management</b>	<ul style="list-style-type: none"> <li>▪ Data entry training for all data entry clerks.</li> <li>▪ Prompt field data entry and transfer; data forms arrive at data entry sites daily and data entry is also daily.</li> <li>▪ Data verification via double-data entry <ul style="list-style-type: none"> <li>➢ Initial data entry of daily totals per Daily Spray Operator Form.</li> <li>➢ Follow-up entry of individual structure data.</li> </ul> </li> <li>▪ Data scan for irregularities by M&amp;E Manager, Database Coordinators and District M&amp;E Assistants.</li> <li>▪ Use of Microsoft Access-based IRS Cleaning/Reporting tool to daily clean data.</li> <li>▪ Use of Data Entry Verification form to ensure accurate data entry.</li> </ul>
<b>Data Security</b>	<ul style="list-style-type: none"> <li>▪ Data collection forms are printed on durable sheets.</li> <li>▪ Data collection forms were filed systematically and stored in binders.</li> <li>▪ Database is designed with password-protected access to restrict unauthorized entry.</li> <li>▪ Databases backed up to on the district server, on Sugar Sync, and on external pen drives every day.</li> </ul>

## 7.2.4 REPORTING

Regular district-level reporting was carried out on a daily basis for both internal planning purposes and external reporting using the automated reports in the AIRS Access Cleaning/Reporting Tool. These push button reports were created by the M&E manager to provide feedback to the District Coordinators, to facilitate program management and decision-making.

On a national-level, data across all 4 districts were aggregated to produce Weekly IRS Progress Reports for PMI and DPS.

## 7.3 RESULTS

The complete list of all program indicators for the 2013 spray campaign is presented in the Monitoring and Evaluation Plan matrix in Annex A-3. The following sections provide summaries on the core PMI indicators and other spray indicators.

### 7.3.1 SPRAY OPERATION DATA

- During the spray campaign a total of 464,295 structures were found by spray operators, of which 414,232 were sprayed, representing 89.2% spray coverage.
- The total population protected by IRS (all ages) was 2,181,896. A total of 379,982 children under the age of five years and 139,499 pregnant women were protected.

Table 20 provides the summary of the 2013 spray operations data per district, following data cleaning and verification.

**TABLE 20: 2013 SUMMARY OF IRS SPRAY RESULTS PER DISTRICT**

District	Structures Found by SOP	Structures Sprayed	Spray Coverage	Total Population Protected	Males Protected	Females Protected	Pregnant Women Protected	Children <5 Years Protected	Population Not Protected	Total Pop	Po Pr
Morrumbala	110,359	97,850	88.7%	429,677	214,328	215,349	27,613	75,749	31,487	461,164	
Milange	152,112	138,628	91.1%	683,375	338,221	345,154	42,253	113,902	9,320	692,695	

Mocuba	150,952	135,146	89.5%	825,646	397,984	427,662	55,327	157,122	77,967	903,613
Quelimane	50,872	42,608	83.8%	243,198	108,536	134,662	14,306	33,209	40,254	283,452
<b>Grand Total</b>	<b>464,295</b>	<b>414,232</b>	<b>89.2%</b>	<b>2,181,896</b>	<b>1,059,069</b>	<b>1,122,827</b>	<b>139,499</b>	<b>379,982</b>	<b>159,028</b>	<b>2,340,924</b>

### 7.3.2 OTHER SPRAY INDICATORS

Data on insecticide use and spray operator performance are presented in Table 21.

**TABLE 21. INSECTICIDE USE PER DISTRICT**

Indicator	Districts				Total for all 4 Districts
	Morrumbala	Milange	Mocuba	Quelimane	
Total Sachets in stock in Quelimane Central warehouse at campaign start	n/a	n/a	n/a	n/a	338,101
Total Sachets Distributed to Districts	72,221	110,238	110,367	39,421	332,247
Total Sachets Used	70,312	110,238	110,340	38,204	329,094
Total Sachets Damaged/Lost	0	0	0	1 <sup>7</sup>	1
Total Sachets Existing Stock Remaining	1,909	0	27	1,216 (central 5,854)	9,006
Avg. # Structures Sprayed/Sachet	1.4	1.3	1.2	1.1	1.3
Avg. # Structures Sprayed by Spray Operators/Day	11	11	12	10	11
Avg # Sachets per Spray Operator/Day	8	9	10	9	9
Avg # of Spray Operators who Worked/ Day	178	258	235	81	752

## 7.4 ENHANCED MALARIA REPORTING SYSTEM

In 2013, AIRS Mozambique continued to assist and supervise malaria data collection in 8 districts (24 health facilities) in Zambezia. In August, AIRS Mozambique presented a Lessons Learned report to the PMI Mozambique team, which included the following observations and recommendations.

<sup>7</sup> Insecticide is issued in cartons from the provincial to the district warehouse. At the district level, the storekeepers do a physical count before issuing to the base storerooms. As a result from a physical count, there was a difference of one sachet when compared to the issuing note.

### 7.4.1 KEY OBSERVATIONS

- Slow uptake of use of new malaria form for a variety of reasons:
  - “Old form easier”
  - Lack of training: Training of Trainers was conducted for all Malaria Focal Persons in 8 districts; the participants had a duty to train clinicians in their respective districts; however, several of the follow-up trainings were never conducted.
  - Stock outs of new forms
- Incomplete forms: Some of the forms/registers do not account for other tests carried out, prescribed medication, stock outs of drugs and supplies, etc. Thus, health facilities are not fully reporting on the indicators. Specifically, health facilities do not record information about ACT stock outs and the number of RDTs used, despite being indicators required by MOH. Also, the use of microscopy is only available in selected health facilities.
- Poor communication between lab technicians and pharmacy staff: Often times technicians from the lab prescribe drugs that are not available at the pharmacy, which leads to having different treatment information recorded on the complimentary forms. For instance, the technician may record ACT prescribed to the patient in the register; however, when the patient gets to the pharmacy, he/she may be given a different drug depending on availability. (Note that the drug commonly substituted for ACTs is Fansidar.)
- Delays in sending reports from health facility to district level: The established timeline is that the health facilities must submit data to the district by the 20th of each month. This is not occurring in a consistent manner. For example, in March 2013 all districts sent reports to DPS, except Milange and Maganja da Costa. Maganja da Costa SDSMAS staff argued they sent data to the DPS, while Milange SDSMAS staff claimed that they were still compiling the data due to delayed submission by the health facilities.
- Unclear reporting system: It was noted that some health facilities send some weekly report numbers via SMS directly to the Malaria Program Manager at the provincial level. The District Malaria Focal person is not copied in the communication between health facility and the Program Manager; hence, they are unable to use the SMS data to update the district reports.
- Lack of transport: Data is not sent monthly by the health facility staff as expected due to lack of transport from health facilities to district offices.
- Lack of capacity at the provincial level to use the new MOH database: MOH NMCP staff trained the provincial malaria program officer to use the malaria database; however, the person who was trained in Zambezia was replaced, leaving no one in Zambezia who was trained to use the database. Additionally, the MOH database data does not coincide with the malaria data collection forms; thus, providing a significant barrier to it effectively being used to aggregate the data from the current forms.

### 7.4.2 KEY RECOMMENDATIONS

- Data Collection at Health Facility level: All clinicians should be trained on the use of new data collection forms. The Malaria Focal Persons, who received a TOT training on the use of new malaria data collection tools, did not train clinicians in their respective districts. The training of clinicians will reduce data collection errors. Also, follow-up supervision should be conducted at the health facilities that are failing to report monthly.

- To address the inconsistency of the distribution of forms, the DPS/SDSMAS should create a system to provide health facilities with forms to avoid stock outs, which at times lead to health facilities poor reporting. Note, at this time the AIRS project has been making copies and providing forms to health facilities that report a stock out of forms.
- Technical assistance should be provided to the DPS / SDSMAS in order to overcome the supply chain management issues. In the full enhanced malaria surveillance report submitted by AIRS, it was noted that 12 of 69 health facilities that were visited during the reporting time line recounted RDT and ACT stock outs.
- Technical support and capacity building should be provided to clinicians who are responsible for data collection and health facility monthly reports. Currently, it is difficult for the HIMS officers to work together with all health facilities in the districts to prepare monthly reports. One HIMS officer supports an average of 12 health facility in a district.
- Districts should be required to keep duplicates of reports they send to the DPS. The districts have photocopy machines to facilitate keeping copies of the forms that they submit. Districts like Maganja reported to have lost all reports they sent to DPS; this could be easily avoided.

## 8. FINANCE AND PAYMENT STRATEGIES

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The financial unit worked closely with the technical and operational teams throughout the year. This year AIRS Mozambique signed an MOU with the MOH / NMCP which allowed for the DPS to contract the temporary operations staff (SOPs, Supervisors, Team Leaders, Pump Technicians) directly. AIRS Mozambique was only responsible for making the payments in two cycles, the dates of which were determined by the DPS. As was implemented in 2012, the AIRS Mozambique program explored different strategies for paying the large number of temporary staff during the spraying season, including paying cash through a security agent; using funds transferred into field workers' bank accounts; and mobile banking units. Due to the limitations of the banking system in Mozambique, the most viable option was to pay cash with the help of a security agent, which was the strategy used by the previous IRS implementing partner and in the 2012 campaign.

According to local labor law restrictions upon AIRS Mozambique to contract temporary staff directly, AIRS Mozambique contracted a temporary agency in 2013 for contracting the more specialized temporary staff for the campaign, including the Database Coordinators, M&E Assistants, and Data Entry Clerks. This was a highly effective and efficient method for contracting these staff.

## 9. CHALLENGES

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The following are a few of the key challenges, including proposed solutions, faced during the 2013 campaign:

- 1. Collection of accurate spray data:** As was reported in the 2012 EOSR, some spray operators were found to be forging the spray data. This was detected in Mocuba and Quelimane, and as a result, spray operators were dismissed.

**Solution:** In order to ensure the spray operators were reporting correct data, AIRS Mozambique reinforced site supervision and monitored the structures reported as sprayed by the spray operators on a daily basis.
- 2. Improper counting of total population living in sprayed and unsprayed structures:** The data collection verification exercise reflected that *Total Populations* data was not counted correctly for some structures, with the most common mistake being the non-inclusion of children.

**Solution:** This seems to occur as SOPs do not probe concerning population figures and households have a tendency to omit children when counting. In 2014, this issue will be addressed during spray operators training on data collection.
- 3. Team leaders not using the error eliminator form correctly:** Many team leaders ticked “Yes” on the error eliminator form without verifying. This issue was wide-spread across all bases visited.

**Solution:** In 2014, during the Team Leaders and Supervisors training more time will be given to the Error Eliminator, including a practical session on how to complete the form.
- 4. Insecticide stock control at base level:** One hundred and fifty is the expected count in a sealed box from the insecticide manufacturer, but this may vary based on weight. Often the boxes of insecticide fell short of 150 sachets, which resulted in a discrepancy in the stock cards at the base level.

**Solution:** Next year this will be rectified by having the warehouse assistant at each base open the boxes upon receipt and count each sachet and record this figure as initial stock on the stock card.
- 5. Refusal Rate in Quelimane:** As mentioned above in section 4.1 above, the refusal rate in Quelimane was very erratic, one day reaching as high as 18%. Measures were taken throughout the campaign to adjust the mobilization strategy, which were successful in bringing down the refusal rate to 2%.

**Solution:** An assessment was conducted by the SDSMAS staff in Quelimane to determine the reasons for the refusal. These results will be used in the 2014 campaign to fine tune the mobilization messages.

# 10. LESSONS LEARNED

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The following are a few of the key lessons learned during the 2013 campaign:

1. **Time to implement IRS:** As was the case in 2012, normally the period between 6:00 a.m. and 1:00 p.m. is used to spray the structures. Local experiences show that this should not be generalized, as people in some localities visit their fields in the morning, so the spray operators had to move to those areas later than scheduled in order to find the population and get their structures sprayed.
2. **Coding houses:** Initially, chalk was not used to code the houses. By week two, white chalk was used by all SOPs to mark the houses sprayed so that any person / supervisor, even in the absence of the homeowner can identify that a particular house was sprayed. The marking was limited only to the houses sprayed.
3. **Coding insecticide sachets:** Initially, not all sachets were being coded using a permanent marker, which is necessary in order to control theft. By week two, sachets were being coded to indicate spray team, base and district. Also related to insecticide control, the insecticide sachet stock figures were not always reconciled on a weekly basis between the M&E database figure reported and the figure reported through the operations weekly reporting system. This practice is necessary to quickly catch discrepancies so that corrective actions can be taken.
4. **Transport safety:** As mentioned previously, there is a need to take additional precautions to prevent a similar accident like the one that occurred on November 18<sup>th</sup>, 2013. Next year the AIRS project will include a separate training module on safety and security specifically focused on transporting SOPs. The drivers receive a safety and security course prior to them receiving their licenses; however, a refresher course is necessary. The AIRS project will also consider a method of fastening the pumps on the benches.

# II. RECOMMENDATIONS

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The following are a few of the key recommendations that were included in the 2012 EOSR that were followed this year with positive results:

1. **The timeline for the next spray cycle activities should be discussed and agreed with the District Health Authorities and all partners involved in the campaign:** AIRS Mozambique was in constant communication with the DPS / SDSMAS regarding the timeline for the campaign. The DPS provided a formal letter to AIRS Mozambique requesting the October 7<sup>th</sup> start date, which resulted in a significant level of ownership on behalf of the DPS Zambezia. More ownership in turn resulted in smoother operations and an overall positive environment for managing the operations aspect of the campaign.
2. **Better gloves need to be procured, as the 2012 campaign gloves were not very durable:** The quality of gloves procured for the 2013 campaign was much higher, resulting in greater protection and morale for SOPs.
3. **M&E supervisory system:** Last year it was recommended that AIRS Mozambique should adopt the data entry supervisory system that is used in other countries and hire M&E Assistants for each targeted district. This system was implemented in 2013 and the M&E Assistants were in charge of directly supervising data entry clerks, and were responsible for managing daily data cleaning. Additionally, the M&E system was improved in 2013 by the addition of the AIRS Access Cleaning/Reporting tool which provided a platform to enable data entry clerks to identify and correct errors in an easy to use system throughout the spray campaign. These steps helped to ensure clean and high-quality data that was reported on time.
4. **Ensure a solid understanding by the DPS and SDSMASs regarding the AIRS Mozambique finance and administration policy and procedures:** All policies and procedures were clearly articulated at the DPS level, as well as through an MOU at the NMCP level. The SOPs were contracted directly by the DPS / SDSMAS, which resulted in a very smooth contract and payment process.

The following are key recommendations for the next campaign based on feedback from PMI, the MOH / DPS and internal reviews conducted in 2013:

1. **Transport safety:** As mentioned above, the AIRS project will include a separate training module on safety and security specifically focused on transporting SOPs. The drivers receive a safety and security course prior to them receiving their licenses; however, a refresher course is necessary. The AIRS project will also consider a method of fastening the pumps on the benches.
2. **Creation of additional bases:** Per the recommendations of the DPS, a base will be created in Alto Benfica to enhance our ability to serve the target population. Per PMI recommendation, AIRS Mozambique will conduct an analysis to determine whether new sites, in addition to Alto Benfica, are needed to prevent overcrowding. This will be done with full BMP compliance. Issues

to consider when creating a base include the following: proximity to water sources and other sensitive features, proximity to populated areas, security, and topology.

3. **Greater transparency with vehicle procurement:** The process of vehicle procurement needs to be more transparent next year. As mentioned above, in December 2013, AIRS Mozambique sent a memo to the DPS outlining the vehicle procurement process, including USAID rules and regulations. AIRS Mozambique is hopeful that this will facilitate transparency for the 2014 campaign.
4. **Mid-term meeting:** It was recommended by the DPS that the midterm meeting next year should be earlier, week 3, not week 5.
5. **Ensure quality PPE:** There were reports of poor quality PPE during the first few weeks of the campaign. This was partly due to the internal decision to re-use the RTI work suits, which mostly were in fine condition but appeared old.
6. **Greater transparency of SDSMAS Warehouse Assistants:** Recruitment of warehouse assistants needs to be more transparent amongst the SDSMAS staff. In 2014 AIRS Mozambique will work closely with the DPS in order to select warehouse assistants based on merit, not family relations.
7. **Increased stock of smaller size boots:** Having boots in the correct size to fit all spray operators is a recurring problem in many AIRS programs, and was observed by the PMI team in Mozambique by the lack of smaller sizes for women. Ensuring that a buffer of smaller sized boots is in stock before the start of the spray campaign is recommended.
8. **Timing to implement IRS:** As noted in the lessons learned section above, in the areas where coverage is low due to household members being out in the field, and spray operators unable to access their homes, it is recommended that the timing of when the spray operators arrive be adjusted to meet the household members' schedules.
9. **Refusal survey:** It was recommended by both PMI and the DPS that AIRS Mozambique and DPS conduct an assessment on the reasons for the high number of refusals in Quelimane. This was conducted in December 2013 and the results will be analyzed for potential solutions.
10. **Increased supervision for quality operations:** Supervision needs to be strengthened to ensure that some of the common errors committed by SOPs are corrected, including not removing all household items and not informing households on the proper hygiene procedures should they come in contact with the insecticide.
11. **Data management:** On the spray operator forms, one of the refusal categories was "not eligible"; however, ineligible structures are not supposed to be recorded as refusals per PMI's standards. This option was a holdover from 2012 when AIRS Mozambique mobilized door-to-door prior to spray and under those circumstances it was supposed to be used in the case when a structure was eligible at the time of mobilization (and thus the household received a IRS Card for it) but at the time of spray it was ineligible. Given that AIRS Mozambique did not mobilize door-to-door, this option should have been dropped and will not be included on the SOP cards next year.
12. **Professional development:** It was advised by PMI that in order to maintain the skilled AIRS Mozambique entomology staff, in particular the head of the insectary, it is recommended that they are provided opportunities to work with the INS in Maputo to strengthen their skills and help with the backlog of work there.

# ANNEX

**TABLE A-I: INTERNATIONAL AND LOCAL PROCUREMENT INVENTORY**

Items	Quantities received	Items	Quantities received
<b>International Procurement</b>		<b>Local Procurement (continued)</b>	
Face shields	1,700	Basin	50
Mouth nose mask	4,500	Insecticide stock card	5,500
Thermometer	22	Insecticide Control Form	2,500
<b>Local Procurement</b>		Pencils	1,000
Boots (pair)	250	First aid kit	100
Padlock	25	T-shirt	2,683
Flash lights	55	Bones	2,683
Hoes	14	House Hold Cards	504,040
Black files	200	Spray card	42,004
Rope, 30 meter rolls	35	Rubber bands (pack)	48
Scissors	25		
Rubber gloves-short	1,700		
Rubber gloves-long	100		
Spare parts kit	21		
6V Battery	1,700		
Barrel	20		
Bathing soap	500		
Towels	392		
Extinguishers	4		
Plastic 100 meter sheets	90		
Rakes	10		
Hammers	25		
Tool kits	25		

**TABLE A-2: POST-SPRAY PROJECT EQUIPMENT AND MATERIALS INVENTORY**

Description	Initial Stock	Additional/Supplementary Qty	Total Stock	Material distributed	Total Returned Useable	Total Damages/used	Stock Balance
Megaphones	99	0	99	82	82	0	99
Markers	345	0	345	334	0	334	11
Charcoal pencils	1	1,000	1,001	477	31	446	555
Adhesive tape	263	50	313	95	0	95	218
Scissors	0	25	25	23	3	20	5
Calculators	135	60	195	195	108	87	108
Clipboards	13	201	214	185	0	185	29
First Aid Kits	50	50	100	77	0	77	23
Pregnancy test	848	0	848	794	62	732	116
Plastic Aprons	147	0	147	115	65	50	97
Team leader ID reflectors	310	0	310	163	158	5	305
Paper masks	9,791	40,960	50,751	47,981	6,770	41,211	9,540
Gloves short	203	1,700	1,903	1,441	0	1,441	462
Gloves long	148	100	248	168	124	44	204
Liquid soap 5L	106	0	106	2	0	2	104
Funnels with filter	538	0	538	200	142	58	480
Detergent (150g)	13,198	0	13,198	5,262	5	5,257	7,941
Batteries	0	1,900	1,900	1,837	0	1,837	63
Flashlight	25	79	104	36	27	9	95
Strainers (big)	2,236	0	2,236	70	39	31	2,205
Towels	1,265	392	1,657	1,326	0	1,326	331
Leather Boots	3	0	3	0	0	0	3
Rubber boots	1,144	220	1,364	1,221	1,073	148	1,216
Suit working 2pcs	1,736	0	1,736	1,591	1,329	262	1,474
Suit 2pc working for Guards	0	0	0	0	0	0	0
Bags	1,661	0	1,661	1,015	898	117	1,544
Hat	2,855	0	2,855	2,466	2,291	175	2,680
Brace Metal	2,273	0	2,273	1,094	839	255	2,018
Visors	785	1,190	1,975	1,038	891	147	1,828
Helmets	1,505	0	1,505	1,038	924	114	1,391

Hand grass mower	3	25	28	17	17	0	28
Machetes	0	30	30	20	12	8	22
Rakes	29	5	34	28	13	15	19
Hoes	15	25	40	36	16	20	20
Shovel	45	0	45	28	21	7	38
Rope 100m	4	13	17	17	2	15	2
Pipe wrenches	11	0	11	3	2	1	10
Screwspanner / wrench	25	0	25	11	2	9	16
Hammers	0	40	40	17	1	16	24
Pliers	0	6	6	6	0	6	0
Wrench, (size 10/11)	9	0	9	8	3	5	4
Star spanner	2	0	2	2	0	2	0
Spray pumps spare parts kits	45	18	63	22	0	22	41
8002E Spare Pump Nozzles	1,576	0	1,576	110	110	0	1,576

**TABLE A-3: MONITORING AND EVALUATION PLAN (MEP) 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 <sup>8</sup>	Results <sup>9</sup>	Target <sup>10</sup>	Results	Target	Results
<b>Component I: 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.</b>											
<b>1.1 Procurement</b>											
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	<p>[<i>Numerator</i>: Number of international insecticide procurement orders delivered in country, at port of entry, at least 30 days prior to the start of spray operations]</p> <p>[<i>Denominator</i>: Total number of international insecticide procurement orders]</p> <p><i>Calculation</i>: [Numerator ÷ Denominator] x 100</p>	Y1, Y2, Y3	<p><i>Data source</i>: Project records – ex: international procurement documents, air way bills, commercial invoices</p> <p><i>Reporting frequency</i>: Each spray season (annual/ semi-annual)</p>	By Spray Campaign	AIRS	1; 100%	1; 100%	n/a (insecticide will be donated by the MOH)	n/a (insecticide was donated by the MOH)	#TBD; 100%	

<sup>8</sup> See Annex B, Table 2 for training plan details from the 2012 AIRS Mozambique Workplan that provided applicable training indicator targets.

<sup>9</sup> Results for Year 1 will be added to the matrix after the completion of the 2012 End of Spray Report.

<sup>10</sup> Targets for Year 2 will be added to the matrix after the 2013 Workplan 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 <sup>8</sup>	Results <sup>9</sup>	Target <sup>10</sup>	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.	<p>[Numerator: Number of international procurement orders for equipment, including PPE, at port of entry, 30 days prior to start of spray operations]</p> <p>[Denominator: Total number of international procurement orders for equipment, including PPE.]</p> <p>Calculation: [Numerator ÷ Denominator] x 100</p>	Y1, Y2, Y3	<p>Data source: Project records</p> <p>Reporting frequency: Each spray season (annual/ semi-annual)</p>	By Spray Campaign	AIRS	1; 100%	1; 100%	2; 100%	2; 100%	#TBD; 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	<p>[Numerator: Number of local PPE procurement orders delivered 14 days before the start of spray operations]</p> <p>[Denominator: Total number of local PPE procurement orders.]</p> <p>Calculation: [Numerator ÷ Denominator] x 100</p>	Y1, Y2, Y3	<p>Data source: Project records – ex: such as delivery notes, goods receiving notes, inventory control cards</p> <p>Reporting frequency: Each spray season (annual/ semi-annual)</p>	By Spray Campaign	AIRS	#N.A <sup>11</sup> ; 100% delivered to the main warehouse 14 days before the start of spray operations	100%	3; 100%	3; 100%	#TBD; 100%	
1.1.4 Successfully completed spray operations without an insecticide stock-out	Milestone: (Achieved/Not Achieved)	Y1, Y2, Y3	<p>Data source: Project records – ex: inventory control cards</p> <p>Reporting frequency: Each spray season (annual/ semi-annual)</p>	By Spray Campaign	AIRS	Achieved	Achieved	Achieved	Achieved	Achieved	

<sup>11</sup> Number of local procurements not targeted in Year 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 <sup>8</sup>	Results <sup>9</sup>	Target <sup>10</sup>	Results	Target	Results
1.2 In-country Logistics, Warehousing, and Training											
1.2.1 Number and percentage of logistics, warehouse managers, and storekeepers trained in IRS supply chain management	<p>[Numerator: Total number of logistics and warehouse managers trained in IRS supply chain management using AIRS Project resources.]</p> <p>[Denominator: Total number of AIRS logistics and warehouse managers.]</p> <p>Calculation: [Numerator ÷ Denominator] x 100</p>	Y1, Y2, Y3	<p>Data source: Routine training records</p> <p>Reporting frequency: Semi-annually</p>	<p>By Spray Campaign</p> <p>By Gender</p>	PMI	29; 100%	34; 100% (31 male, 3 female; 8.8% female)	25; 100%	25; 100% (24 male, 1 female; 4% female)	TBD	
1.2.2 Number and percentage of base stores where physical inventories are verified by up-to-date stock records	<p>[Numerator: Number of base stores where physical inventories are verified by up-to-date stock records]</p> <p>[Denominator: Total number of base stores audited.]</p> <p>Calculation: [Numerator ÷ Denominator] x 100</p> <p>(See PIRS for details on sample size for operational audits)</p>	Y2, Y3	<p>Data source: Project records - ex: inventory control cards</p> <p>Reporting frequency: Each spray season (annual/ semi-annual)</p>	By Spray Campaign	AIRS	N.A.	33; 100%	21; 100%	21; 100%	#TBD; 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	<p>Data source: Project records - ex: warehouse inventory control cards</p> <p>Reporting frequency: Each spray season (annual/ semi-annual)</p>	By Spray Campaign	AIRS	N.A.	Not Completed	Completed	Completed	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 <sup>8</sup>	Results <sup>9</sup>	Target <sup>10</sup>	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	Completed	Completed	Completed	Completed	
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**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 <sup>12</sup>	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	Completed	Completed	Completed	Completed	
2.2.2 Number and percentage of soak pits and warehouse/storerrooms inspected and certified prior to spraying	[Numerator: Number of soak pits or storehouses inspected and certified by AIRS Environmental Compliance Office prior to spraying]  [Denominator: Total number of project soak pits or warehouses/ storerooms]  Calculation: $[Numerator \div$	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	33 storerooms; 28 soakpits;  100% inspected and certified prior to spraying	33 storerooms; 28 soakpits;  100% inspected and certified prior to spraying.	21 storerooms; 20 soakpits  100% inspected and certified prior to spraying	21 storerooms; 20 soakpits  100% inspected and certified prior to spraying	TBD	

<sup>12</sup> 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 <sup>8</sup>	Results <sup>9</sup>	Target <sup>10</sup>	Results	Target	Results
	<i>Denominator] x 100</i>								spraying		
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	<i>Data source:</i> Project training reports  <i>Reporting frequency:</i> Semi-annually	By Spray Campaign  By Gender	AIRS	30	27 (20 Male, 7 Female; 26% Female)	30	23 (18 Male, 5 Female; 22% Female)	TBD	
2.2.4 Number of spray personnel trained in environmental compliance and personal safety standards in IRS implementation	Total number of spray personnel who attend a training in environmental compliance and personal safety standards in IRS implementation using AIRS Project resources, includes all staff who received environmental compliance training - spray operators, team leaders, washpersons, and storekeepers.	Y1, Y2, Y3	<i>Data source:</i> Project records – Training reports  <i>Reporting frequency:</i> Each spray season	By Spray Campaign  By Gender	AIRS	1,120	1,244 <sup>13</sup> (932 male, 312 female, 25.1% female)	1,195	1,223 <sup>14</sup> (934 male, 289 female, 23.6% female)	TBD	
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	<i>Data source:</i> Project records – Training reports  <i>Reporting frequency:</i> Each spray season	By Spray Campaign  By Gender	AIRS	58 <sup>15</sup>	27 (20 Male, 7 Female; 26% Female)	30	23 (18 Male, 5 Female; 22% Female)	TBD	
2.2.6 Number of adverse reactions to pesticide exposure documented	Total number of incidents of pesticide exposure reported that resulted in a referral for medical care	Y1, Y2, Y3	<i>Data source:</i> Incident report forms that are required for each incidence of pesticide exposure	By Spray Campaign  By residential/oc	AIRS	0	0	0	0	0	

<sup>13</sup> Includes 24 (20 male, 4 female) Training of Trainer attendees, 1,097 (860 male, 237 female) receiving Spray Operator training, 34 warehouse keepers (31 male, 3 female), 89 washers (21 male, 68 female)

<sup>14</sup> Includes 31(25 male, 6 female) Training of Trainer attendees, 1,097 (866 male, 231 female) receiving Spray Operator training, 25 warehouse keepers (24 male, 1 female), 70 washers (19 male, 51 female)

<sup>15</sup> Figure is from planning session, not listed in the 2012 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 <sup>8</sup>	Results <sup>9</sup>	Target <sup>10</sup>	Results	Target	Results
			<i>Reporting frequency:</i> Each spray season	cupational exposure							
2.2.7. Number of vehicular accidents reported	Total number of vehicular accidents reported	Y1, Y2, Y3	<i>Data source:</i> Vehicular incident report forms that are required for each accident  <i>Reporting frequency:</i> Each spray season	By Spray Campaign	AIRS	0	0	0	2 <sup>16</sup>	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	<i>Data source:</i> Entomological reports  <i>Reporting frequency:</i> Annually	By Spray Campaign	AIRS	14	11	4	4	TBD	
2.3.2 Number and percentage of entomological monitoring sentinel sites measuring all five primary PMI entomological indicators	<i>[Numerator:</i> Number of entomological monitoring sites measuring all five primary PMI entomological indicators]  <i>[Denominator:</i> Number of entomological monitoring sentinel sites]  <i>Calculation:</i> [Numerator ÷ Denominator] x 100	Y1, Y2, Y3	<i>Data source:</i> Entomological reports  <i>Reporting frequency:</i> Annually	By Spray Campaign	AIRS	6; (6/14= 43%)	4; (4/14 = 28.5%)	3; (3/4=75%)	3; (3/4=75 %)	TBD	
2.3.3 Number and percentage of entomological monitoring sites measuring at least	<i>[Numerator:</i> Number of entomological monitoring sites measuring at least one secondary PMI indicator]	Y1, Y2, Y3	<i>Data source:</i> Entomological reports  <i>Reporting frequency:</i> Annually	By Spray Campaign	AIRS	0 out of 0; n.a.%	0 out of 0; n.a.%	0;0%	0 out of 0 planned; n.a.%	TBD	

<sup>16</sup> 1 incident in Milange occurring on Nov 18, 2013 and 1 incident in Mocuba occurring on Oct 18, 2013. Both were reported to PMI in a timely manner.

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 <sup>8</sup>	Results <sup>9</sup>	Target <sup>10</sup>	Results	Target	Results
one secondary PMI indicator	<i>[Denominator: Number of entomological monitoring sites]</i>  <i>Calculation: [Numerator ÷ Denominator] x 100</i>										
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 <sup>17</sup> recommended for malaria vector control	<i>[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.]</i>  <i>[Denominator: Number of insecticide resistance testing sites]</i>  <i>Calculation: [Numerator ÷ Denominator] x 100</i>	Y1, Y2, Y3	<i>Data source: Entomological reports</i>  <i>Reporting frequency: Annually</i>	By Spray Campaign  By Type of Insecticide	AIRS	0 out of 0; n.a.% <sup>18</sup>	0 out of 0; n.a.% <sup>19</sup>	4;(4/4=100%) <sup>20</sup>	4;(3/4=75%) <sup>21</sup>	TBD	
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	<i>Data source: Entomological reports</i>  <i>Reporting frequency: Per spray campaign</i>	By Spray Campaign	PMI	10 (tests conducted in 10 houses located in the 6 targeted districts)	12 (tests conducted in 12 houses in 3 targeted districts)	12 (test conducted in 12 houses in 3 of 4 target districts, Quelimane not included)	15 test <sup>22</sup>	TBD	

<sup>17</sup> Organochlorines class (DDT), Organophosphates class (Malathion, Fenithrothion, Pirimiphos Methyl), Carbamates class (Propoxur, Bendiocarb), Pyrethroids class (Detamethrin, Alpha-cypermethrin).

<sup>18</sup> AIRS Mozambique will not test all 4 classes of insecticide. Plan is to test only Carbamates and Pyrethroids at all 4 sites.

<sup>19</sup> AIRS Mozambique did not test all 4 classes of insecticide. Only Pyrethroids were tested at 3 of the 4 sites.

<sup>20</sup> 4 Sites ; 100% to test Organochlorine, Organophosphate, Carbamates and Pyrethroid classes.

<sup>21</sup> 4 Sites; in 3 out of the 4 sites (75%) tested insecticides belonging to the Organochlorine, Carbamates, Organophosphate and Pyrethroid classes of insecticide; in one site (in Milange) only tested insecticide belonging to the Pyrethroid class of insecticide.

<sup>22</sup> 1 test per house, 5 houses in each the 3 districts; 3 of 4 target districts used for testing, Quelimane not included.

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 <sup>8</sup>	Results <sup>9</sup>	Target <sup>10</sup>	Results	Target	Results
2.3.6 Number of wall bioassays conducted after the completion of spraying at monthly intervals to evaluate insecticide decay	Total number of wall bioassay studies conducted at monthly intervals in established sentinel sites to evaluate the rate of insecticide decay on sprayed surfaces	Y1, Y2, Y3	<i>Data source:</i> Entomological reports  <i>Reporting frequency:</i> Per spray campaign	By Spray Campaign	PMI	40 (in 10 houses at months 1, 2, 3, 4, etc.)	60 (in 12 houses at months 1, 2, 3, 4 and 5)	60 (in 12 houses at months 1, 2, 3, 4 and 5)	On process <sup>23</sup>	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	<i>Data source:</i> Entomological reports  <i>Reporting frequency:</i> Per spray campaign	By Spray Campaign  By Type of Insecticide	PMI	16 (4 sites each testing all 4 classes of insecticide)	5	16; (4 sites each testing all 4 classes)	16; (4 sites, 3 of them tested for all four classes and one tested for one class)	TBD	
<b>2.4 Conduct Communications Activities and Community Mobilization</b>											
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	<i>Data source:</i> Project records ex: payment receipts  <i>Reporting frequency:</i> Semi-annually	By Spray Campaign	AIRS	100 - radio spots <sup>24</sup> ;  N.A. - talk shows	120 – radio spots  1 – talk show	0	1,650	TBD	

<sup>23</sup> As of January 15, 2014, 30 tests have been completed in 15 houses in months 1 and 2. There are plans to complete the tests in all 15 houses in months 3, 4, 5 and 6 with the overall all goal being 90 total tests.

<sup>24</sup> From 2012 Workplan budget.

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 <sup>8</sup>	Results <sup>9</sup>	Target <sup>10</sup>	Results	Target	Results
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	<i>Data source:</i> Project records  <i>Reporting frequency:</i> Semi-annually	By Spray Campaign  By Type of printed material and message(s)	AIRS	550,000 pamphlets <sup>25</sup>	290,450 pamphlets	n.a. <sup>26</sup>	n.a.	TBD	
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	<i>Data source:</i> Project records  <i>Reporting frequency:</i> Monthly	By Spray Campaign  By Gender	AIRS	889,318 (50% of target population 1,778,635)	2,118,280	n.a. <sup>27</sup>	n.a.	TBD	
<b>2.5 Spray Targeted Structures According to Technical Specifications</b>											
2.5.1 Number of structures targeted for spraying <sup>28</sup>	Total number of structures found in targeted districts by Spray Operators	Y1, Y2, Y3	<i>Data source:</i> Daily Spray Operator Forms  <i>Reporting frequency:</i> Daily per spray campaign	By Spray Campaign	PMI	608,344	585,299	458,218 <sup>29</sup>	464,295	TBD	
2.5.2 Number of structures sprayed with IRS <sup>30</sup>	Total number of structures sprayed in targeted districts	Y1, Y2, Y3	<i>Data source:</i> Daily Spray Operator Forms  <i>Reporting frequency:</i> Daily per spray campaign	By Spray Campaign	PMI	517,092 (85% of 608,344)	536,558	389,458 (85% of 458,218)	414,232	TBD	
2.5.3 Percentage of	[Numerator: Total number of	Y1, Y2, Y3	<i>Data source:</i> Daily Spray	By Spray	PMI	85%	92%	85%	89.2%	85%	

<sup>25</sup> 300,000 pamphlets in stock and budgeted for 250,000 pamphlets in 2012 Workplan budget.

<sup>26</sup> AIRS Mozambique will not be distributing IRS printed materials as part of the IEC/BCC outreach in 2012.

<sup>27</sup> In 2013, the MOH will be taking the lead on mobilization efforts through the IEC Coordinators. AIRS Mozambique will not be leading any door-to-door mobilization efforts.

<sup>28</sup> The yearly targets for this indicator are from the applicable workplan, in this way the variation in targeted spray areas from year-to-year can be taken into account. The yearly results are the number of structures found by Spray Operators during the spray campaign.

<sup>29</sup> Note that this target is different from that approved in the Work Plan 2013 due to the addition of several bases post micro-planning meeting.

<sup>30</sup> The target per year for this indicator is based on 85% of the number of structures to be targeted as noted in indicator 2.5.1.

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 <sup>8</sup>	Results <sup>9</sup>	Target <sup>10</sup>	Results	Target	Results
total structures targeted for spraying that were sprayed with a residual insecticide (Spray Coverage)	structures sprayed in targeted districts ]  [Denominator: Total number of structures in targeted areas found by spray operators]  Calculation: [Numerator ÷ Denominator] x 100		Operator Forms  <i>Reporting frequency:</i> Daily per spray campaign	Campaign							
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	<i>Data source:</i> Daily Spray Operator Forms  <i>Reporting frequency:</i> Daily per spray campaign	By Spray Campaign  By Number of pregnant women  By Number of children <5 years old	PMI	1,778,635	2,716,176; including 174,370 pregnant women and 501,522 children under 5	1,814,881	2,181,896; including 139,499 pregnant women and 379,982 children under 5	TBD	
<b>Component 3: Provide ongoing monitoring and evaluation and quality control measures</b>											
3.1 Submit Monitoring and Evaluation Plan (MEP) to PMI-Mozambique	<i>Milestone:</i> (Completed/Not Completed)	Y1, Y2, Y3	<i>Data source:</i> Project records  <i>Reporting frequency:</i> Semi-annual		AIRS	Completed	Completed	Completed	Completed	Completed	
3.2 Submit a post-spray data quality audit (PSDQA) report to the AIRS M&E	<i>Milestone:</i> (Completed/Not Completed)	Y1, Y2, Y3	<i>Data source:</i> Spray operations reports  <i>Reporting frequency:</i> Per	By Spray Campaign	AIRS	N.A. <sup>31</sup>	N.A.	N.A. <sup>32</sup>	N.A.	Completed	

<sup>31</sup> AIRS Mozambique has been chosen to carry out the PSDQA in Year 2.

<sup>32</sup> Originally AIRS Mozambique had planned to carry out the PSDQA in Year 2. However, due to the dismissal of the M&E Manager and Database Manager, the was short staffed for this activity and requested from PMI that it be carried out in Year 3 should continuing program funds allow.

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 <sup>8</sup>	Results <sup>9</sup>	Target <sup>10</sup>	Results	Target	Results
specialist in the home office within 60-180 days of completion of spray operations			spray campaign								
3.3 Submit a country-specific Eligible Structure Definition Document to local PMI advisors and NMCP	Milestone: (Completed/Not Completed)	Y1	Data source: Project records  Reporting frequency: Semi-annually		AIRS	Completed	Completed	N.A.	N.A.	N.A.	N.A.
3.4 Supply chain review conducted by RTT	Milestone: (Completed/Not Completed)	Y1, Y2	Data source: RTT supply chain review reports  Reporting frequency: Semi-annually	By Spray Campaign	AIRS	Completed	Completed	N.A.	N.A.	TBD	

**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	4 <sup>33</sup>	6 <sup>34</sup>	9 <sup>35</sup>	12 <sup>36</sup>		
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<sup>33</sup> 3 Environmental Compliance Officer checklists, 1 supervisory checklist.

<sup>34</sup> 4 Environmental Compliance Officer checklists, 2 supervisory checklists

<sup>35</sup> 4 Environmental Compliance Officer checklists, 2 supervisory checklists, 3 M&E supervisory forms

<sup>36</sup> 7 Environmental Compliance Officer checklists - PSECA Report, End-of-Day Cleanup, Homeowner Preparation, Morning Mobilization, Storekeeper Performance, Transport Vehicle Inspection, and Post-IRS Inspection; 1 Operations tool- Storekeeper pocket guide; 4 M&E supervisory forms – AIRS Mozambique-specific Error Eliminator, Data Collection Verification Form, Data Entry Verification form and Data Center Supervisory form.

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 <sup>8</sup>	Results <sup>9</sup>	Target <sup>10</sup>	Results	Target	Results
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	<i>Data source:</i> Project records – Activity reports  <i>Reporting frequency:</i> Semi-annually	By IRS Technical Area	AIRS	N.A.	1 <sup>37</sup>	0	1 <sup>38</sup>	TBD	

**Component 5 (Cross-cutting): Capacity Building, Knowledge Transfer, Gender Inclusion**

**5.1 Capacity Building<sup>39</sup> (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 clerks, IEC mobilizers, drivers, washers, porters, pump technicians, security guards, etc.	Y1, Y2, Y3	<i>Data source:</i> Project records – Training reports  <i>Reporting frequency:</i> Semi-annually	By Spray Campaign  By Gender Percentage of Women Trained	PMI	1,120	1,097; 860 Male; 237 Female; 22% Female	1,113 67% Male 33% Female	1,128; 891 Male; 237 Female; 21% Female	TBD	
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	Y1, Y2, Y3	<i>Data source:</i> Project records – Training reports  <i>Reporting frequency:</i> Semi-	By Spray Campaign  By Gender	AIRS	2,093	1,953; 1,357 Male; 596 Female;	1,368	1,368; 1065 Male; 303	TBD	

<sup>37</sup> AIRS Mozambique – Country Lessons Presentation at AIRS Annual Conference in Durban, South Africa on December 4, 2012, Pedro Muianga), AIRS Mozambique Operations Manager.

<sup>38</sup> Presentation by Chief of Party, Cathy Clarence on the AIRS Mozambique program to the MOP team on May 3<sup>rd</sup>, 2013. The purpose of the presentation was to provide the NMPC and PMI a summary of AIRS progress to date, including lessons learned and best practices.

<sup>39</sup> See Annex B for the breakdowns of the training targets as presented in the 2012 AIRS Mozambique 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 <sup>8</sup>	Results <sup>9</sup>	Target <sup>10</sup>	Results	Target	Results
	of IRS in target districts.  This figure includes all cadre that serve a role in IRS.		annually	By Role (e.g., spray operator, storekeeper)  Percentage of women trained			31% Female		Female; 22% Female		
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	<i>Data source:</i> Project records – Training reports  <i>Reporting frequency:</i> Semi-annually	By Spray Campaign  By Gender  Percentage of women trained	AIRS	31	24	30	31; 25 Male, 6 Female; 19% Female	TBD	
5.1.4 Number of government environmental and/or health officials trained in IRS oversight	Total number of national and sub-national/district government environmental and/or health officials who are trained in oversight of IRS implementation using AIRS Project resources	Y1, Y2, Y3	<i>Data source:</i> Project records – Training reports  <i>Reporting frequency:</i> Semi-annually	By Spray Campaign  By Gender  Percentage of Women Trained  Type of government official (e.g. environmental /health)	AIRS	30	27 (20 Male, 7 Female; 26% Female)	30	23 (18 Male, 5 Female; 22% Female)	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 <sup>8</sup>	Results <sup>9</sup>	Target <sup>10</sup>	Results	Target	Results
5.1.5 AIRS conducted a capacity assessment	AIRS Mozambique program conducted an assessment of IRS capacity among national and sub-national/district government health officials	Y1, Y2	<i>Data source:</i> Project records – Capacity assessment reports  <i>Reporting frequency:</i> Semi-annually		AIRS	Completed	Completed	Completed	Completed; Pending NMCP Approval	TBD	
5.1.6 Number of capacity-building MOUs signed by AIRS, NMCP and partners/ institutions	Total number of Memoranda of Understanding (MOU) on provision of local capacity building finalized and signed between AIRS, the National Malaria Control Program, and other local partners and institutions	Y1, Y2, Y3	<i>Data source:</i> Project records – MOUs  <i>Reporting frequency:</i> Semi-annually	By Spray Campaign	AIRS	1 MOU with MOH	Not Completed	1 MOU with MOH	1 MOU with MOH completed	TBD	