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

**ZAMBIA 2016**  
**END OF SPRAY REPORT**

**SPRAY CAMPAIGN: SEPTEMBER 26 – DECEMBER 10, 2016**

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**ZAMBIA 2016**  
**END OF SPRAY REPORT**

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# ACRONYMS

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<b>AIRS</b>	Africa Indoor Residual Spraying
<b>BCC</b>	Behavior Change Communication
<b>DFID</b>	(UK) Department for International Development
<b>DHMT</b>	District Health Management Team
<b>DCV</b>	Data Collection Verification
<b>DEC</b>	Data Entry Clerk
<b>DOS</b>	Daily Observation of Spray
<b>EC</b>	Environmental Compliance
<b>ECO</b>	Environmental Compliance Officer
<b>EE</b>	Error Eliminator
<b>HLC</b>	Human Landing Catch
<b>IEC</b>	Information, Education and Communication
<b>IRS</b>	Indoor Residual Spraying
<b>M&amp;E</b>	Monitoring & Evaluation
<b>MOH</b>	Ministry of Health
<b>MSP</b>	Mobile Soak Pits
<b>NMCC</b>	National Malaria Control Centre
<b>NMCP</b>	National Malaria Control Program
<b>PMI</b>	President's Malaria Initiative
<b>PPE</b>	Personal Protective Equipment
<b>PSC</b>	Pyrethrum Spray Catch
<b>PSECA</b>	Pre-Season Environmental Compliance Assessment
<b>SEA</b>	Supplemental Environmental Assessment
<b>SOP</b>	Spray Operator
<b>TL</b>	Team Leader
<b>TLA</b>	Team Leader Assistant
<b>TOT</b>	Training of Trainers
<b>USAID</b>	United States Agency for International Development
<b>WHO</b>	World Health Organization
<b>ZEMA</b>	Zambia Environmental Management Agency



# EXECUTIVE SUMMARY

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The President's Malaria Initiative (PMI) has funded indoor residual spraying (IRS) in Zambia since 2008 with the aim of reducing the malaria burden, especially among children less than five years old and pregnant women. With PMI support, Zambia sprayed 15 districts in 2008 and gradually scaled up to 25 districts in 2011. In 2014, the number of IRS districts increased to 40 as a result of more funding from the UK Department for International Development (DFID) through PMI. In August 2014, Abt Associates was awarded a three-year Africa-wide IRS project called The PMI Africa Indoor Residual Spraying (AIRS) project, funded by the United States Agency for International Development (USAID) under PMI.

Implementation of Zambia's IRS program in 2016 was built upon lessons learned as the country entered its ninth year of PMI support for IRS. AIRS Zambia continued to implement IRS in four provinces that were sprayed in 2015. However Central province, where AIRS supported 4 districts with IRS in 2015, was not sprayed in 2016 because DFID support ended. However, AIRS Zambia was chosen to be a recipient country for the NGenIRS project and as a result, the quantity of pirimiphos-methyl purchased and used for the 2016 spray round was made possible through a copayment mechanism. Without the co-funding AIRS Zambia would have reduced its target number of structures by 204,108 amounting to a 37% decrease.

The four provinces where AIRS implemented IRS in 2016 included Eastern (9 districts), Luapula (10 districts), Muchinga (7 districts) and Northern (9 districts). The IRS campaign started on September 26<sup>th</sup> and ended on December 10<sup>th</sup>. The start dates for the IRS campaign were staggered to allow the AIRS team to be in the field and supervise the logistics and the quality of spraying during the campaign. AIRS trained a total of 147 supervisors from 35 districts to enhance the supervision of spray operators (SOPs) and assure high spray quality. Local temporary staff were recruited and trained well before the start of the campaign. Logistics and environmental compliance assessments were carried out to ensure that the standard operating procedures and Best Management Practices (BMP) were followed. Stakeholder, partner planning, and community sensitization meetings were also held in order to create awareness and effective involvement of all stakeholders for successful spray operations.

A total of 542,184 structures were targeted to be sprayed in the four provinces and the targeted population was 2,475,741. By the end of IRS operations, day 54 of the campaign, SOPs found 612,929 structures. A total of 559,550 structures were sprayed yielding spray coverage of 91%. A total of 2,626,718 people were protected by IRS, including 69,118 pregnant women and 399,367 children under five years old.

The AIRS Zambia team experienced some challenges during the campaign, especially in Luapula province. One of the main challenges was low IRS acceptability in three districts in Luapula province, namely Chiengi, Mansa and Nchelenge districts. The low IRS acceptability was mainly due to poor sensitization before the campaign started. Even though the AIRS Zambia team increased IEC/BCC messages during the campaign, refusals occurred because IRS was associated with an increase in the number of fleas in some households. In urban parts of the districts, refusals were also associated with the smell of the insecticide, as well as the inconvenience of home preparation. Another main challenge was the increase in the number of structures found in Luapula and Eastern provinces. In Luapula province, the reason for the unexpected increase was that different maps were used for target setting and IRS implementation. In Eastern province, we suspect that poor supervision in 2015 contributed to the increase in the number of structures found in 2016. There was a higher usage and wastage of insecticide in most of the districts with low coverage. This was because when SOPs encounter refusals and cannot finish all of the insecticide left in their spray tank, the insecticide is used as water the following day. Therefore the team needed to buy additional insecticides to finish the spray campaign.

**TABLE 1: 2016 IRS CAMPAIGN SUMMARY RESULTS**

Insecticide Used	Organophosphates (Actellic 300 CS)
Number of provinces covered by PMI-supported IRS	4 (Eastern, Northern, Muchinga and Luapula)
Number of districts covered by PMI-supported IRS	35
Number of structures found by SOPs	612,929
Number of structures sprayed by PMI-supported IRS	559,550
2016 spray coverage	91%
Population protected by PMI-supported IRS	Total Population: 2,626,718 Children under 5: 399,367 Pregnant women: 69,118
Dates of PMI-supported IRS campaign	September 26 – December 10, 2016
Length of campaign (total days)	54 days
Number of people trained with U.S. Government funds to deliver IRS	1,982

# I. COUNTRY BACKGROUND

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IRS was conducted in Zambia in the Copperbelt beginning in the 1930's. However, by the 1980's, IRS in Zambia had ceased and it wasn't re-launched until 2003. PMI has supported IRS in Zambia since 2008. Beginning in 2011, a change in malaria incidence left the eastern half of the country with the highest burden and prompted a shift to implement IRS in 20 districts in this area. Initially districts sprayed more structures because more resources were available but the country switched to targeted spraying in 2014 to cover high risk areas in line with the National Malaria Strategic Plan 2011-2016.

PMI, AIRS Zambia and the Zambia Ministry of Health (MOH) agreed to conduct IRS in 2016 in 35 high-burden malaria districts in four provinces. The four provinces in which IRS was implemented were Eastern (9 districts), Luapula (10 districts), Muchinga (7 districts) and Northern (9 districts) with a total of 547,548 structures targeted. A total of 559,550 structures, out of 612,929 structures found in the 35 districts, were sprayed from September 26 – December 10 using an organophosphate insecticide (Actellic 300 CS).

Working in collaboration with the MOH, AIRS Zambia was tasked to achieve at least 85 percent spray coverage in the IRS target areas. In addition, AIRS Zambia provided technical support in the following activities:

- Training, capacity building, and advocacy at the national and district level as a means of achieving IRS sustainability. This included building the capacity of government officials and partners to undertake high-quality IRS.
- Daily monitoring of the IRS program via supervision of data collection and data entry using the AIRS Access database and the monitoring and evaluation (M&E) supervisory tools, plus the mSpray platform developed by Akros, which was used in seven districts in Luapula. AIRS Zambia also implemented the Daily Observation of Spray (DOS) to supervise the quality of IRS.
- Logistics assessments and coordination of all procurements, delivery, and storage of spray pumps, spare parts, insecticides, and personal protective equipment (PPE).
- Safe and correct insecticide application, thus minimizing human and environmental exposure to IRS insecticides, in compliance with the Pesticide Evaluation Report and Safer Use Action Plan (PERSUAP) and Supplemental Environmental Assessment (SEA).
- Coordination of sensitization and mobilization activities using door to door mobilization and radio announcements to raise the populations' awareness and acceptance of IRS and to encourage ownership.
- Conduct entomological surveillance including assessing malaria vector density and species composition in intervention areas; establish vector feeding time and location; monitor the quality of insecticide application and insecticide decay rates and assess vector susceptibility.
- Maintenance of the entomological laboratory to ensure that all necessary studies can be carried out throughout the year.

The following map shows the locations of IRS target provinces and districts.



## 2. PRE-SEASON ACTIVITIES

### 2.1 SELECTION OF IRS DISTRICTS AND CATCHMENT AREAS

Thirty-five districts in the Eastern, Luapula, Muchinga and Northern provinces were selected for IRS in 2016. The 2016 selection criteria were based on the following:

- malaria burden
- population density
- structure density
- available resources
- accessibility of areas
- consideration of universal coverage of ITNs as the primary vector management intervention

While all the above were considered, the main criteria for inclusion was if the catchment area was targeted in the 2015 IRS campaign. Just like in 2015, AIRS Zambia supported the districts to conduct a thorough review of the location of IRS target areas in 2016 to ensure that they were accessible and operationally feasible. There were very few modifications for most districts except for districts in Luapula where some communities were left out in 2015 because they were not picked up by the map that was used last year.

The following map shows the prevalence by microscopy confirmation of malaria in 2012 and 2015.

**FIGURE 2: MAP OF ZAMBIA SHOWING MALARIA PREVALENCE, 2012 - 2015**

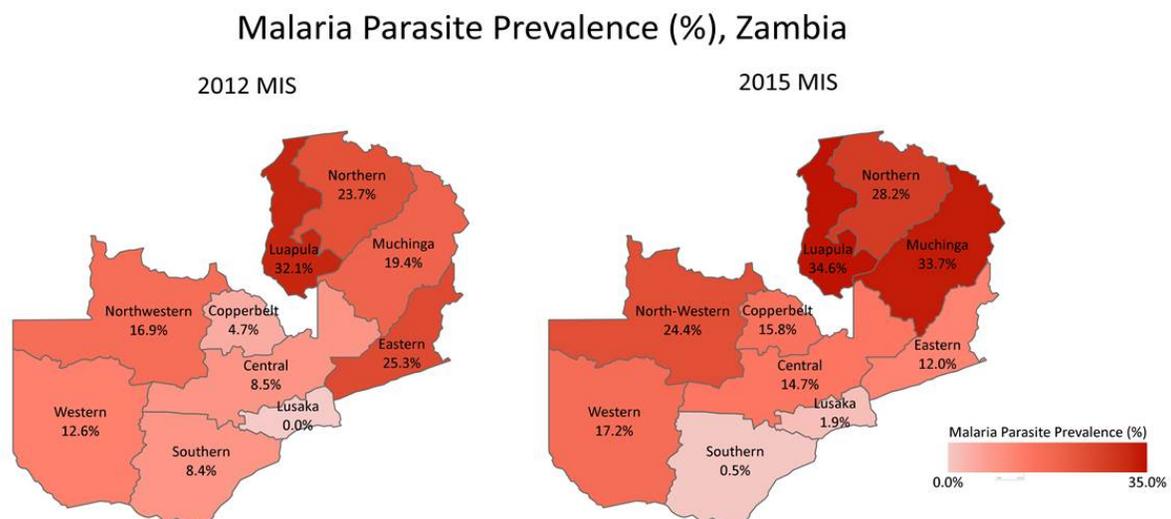


Table 2 below shows a summary of the number of target structures in the 35 districts.

**TABLE 2: NUMBER OF TARGET STRUCTURES BY PROVINCE**

Province	Number of Districts	Number of Target Structures
Eastern	9	196,578
Luapula	10	153,755
Northern	9	121,602
Muchinga	7	70,249
Total	35	542,184

## 2.2 SELECTION OF CATCHMENT AREAS IN THE DISTRICTS

Micro-planning meetings were held at the district level to support them with the selection of catchment areas in Eastern, Muchinga, and Northern provinces. Each district listed the number of catchment areas by number of structures, population and by malaria incidence per catchment area. In collaboration with the NMCP, the provincial health offices, and district health teams, it was decided that the same catchment areas that were targeted in 2015 should be targeted again in 2016. The only exception was for Mungwi and Chadiza districts where one more catchment area was added to the catchment areas that were sprayed in 2015.

AIRS Zambia worked with Akros in Luapula province to review the location of IRS target areas in those seven districts to ensure that they were accessible and operationally feasible. As a result, there were a few modifications to the location of the target areas which included adding a few pockets of communities that were initially left out of the targeting exercise.

## 2.3 DISTRICT PLANNING MEETINGS

Four micro-planning meetings with provincial and district authorities were held in each province from May 18 - 31. The meetings were held in Petauke (Eastern province), Nakonde (Muchinga province), Kasama (Northern province) and Samfya (Luapula province). A two-day planning meeting was organized to discuss and develop IRS operational plans with district teams. Issues discussed during the micro-planning meetings included:

- Timing of spray operations
- The requirement to target 100% of eligible structures in each catchment area
- Spray campaign duration (# of days)
- Insecticide selection
- Procurement and logistics
- Spray performance targets
- Monitoring and supervision plan
- Recruitment of spray operators
- Commencement date for spray operations
- Role and responsibilities of stakeholders before, during, and after spray operations

## 2.4 INSECTICIDE SELECTION

An organophosphate, pirimiphos-methyl (Actellic 300 CS), was used during the 2016 IRS campaign in the 35 districts. The selection was based on data obtained from insecticide susceptibility assays that were carried out in 2015 and 2016. Zambia has a rigorous insecticide resistance management structure that supports entomological studies on which insecticide selection is based. The Insecticide Resistance Technical Advisory Committee that comprises representatives from the Tropical Diseases Research Centre, the Macha Malaria Institute, University of Liverpool, Johns Hopkins University, CDC, AIRS Zambia, PMI and the National Malaria Control Centre (NMCC) reviews the entomological studies that are carried out and makes recommendations to the Insecticide Resistance Management Technical working group that selects the insecticide of choice. This decision was based largely on the susceptibility of the local vectors and residual effect of insecticides.

NGenIRS is a UNITAID-funded partnership between the Innovative Vector Control Consortium, PMI, and its IRS implementing partners Abt Associates Inc., Global Fund, PATH/Malaria Control and Elimination Partnership in Africa and NMCCs. The objective is to accelerate and expand access and affordability of new, third generation formulations of IRS insecticides (3GIRS) for malaria vector control to mitigate insecticide resistance and increase the effective susceptible lifetime of IRS insecticides. The goal of the NGenIRS project is sustainable and rational deployment of effective malaria vector control tools in insecticide resistance management programs to save lives and improve health. Zambia was chosen to be a recipient country for the NGenIRS project and as a result, the quantity of pirimiphos-methyl purchased and used for the 2016 spray round was made possible through a copayment mechanism. With the copayment, AIRS Ethiopia was able to procure and use pirimiphos-methyl in 35 districts in 2016.

## 2.5 LOGISTICS NEEDS AND PROCUREMENT

For efficiency and effectiveness in conducting logistics assessments, AIRS organized three teams to be responsible for providing technical support to the districts during the logistics assessment for the 2016 IRS season. The logistics assessment team comprised at least one District Coordinator (DC), Logistics Manager, Chief Environmental Health Officer from the respective province, and an experienced Public Health Officer from the chosen district. The process involved discussions with the District Commissioners, who are the political heads in the districts and district health officials (District Medical Officer, Planning Officer, Malaria Focal Person, and IRS Manager). In order to standardize the collection of data in the field, an IRS needs assessment checklist was used.

The following activities were carried out:

- Held meetings with the district health office teams to discuss district readiness for the IRS campaign
- Reviewed previous coverage
- Reviewed the district plans to ensure the inclusion of all IRS activities and the costs that go along with the activities.
- Assisted districts in strategizing how to identify potential partners and engage all stakeholders in IRS activities.
- Quantified the IRS commodities required for 2016 spray season. The AIRS Zambia team made local and international procurements using an open tender process.

## 2.5.1 PROCUREMENT

Procurement for commodities was divided into two - international and local procurements. All items that were available in Zambia were procured locally which ensured cost effectiveness and the timely delivery. In total, 136,428 bottles of Actellic were procured for use in the 2016 spray operations- 132,420 bottles were received in September and the additional consignment of 4,008 bottles was received in December.

A consignment of PPE, including 350 pumps, 175 repair kits, 1280 hard hats, 56,533 nose masks were received in August. Another package containing 1,989 control flow valves and 2,652 nozzles were received in September. In some districts in Luapula Province, the overalls were delivered two days before the campaign started and therefore most districts used the first day for dress rehearsals. Various entomology materials were also procured through the Home Office for the 2016 spraying period. PPE, printing of M&E data entry forms and transport services were procured through open national competitive bidding process. All the tenders were evaluated by the procurement committee.

Tables in Annex I list the commodities that were procured internationally and locally. International procurements were based on the number of SOPs for 2016 campaign and the balance brought forward from the 2015 spray campaign. All insecticides for the 2016 spray campaign were received and stored at Central Medical Stores Limited while the PPE was stored at the NMCC in Lusaka ready for distribution. AIRS Zambia used NMCP trucks to distribute the IRS commodities before the start of the IRS campaign.

## 2.6 HR REQUIREMENTS

At the district level, human resource requirements consisted of two categories: (I) fulltime staff who include the following: DCs, IRS Managers, Supervisors and one Store Keeper and (II) seasonal workers included the following: M&E Assistants, Data Entry Clerks (DECs), Team Leaders (TLs), SOPs, one Store Keeper and Washers. Kindly note that the IRS Managers, Supervisors and one Store Keeper per district were Government employees while DCs and one Store Keeper per district were seasonal workers employed by AIRS Zambia. In addition, some Neighborhood Health Committee members, Community Health Volunteers and individuals who could read and write were engaged by AIRS Zambia to carry out house-to-house mobilization activities. Some Environmental Health Technicians in the entomological sentinel sites were also engaged to carry out routine entomological activities, such as mosquito collectors.

### 2.6.1 SEASONAL STAFF HIRED

AIRS Zambia hired the following seasonal staff during the 2016 spray campaign.

**TABLE 3: NUMBER OF PERSONS HIRED**

Categories of Persons Hired	Number of staff hired to Support IRS				Total
	Spray Ops		Data Capture		
	M	F	M	F	
<b>Spray Operators &amp; Team leaders</b>	907	458			1,365
<b>Team Leader Assistants</b>			67	25	92
<b>Data Entry Clerks</b>			26	25	51

<b>M&amp;E Assistants</b>			49	13	62
<b>TOTAL M/F</b>	907	458	142	63	1,570
<b>TOTAL</b>	1,365		205		

## 2.6.2 IRS TRAININGS

IRS is a highly technical process and demands vigorous and thorough training of all personnel involved in order to achieve the intended impact. Training of all the personnel involved in IRS is done by AIRS Zambia in collaboration with the District Health Offices and is conducted annually before the commencement of spray operations. These trainings are meant to provide specific skills to personnel involved in the IRS campaign so that they are able to spray structures correctly. Table 4 below lists each type of IRS training, a description, and the duration. Table 5 lists the number of people trained during each of the trainings disaggregated by gender.

**TABLE 4: TYPE, DESCRIPTION, AND DURATION OF TRAININGS**

Type of Training	Description of Training	Duration of Training
Training of Trainers and Supervisors (TOT)	Participants included IRS trainers and supervisors at provincial and district level. The training was designed to train individuals who would train seasonal workers (SOPs, store keepers and community mobilizers). The emphasis was to ensure that trainers are able to effectively explain and demonstrate current IRS best practices.	5 days
Spray Operators (SOPs)	AIRS Zambia worked with DHMTs to recruit and train SOPs in all of the 35 target districts. The training was designed to build SOPs' capacity to conduct IRS and communicate with households effectively. The emphasis was placed on ensuring that SOPs found all structures and they conduct quality spraying. Other topics covered: introduction to malaria control, spray techniques, handling and managing insecticides and spray pumps, personal and environmental safety, leading a spraying team, data collection and filling out data collection forms, and basics of IEC for IRS.	10 days
Team Leaders	Team Leaders were recruited by DHMTs in collaboration with AIRS Zambia in all of the 35 target districts. The training was designed to build capacity and skills of spray team leaders to lead a team of at least 5 SOPs ensuring that spraying is completed on schedule and delivered with a high degree of quality.	2 days
Data Collection	This involved training of Data Entry Clerks and M&E Assistants. Training topics included: familiarity with data collection forms (SOP and TL forms, and the AIRS supervisory toolkit), understanding key IRS definitions (e.g. eligible structure) and indicators, supervisory roles and responsibilities, reviewing collected data and spotting irregularities, timely, consistent, and accurate reporting, setting appropriate and realistic reporting timelines, establishing a backup reporting/ communication protocols, AIRS database and security protocols, and data quality assurance and control.	3 days
Logistics	The target audience were store keepers from each of the 35 target districts. There were at least two participants from each target district; one was a Government employee and the other one was an AIRS seasonal store keeper. Topics included store	2 days

	and inventory management.	
Clinicians	The target audience were the clinicians recruited from two key health facilities from each target district. The training focused on insecticide poisoning management, poisoning prevention and mitigation practices, health hazards and their management.	1 day
Provincial Medical Officers and DMOs	The target audience was provincial and district medical officers respectively. The training was designed to strengthen participants' abilities to implement, supervise and evaluate IRS operations at the district and provincial levels.	1 day
Community Mobilizers	The target audience was community health workers. The objective was to build skills for community mobilizers to increase the community's understanding of malaria, acceptance for IRS, and awareness of IRS spray schedule.	2 day
Drivers	The target audience for the training was newly hired drivers certified to drive for the 2016 IRS spray season. The training was designed to provide drivers with an overview of the importance of safely transporting materials and people for IRS.	1 day
Procurement	The Procurement Policy was made available for use to DCs. The Procurement Policy is intended to guide the District Coordinators in their day to day procurement of goods and services in line with the Abt Procurement Policy and USAID regulations. This is to ensure strict adherence to all procurement procedures. The Districts Coordinators were trained in the use of the Procurement Policy guidelines to ensure that procurement functions were carried out correctly at the district level.	1 day
Gender Sensitivity	All the District Coordinators received training in gender issues and the importance of having more women recruited during 2016 spraying season.	1 day

**TABLE 5: NUMBER AND TYPE OF SEASONAL TRAININGS**

Categories of Persons Trained	Training on IRS Delivery														Total		
	Training of Trainers		Spray Operations		Data Capture		Mobilization		Logistics Training		Poison Control/ Adverse Events		Supervision				
	M	F	M	F	M	F	M	F	M	F	M	F	M	F			
Supervisors	128	19															147
Mobilizers							3,387	1,590									4,977
Spray Operators			983	516													1,499
Team Leaders			177	95													272
Team Leader Assistants					89	30											119
Data Entry Clerks					36	25											61
District Health Information Officers					24	11											35
M&E Assistants					56	13											69
District storekeepers									58	25							83
Clinicians											47	17					64
Provincial and District Medical Officers														30	3		33
TOTAL M/F	128	19	1,160	611	181	68	3,387	1,590	58	25	47	17	30	3			4,991   2,333
TOTAL/Training	147		1,771		249		4,977		83		64		33				7,324

## 3. GENDER MAINSTREAMING

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As part of the Project gender strategy, AIRS Zambia implemented several activities to promote gender mainstreaming across its activities. To ensure that all program activities align with US government policy on Gender Equality and Female Empowerment, AIRS Zambia included modules on gender in all of the trainings that were conducted. To show emphasis at the provincial and district levels, Provincial Medical Officers, Chief Environmental Health Officers and District Medical Officers were taken through an orientation in gender awareness and integration to ensure they lead in addressing gender issues. After these presentations, it was clear that most participants appreciated the idea of integrating more women in the spray teams to increase women's participation in IRS.

AIRS Zambia implemented a Gender Study aimed at assessing the effect of increased women's participation in IRS operations. Specifically, the objectives were to:

- assess the number of structures sprayed per day per spray team, disaggregated by the gender composition of the spray team,
- assess data quality with increased women's participation,
- assess community acceptance of IRS with increased women's participation,
- evaluate whether spray quality differs between male and female SOPs.

In this study, eight districts were identified; four were used as control districts and the other four as intervention districts. AIRS Zambia hired 50% men and 50% women as Spray Operators and Team Leaders in the intervention districts, while routine selection of seasonal workers was done in the control districts. Data from the study will be analyzed in the coming quarter and findings shared with relevant stakeholders.

AIRS Zambia also worked with NMCP in ensuring that IEC materials had pictures of women depicted on them. This is an effort to ensure that more women are motivated to join the IRS program. Anecdotal data suggest that these inclusive images were important to female SOPs in their decision to apply for positions on the campaign.

Several PMI/AIRS countries have found that distribution of sanitary pads to female workers supports optimal attendance. AIRS Zambia distributed sanitary pads to female SOPs in Eastern Province this year, piloting this approach in the Zambian context. Anecdotal reports from seasonal workers are positive, noting that these supplies were appreciated and allowed more women to come to work while menstruating. The project will expand this effort next year, distributing sanitary pads to seasonal workers in all provinces and adding sanitary bins to washrooms to promote hygienic disposal. Zambian labor law allows women one absence from work per month while menstruating. Commonly referred to in Zambia as "mother's day", AIRS Zambia increased its communication efforts this year in Eastern Province to ensure that all seasonal workers were aware of this benefit and supervisors understood that these absences were paid. This initiative will expand to all AIRS Zambia provinces next year. During the spray campaign, there were no reports of sexual harassment in any district.

In the 2016 IRS season, AIRS Zambia recorded an increase in the number of women who were trained and hired by the program to support IRS. In total 15 females were hired as DEC's and M&E Assistants in 2014 representing about 20% of the total personnel hired as DEC's and M&E Assistants. This figure improved to 32 (DEC's and M&E Assistants) in 2015 representing 35% of the total personnel hired as female DEC's and M&E Assistants. In 2016, 73 females were hired as DEC's and M&E Assistants representing about 35%. Although the proportion remained the same as the previous year, the absolute figure increased from 32 to 73. The percentage of women who were hired as SOPs increased from 30%

in 2015 to 34% in 2016. This improvement shows that deliberate initiatives implemented in 2016 to increase the number of women SOPs for the IRS program in Zambia have yielded results. The project will continue dialogue with the NMCP and other stakeholders to support additional progress towards equitable employment of women and men in IRS for future campaigns.

# 4. INFORMATION, EDUCATION, AND

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## 4.1 INTRODUCTION

The IEC component of the IRS program performs a major role in creating awareness and adequately mobilizing community members for spraying. Several strategies were employed to ensure successful operations. Some of these strategies included: stakeholder meetings, door-to-door mobilization, drama performances, radio announcements and discussions. The engagement of beneficiaries, stakeholders and partners ensured open discussions that reached many people of different target groups and was aimed at improving acceptance. While our IEC strategy was heavily strengthened in the large urbanized districts where IRS acceptance was low in 2015, especially in Chipata district where community meetings and drama groups yielded results, there were still a lot of challenges encountered. Therefore it is important to re-look at the IEC strategies for urban districts in 2017..

## 4.2 DOOR-TO-DOOR MOBILIZATION

Door-to-door mobilization commenced two weeks before the start of the 2016 spray campaign. The program trained and engaged a total of 4,977 mobilizers who resided in the target communities. This enabled them to visit every household with IRS messages. Face-to-face interaction with households demystified and corrected any misconceptions about IRS and educated households on their roles and responsibilities before, during, and after spray activities. Mobilizers also ensured that community members were informed of spray dates for their communities. During the door-to-door mobilization, mobilizers collected household data on the number of people reached with IRS messages, provided each household with an IRS card and labeled the wall with a chalk to give a unique identity to the structures. This data helped provide an enumeration of the number of structures in a catchment area and was used to track and verify the number of structures visited. One of the main challenges during mobilization was that a number of households misplaced cards distributed to them in the previous campaign. In other cases, mobilizers distributed cards without asking if the home owners if they had cards from the previous campaign. Fortunately, this was dealt with during the first few days.

## 4.3 MASS MEDIA COMMUNICATION

The Minister of Health launched the IRS spray campaign on national television and the radio. There were three main radio programming initiatives used in the 2016 IRS campaign: radio spots which are also called jingles, radio discussions (interactive shows) and announcements about IRS and its benefits. Radio spots started airing on September 21 a week before the start of spray operations and continued three times per day throughout the spray period. Discussions were centered on achieving the NMCP and PMI target of 85% per catchment area (coverage) and addressing other community concerns about spray activities. It also included messages about household preparation, safety, and compliance. These radio programs were conveyed in the local language to ensure the full understanding of community members and the general public. Monitoring of radio spots in terms of timing and adequate slots was successfully carried out by the DCs in their respective districts.

## 5. IMPLEMENTATION OF IRS ACTIVITIES

IRS implementation was carried out over a 54 day period from September 26 to December 10. A total of 542,184 structures were targeted to be sprayed in four provinces. The start dates were staggered by district and therefore the end dates varied from district to district. By the end of IRS operations, AIRS Zambia found 612,929 structures. A total of 559,550 structures were sprayed yielding spray coverage of 91%. A total of 2,626,718 people were protected by IRS, including 69,118 pregnant women and 399,367 children under 5 years old. Please see Annex 2 for the start and end dates of the spray campaign for each district.

**TABLE 6: PROVINCIAL NUMBER OF STRUCTURES FOUND AND SPRAYED**

Province	Targeted	Found	Sprayed	Spray Coverage
Eastern	196,578	223,361	207,348	94%
Muchinga	70,249	76,499	70,865	93%
Luapula	153,755	182,032	162,374	89%
Northern	121,602	131,037	118,963	91%
<b>Total</b>	<b>542,184</b>	<b>612,929</b>	<b>559,550</b>	<b>92%</b>

### 5.1 IRS SUPERVISION

To ensure adequate supervision, AIRS Zambia ensured that all the levels of supervision were functional in both mSpray and non-mSpray districts. The position of Team Leader Assistant (TLA) was introduced in 2016 for the seven mSpray districts in Luapula province to ensure that TLs could focus solely on spray supervision and quality. In the 2015 spray campaign, the TLs spent the majority of their time entering data in to the tablets as opposed to supervising spray teams to achieve spray quality. In non-mSpray districts, five SOPs and one TL formed a team while six SOPs, one TL, and two TLAs formed a team in the mSpray districts. DCs were instrumental in strategizing the deployment of SOPs and they coordinated the overall supervision. At the national level, the Chief of Party, the Deputy Chief of Party and the Operations Manager continued providing oversight in the four provinces. The Chief of Party was in charge of Northern Province, while the Deputy Chief of Party was in charge of Luapula province. The Operations Manager was in charge of Muchinga and Eastern provinces. The district teams were comprised of the DC, IRS Manager, Supervisors, the M&E Assistants, TLs and TLAs (in the case of seven mSpray districts). Other technical staff from the AIRS Zambia team also joined the district teams for supervision. All teams used standardized AIRS supervision and monitoring tools to assess the spray quality, environmental compliance activities and spray data collection. TLs and other supervisors used the newly introduced DOS forms to ensure quality of spray. SOP performance was monitored using the performance tracker that was compiled by the DC and submitted to the Operations Manager on a weekly basis. The DCs, Supervisors and IRS Managers met on a daily basis to review the daily progress and plan for the following day. When the team had some difficulties or any concerns pertaining to IRS operations that could not be dealt with at district level, these were communicated to the provincial coordinators immediately.

A monitoring and supervision schedule was developed and used during the 2016 spray campaign. The schedule showed the role of specific individuals, which site they were working from, the type of supervisory tools to be used and the frequency of the usage of each supervisory tool. Master Trainers were deployed to districts which had weak supervision in the 2015 IRS season to support the district in supervision of IRS implementation,

## 5.2 LOGISTICS

### 5.2.1 IRS STORAGE AND INSECTICIDE STOCK MANAGEMENT

The Logistics Manager was in charge of managing stock at the central level and provided overall supervision for the 83 Store Keepers. Each district store was managed by two Store Keepers, one Government employee and one AIRS seasonal Store Keeper. All of the districts had store rooms where all of the commodities were kept, however, there were a few districts which used storage facilities that belonged to the local authorities (district councils). These facilities were rented free of charge. All IRS commodities were stored according to the standard operating procedures for storage of IRS commodities. To enhance tracking of the insecticide usage, the IRS Daily Insecticide usage register and the Stock Control Cards were used to account for the quantity issued, quantity used and quantity returned. The document register were also used to account for the number of empty bottles and the possible discrepancy between number of bottles used and the empty bottles brought by the SOPs.

**TABLE 7: ACTELIC CONSUMPTION, BY PROVINCE**

Province	No. of Bottles
Luapula	43,082
Northern	32,374
Muchinga	13,087
Eastern	51,475
Total	140,018

A total of 140,018 bottles of insecticide were used to spray 559,550 structures with a utilization ratio of approximately 1:4.0 bottles to structures sprayed. This is similar to the 2015 IRS campaign where a total of 135,689 bottles of insecticide were used to spray 460,856 structures with a utilization ratio of approximately 1:4.0 bottles to structures sprayed. In total, only 50 bottles of Actellic remained unused at the end of the 2016 IRS campaign. These bottles will expire in June 2018 and therefore will be used in the 2017 IRS campaign.

# 6. POST-SEASON ACTIVITIES

## 6.1 POST-SPRAY INVENTORY

In order to ensure safe and effective completion of the spray season, the AIRS Zambia team completed post-spray activities. All IRS materials and equipment, remaining insecticides, and insecticide-contaminated wastes were returned to the district warehouses. All equipment was checked to see any malfunctioning.

Broken equipment was identified and would be repaired before the start of the 2016 IRS campaign. All unsalvageable equipment, like plastic sheets, will be disposed of according to environmental compliance protocols. All remaining insecticides are currently stored according to instructions provided by PMI, NMCP and the Zambia Environmental Management Agency (ZEMA) at the district warehouse and they will be moved to the central warehouse for proper monitoring and storage. The quantity and functionality of all other IRS materials and equipment was checked and documented to help plan for the next spray season. All insecticide-contaminated waste generated from operations will be disposed of in ways compliant with environmental regulations using disposal facilities available in Zambia.

## 6.2 POST-SPRAY REVIEW MEETINGS

After the IRS campaign, a post spray review meeting is organized and attended by PMI, NMEP and other stakeholders. The all partners' meetings occurred from January 25 to February 3, 2017 in each of the provinces. During these meetings, the operations, successes, challenges, lessons learned and recommendations during the last spray campaign were discussed with the way forward for the next campaign was agreed.

# 7. MONITORING AND EVALUATION

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M&E for the 2016 IRS campaign followed the processes outlined in the 2016 AIRS Zambia Work Plan. The AIRS M&E approach incorporated successful aspects of the M&E system and lessons learned from the 2015 IRS campaign as well as IRS M&E best practices from other AIRS countries.

## 7.1 KEY OBJECTIVES

The key objectives of AIRS Zambia M&E activities were:

- To emphasize accuracy of both the data collection and the data entry process through comprehensive training and supervision at all levels;
- To streamline and standardize data flow, minimize error, and facilitate timely reporting;
- To ensure IRS data security and storage for future reference through the establishment and enforcement of proper protocols; and
- To document lessons learned and good practices observed in the implementation of the project activities and apply to future project years.

## 7.2 M&E SYSTEM DEVELOPMENT AND IMPLEMENTATION

The AIRS Zambia M&E system was drafted and defined before the start of IRS implementation to ensure the collection, management, and reporting of high-quality data. As noted above, the Zambia team considered and adopted the successful aspects of M&E system from the 2015 AIRS IRS campaign. The first step was to adapt the Daily SOP Form to include the indicators that AIRS reports, such as vulnerable populations (e.g., pregnant women and children under five years) and population protected, by gender. During the TOT training for IRS Managers and Supervisors, the M&E team reviewed the revised SOP form. The IRS Managers and Supervisors were then able to explain the form in detail during the cascade training for SOPs and TLs. The SOP form served as the primary tool for data collection. To support data collection and entry and the supervision of both activities, AIRS hired M&E assistants and DECAs, in each of the 35 districts. AIRS Zambia also utilized the Client Technology Center, located at the Abt Home Office, for the AIRS database, which tracked key performance and output indicators. AIRS technical staff also used the database to generate near “real-time” reports for quick feedback and to reconcile and prevent additional errors in data collection and entry.

Spray data was collected by SOPs, and verified by team leaders, supervisors, and M&E assistants. The M&E assistants gave the forms to the DECAs for entry, who then performed a final verification of spray data before updating the database. At the end of each day, the M&E team reviewed the data entry progress for all of the districts and sent an update to the Home Office via email. The M&E team checked for errors and addressed any issues with the DECAs immediately. For quality control purposes and timely generation of weekly client spray progress reports, all data were expected to be entered within 48 hours of spraying. However, in some instances, data were not entered or synced within 48 hours for several reasons, which included:

- Frequent internet outages by some mobile carriers in some districts.
- Issues with remote data syncing: SOPs would sometimes camp overnight when they were spraying in remote areas. In these instances, DECAs would either go camping with SOPs and enter data (but not sync it) when they returned to the base or they would wait until SOPs returned to the base to enter and sync the data.

Daily SOP Forms were filed at the data centers according to spray date and team number. Spray data was also backed up daily to each computer hard disk and to an external hard drive for data safety and storage.

### 7.3 DIMAGI PLATFORM

AIRS Zambia collaborated with Dimagi to implement the Dimagi platform to ensure quality reporting and supervision in all the 35 target districts. The Dimagi platform focused on the following:

- Daily Reminder Messages: this system was used to send daily SMS reminders (job aids) to SOPs, TLs, Supervisors, DCs and M&E Assistants.
- Data Correction and Verification (DCV) forms: this system was used on a daily basis by M&E Assistants to update the database with data collected using DCV forms.
- Performance tracking sheets data: this system was used to update data and send daily reports. The Dimagi platform collected and sent out daily aggregated summary data on spray performance for target provinces and districts.
- Supervisory Checklists: this system was used to update and send out daily supervisory checklist reports.

### 7.4 MSPray IMPLEMENTATION

AIRS Zambia, in partnership with Akros, utilized mobile devices for data collection and management (mSpray) in seven districts in the Luapula Province for a third year. The mSpray platform is a cloud-based data recording and management system that allows spray personnel to electronically collect spray data and GPS coordinates using a mobile phone or tablet. Data was submitted to a shared project folder, or cloud, for immediate viewing of spray campaign progress. The following is a list of key features of the mSpray tool for data collection and management:

- Data is captured directly on mobile forms that are loaded on a smartphone or tablet.
- Pre-programmed data entry controls on mobile devices reduce illogical data errors.
- There is real-time data availability via a shared, cloud-based monitoring and reporting platform to immediately address campaign challenges and improve spray progress.

### 7.5 DATA QUALITY ASSURANCE AND CONTROL

During the 2016 spray season, AIRS Zambia used the AIRS M&E Supervisory Toolkit, which consists of the following two tools to standardize and improve data collection:

- Error Eliminator (EE) forms were used to verify the completeness and correctness of spray data collected in the field. The EE facilitates a systematic review of the SOP forms and easily exposes common errors for correction by supervisors at various levels. During the spray campaign, the EE was completed daily by team leaders for 100% of their SOPs, and randomly by M&E Assistants, IRS managers, supervisors, district coordinators as well as AIRS senior staff visiting the districts.
- Data Collection Verification forms were used to check the accuracy of data collected in the field. M&E assistants and supervisors used the DCV form to ensure that the data recorded on the Daily SOP Forms matched the information reported by households.

#### 7.5.1 PHYSICAL DATA VERIFICATION

Physical data verification was performed at three different levels:

- Team Leader Level: 100% of spray data collected on SOP forms was reviewed and the math was

verified.

- District Level: each supervisor had to review five sprayed structures per week in their district while DCs had to review 20 sprayed structures in their districts.
- Staff from AIRS and the NMEC central level performed random data verification as part of routine monitoring visits across the 35 target districts.
- Data Entry Level: Data clerks reviewed each form for typos and transcription errors, and verified the arithmetic before entering the data into the database.

### 7.5.2 DATABASE QUALITY CONTROL

AIRS Zambia used the Microsoft Access database, which includes pre-programmed audit checks and data locks to reduce the number of data entry errors. AIRS Zambia also used the IRS Reporter (cleaning/reporting tool) to help data clerks clean and reconcile data. Additionally, AIRS Zambia required DECAs to enter data in two ways: 1) by spray “Totals” or a summary of each Daily SOP Form in order to produce “real-time” reporting of spray progress, and 2) by spray “Details” data (line-by-line or structure-by-structure) for more accurate data entry and high quality data. By using the IRS Reporter, DECAs investigated and reconciled discrepancies between spray “Totals” and “Details” data for a final dataset with the campaign results. Corrections were made to the paper spray forms and the database, where necessary.

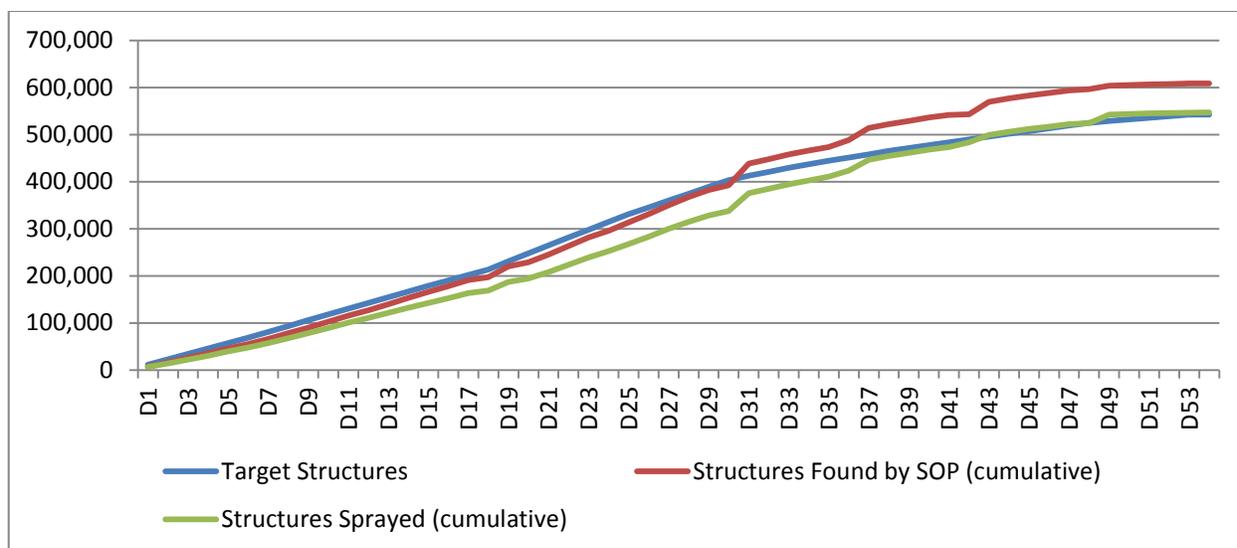
### 7.5.3 RANDOM SPOT CHECKS

The M&E team performed daily data verification activities of the Microsoft Access database to guarantee the quality of the data. They scanned the database and ran spray progress reports to identify progress and anomalies in data entry. In the event they found discrepancies between data collected and data entered that could not be reconciled at the data center, the M&E team contacted the field supervisor for clarification to resolve the issue.

M&E assistants conducted field checks by visiting villages sprayed in the past few days to randomly interview households on their spray status. They collected data using the DCV form and compared them with data collected on the SOP forms. Any discrepancies were addressed and rectified with the appropriate AIRS staff. In a few instances it was observed that data collected by the M&E Assistants did not match with the data on the ground. The M&E Assistant involved was mentored on how to conduct DCVs properly.

## 7.6 IRS RESULTS

**FIGURE 3: IRS DAILY PERFORMANCE TRACKER**



### 7.6.1 INSECTICIDE USAGE

The total number of bottles used during the 2016 campaign was 140,018. On average, one bottle sprayed 4.0 structures. The average number of bottles used by a spray operator per day was 3.7 and each operator, on average, sprayed 14.6 structures per day in the 35 target districts.

Please see the M&E Plan Matrix in Annex 10 for a full list of project indicator targets and results.

**TABLE 8: INSECTICIDE USAGE**

Province	District	Structures Sprayed	Bottles Used	Avg Sprayed Structures per Bottle	Avg Bottles per SOP per Day	Structures Sprayed per Day per SOP
Eastern	Chadiza	14,854	3,612	4.3	3.6	15.5
	Chama	15,861	2,915	5.7	2.7	15.1
	Chipata	66,957	14,801	4.4	3.8	16.7
	Katete	24,057	6,126	3.6	5.0	18.1
	Lundazi	30,369	8,103	3.8	4.7	17.7
	Mambwe	8,642	1,512	5.6	3.0	17.0
	Nyimba	12,832	2,599	4.9	3.0	14.5
	Petauke	36,918	8,657	4.3	4.0	16.9
	Sinda	6,846	1,388	3.4	4.9	16.6
	Vubwi	5,375	1,762	3.1	5.0	15.2
Muchinga <sup>a</sup>	Chinsali	12,467	2,981	4.2	4.0	17.0
	Isoka	5,627	1,310	4.3	3.0	13.1
	Mafinga	7,544	1,476	5.1	3.0	15.4

Province	District	Structures Sprayed	Bottles Used	Avg Sprayed Structures per Bottle	Avg Bottles per SOP per Day	Structures Sprayed per Day per SOP
	Mpika	12,248	3,157	3.9	3.5	13.8
	Nakonde	12,939	3,106	4.1	3.3	13.7
	Shiwang'andu	4,179	1,057	4.0	3.8	15.1
Northern	Chilubi	12,488	3,647	3.4	4.2	14.2
	Kaputa	10,282	2,531	4.0	3.0	11.9
	Kasama	22,072	5,879	3.9	3.8	14.7
	Luwingu	13,856	4,236	3.2	4.3	13.6
	Mbala	15,354	3,335	4.1	3.0	12.1
	Mporokoso	11,454	2,882	4.0	3.6	14.2
	Mpulungu	11,505	3,362	3.5	4.0	13.8
	Mungwi	14,082	4,218	3.4	3.5	11.7
	Nsama	7,765	2,284	3.4	3.8	12.9
Luapula	Chembe	5,351	1,357	4.0	3.6	14.3
	Chiengi	32,599	8,229	4.1	3.4	14.0
	Chipili	1,537	424	3.3	3.9	13.0
	Kawambwa	11,710	2,859	4.2	3.8	16.0
	Mansa	25,967	7,723	3.4	3.2	11.1
	Milenge	2,513	732	4.7	4.0	19.1
	Mwansabombwe	8,280	1,836	4.8	2.8	13.5
	Mwense	19,072	5,476	3.4	4.0	13.9
	Nchelenge	26,027	6,942	3.9	2.9	11.4
	Samfya	30,344	7,504	4.2	3.6	14.9
<b>Total</b>		<b>163,400</b>	<b>140,018</b>	<b>4.0</b>	<b>3.7</b>	<b>14.6</b>

# 8. ENVIRONMENTAL COMPLIANCE

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This chapter focuses on the activities that were undertaken in overseeing IRS program compliance with:

- The United States Government (USG): USAID Regulation 216,
- The Government of the Republic of Zambia (GRZ) Environmental Regulations: Zambia Environmental Management Act (EMA) cap 204, No 12 of 2011, and
- The 2015 Supplemental Environmental Assessment – including the Pesticide Evaluation Report and Safer Use Action Plan (PERSUAP).

This chapter also contains some of the outstanding issues that came up during IRS implementation and what was done in response. More details can be found in Annex 3 – the Environmental Mitigation and Monitoring Report (EMMR).

In accordance with 22 CFR 216, AIRS Zambia operates under a Supplemental Environmental Assessment (SEA) that was approved in September 2015. The SEA authorizes the use of all four classes of insecticides recommended by WHOPEs (pyrethroids, carbamates, organophosphates, and organochlorine) as well as chlorfenapyr when recommended by WHOPEs. It is valid for IRS nationwide during the period September 2015 – September 2020.

## 8.1 ENVIRONMENTAL DOCUMENTATION

The 2015 Supplemental Environmental Assessment (SEA) for Zambia stipulates that PMI AIRS Zambia is required to submit an annual Letter Report to PMI two months prior to the beginning of spraying. The 2016 Letter Report was submitted to USAID in July 2016 and covered the Sept-Oct 2016 spray campaign.

## 8.2 PRE-SEASON ENVIRONMENTAL COMPLIANCE ASSESSMENT (PSECA)

In May 2016, the ECO travelled to all the district IRS operations sites in order to ascertain the district preparedness with regard to the state of the IRS facilities such as warehouses, soak pits, shower rooms, pit latrines, wash bays etc. The Pre-Season Environmental Compliance Assessment (PSECA) tool imbedded on smart phones was used in order to assess, among other things:

- The soak pits' capacity to filter traces of chemical from rinse water during end of day clean up.
- Warehouse capacity to store and handle pesticides and other IRS supplies.

Work lists produced from the assessments detailed environmental compliance findings at each IRS operations site, and an implementation plan was developed to address any deficiencies. The implementation plan delineated the roles and responsibility of respective individuals from both AIRS and MOH in addressing the findings. The refurbishment process commenced after the plan was approved.

In all, twelve (12) new soak pits were constructed, and ten (10) existing ones were renovated. Since the number of SOPs in some of the districts increased drastically, wash bays had to be expanded at some operations sites to avoid congestion at the soak pit during end of day cleanup. In some districts, the distance between the primary soak pit and the spray site was too long, and as such the use of mobile soak pits (MSP) was encouraged in those areas. A total of 45 MSP were constructed in order to facilitate end of day cleanup at the distant spray areas.

### 8.3 NEW SPRAY AREAS/ OPERATIONAL SITES/ MAJOR RENOVATIONS

In 2015, 6 of the large districts in Northern Province were subdivided into 2 different divisions respectively and at each subdivision an IRS operations site was set up. This reduced the number of non-compliant EC issues during end of day cleanup, because SOPs covered short distances to get to the spray sites and managed to report back to the operations site before sunset. Therefore, in 2016 AIRS Zambia divided 16 large districts in Muchinga, Luapula and Eastern Provinces. In total, eight (8) new operations sites were created and therefore IRS facilities, such as warehouse, soak pit, shower/change rooms, pit latrines, and wash bays in Samfya, Mpika, Shiwang'andu, Nakonde, Nsama Chipata-Mkanda, Mbala-Senga and Petauke districts. Storage facilities were renovated in Mansa, Lundazi, Katete, Mambwe, Chipata-Boma, Chinsali and Chama districts; new soak pits and fencing were built in Chipata-Boma, Lundazi Chinsali and Mpulungu; and pit latrines, bath and changing rooms were built in Chienge, Chipata-Boma, Mbala, Chipili, Mansa and Chembe districts; as well as installation of water distribution systems in Shiwang'andu and Isoka districts. In all cases, the work was performed under the full supervision of the DCs, MOH district representatives and given final approval by the in-country ECO.

### 8.4 FOLLOW-UP ENVIRONMENTAL COMPLIANCE INSPECTIONS

After having successfully addressed all the EC deficiencies identified by PSECAs, two weeks prior to the launch of the spray campaign, the ECO, Mission Environmental Officer and, a PMI Resident Advisor revisited all IRS bases to confirm that the refurbishment processes were conducted according to the plan and ascertain the district's preparedness for the 2016 IRS campaign. All the storage facilities in all PMI supported districts met the minimum EC requirements and were certified ready to receive and safely store pesticides. Additionally, all soak pits were suitable for an environmentally responsible disposal of pesticide-contaminated liquid waste, except for the one in Chinsali district which was clogged. This problem was however rectified and the soak pit began working properly as a filter before the launch of the IRS campaign.

### 8.5 PRE-CONTRACT MOTOR VEHICLE INSPECTIONS

In September, prior to the awarding of contracts to the transport vendors, all vehicles were subjected to an inspection against PMI BMP to ensure compliance with safety and environmental requirements. A total of 93 vehicles (trucks) were hired through this process and consequently, 110 drivers were trained in the drivers' trainings that were conducted in Mansa, Kasama and Chipata a few weeks before the commencement of the spray campaign. During the inspection, transporters were advised to retrofit the trucks with benches, tents, railings and to ensure that all the trucks were roadworthy; which advice was followed. All the vehicles hired were equipped with Spill Management and First Aid kits, Material Safety Data Sheets and Accident/Emergency response procedures.

### 8.6 MEDICAL CLEARANCES

All the SOPs that were engaged to take part in the 2016 spray season underwent medical examinations and only the SOPs who passed the examinations were incorporated into the program. Additionally, all female SOPs were provided with pregnancy testing before the commencement of the IRS campaign. The test was repeated on the 30<sup>th</sup> spray day for the districts that had a spray calendar of more than 30 days. The medical tests conducted included: pregnancy test (for females), physical examination, hemoglobin (Hb) and blood pressure.

## 8.7 MANAGEMENT OF INSECTICIDE ADVERSE EFFECTS

A two-day training was conducted in order to orient clinicians from all PMI supported districts with regard to the possible toxic effects of insecticides and their management. A total of 64 participants attended the training from 35 districts in the PMI supported provinces. In readiness for any unforeseen incidences such as insecticide poisoning, atropine which is an antidote for insecticide poisoning, was readily available in all district hospitals as well as central medical stores.

## 8.8 MID-SPRAY ENVIRONMENTAL COMPLIANCE INSPECTIONS

The 2016 IRS monitoring and supervision was conducted by all AIRS staff in close collaboration with the MOH employees in the respective districts using EC tools embedded on smart phones. A total of 95 smart phones that were procured in 2015 were in use in order to facilitate electronic submission of all mid spray inspection reports. Other MOH employees, who did not have a smart phone, were encouraged to use paper based monitoring and supervisory checklists when administering mid spray inspections. The paper based reports were reviewed by the ECO and the DCs once every week.

### 8.8.1 MORNING MOBILIZATION

In order to ensure that SOPs' safety was upheld, the ECO carried out random physical inspections during morning mobilization to check for any SOPs who might have been experiencing difficulties in breathing, fatigue, weakness, and alcohol intoxication etc. In addition, spray team leaders and supervisors were trained to monitor their operators for any of these signs of problems. During morning mobilization, most of the activities in most of the districts were conducted in accordance with the BMP guidelines except in some instances where SOPs were not wearing full PPE before boarding the vehicles. In these instances, they were immediately told that full PPE is needed at all times. SOPs began the day by reporting to a restaurant to have a meal. This reduced non-compliant issues reported in previous campaigns where SOPs were seen having meals after donning in PPE.

Every time, especially in the first few days, an anomaly was reported, corrective measures were put in place and subsequently, a meeting was convened with the spray teams and guidance was given on the way forward regarding the best practices in order to avoid repetition of same EC violations.

### 8.8.2 HOME OWNER PREPARATIONS AND SOP PERFORMANCE

These inspections were performed while SOPs were in the field conducting IRS. They also involved interviewing homeowners to assess whether they were furnished with adequate information on their responsibilities.

Below are some of the few EC irregularities that were reported:

- Some residents were refusing IRS because they claimed: they were not fully informed about IRS; not all mosquitoes died after the last spray season and that there was an increase in population of other pests e.g. bedbugs after the last IRS campaign
- Some SOPs were not spraying all the recommended surfaces, especially the eaves
- Some SOPs were not spraying at the correct speed and could not maintain the swath
- Some SOPs were seen not to be in full PPEs and this was one of the non-compliant issues that came out prominent in the electronic reports submitted and was adequately dealt with by supervisors

All the above reported non-compliant issues only occurred in the initial stages of IRS implementation and corrective measures were immediately instituted, which subsequently resulted in a drastic reduction in the number of non-compliant issues.

### 8.8.3 STOREKEEPER PERFORMANCE INSPECTIONS

In 2016 PMI AIRS Zambia fully sponsored 35 seasonal storekeepers who each worked in close collaboration with the district medical office storekeeper in respective districts which brought the total number of storekeepers to 70. The fact that most of the store keepers were new in the program made it a bit difficult for them to do their work as required in the first few days of operations. However, since all AIRS employees were also in the field to monitor operations, a number of non-compliant issues that were spotted were rectified immediately and corrective measures were implemented. As such, there were no critical recurring non-compliant issues except for one minor lapse indicated below that was reported:

- Missing items in the First Aid boxes such as eyewash, antibiotic, band aids gauze etc. This could be attributed to the fact that most of our IRS bases are located at the hospital or health center premises and such items are readily available in the hospitals and are normally in the custody of a clinician who underwent poison management training.

The discrepancies that were observed in stock management in the first few instances were rectified by conducting a physical count of all the stocks until reconciliation between empty bottles and full stocks was reached. As the program continued, all the storekeepers improved their performance and in the end everything was normalized and there was literally little or no non-compliant issues recorded.

### 8.8.4 END-OF-DAY CLEANUP INSPECTIONS

The end of day cleanup inspection was conducted at the IRS operations site and the camping sites where mobile soak pits were in use at the end of the day after SOPs had returned from the field. During the 2016 IRS campaign there was a drastic reduction with regard to non-compliant issues during end of day cleanups as compared to the 2015 spray campaign, due to the fact that in 2015 washers were newly introduced in the program and it was a bit difficult for them to adhere to the safe guards. Most districts retained the 2015 washers to wash overalls. Introduction of washers in the program was a big improvement as it eliminated SOPs from carrying contaminated PPE home.

Furthermore, equipping the IRS facilities with shower and change rooms with adequate water and privacy prompts SOPs not to only at a minimum wash their faces and hands after spraying but also have a shower on-site. There were no major non-compliant issues and only a few behavioral challenges were reported in the first few days of IRS operations which included the following:

- Leaving rinse and/or waste water drums uncovered overnight
- Some Team Leaders were not supervising cleaning and wash-up
- Some Team Leaders were observed handling contaminated overalls without wearing gloves
- Drivers were not cleaning the vehicles on daily basis
- Some vehicles were observed having stains of chemical
- Failure by some SOPs to depressurize the spray pumps when coming back from the field
- Some SOPs did not continue to wear PPE on the way back to the operations site
- SOPs were coming with too much chemical from the field
- Some SOPs were not washing their PPE, especially helmets and face shields
- Some SOPs were observed handling contaminated PPEs after having had a shower
- In case of spillages, drivers were not following the right procedure of disposal of contaminated sand used in cleaning up the spill
- Some supervisors in some districts were not inspecting vehicles
- Some supervisors in some districts were not supervising drivers
- Despite drivers being given overalls they were not wearing them

## 8.9 INCIDENTS

During the 2016 spray campaign, there were no major incidents, and only two minor occurrences in Petauke and Mbala districts. The two incidents were recorded and reported immediately. A road traffic accident occurred in Petauke district involving a hired SOP transport vehicle at the end of the spray activities when SOPs were getting on the truck to go back to the IRS operations site for the end of day cleanups. The root cause of the incident was that the driver started the engine and drove off before all the SOPs got settled in the truck which caused one of the SOPs to fall from the rails of the vehicle and hitting hard on the steel skids of the vehicle. The casualty sustained injuries in the right leg and was immediately rushed to the hospital for treatment. The X-ray was conducted on the injured leg and the results showed that there was neither a fracture nor dislocation. The driver was subsequently removed from the program and was replaced by trained drivers from the buffer. As a corrective measure all the drivers in all the districts began attending morning safety talks where they were constantly reminded about the occupation health, safety and environmental safe guards to embrace during operations.

In Mbala District, one of the SOPs did not depressurize the pump on the way back from the spray site to the IRS operations site and when disembarking from the vehicle another SOP stepped on the trigger and the leftover chemical from the tank splashed on other SOPs. Unfortunately some of the chemical splashed into one of the SOP's eyes and they became itchy and swollen. The casualty's eyes were immediately washed with adequate water before she was rushed to Mbala General Hospital where she received medical attention. The affected SOP was able to return for work after two days and was put on light duty until she fully recovered. As a corrective measure all the SOPs were during morning mobilization reminded to depressurize the pumps when boarding the trucks after the field spray activities and team leaders began inspecting the pumps prior to boarding the trucks.

## 8.10 POST-SEASON ENVIRONMENTAL ASSESSMENT

The AIRS Logistics Officer, DCs and ECO in collaboration with the district representatives from MOH set out to conduct post spray inventory and audits of all IRS commodities immediately after the spray campaign came to an end.

### 8.10.1 CLOSURE OF STORE ROOMS AND SOAK PITS

Decommissioning of all IRS facilities, specifically store rooms and soak pits, was principally the role of the ECO supported by the MOH personnel from the respective districts. During the inspection, the ECO made sure that the following was undertaken:

#### **IRS Documentation:**

- All the records for all IRS commodities were updated and balanced up.
- The amount of chemical used tallied with the empty bottles available.
- Submission of Medical Examination records for record keeping at central level.
- Submission of Certificate of completion regarding EC rehabilitation works for record keeping.

**Pesticide Storage facility:** The storage facilities were thoroughly washed with soap and water. The leftover chemical with other IRS commodities as well as IRS wastes were clearly quantified, labeled and nicely packed. EC items such as pallets, hand washing bucket, fire extinguisher, thermometer, first-aid kit, spill management kit, emergency and spill response procedure as well as waste storage bins have been preserved for use in the 2017 IRS campaign. All IRS wastes were collected from the districts and are temporarily kept at the Lusaka Cleansing Depot awaiting a safe and environmentally sound disposal in presence of representatives from ZEMA and MOH.

**Soak Pit and Wash bay:** The wash bays were washed with adequate water in order to remove all traces of pesticides and all the waste water drained into the soak pit. The soak pits have since been covered in order to prevent fallen material e.g. debris to get to the soak pit during the off season as they have potential to affect the functionality of the soak pit. The soak pit areas have been locked with danger signs displayed in order to avoid unauthorized access to the facility. The fact that the off spray season normally falls in rainy season a lot of vegetation (grass) during this period grows taller therefore, the ECO has instructed the DCs to be conducting periodical grass cutting at specified time intervals (two to three weeks).

**PPE:** Overalls, helmets, face shields and gum boots were thoroughly washed with soap and water and kept safely in the provincial storage facility for use in the 2017 spray campaign.

**Defective Pumps:** Defective spray pumps and other IRS equipment that got damaged during the IRS implementation have safely been stored in the district store rooms and will be repaired before the commencement of the 2017 spray season.

**IRS Waste:** Used nose masks, polythene sheets and worn out coveralls, face shield, helmets, gloves, boots, and back packs (bags) were quantified, weighed and kept in respective waste bins awaiting the environmentally sound disposal.

## 8.11 IRS WASTE DISPOSAL

The table below shows the categories of IRS solid waste generated in the 2016 campaign.

**TABLE 9: CATEGORIES OF IRS SOLID WASTE**

Plastic	Cloth	Rubber	Paper
Empty Bottles	Used Nose Masks	Gum Boots	Empty Actellic Boxes
Polythene sheets	Cloth	PVC Gloves	Nose Mask Packages
Helmet & Face shields	Worn out Overalls		

**Liquid Waste:** Liquid effluent from the rinsing of pumps was reused as water for mixing chemicals on the following day and the wash water from washing the outside of the spray tank and rinsing of the strainer and nozzles was drained into soak pits that are carefully sited according to the criteria in the PMI BMP manual. The soak pits were designed so that traces of pesticides in rinse water could be adsorbed by the charcoal layer, and held until environmental processes result in the degradation of the pesticide.

**Solid Waste:** At the end of the spray season, non-pesticides contaminated wastes, or those that were cleaned thoroughly with soap and water were nicely labeled and kept in the storage facility awaiting a safe and an environmentally sound disposal method. These types of waste include; worn out overalls, gum boots, gloves as well as used mutton cloth and polythene sheet. These items will be distributed to spray operators once a distribution plan is finalized.

**Solid Waste Disposal Streams:** Below are the disposal methods for each type of waste which was generated in the 2016 Zambia IRS campaign:

**Insecticide Containers:** By February, 2017 all the empty bottles together with carton boxes will be collected from the districts and taken to central level at Lusaka Cleansing Depot awaiting thorough cleaning with soap and water, removal of labels and seals, compression and bailing prior to their shipment

to the South Africa for recycling. There has been a delay in shipping empty bottles to South Africa since 2015 due to the fact that empty bottles were initially classified as hazardous waste by ZEMA which attracted stringent environmental guidelines stipulated in the Basel Convention. Since then, ZEMA has re-categorized the bottles as non-hazardous waste. In 2017, a local recycling company expressed interest in recycling empty Actellic bottles into plastic covers used for motor vehicle batteries. Therefore, empty bottles will be recycled in Zambia. This will be completed by spring of 2017.

**Cardboard Boxes:** Uncontaminated boxes will be supplied to Zambezi Paper Mills as raw material in the manufacturing of carton boxes, books, pencil etc. Contaminated cardboard boxes on the other hand (i.e., cardboard boxes that contained insecticides with damaged packaging) will be incinerated with nose masks at the University Teaching Hospital incinerator.

**Gloves and Boots:** Gloves and boots which would no longer be used in future IRS campaigns were thoroughly washed with adequate soap and water after the spray campaign and will be donated to deserving SOPs for their personal use.

**Dust Masks, Overalls, and Back Sacks:** Waste dust masks are always considered as contaminated and hazardous and will therefore be incinerated using University Teaching Hospital incinerators. Overalls and back sacks that would no longer be used for IRS will be given to deserving SOPs for their personal use, after they are thorough washed with adequate soap and water. Table 1.2 below shows the summary of type, quantity and disposal stream of the 2016 IRS solid waste.

**TABLE 10: SUMMARY OF TYPE, QUANTITY AND DISPOSAL STREAM OF THE 2016 IRS SOLID WASTE**

Waste Category	Quantity	Disposal Method
Empty Bottles	Physical Quantity 140,018 Bottles	Shipping to South Africa for recycling after thorough cleaning, removal of labels, compression and baling
Plastic Sheeting	425.6 Kg	Disposal at the national dumpsite in Lusaka after thorough cleaning with soap & water
Helmet & Face Shields	88.9 Kg	Disposal at the national dumpsite in Lusaka after thorough cleaning with soap & water
Boots	3 pairs	Worn out boots will be given to deserving SOPs after been thoroughly cleaned with soap & water
PVC Gloves	293.8 Kg	Prior to their disposal in a landfill, worn out gloves will be cleaned with soap and water and shredded.
Used Nose Masks	720.3 Kg	Masks will be weighed at the point of generation and will be incinerated at UTH incinerator in Lusaka
Mutton Cloth	355.4 Kg	To be given to each and every SOP for their personal use after washing with soap & water
Worn out Overalls and Back Packs	57.1 Kg	Overalls and Bags will be given to deserving SOPs after been thoroughly cleaned with soap & water
Carton Boxes as packaging for Nose masks, pumps, IRS items etc	124.14 Kg	Contaminated boxes will be incinerated whereas uncontaminated boxes will be supplied to Zambezi Paper Mills (ZPM) as raw material



## 9. CAPACITY BUILDING

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One of AIRS Zambia's main tasks is to enhance government staff's technical knowledge and management capacity to implement IRS. AIRS' guiding partnership principles emphasize the importance of building relationships with local partners and strengthening their skills in areas such as strategic planning, leadership, operating systems (technical) advocacy, organizational management and project development and management.

In entomology, AIRS continued to provide capacity building to district-level environmental health officers and human landing collectors to manage entomological data collection at the sentinel sites. Two participants from Zambia, one entomology field technician from AIRS and one environmental health officer from MOH, attended regional entomology training in Zimbabwe from June 27 to July 3, 2016. The training, which was organized by AIRS HQ, was aimed at equipping malaria vector control officers in various entomological monitoring techniques with a view of ensuring sustainability of entomological activities in each of the participating countries. In addition, the training provided an opportunity for participants to improve their skills in morphological identification of malaria vector species. During the training, participants were subjected to intense practicals ranging from mosquito identification to the determination and use of CDC bottle bioassays and WHO tube tests.

As part of capacity building, in the 2016 work plan, AIRS Zambia provided financial support for a NMCP IRS technical working group. The main aim of the TWG is to make sure that the program has efficient technical policies, procedures, and standards as required to ensure correct application of IRS and sustainability of IRS.

As part of capacity building, in the 2016 work plan, the Zambia AIRS team planned to provide financial support to NMCP to conduct IRS technical working group. During the period under review, the program supported all IRS related technical working groups which occurred quarterly. The main aim of the these TWGs is to make sure that the program has efficient technical policies, procedures, and standards as required to ensure correct application of IRS and sustainability of IRS. Also as part of the capacity building, AIRS Zambia planned to organize a post-spray meeting with NMCP during 2016 to discuss the 2016 IRS campaign and the plan for the 2017 campaign.

In 2016, AIRS Zambia developed a capacity building plan which was developed in collaboration with the National Malaria Elimination Program and PMI. It was envisioned that the capacity building activities would be implemented in 2017.

# 10. ENTOMOLOGY

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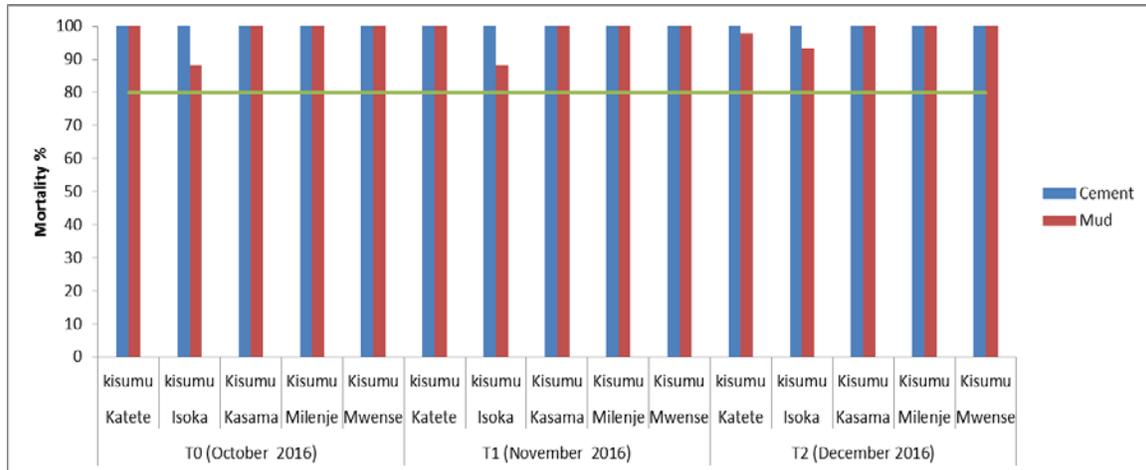
AIRS Zambia has been performing the 2016 IRS campaign entomological surveillance on a monthly basis. Entomological surveillance is an important activity in malaria control because it directly deals with the monitoring of the malaria vector in response to vector control interventions such as IRS and the distribution of LLINs. It is a key component for IRS programming, providing information on the impact of IRS on vector density and behavior in IRS spray areas. Entomological activities also assess the quality of the IRS operations, the decay rates of the insecticide applied, and the vector susceptibility to insecticides used for malaria vector control. AIRS Zambia is supporting the NMEC to generate data on key entomological indicators, including spray quality assessment through the cone bioassay tests, whose summary results are outlined below.

The baseline data were collected in September 2016 and the impact of the IRS on malaria vectors was carried out in November and December 2016. Detailed information on the malaria behavior will be shared in the entomological final report.

The spray quality assessment was carried out in five districts 24h after spraying. A total of 40 houses in five villages were used for the cone bioassay tests, 30 treated houses and 10 unsprayed houses as a control. *An. gambiae* s.s. Kisumu strain were exposed on treated walls in Mwense, Milenge, Katete, Isoka and Kasama in October at T0, in November at T1 and in December at T2. All mosquitoes that were exposed were dead after the 24 hour holding period except in Isoka district. The 100% mortality rate at T0 was noted at all sites except in Isoka district where the mortality for mud houses was 88.8%. The mortality rate of mosquitoes at the end of the test in the control sites was less than 5%, except in Kasama district where the mortality in the control was 6.7% and the exposure mortality was corrected using the Abbott formula. By analyzing the results by spray operator, it was evident that one spray operator did not spray a structure well at the bottom of the wall (0.5m). Therefore, in order to assess how wide spread the quality issue was in Isoka, ten additional mud and cement sprayed houses were selected, including houses sprayed by different spray operators, at different dates and in three different villages. The 100% mortality rate was noted for all ten randomly selected houses. All the houses sprayed by this particular SOP in Muswema village in Isoka where the low mortality was observed for mud sprayed houses were re-sprayed.

All the mosquitoes exposed in November, one month after spraying were dead after the 24 hours holding period at all sites. The 100% mortality was recorded at all sites for both mud and cement sprayed walls in December, two months after spraying except in Isoka and Katete districts where the mortality for mud walls was respectively 94.4% and 97.8%.

**FIGURE 4. MORTALITY OF KISUMU SUSCEPTIBLE STRAIN OF AN. GAMBIAE S.S. AFTER 30 MINS EXPOSURE TO PIRIMIPHOS-METHYL CS AND 24H HOLDING PERIOD AT T0, T1 AND T2 IN KASAMA, ISOKA, MILENGE, MWENSE AND KATETE**



# II. CHALLENGES AND LESSONS LEARNED

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## II.1 CHALLENGES

The main challenges experienced during the IRS campaign included:

- The campaign experienced low IRS acceptability rates in three districts in Luapula province, namely Chiengi, Mansa, and Nchelenge districts despite massive IEC/BCC efforts. The main reason for refusal in the province was because IRS was being associated with an increase in the number of fleas in some households. In urban parts of all districts, refusals were associated with the smell of the insecticides and the fact that most urban dwellers own a lot of goods which makes home preparation difficult. In most districts, mobilization was not well implemented because of poor supervision and therefore this affected IRS coverage. During implementation, AIRS Zambia engaged the political and traditional leadership to help demystify myths and concerns about IRS through radio and organized meetings with communities. AIRS Zambia also engaged drama groups to better inform the communities and improve IRS acceptability. This strategy eventually paid off.
- More structures were unexpectedly found in Eastern province and Luapula province in the mSpray districts. In Luapula province, the main reason is that Akros used an older map when enumerating structures for target setting compared to a more recent map that they used during the 2016 spray campaign for implementation. In Eastern province, it is believed that poor supervision in 2015 resulted in more structures being found in 2016. Coupled with wastage of insecticides because of high refusal rates, additional days were added to the campaign for mop up. More insecticide was used in these areas and the AIRS Zambia team needed to procure 4,008 more bottles of insecticides from South Africa.
- There was a delay in the delivery of extra insecticides to cover the extra structures in Luapula. The team expected the insecticides to arrive in the country during the last week of November. However, this was delayed by a week. The team used the delayed period to conduct more mobilization. As a result, spraying in Chipata and three districts in Luapula was completed on December 10<sup>th</sup>.
- There was a massive blackout in the country that lasted five days and affected Eastern, Muchinga, Northern, and Luapula provinces. This impacted the network, electricity, and access to water. The team made efforts to work around this by ferrying water, making use of gensets and solar power, but this could not fully achieve what electricity could provide.
- The NMCP and AIRS Zambia have faced challenges with the management and disposal of insecticide containers since Actellic 300 CS was introduced to the program in 2012 because there are no recycling companies to transform insecticide containers into non-consumptive products in Zambia. This was further compounded by the fact that ZEMA classified the empty bottles as hazardous despite going through thorough cleaning. The team engaged ZEMA through lengthy discussions and negotiations until the reclassification was done after the team independently produced results from Zambia Bureau of Standards that showed that the bottles had chemicals that were within safe limits. Due to the delays to transport the baled empty bottles to South Africa, the storage facility has remained full and therefore the company compressing and baling the bottles had to create extra space for the compressed empty bottles. Since this space was not originally meant for the compressed empty bottles, the company charged AIRS Zambia for storage.

- Challenges in the management of IRS waste has been exacerbated by the fact that 19,728 bottles of insecticide from the 2014 spray campaign expired because they were not delivered by the insecticide manufacturer with a full shelf life. A local company approved by ZEMA has finally been identified that will incinerate the expired insecticides and the process to incinerate the insecticides is ongoing.
- Since AIRS Zambia had hired transporters from within the province, some transporters were not residents of the districts and therefore general contract management was a problem. This meant that some vehicle problems were not fixed on time because the manager was not in the district. The second problem was the issue of fuel management. This was a very big challenge and delayed the transportation of SOPs to the spray sites. This was further compounded by the increase in fuel prices so vendors struggled to acquire fuel during the campaign.
- A review of primary data collection tools revealed that in some areas, like Eastern province, ineffective supervision of SOPs and mobilizers resulted in the following: 1) some SOPs might have been skipping and not documenting unsprayed structures and 2) some mobilizers might not have recorded data on their data collection forms.
- In Isoka District, there were spray quality issues which were identified by the cone bioassays. More houses were investigated for poor quality using the cone bioassays. During the investigations, it was observed that this was due to one SOP and therefore, all the houses that were sprayed by the identified SOP were re-sprayed and the repeated cone bioassays showed improved quality.
- There were more structures found in the mSpray districts than anticipated. The main reason that more structures were found in Luapula is that Akros used a three year old map when enumerating structures to set targets and during the 2016 spray campaign, they used a more recent map. More structures were found than anticipated in Eastern province. It is believed that this was due to poor supervision in 2015. Refusals in the provinces arose from poor social mobilization. Traditional leaders had to be engaged to help convince the community to accept the program particularly in rural areas while in Mansa, which has a large urban setting, announcements were done using mega phones later in the day.
- In most mSpray districts, there was data discrepancy among the various data sources, including IRS HH submission, Ona/Dashboard (online visualization tool) and Ona/Akros CVS (exported data from the cloud server). This discrepancy posed a challenge in terms of data analysis and decision making. One possible explanation is that the mSpray database double counted the number of structures found if a structure was revisited. This only happened in one of these three data sources, the visualization tool, but not in the HH submission nor the CSV file. Since the data sources did not match up, it took considerable time and effort to sort through the problem and understand it. It also made decision making during mop up difficult because the senior management team did not know which data source to rely on. However, in one instance during a field spot-check of structures sprayed in Mwenze, a paper based forms that were not correctly filled out could only be verified using mSpray that the actual coverage was below 85%.
- Due to the large volume of data, the mSpray system failed to synchronize and TLAs therefore did not use the locator. Thus, they were not able to locate the red structures which were due for mop ups. Akros was able to fix this problem during the campaign by utilizing a new software which worked better and the TLAs were later able to locate the structures for mop up.

## 11.2 LESSONS LEARNED

- Engagement of traditional leaders as mobilizers at the operational site level to conduct mobilization

enhanced the acceptability of IRS in the rural parts of the districts.

- AIRS Zambia implemented pre-season spray activities well before the start of IRS resulting in the team commencing the spray campaign in good time.
- The engagement of TLAs in mSpray districts greatly improved the rate and quality of data entry and allowed TLs to focus on spray quality and supervision.
- Using mSpray maps to determine spray coverage and plan the next target areas proved to be helpful to the spray teams during IRS operations.
- Using mSpray maps to determine spray coverage and plan the next target areas was useful for district field teams during IRS operations in the seven mSpray districts.
- The introduction and use of TLAs in mSpray districts improved the rate and quality of data entry since they exclusively entered data.
- mSpray has the potential to map IRS spraying via a visualization tool that provides near real-time feedback on spray coverage. IRS managers were able to make strategic decisions on the use of resources based on coverage levels.
- Although mSpray is able to provide information on the number of structures found and the location of each structure, the real-time benefit of this was not realized because the data entered on the tablets could not be immediately transferred to the central data server.
- mSpray is a useful tool when it comes to implementing an effective mop-up strategy. Field teams were able to use this tool to select structures that would help up coverage to 85% with less effort. This was achieved by looking at how much it would take in terms of the number of personnel needed to increase coverage to 85% as well as the number of days it would take.
- mSpray is capable of identifying IRS target areas using a quantifiable, scientific approach utilizing a range of variables (e.g., malaria incidence, environmental factors, population density, etc.). This process is systematic, structured and reproducible.
- mSpray used the Google Maps GPS function to accurately pinpoint the location of structures. This is very dependent on the resolution and how old/recent the maps are though. Akros initially used an older version of the maps and in some target areas structures had been demolished and new ones may have been constructed.

# ANNEX I: PROCUREMENTS

## INTERNATIONAL PROCUREMENTS

Item	Quantity before the campaign	Quantity procured	Total	Quantity Used	Quantity Damaged	Quantity remaining after campaign
Spray Pumps (Hudson and Goizper)	1,110	350	1,460	1,460	97	1,363
Hard Hats	964	1,280	2,244	1,578	0	2,244
Face Shields	0	2,241	2,241	1,815	1,815	426
Nose Masks	0	56,533	56,533	43,842	43,842	12,691
Actellic 300 CS (bottles)	3,673	136,428	140,101	140,051	0	50
Pressure Gauges (for pumps)	0	250	250	221	0	29
Repair Kits (for pumps)	0	175	175	142	0	33
Gloves	516	10,868	11,384	10,510	10,510	874
Gumboots	66	2,427	2,493	1,876	80	1,796
Insecticide bags	113	1,288	1,401	1,401	194	1,207
CFVs	1,989	0	1,989	1,989	740	1249
Nozzles 8002	2652	0	2,652	2,652	1,179	1473

### LOCAL PROCUREMENTS

Item	Quantity Before the Campaign	Quantity Procured	Total	Quantity Used	Quantity Damaged	Quantity remaining after campaign
Overalls	1,646	1,769	3,415	2,631	784	2,631
Bath soap	0	6,728	6,728	3,790	0	2,938
Safety Shoes	0	109	109	0	0	109
Work suits	0	218	218	218	0	0
Socks	0	3,258	3,358	3,358	0	577
Tooth brushes	0	2,668	2,668	2,668	0	228
Washing soap	3,768	1,582	5,350	5,245	0	105
Mutton cloth	3,813	1,597	5,410	4,466	4,466	944
Fire Extinguishers	4	44	44	44	0	44
Daily SOP card	0	56,026	56,026	56,026	0	0
Mobilization Cards	0	56,026	56,026	56,026	0	0
Error Elimin. Forms	0	19,301	19,301	19,301	0	0
Team Leader Forms	0	14,464	14,464	14,464	0	0
IRS Cards*	0	547,606	547,606	547,606	0	0
Socks	618	4,318	5,329	4,752	0	577

\* The Zambia team will consider alternative to traditional IRS cards, such as zip ties, before procuring anything.

## ANNEX 2: SPRAY START AND END DATES BY DISTRICT

Province	District	Spray Details		
		No. Spray days	Spray Start Date	Spray End Date
Eastern	Chadiza	30	17-Oct	26-Nov
	Chipata	39	17-Oct	10-Dec
	Katete	24	17-Oct	11-Nov
	Lundazi	39	17-Oct	10-Dec
	Mambwe	23	17-Oct	16-Nov
	Nyimba	30	17-Oct	22-Nov
	Petauke	39	17-Oct	10-Dec
	Sinda	20	17-Oct	05-Nov
	Vubwi	26	17-Oct	11-Nov
	Chama	30	17-Oct	21-Nov
Muchinga	Chinsali	25	03-Oct	02-Nov
	Isoka	17	26-Sep	15-Oct
	Mpika	25	26-Sep	27-Oct
	Mafinga	17	26-Sep	17-Oct
	Shiwang'andu	15	26-Sep	17-Oct
	Nakonde	30	26-Sep	31-Oct
Northern	Chilubi	30	26-Sep	05-Nov
	Kaputa	30	26-Sep	03-Nov
	Kasama	31	26-Sep	04-Nov
	Luwingu	30	26-Sep	04-Nov
	Mbala	30	04-Oct	11-Nov
	Mporokoso	25	26-Sep	23-Oct
	Mpulungu	35	27-Sep	10-Nov
	Mungwi	37	26-Sep	11-Nov
	Nsama	20	26-Sep	21-Oct

Province	District	Spray Details		
		No. Spray days	Spray Start Date	Spray End Date
Luapula	Mansa	30	26-Sep	30-Nov
	Chembe	20	26-Sep	21-Oct
	Chipili	14	26-Sep	14-Oct
	Samfya	37	26-Sep	09-Nov
	Mwense	33	26-Sep	05-Nov
	Kawambwa	34	26-Sep	06-Nov
	Mwansabombwe	35	26-Sep	07-Nov
	Nchelenge	54	26-Sep	10-Dec
	Chiengi	54	26-Sep	09-Dec
	Milenge	17	26-Sep	14-Oct

# ANNEX 3: SPRAY PROGRESS AND COVERAGE BY DISTRICT

Province	District	Spray Progress	Target	Found	Sprayed	Spray Coverage	Total Population Protected			
							Male	Female	Pregnant women	Children < 5
Eastern	Chadiza	99%	14,969	16,042	14,854	93%	28,181	27,817	1,007	9,776
	Chipata	109%	61,671	75,041	67,455	90%	141,055	136,552	6,222	37,640
	Katete	99%	24,253	24,756	24,057	97%	44,629	44,317	1,381	13,477
	Lundazi	111%	27,423	31,909	30,369	95%	62,503	63,159	3,426	17,170
	Mambwe	110%	7,855	9,221	8,642	94%	16,941	16,264	805	5,254
	Nyimba	91%	14,152	13,116	12,832	98%	29,840	29,952	1,103	9,962
	Petauke	109%	34,023	40,463	36,918	91%	67,087	65,755	2,641	21,036
	Sinda	99%	6,889	7,097	6,846	96%	12,601	12,516	448	4,060
	Vubwi	101%	5,343	5,716	5,375	94%	11,424	10,881	485	3,598
<b>Total</b>	<b>103%</b>	<b>196,578</b>	<b>223,361</b>	<b>207,348</b>	<b>94%</b>	<b>414,261</b>	<b>407,213</b>	<b>17,518</b>	<b>121,973</b>	
Muchinga	Chama	89%	17,724	16,778	15,861	95%	37,248	37,023	2,688	11,776
	Chinsali	110%	11,284	12,802	12,467	97%	32,462	32,511	1,811	8,871
	Isoka	97%	5,821	5,975	5,627	94%	12,637	12,172	754	3,585
	Mafinga	128%	5,903	8,316	7,544	91%	16,395	16,676	1,072	4,925
	Mpika	99%	12,407	14,099	12,248	87%	31,506	31,264	1,783	7,276
	Nakonde	102%	12,663	14,096	12,939	92%	28,376	27,538	1,146	8,096
	Shiwang'andu	94%	4,447	4,433	4,179	94%	9,998	9,601	425	3,288
	<b>Total</b>	<b>103%</b>	<b>70,249</b>	<b>76,499</b>	<b>70,865</b>	<b>93%</b>	<b>168,622</b>	<b>166,785</b>	<b>9,679</b>	<b>47,817</b>
North ern	Chilubi	89%	14,147	13,166	12,593	96%	32,451	33,304	1,624	11,460
	Kaputa	90%	11,385	11,575	10,282	89%	29,420	28,020	1,498	10,328

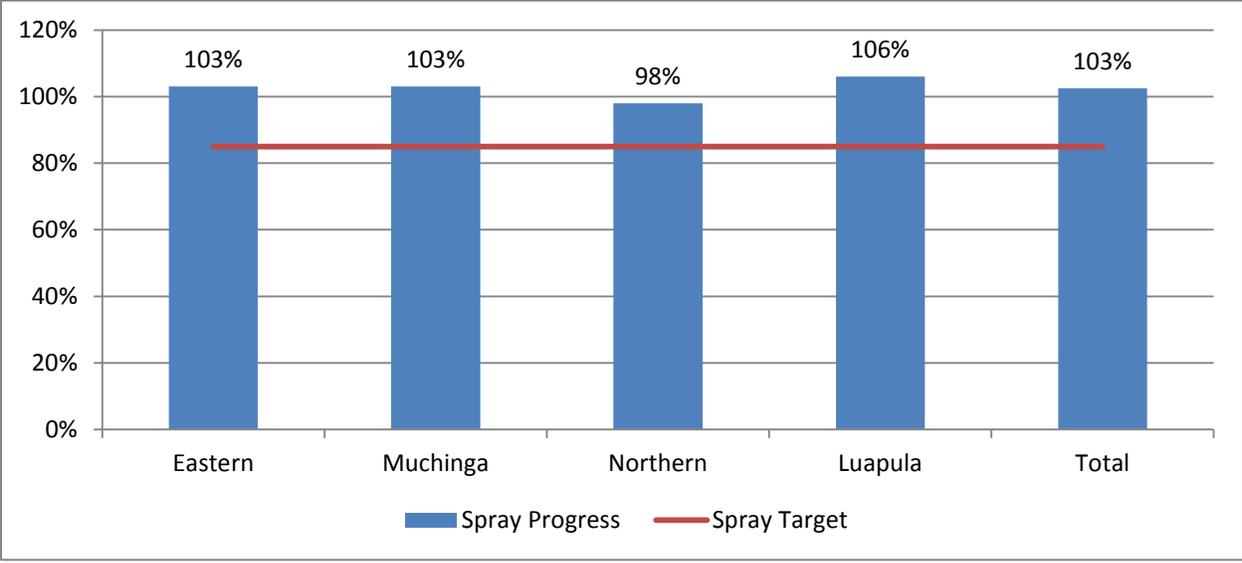
	Kasama	94%	23,365	25,850	22,072	85%	53,223	53,211	3,069	13,131
	Luwingu	91%	15,265	14,676	13,856	94%	35,569	35,298	1,618	11,823
	Mbala	115%	13,338	15,847	15,354	97%	38,286	37,925	1,729	12,098
	Mporokoso	102%	11,180	12,410	11,454	92%	28,135	28,019	1,326	8,314
	Mpulungu	124%	9,274	12,878	11,505	89%	30,779	30,788	3,056	9,597
	Mungwi	91%	15,504	16,428	14,082	86%	36,811	35,558	1,643	9,988
	Nsama	95%	8,144	8,207	7,765	95%	21,907	21,492	1,414	7,664
	<b>Total</b>	<b>98%</b>	<b>121,602</b>	<b>131,037</b>	<b>118,963</b>	<b>91%</b>	<b>306,581</b>	<b>303,615</b>	<b>16,977</b>	<b>94,403</b>
Luapula	Chembe	97%	5,544	5,713	5,351	94%	14,136	14,164	623	4,549
	Chiengi	121%	27,035	36,336	32,599	90%	85,823	80,878	4,842	27,212
	Chipili	97%	1,556	1,718	1,512	88%	4,128	4,150	215	1,452
	Kawambwa	100%	11,722	12,633	11,710	93%	29,455	29,232	1,258	8,724
	Mansa	108%	24,142	29,631	25,967	88%	64,905	66,151	3,601	18,063
	Milenge	130%	1,933	2,903	2,513	87%	6,430	6,700	303	2,706
	Mwansabombwe	108%	7,634	9,256	8,280	89%	23,218	23,559	1,257	7,696
	Mwense	96%	18,910	20,018	18,145	91%	50,780	50,954	3,168	15,530
	Nchelenge	103%	25,168	30,118	26,027	86%	73,832	71,471	4,140	23,521
	Samfya	101%	30,111	33,706	30,270	90%	78,579	81,096	5,537	25,721
<b>Total</b>	<b>106%</b>	<b>153,755</b>	<b>182,032</b>	<b>162,374</b>	<b>89%</b>	<b>431,286</b>	<b>428,355</b>	<b>24,944</b>	<b>135,174</b>	
<b>Total</b>	<b>103%</b>	<b>542,184</b>	<b>612,929</b>	<b>559,550</b>	<b>92%</b>	<b>1,320,750</b>	<b>1,305,968</b>	<b>69,118</b>	<b>399,367</b>	

## ANNEX 4: TABLE OF TARGETED CATCHMENT AREAS

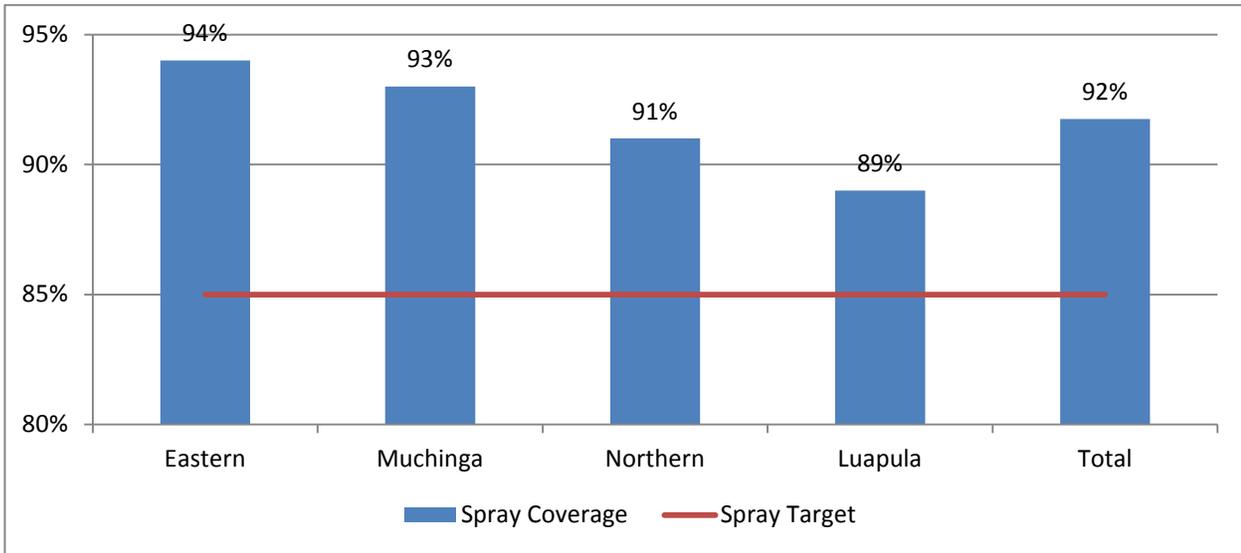
District Name	Number of catchment areas per district	Number of AIRS targeted catchment areas per district	Total number of structures in entire district *reported by district	Number of Eligible structures per district	Number of structures in (AIRS) targeted catchment areas	Total number of structures in none -targeted catchment areas	Number of found structures per district	Number of sprayed structures per district
Eastern	255	135	417,566	371,543	196,578	174,965	223,361	207,348
Chadiza	20	9	21,372	21,023	14,969	6,054	16,042	14,854
Chipata	61	30	165,561	141,664	61,671	79,993	75,041	67,455
Katete	20	14	33,870	33,698	24,253	9,445	24,756	24,057
Lundazi	41	17	65,052	59,130	27,423	31,707	31,909	30,369
Mambwe	15	7	17,764	16,209	7,855	8,354	9,221	8,642
Nyimba	19	11	23,060	21,416	14,152	7,264	13,116	12,832
Petauke	43	28	55,840	46,636	34,023	12,613	40,463	36,918
Sinda	24	10	27,387	25,217	6,889	18,328	7,097	6,846
Vubwi	12	9	7,660	6,550	5,343	1,207	5,716	5,375
Muchinga	96	51	169,613	134,679	70,249	64,430	76,499	70,865
Chama	23	13	26,195	24,135	17,724	6,411	16,778	15,861
Chinsali	9	6	21,890	17,312	11,284	6,028	12,802	12,467
Isoka	10	3	18,065	15,289	5,821	9,468	5,975	5,627
Mafinga	9	3	17,704	17,004	5,903	11,101	8,316	7,544
Mpika	25	13	44,830	33,204	12,407	20,797	14,099	12,248
Nakonde	11	9	26,982	20,191	12,663	7,528	14,096	12,939

Shiwang'andu	9	4	13,947	7,544	4,447	3,097	4,433	4,179
Luapula	144	81	272,944	213,807	153,755	60,052	182,032	162,374
Chembe	5	5	6,089	5,902	5,544	358	5,713	5,351
Chiengi	11	9	34,419	31,535	27,035	4,500	36,336	32,599
Chipili	13	4	4,321	4,060	1,556	2,504	1,718	1,512
Kawambwa	15	10	24,639	17,133	11,722	5,411	12,633	11,710
Mansa	26	13	70,456	52,604	24,142	28,462	29,631	25,967
Milenge	9	4	6,596	4,000	1,933	2,067	2,903	2,513
Mwansabombwe	6	5	11,922	11,400	7,634	3,766	9,256	8,280
Mwense	13	10	25,822	25,530	18,910	6,620	20,018	18,145
Nchelenge	14	11	51,166	28,168	25,168	3,000	30,118	26,027
Samfya	32	10	39,896	37,070	30,111	4,260	33,706	30,270
Northern	144	74	268,856	229,996	121,602	108,394	131,037	118,963
Chilubi	12	8	27,431	23,362	14,147	9,215	13,166	12,593
Kaputa	9	6	18,875	15,210	11,385	3,825	11,575	10,282
Kasama	33	15	61,842	55,359	23,365	31,994	25,850	22,072
Luwingu	10	8	32,607	24,042	15,265	8,777	14,676	13,856
Mbala	31	9	40,389	38,979	13,338	25,641	15,847	15,354
Mporokoso	14	12	19,216	13,180	11,180	2,000	12,410	11,454
Mpulungu	11	4	20,534	17,767	9,274	8,493	12,878	11,505
Mungwi	16	6	35,578	29,967	15,504	14,463	16,428	14,082
Nsama	8	6	12,384	12,130	8,144	3,986	8,207	7,765
Total	639	341	1,128,979	950,025	542,184	407,841	612,929	559,550

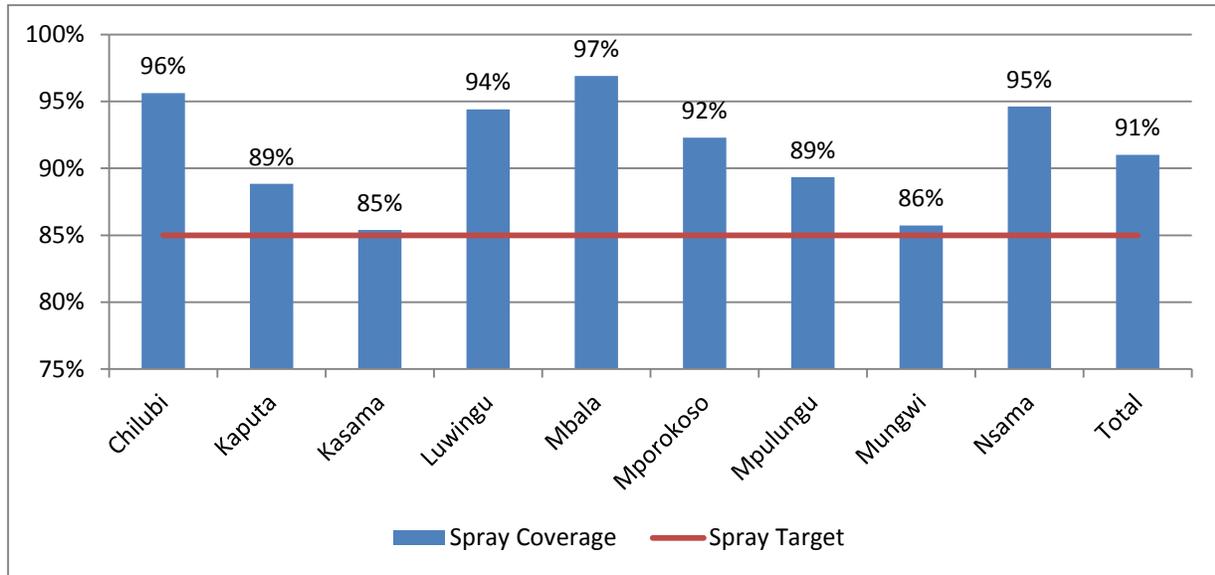
# ANNEX 4: PROVINCIAL SPRAY PROGRESS



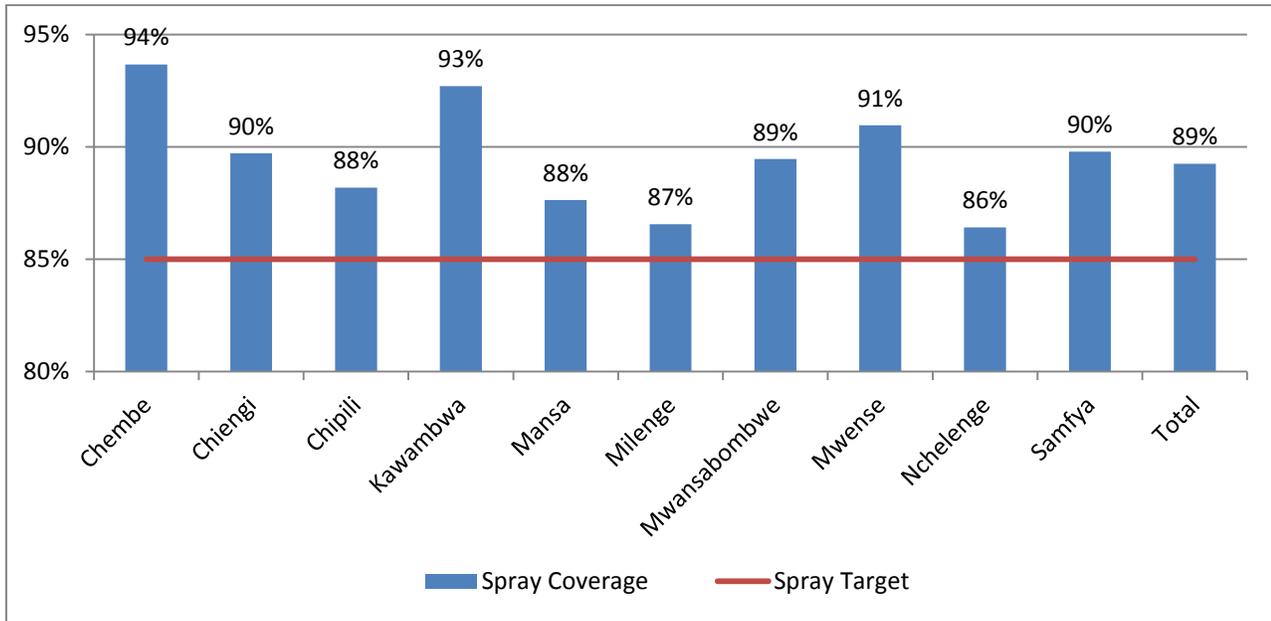
# ANNEX 5: PROVINCIAL SPRAY COVERAGE



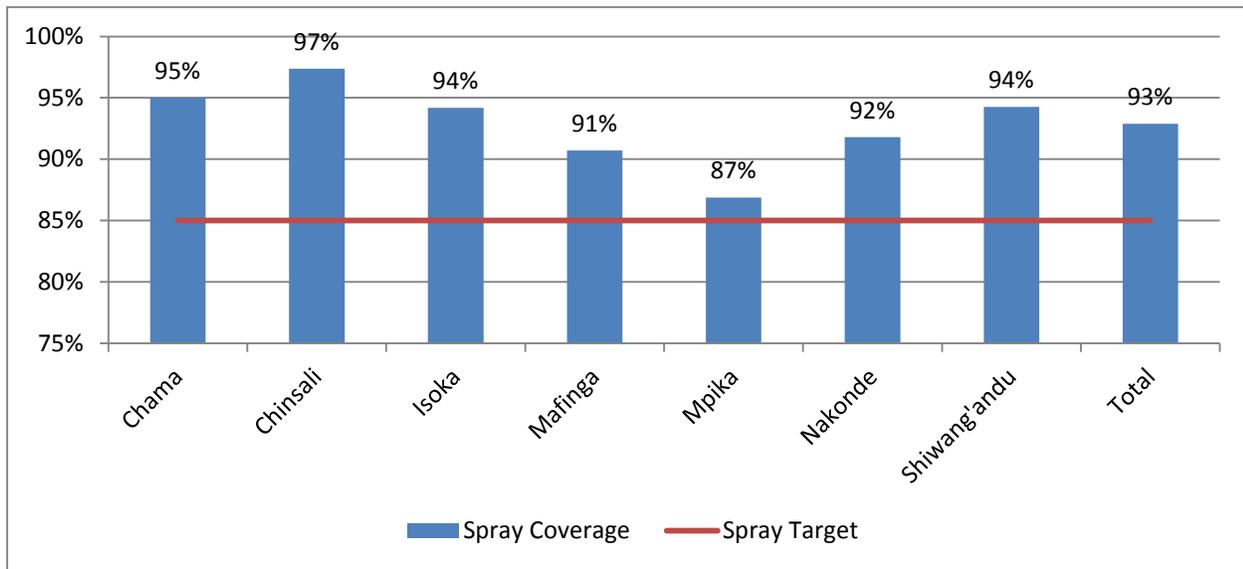
# ANNEX 6: DISTRICT SPRAY COVERAGE, NORTHERN PROVINCE



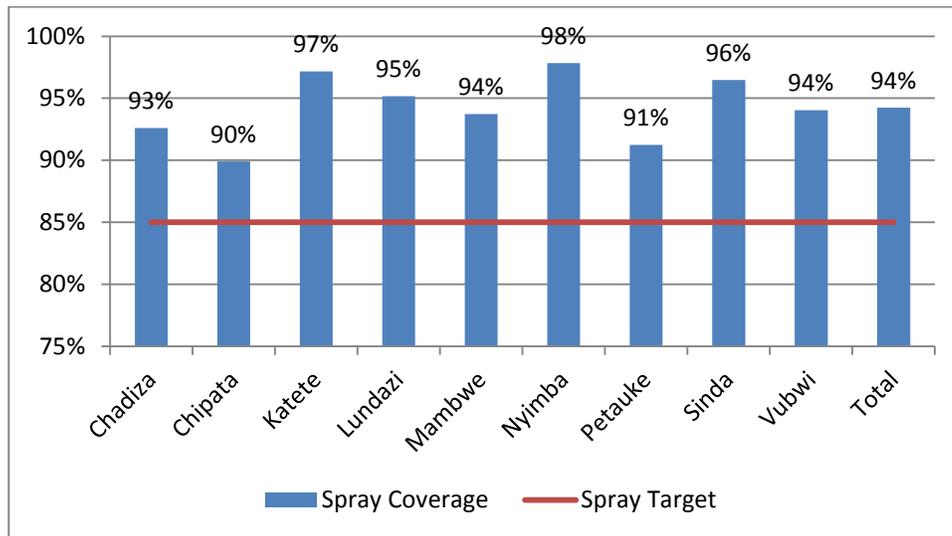
# ANNEX 7: DISTRICT SPRAY COVERAGE, LUAPULA PROVINCE



# ANNEX 8: DISTRICT SPRAY COVERAGE, MUCHINGA PROVINCE



# ANNEX 9: DISTRICT SPRAY COVERAGE, EASTERN PROVINCE



# ANNEX 10: M&E PLAN MATRIX – 2016 CAMPAIGN RESULTS

Performance Indicator	Data Source(s) and Reporting Frequency	Disaggregate	Annual Targets and Results					
			Year 1		Year 2		Year 3	
			Target	Results	Target	Results	Target	Results
<b>Component 1: Establish cost-effective supply chain mechanisms and execute logistical plans</b>								
<b>1.1 Procurement</b>								
1.1.1 Number and percentage of insecticide procurements that had a pre-shipment QA/QC test at least 60 days prior to spray campaign	Data source: Project records – insecticide procurements  Reporting frequency: Each spray campaign	By Spray Campaign	1; 100%	1: 100%	1; 100%	1: 100%	TBD; 100%	
1.1.2 Number and percentage of international insecticide procurements delivered in country, at port of entry, at least 30 days prior to the start of spray operations	Data source: Project records – international procurements  Reporting frequency: Each spray campaign	By Spray Campaign	1; 100%	1: 100%	1; 100%	1: 100%	TBD; 100%	
1.1.3 Number and percentage of international equipment procurements, including PPE, delivered in country, at port of entry, at least 30 days prior to start of spray operations	Data source: Project records  Reporting frequency: Each spray campaign	By Spray Campaign	1; 100%	1: 100%	1; 100%	1: 100%	TBD; 100%	

Performance Indicator	Data Source(s) and Reporting Frequency	Disaggregate	Annual Targets and Results					
			Year 1		Year 2		Year 3	
			Target	Results	Target	Results	Target	Results
1.1.4 Number and percentage of local procurements for PPE delivered 14 days before the start of spray operations	Data source: Project records Reporting frequency: Each spray campaign	By Spray Campaign	1;100%	1:100	1; 100%	1: 100%	TBD; 100%	
1.1.5 Successfully completed spray operations without an insecticide stock-out	Data source: Project records Reporting frequency: Each spray campaign	By Spray Campaign	Completed	Completed	Completed	Not Completed , But more chemical was procured.	Completed	
<b>1.2 In-Country Exemption and Custom Clearance Process</b>								
1.2.1 Complete exemption and clearance process within the minimum 2 weeks	Data source: Project records Reporting frequency: Each spray campaign	By Spray Campaign	Completed	Completed	Completed	Completed	Completed	
<b>1.3 In-Country Logistics, Warehousing, and Training</b>								
1.3.1 Number and percentage of logistics and warehouse managers trained in IRS supply chain management	Data source: Training records Reporting frequency: Each spray campaign	By Spray Campaign By Gender	80; 100%	79 <sup>1</sup> ; 99%	70; 100%	83; 119 <sup>2</sup> %	TBD; 100%	

<sup>1</sup> One logistics and warehouse manager , from Nsama district, could not attend the training because he was unable to travel to the training due to personal reasons

<sup>2</sup> There was an increment in the number of operational sites and therefore there was need to train more logistics and warehouse managers

Performance Indicator	Data Source(s) and Reporting Frequency	Disaggregate	Annual Targets and Results					
			Year 1		Year 2		Year 3	
			Target	Results	Target	Results	Target	Results
1.3.2 Number and percentage of base stores where physical inventories are verified by up-to-date stock records	Data source: Project records Reporting frequency: Each spray campaign	By Spray Campaign	40; 100%	39 <sup>3</sup> ; 98%	35; 100%	51;146 <sup>4</sup> %	TBD; 100%	
1.3.3 Submit up-to-date inventory records 30 days after the end of each spray campaign	Data source: Project records Reporting frequency: Each spray campaign	By Spray Campaign	Completed	Completed	Completed	Completed	TBD; 100%	

**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 PMI AIRS country work plan developed and submitted on time	Data source: Project records Reporting frequency: Annually	By Spray Campaign	Completed	Completed	Completed	Completed	Completed	
2.1.2 Percentage reduction in project operational expenses per structure from the previous year,excluding insecticide costs.	Data source: Project financial records Reporting frequency: Annually	By Spray Campaign	5%	-10% <sup>5</sup>	5%	xxxxx	5%	

**2.2 Support of Safety and Health Best Practices and Compliance with USAID and Host Country Environmental Regulations**

2.2.1 SEA/letter reports	Data source: Project	By Spray	Completed	Completed	Completed	Completed	Completed	
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<sup>3</sup> AIRS did not spray in one district, Lunga, because the district was disqualified based on environmental criteria stipulated in the BMP  
<sup>4</sup> There were some districts that were subdivided and therefore more IRS operational sites were needed to be created  
<sup>5</sup> Operational costs increased by 10% from 2015 to 2016. This was most likely due to inflation.

Performance Indicator	Data Source(s) and Reporting Frequency	Disaggregate	Annual Targets and Results						
			Year 1		Year 2		Year 3		
			Target	Results	Target	Results	Target	Results	
submitted on time based on schedule agreed upon with the-PMI COR team	records – submitted SEAs/ letter reports  Reporting frequency: Each spray campaign	Campaign							
2.2.2 Number of spray personnel trained in environmental compliance and personal safety standards in IRS implementation	Data source: Project records – Training reports  Reporting frequency: Each spray season	By Spray Campaign  By Gender	1,515	1,914	2,073 <sup>6</sup>	2,001 <sup>7</sup> 1,346 Males 655 Females	2001		
2.2.3 Number of health workers receiving insecticide poisoning case management training	Data source: Project records – Training reports  Reporting frequency: Each spray season	By Spray Campaign By Gender	80; men: 60 women: 20	77; men: 61 women:16	70	64 47 Males 17 Females	TBD		
2.2.4 Number of adverse reactions to pesticide exposure documented	Data source: Incident report forms  Reporting frequency: Each spray campaign	By Spray Campaign  By Residential/ occupational exposure	0	0	0	1	0		
2.2.5 Number and percentage of soak pits and storehouses	Data source: Project records – Reports	By Spray Campaign	80 <sup>8</sup> ; 100%	89 <sup>9</sup> ;125%	70; 100%	102, 146%	TBD; 100%		

<sup>6</sup> This includes 1,501 SOPs, 338 TLs, 164 Supervisors and 70 Store keepers

<sup>7</sup> This includes 1,499 SOPs, 272 TLs, 147 Supervisors and 83 Store Keepers

<sup>8</sup> This number includes 40 soak pits and 40 store houses

<sup>9</sup> This number includes 50 soak pits and 39 store houses. There were additional soak pits that were renovated before commencement of the 2015 spray campaign

Performance Indicator	Data Source(s) and Reporting Frequency	Disaggregate	Annual Targets and Results					
			Year 1		Year 2		Year 3	
			Target	Results	Target	Results	Target	Results
inspected and approved prior to spraying	submitted by district environmental officers  Reporting frequency: Each spray season	By Soak Pit  By Storehouse				51 Soak Pits  51 Storehouses		

**2.3 Conduct Communications Activities and Community Mobilization**

2.3.1 Number of radio spots and talk shows aired	Data source: Project records  Reporting frequency: Per spray campaign	By Spray Campaign	113	833 <sup>10</sup>	760 <sup>11</sup>	319	TBD	
2.3.2 Number of IRS print materials disseminated	Data source: Project records  Reporting frequency: Semi-annually	By Spray Campaign  By Type of printed material and message(s)	2,000 <sup>12</sup>	39,000 <sup>13</sup>	37,000 <sup>14</sup>	8,500 <sup>15</sup>	TBD	
2.3.3. Number of people reached with IRS messages via door-to-door mobilization	Data source: Mobilization Data Collection Forms	By Spray Campaign	1,043,397	1,190,422	1,144,790	1,322,580 Male:	TBD	

<sup>10</sup> This number includes 824 radio sports and 9 radio talk shows

<sup>11</sup> This includes 751 radio sports and 9 radio talk shows

<sup>12</sup> 2000 posters

<sup>13</sup> This number includes 30,000 brochures (18,750 PMI, 11250 DFID) and 9,000 posters

<sup>14</sup> This includes 29,000 brochures, 8,000 posters

<sup>15</sup> This includes 6,000 brochures and 2,500 posters

Performance Indicator	Data Source(s) and Reporting Frequency	Disaggregate	Annual Targets and Results					
			Year 1		Year 2		Year 3	
			Target	Results	Target	Results	Target	Results
	Reporting frequency: Daily per mobilization conducted	By Gender				611,762 Female: 710,818		

**2.4 Spray Targeted Structures According to Technical Specifications**

2.4.1 Number of structures targeted for spraying	Data source: Previous spray campaign data, enumeration data (targets); Daily Spray Operator Forms (results)  Reporting frequency: Daily per spray campaign	By Spray Campaign	438,252	549,724	542,184	612,929	TBD	
2.4.2 Number of structures sprayed with IRS	Data source: Daily Spray Operator Forms  Reporting frequency: Daily per spray campaign	By Spray Campaign	549,724	519,598	542,184	559,550	TBD	
2.4.3 Percentage of total structures targeted for spraying that were sprayed with a residual insecticide (Spray Coverage)	Data source: Daily Spray Operator Forms  Reporting frequency: Daily per spray campaign	By Spray Campaign	85%	95%	85%	91%	85%	

Performance Indicator	Data Source(s) and Reporting Frequency	Disaggregate	Annual Targets and Results					
			Year 1		Year 2		Year 3	
			Target	Results	Target	Results	Target	Results
2.4.4 Number of people residing in structures sprayed (Number of people protected by IRS)	Data source: Daily Spray Operator Forms  Reporting frequency: Daily per spray campaign	By Spray Campaign  By Gender  By pregnant women  By children <5 years old	2,689,782	2,544,290 <sup>16</sup>	2,475,741 <sup>17</sup>	2,626,718 <sup>18</sup> Male;1,320,750 Female; 1,305,968, Preg WOM; 69,118, Child < 5; 399,367	TBD	
<b>Component 3: Ongoing Monitoring and Evaluation and Quality Control Measures</b>								
3.1 Submit AIRS Zambia M&E Plan to PMI for approval	Data source: Project records  Reporting frequency: Semi-annual	By Spray Campaign	Completed	Completed	Completed	Completed	Completed	
3.2 Conduct a post-spray data quality audit within 60 days of completion of spray operations	Data source: Spray operations reports  Reporting frequency: Per spray campaign	By Spray Campaign	NA	NA	Completed	Completed	Completed or N.A.	
<b>Component 4: Contribute to Global and Country-Level IRS Policy Setting and Develop and Disseminate Experiences and Best Practices</b>								
4.1 Number of guidelines/checklists/tools related to IRS operations	Data source: Project records – Activity reports	By Spray Campaign	3	3	3	3 <sup>19</sup>	TBD	

<sup>16</sup> This number includes 1,268,242 males and 1,276,048 females of which 67,107 are pregnant women and 392,903 are children

<sup>17</sup> This figure includes 1,233,648 men, 1,242,093 women of which 65,585 pregnant women and 382,630 children under 5 years

<sup>18</sup> This figure includes 1,233,648 men, 1,242,093 women of which 65,585 pregnant women and 382,630 children under 5 years

<sup>19</sup> mSpray protocol was developed in collaboration with Akros while Performance Tracker (PT) and Supervisory checklist were refined

Performance Indicator	Data Source(s) and Reporting Frequency	Disaggregate	Annual Targets and Results					
			Year 1		Year 2		Year 3	
			Target	Results	Target	Results	Target	Results
developed or refined with project support	Reporting frequency: Semi-annually	By guideline/checklist/tool						
4.2 Number of articles/best practices documents published	Data source: Project records – Activity reports Reporting frequency: Semi-annually	By Spray Campaign By IRS Technical Area	2	0	2	1 <sup>20</sup>	TBD	
4.3 Number of best practice presentations given at national/ regional/international workshops and conferences	Data source: Project records – Activity reports Reporting frequency: Semi-annually	By Spray Campaign By IRS Technical Area	5	0	2	4	TBD	
4.4 Number of enterprises engaged through public-private partnerships	Data source: Project records – Activity reports Reporting frequency: Semi-annually	By Spray Campaign	2	0	2	3	TBD	

**Component 5: Contribute to the collection and analysis of routine entomological and epidemiological data**

**5.1 Support entomological monitoring activities and insecticide resistance strategies**

5.1.1 Number of entomological sentinel sites supported by the PMI AIRS Project established to monitor	Data source: Entomological reports Reporting frequency:	By Spray Campaign	6	6	6	6	TBD	
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<sup>20</sup> One online video on the benefits of women working on IRS in Zambia

Performance Indicator	Data Source(s) and Reporting Frequency	Disaggregate	Annual Targets and Results						
			Year 1		Year 2		Year 3		
			Target	Results	Target	Results	Target	Results	
vector bionomics and behavior (vector species, distribution, seasonality, feeding time, and location )	Annually								
5.1.2 Number and percentage of entomological monitoring sentinel sites measuring all the five primary PMI entomological monitoring indicators	Data source: Entomological reports  Reporting frequency: Annually	By Spray Campaign	6;100%	0;0%	6; 100%	6; 100%	6		
5.1.3 Number and percentage of entomological monitoring sites measuring at least one secondary PMI indicator	Data source: Entomological reports  Reporting frequency: Annually	By Spray Campaign	6;100%	6;100%	6	6; 100%	6		
5.1.4 Number and percentage of insecticide resistance testing sites that tested at least one insecticide from each of the four classes of insecticides recommended for malaria vector control	Data source: Entomological reports  Reporting frequency: Annually	By Spray Campaign  By Insecticide class	6;100%	6;100%	26	10; 39%	TBD		
5.1.5 Number of wall bioassays conducted within 2 weeks of spraying to evaluate the quality of IRS	Data source: Entomological reports  Reporting frequency: Per spray campaign	By Spray Campaign	36	39	48	90	TBD		

Performance Indicator	Data Source(s) and Reporting Frequency	Disaggregate	Annual Targets and Results					
			Year 1		Year 2		Year 3	
			Target	Results	Target	Results	Target	Results
5.1.6 Number of wall bioassays conducted after the completion of spraying at monthly intervals to evaluate insecticide decay	Data source: Entomological reports Reporting frequency: Per spray campaign	By Spray Campaign	252	248	384	540	TBD	
5.1.7 Number of vector susceptibility tests for different insecticides conducted in selected sentinel sites	Data source: Entomological reports Reporting frequency: Per spray campaign	By Spray Campaign	72	176	48	48	TBD	
<b>5.2 Support Epidemiological Malaria Data Collection and Analysis</b>								
5.2.1 Collect routine epidemiological data	Data source: <i>Project Reports</i> Reporting Frequency: Annually	By Spray Campaign	NA	NA	NA	NA	TBD	
5.2.2 Number of targeted health facilities with routine epidemiological malaria data collection supported by the PMI AIRS Project	Data source: Epidemiological reports Reporting frequency: Annually	By Spray Campaign	NA	NA	NA	NA	TBD	
<b>Component 6 (Cross-cutting): Capacity Building, Knowledge Transfer, Gender Inclusion</b>								
<b>6.1 Increasing the Role of Women and Addressing Gender Barriers</b>								
6.1.1 Number of people	Data source: Project	By Spray	1,435; 40%	1,912 <sup>21</sup> ;	2,073 <sup>22</sup>	1,982 <sup>23</sup> ;	TBD	

<sup>21</sup> This includes 1,653 SOPs/TLs, 182 supervisors, 77 clinicians

Performance Indicator	Data Source(s) and Reporting Frequency	Disaggregate	Annual Targets and Results					
			Year 1		Year 2		Year 3	
			Target	Results	Target	Results	Target	Results
trained to deliver IRS in target districts	records – Training reports  Reporting frequency: Semi-annually	Campaign  By Spray Campaign  By Gender  Percentage of Women Trained	women	men: 1,347 women: 565  30% women		32.6%  Men: 647 Women: 1,335		
6.1.2 Total number of people trained to support IRS in target districts	Data source: Project records – Training reports  Reporting frequency: Semi-annually	By Spray Campaign  By Spray Campaign  By Gender  Percentage of women trained	1,665; 40% women	2,105; men: 1,480 women: 625 30% women	2,264	2,195 <sup>24</sup> Male: 1,485 Female: 710 32%	TBD	
6.1.3 Number and percentage of women recruited (i.e. number/percentage of women on the selection list) for IRS employment	Data source: Project records – Recruitment reports reports  Reporting frequency: Semi-annually	By Country	506;  40% women	511;  31% women	670;  40% women	521;  33% women	TBD	

<sup>22</sup> This includes 70 clinicians, 1,501 SOPs, 338 TLs, 164 Supervisors

<sup>23</sup> This includes 64 clinicians, 1,499 SOPs, 272 TLs, 147 Supervisors

<sup>24</sup> This includes 64 clinicians, 1,499 SOPs, 272 TLs, 147 Supervisors, 83 store keepers, 69 M&E Assistants, 61 DEC; target was not met because districts in central province were dropped because DFID support came to an end

Performance Indicator	Data Source(s) and Reporting Frequency	Disaggregate	Annual Targets and Results					
			Year 1		Year 2		Year 3	
			Target	Results	Target	Results	Target	Results
6.1.4 Number of people trained as IRS Training of Trainers	Data source: Project records – Training reports  Reporting frequency: Semi-annually	By Spray Campaign  By Gender  Percentage of women trained	118; 40% women	182; men: 144 women: 38 21% women	199 <sup>25</sup>	147 <sup>26</sup> ; Men: 128 Women: 19, 12.9% women	TBD	
6.1.5 Total number of people hired to support IRS in target districts	Data source: Project records – Contracts signed  Reporting frequency: Semi-annually	By Spray Campaign  By Gender  Percentage of women hired	1,266; 40%	1,709; men: 1199 women: 510 30%	1,675	1,570 <sup>27</sup> Male: 1,049 Female: 521 33%	TBD	
6.1.6 Number of women hired in supervisory roles in target districts (this number includes site supervisors, team leaders,	Data source: Project records – Contracts signed  Reporting frequency:	By Spray Campaign  Percentage	121 <sup>28</sup>	78 <sup>29</sup>	138 <sup>30</sup>	108 <sup>31</sup> Team Leaders: 95, M&E	TBD	

<sup>25</sup> This includes 164 supervisors and 35 IRS Managers

<sup>26</sup> Target was not met because districts in central province were dropped because DFID support came to an end

<sup>27</sup> This includes 1,365 SOPs, 92 Team Leader Assistants, 62 M&E Assistants, 51 DEC's. AIRS do not hire but do work with clinicians and store managers from MoH, 1,005 men, 670 (40%) women

<sup>28</sup> This number includes 105 Team Leaders and 16 M&E Assistants. In Zambia we do not hire but do engage supervisors who are MOH staff

<sup>29</sup> This number includes 67 Team Leaders and 11 M&E Assistants

<sup>30</sup> This includes 118 TL and 20 M&E Assistants

<sup>31</sup> This includes 95 Team Leaders and 13 M&E Assistants

Performance Indicator	Data Source(s) and Reporting Frequency	Disaggregate	Annual Targets and Results					
			Year 1		Year 2		Year 3	
			Target	Results	Target	Results	Target	Results
M&E assistants and others who supervise seasonal staff)	Semi-annually	of women hired  By role				Assistants: 13		
6.1.7 Number of staff (permanent and seasonal) who have completed gender awareness training	Data source: Project records – Training reports  Reporting frequency: Semi-annually	By Spray Campaign  By Gender  Percentage of women	1,544	1,983 <sup>32</sup>  men: 1,380 women:603 30% women	2,037 <sup>33</sup>	1,948 <sup>34</sup> Men: 1,309 women:639 33% women	TBD	
<b>6.2 Capacity Building</b>								
6.2.1 Number of government officials trained in IRS oversight	Data source: Project records – Training reports  Reporting frequency: Semi-annually	By Spray Campaign  By Gender  Percentage of Women	118: men: 71 women: 47 40% women	62: men: 55 women:7 11% women	199; Men; 119 Women; 80, 40% women	147; Men; 128, Women; 19 12.9% women	TBD	
6.2.2 Implement all activities outlined in their yearly Capacity Building Action Plan	Data source: Project records – Capacity Assessment reports  Reporting frequency: Semi-annually	By Spray Campaign	Completed	Completed	Completed	Complete	Completed	
6.2.3 Zambia government	Data source: Project	By Spray	Completed	Completed	Completed	Completed	Completed	

<sup>32</sup> This number includes the following: 1,653 SOPs, 182 Supervisors, 114 Data Capture Personnel, 19 DCs and 15 AIRS Technical Staff

<sup>33</sup> This includes 1,501 SOPs, 338 TLs, 164 Supervisors, 15 Technical staff, 19 DCs; 1,222 men, 815 (40%) women

<sup>34</sup> This includes 1,499 SOPs, 272 Team Leaders, 147 Supervisors, 12 Technical staff, 18 DCs; 1309 men, 639 (33%) women

Performance Indicator	Data Source(s) and Reporting Frequency	Disaggregate	Annual Targets and Results					
			Year 1		Year 2		Year 3	
			Target	Results	Target	Results	Target	Results
implements at least one aspect of the IRS program independently.	records – MOUs Reporting frequency: Semi-annually	Campaign						

# ANNEX II: ENVIRONMENTAL MITIGATION AND MONITORING REPORT

Mitigation Measure	Status of Mitigation Measures	Outstanding issues relating to required conditions	Remarks
Ia. Pre-contract inspection and certification of vehicles used for pesticide or spray team transport.	Pre-contract inspection and certification of vehicles was conducted between September 11 and October 14, 2016. In total 115 vehicles were inspected but only 79 vehicles were hired	Some of the trucks presented for inspection were not retrofitted with benches and railings, whereas others did not carry comprehensive insurance but had a third part insurance coverage. Other vehicles were not roadworthy.	After the inspections, all the trucks hired were retrofitted with benches and hand rails. The insurance coverage was also upgraded to comprehensive coverage. Vehicles that were not roadworthy were not hired.
Ib. Driver training	A total of 110 drivers were trained during driver trainings which were conducted between September 11, and October 14 in, Chipata, Mansa and Kasama. In 17 instances of the 517 transportation vehicle inspections, drivers were reported to have not attended training. However these were instances where the transport vendor decided to substitute a driver without notifying the ECO for a one-to-one orientation and issues a certificate	Transport vendors changing drivers without notifying the ECO or DCs.	The drivers that joined in the middle of the IRS campaign were given a one-on-one orientation with regard to the occupational health, safety and environments safe guards when dealing with Actellic 300CS and transporting spray operators on the first day they reported for work by the AIRS personnel present though it was still needed to be reported that they did not attend the official drivers training.
Ic. Cell phone, personal protective equipment (PPE) and spill kits on board during pesticide transportation.	All drivers were in possession of a cell phone as a pre-requisite for hiring and were each assigned adequate PPE after being trained. Each vehicle was assigned a first aid box supplied by AIRS	Drivers did not have cell phones. Some vehicles were missing spill kit items.	All drivers were provided with PPE before the onset of the spray campaign and the 38 instances when it was reported that drivers had no PPE was because the monitors expected to find

	whereas spill management kits were provided by the transport vendors. In order to ensure that the required conditions were adhered to, a total of 517 morning mobilization inspections were conducted. In 38 instances, the vehicle was reported not to have all the items that make up a spill kit and the driver was without the required PPE in 23 instances.		drivers donned in full PPE even if they were not handling chemicals. However, this was discussed and information was disseminated to say drivers do not need to be in full PPE except coveralls and that other PPEs must be available for use when about to handle pesticides or conduct decontamination.
Id. Initial and 30-day pregnancy testing for female candidates for jobs with potential pesticide contact.	Initial pregnancy tests were conducted before hiring spray operators, washers and store assistants between September 1 and 26, 2016. A second round of pregnancy tests were conducted only for the districts that had a spray calendar of over 30 days.		
Ie. Health fitness testing for all operators	All the SOPs hired were subjected to medical examinations prior to their engagement. Examination conducted included physical examinations, Hb, and blood pressure tests.		
If. Procurement of, distribution to, and training on the use of PPE for all workers with potential pesticide contact.	Both International and local procurements were carried out successfully prior to all trainings. The use of PPE was successfully demonstrated during TOTs, Cascade and Store keeper trainings prior to the commencement of the spray campaign.		
Ig. Training on mixing pesticides and the proper use and maintenance of spray pumps.	The correct mixing procedure for pesticides, including triple rinse of the bottles, was included in all trainings. A total of 147 Supervisors were trained during TOTs whereas 272 Team Leaders were trained during cascade training as pump mechanics for the maintenance of the pumps		

<p>1h. Provision of adequate facilities and supplies for end-of-day cleanup.</p>	<p>All the 51 IRS operations sites were on health center grounds and a total of 8 new IRS operations sites with facilities such store room and soak pits were established whereas 7 old storage facilities were rehabilitated. The ten (10) fixed soak pits that were in bad condition during PSECA were renovated. In addition, 45 MSP and with 135 20-liter buckets for use as rinse barrels were provided prior to the commencement of the campaign. In overseeing the program adherence to the BMP guidelines, a total of 462 end of day cleanup inspections on both fixed and mobile soak pits were conducted by both AIRS Staff and MOH supervisors. However, in only on one (1) instance out of the 379 reports submitted on fixed soak pit, it was reported that the operations site had no wash facilities with soap and water available for operators.</p>	<p>Erratic water system</p> <p>In some districts washers covered more than 30m in order to draw water from the well for the end of day clean ups, especially at the camping site.</p>	<p>All the IRS operational bases had wash facilities with adequate water, Soap, buckets and privacy. The camping sites also had temporary wash facilities which were certified prior to the commencement of the spray campaign. Some districts however experienced erratic water supply and as such, washers were advised to draw and reserve water for use during end of day clean up before SOPs return from the field. In districts where a borehole or well was far from the operations site, there was the need for porters in the program to draw water for the end of day cleanup.</p>
<p>1i. Enforce clean-up procedures.</p>	<p>The clean-up procedures for the pumps was done in designated wash areas and supervised by the ECO, IRS managers, DCs and other AIRS staff present. In total 462 inspections were conducted by the aforementioned staff. The number of non-compliant issues reported for the 51 fixed operations and 10 camping sites inspected were 45 with one issue to do with Team leaders not supervising cleaning and wash ups which was reported on 4 instances</p>	<p>Team Leaders not supervising cleaning and wash ups.</p>	<p>In the initial stages of IRS operations, Team Leaders did not take time to supervise the end of day cleanup activities. This was addressed by the AIRS staff that had spread out in all the 35 districts. As a result the end of day cleanup supervisions gained momentum as the campaign progressed.</p>
<p>2a. IEC campaigns to inform homeowners of responsibilities and precautions.</p>	<p>Four thousand nine hundred and seventy seven (4,977) community mobilizers were trained to conduct door to door community sensitization</p>	<p>In some districts community mobilization was not properly done and led to high rate of refusals, inadequate house preparation and failure to follow</p>	<p>There is a need to commence community sensitization regarding IRS in good time, say, 4 weeks before the commencement of the campaign, so</p>

	<p>on IRS with the primary focus regarding informing homeowners on what to do before, during and after administering IRS.</p> <p>All the districts conducted radio programs to champion IEC campaigns and in some districts IEC was enhanced by using drama groups</p>	<p>post spray EC protocols by homeowners.</p>	<p>that feedback or mobilization report can be presented prior to launching the campaign. The report will be resourceful in determining whether or not the mobilization was properly done. In cases where the report shows that the mobilization was not properly done, there should be need to delay the campaign and redo the mobilization until it is successfully done. This is because lack of proper mobilization may be a recipe for poor spray coverage and increased non-compliance.</p>
<p>2b. Prohibition of spraying houses that are not properly prepared.</p>	<p>SOPs were advised not to administer IRS in structures that were not properly prepared, and in order to strengthen this requirement, a total of 970 Homeowner preparations and spray operator performance inspections were conducted by both MOH and AIRS staff. In the initial stages of the campaign, in 21 instances, some structures were reported to have been sprayed without being properly prepared.</p>	<p>Inadequate house preparation</p>	<p>The structures that were found to have been sprayed without been adequately prepared were re-sprayed during mop up after having removed all the household goods that needed to be removed.</p>
<p>2c. Two-hour exclusion from house after spraying</p>	<p>In most of the districts, SOPs informed the homeowners to keep the windows and doors of the sprayed structure closed for two hours, after which doors and windows were opened to allow circulation of air for at least 30 minutes before cleaning. The ECO, DCs and Supervisors played a pivotal role in championing this requirement and as such, from a total of 970 inspections conducted, only in 3 instances was a structure reported to have been sprayed without informing</p>		<p>All the homeowners were informed of the post spray instructions and the three instances reported could be attributed to those instances when household owners decided to leave home for other activities before the 2-hours had elapsed and left instructions with children who could not memorize everything.</p>

	homeowners of the 2-hour exclusion requirement.		
2d. Instruct homeowners to wash itchy skin and go to health clinic if symptoms do not subside.	Homeowners were instructed to wash their skin with plenty of water and soap if they experienced itching or visit the nearest clinic if itching persisted.. In 28 instances out of the 970 inspections conducted, a structure was reported to have been sprayed without informing residents of post spray instructions.	Failure by homeowners to recall the post spray protocols/ instruction given to them by SOPs .	Most of the SOPs left information with homeowners but it was observed that homeowners could at times forget the post spray instructions which were left with them. However, these instructions were consistently repeated by the MOH and AIRS employees deployed for monitoring and supervision.
3a. Indoor spraying only.	The ECO, DCs, TLs and supervisors worked so hard in ensuring that all spray-able surfaces were sprayed including the wall, ceiling, and the eaves of all sleeping spaces. In 5 instances out of the 970 inspections conducted, it was reported that SOPs were spraying wrong surfaces such as floors, metal roof, the outside of door, glass etc.		The 5 instances of non-compliance with regard to this requirement occurred in the first few days of IRS operations before SOPs had gained momentum. All the outstanding issues were later addressed, and as the campaign progressed, corrective measures were put in place to prevent such errors.
3b. Training on proper spray technique	TLs and SOPs underwent a rigorous training on the proper spray techniques during cascade trainings that were held between September 5 and 23, 2016 in Luapula, Muchinga and Northern provinces. For the Eastern province, the training was conducted between September 26, and October 17, 2016. Out of the 970 inspections conducted, there were only 19 instances where a spray operator was reported to be non-compliant.		During the early stages of spraying, SOPs who were new in the program were not consistent with the spray techniques but this was controlled as the program progressed (as indicated by the lower number of non-compliant issues reported later).
3c. Maintenance of pumps	Spray Pumps were serviced on daily basis by the TLs and supervisors prior to the deployment of SOPs. Out of 970 inspections conducted, in 48 instances pumps were reported to be leaking while in the field. However, TLs and		

	supervisors were always in the field to attend to such incidences and repair the defective pumps so that SOPs could resume work in no time.		
4a. Choose sites for disposal of liquid wastes, including Mobile Soak pit sites according to PMI BMPs.	Selecting the soak pit sites for liquid waste disposal was jointly done by the ECO, ZEMA, and MOH district representative and was supervised by the COP in accordance with the PMI BMP. In total 51 fixed soak pit and 45 MSPs that were properly sited were in use during the 2016 IRS campaign. From the 83 inspections conducted at MSP sites, there were no reports of badly selected MSP sites. Also, from the PSECA conducted, there were no reports of badly selected permanent soak pits.		All the sites selected for both FSP and MSP were suitable for the disposal of liquid waste.
4b. Construct fixed and Mobile Soak pits with charcoal to adsorb pesticide from rinse water.	Twelve (12) new soak pits were constructed as per design demonstrated in the BMP. The construction was supervised by the ECO, DCs, and MOH district representative before approval by ZEMA. 45 MSPs filled with granulated activate charcoal (GAC) were constructed and installed in 8 districts where camping of SOPs was needed in order to reduce the distance between the operations site and spray sites		The use of MSPs was welcome, as it reduced the cost and non-compliance issues associated with travelling long distances between the fixed IRS operations site and the spray sites.  The end of day cleanup was expedited as only 5 SOPs needed to use one mobile soak pit which quickened the progressive rinsing process without congestion at the tarpaulin.
4c. Maintain soak pits as necessary during season.	The soak pits were well maintained such that, of the 379 and 83 reports submitted on FSP and MSP respectively, there were no reports of the contaminated water failing to drain properly into the soak pits.		

<p>4d. Inspection and certification of solid waste disposal sites before spray campaign.</p>	<p>Solid waste disposal sites were inspected by the ECO, Chief Environmental Health Officer and the AIRS Operations Manager before the commencement of the campaign.</p>	<p>Mismanagement of solid waste disposal sites in provincial capitals.</p>	<p>Most of the dumpsites in Zambia are not properly managed and thus there's a lot of scavenging that happens around. As such, uncontaminated waste, such as old overalls, bags, and used mutton clothes will be given to deserving SOPs after thorough washing with soap, whereas worn out helmets, face shields and gloves after being thoroughly washed with soap will be shredded and buried at the national dumpsite.</p> <p>All empty bottles in boxes will be collected from the districts and taken to a central facility (Lusaka Cleansing Depot) awaiting thorough cleaning with soap and water; removal of labels and seals; and compression and bailing prior to shipment to the Republic of South Africa (RSA) for recycling. This is necessary since there are no companies in Zambia that can recycle these materials. Contaminated boxes, as well as nose masks, will be incinerated at the University Teaching Hospital incinerators whereas uncontaminated boxes will be supplied to Zambezi Paper Mills as raw material in paper production</p>
<p>4e. Monitoring waste storage and management during campaign.</p>	<p>All the IRS solid waste generated were segregated in different categories as paper, plastic, rubber, cloth, etc. and were stored in labeled refuse bags. However, from the 203 storekeeper performance inspections conducted, only in 5 instances where the containers for empty sachets and used masks reported not to be available and</p>	<p>Failure by storekeepers to count and store the used sachets in labeled container.</p>	<p>Recording and labelling of IRS solid waste was the responsibility of storekeepers and like earlier stated most of the storekeepers were new in the program and only focused on monitoring and recording the movement of pesticides and paid little attention to recording IRS waste. However, when this was noted via</p>

	labeled. Whereas in 2 instances the used sachets were not counted and stored in labeled containers.		smart phone reports, storekeepers were re-oriented by the ECO and DCs on the best practices regarding the handling of IRS waste. Thereafter, the waste was counted , weighed and stored in labeled containers
4f. Monitoring disposal procedures post-campaign.	The ECO will monitor the post spray campaign solid waste disposal procedure. Collection of the 2016 IRS waste from the districts to the central facility (Lusaka cleansing depot) for disposal at the national dumpsite has been completed. The incineration of pesticide-contaminated wastes such as used nose masks will be conducted at UTH by February 2017.	Recycling of empty pesticide containers	Zambia has no recycling companies to perform the recycling of empty bottles. Therefore, all the empty bottles from the districts will be delivered to the Lusaka Cleansing Depot for thorough cleaning, removal of labels and seals as well as compressing and baling prior to shipping to South Africa for recycling
5a. Maintain records of all pesticide receipts, issuance, and return of empty sachets/bottles.	Records of all pesticides receipts from central stores, issuances and returns of empties were kept on the stock cards with backups in ledger books at central and district stores, as well as the sub-districts stores. Of the 203 storekeeper performance inspections conducted, there was 1 instance where the sum of the stock balance on the stock card + the stock issued out for the day + the stock balance of empty sachets/bottles did not equal to the opening balance in the ledger		A non-compliant issue on this requirement occurred during the early stages of IRS operations. This was rectified by conducting a physical count of all the stocks until reconciliation between empty bottles and full stocks was achieved. What could have attributed to this anomaly was the fact that most of the stores officer were new in the program and made mistakes with regard to the entries on the stock control cards.
5b. Reconciliation of number of houses sprayed vs. number of sachets/bottles used.	Based on the total number of pesticides used against total number of structures sprayed, the average structures sprayed per bottle of insecticide was 4.0. This therefore means that, the standard average of 3.64 structures to be sprayed per bottle of insecticide was exceeded by 0.36.		Exceeding the targeted average structures to be sprayed per bottle of insecticides could be attributed to the fact that IRS in Zambia is administered in rural areas with some catchment areas having very small structures.

<p>5c. Visual examination of houses sprayed to confirm pesticide application.</p>	<p>Visual examination of houses sprayed was conducted by observing the traces of the sprayed chemical of the walls, ceilings, and eaves during home owner preparation and spray operator performance inspections as well as during the data collection verification exercise by supervisors, DCs, M&amp;E assistants and any other AIRS staff.</p>		
<p>5d. Perform physical inventory counts during the spray season.</p>	<p>ECO, DCs and Logistics Coordinator conducted physical inventory counts during and after the spray season with the storekeeper performance inspection checklist. A total of 203 inspections were conducted throughout the campaign and only in 2 instances didn't the balance on stock cards equal results of physical stock. However, after the physical count all the records balanced.</p>		<p>Most of the storekeepers were new to the program therefore, it was difficult for them during the first few days to use stock control cards and daily insecticide usage registers, which resulted in so errors with entries on the stock cards. However, when the physical count was conducted, it was observed that the chemical used was equal to the empty bottles that were found.</p> <p>The storekeepers were therefore retrained on recording stock entries for all IRS commodities, especially chemicals.</p>