



PRESIDENT'S MALARIA INITIATIVE



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Indoor Residual Spraying (IRS 2) Task Order Six

TANZANIA
END OF SPRAY REPORT

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ACRONYMS

AIRS	Africa Indoor Residual Spraying
BCC	Behavior change communication
BMP	Best management practices
CBIRS	Community-based IRS
CDC	Centers for Disease Control and Prevention
CFV	Control flow valve
CHW	Community health worker
COP	Chief of Party
DCV	Data collection verification
DEV	Data entry verification
DHIS2	District Health Information System 2
DHO	District Health Officer
DIECO	District IEC Officer
DITT	District IRS Technical Team
DMFP	District malaria focal person
DVCO	District Vector Control Officer
ECO	Environmental Compliance Officer
EE	Error Eliminator
GGM	Geita Gold Mine
HDPE	High density polyethylene
HLC	Human landing catch
IEC	Information, education and communication
IRS	Indoor Residual Spraying
MCN	Malaria case notification
MEEDS	Malaria Early Epidemic Detection System
M&E	Monitoring and evaluation
MOH	Ministry of Health, Community Development, Gender, Elderly and Children
MOP	Malaria Operational Plan
NEMC	National Environmental Management Council

NIMR	National Institute for Medical Research
NMCP	National Malaria Control Programme
PERSUAP	Pesticide Evaluation Report and Safer Use Action Plan
PMI	President’s Malaria Initiative
PMT	Performance Monitoring Tracker
PPE	Personal protective equipment
PSC	Pyrethrum spray catch
Q&A	Questions and answers
RMO	Regional Medical Officer
SEA	Supplemental Environmental Assessment
SOP	Spray operator
TL	Team Leader
ToT	Training of trainers
TPRI	Tropical Pesticides Research Institute
URT	United Republic of Tanzania
USAID	United States Agency for International Development
USG	United States Government
WG	Wettable granules
WHO	World Health Organization
WP	Wettable powder
ZAMEP	Zanzibar Malaria Elimination Programme
ZEMA	Zanzibar Environmental Management Agency

EXECUTIVE SUMMARY

Abt Associates supports the implementation of indoor residual spraying (IRS) in mainland Tanzania and Zanzibar through the President's Malaria Initiative Africa Indoor Residual Spraying (PMI AIRS) project, which is funded by the United States Agency for International Development (USAID). The objective of the Project is to contribute to PMI's goal to halve the burden of malaria in 70 percent of at-risk populations in sub-Saharan Africa. The PMI goal fits well into the National Malaria Control Programme (NMCP) mission for the period 2014 – 2020, which aims to ensure that Tanzanians have access to quality, effective, safe, and affordable malaria interventions through timely and sustainable collaborative efforts with partners and stakeholders at all levels.

To achieve this, the AIRS Tanzania Project conducted IRS for the first time in Tanzania from February to April 2016, with a target of spraying 453,406 structures in mainland Tanzania and 29,528 in Zanzibar. The operation covered eight districts on the mainland: Bukoba Rural, Missenyi and Ngara (in Kagera), Sengerema and Kwimba (in Mwanza), Musoma rural and Butiama (in Mara), and Chato (in Geita). In addition, the Project covered seven districts in Zanzibar: Central, North A, North B, South, and West (on Unguja island) and Chakechake and Micheweni (on Pemba island). The Project sprayed the organophosphate insecticide, pirimiphos methyl (Actellic 300CS) in this campaign.

The AIRS Tanzania project is partnering with Geita Gold Mine (GGM) and Geita Town Council (GTC) through a public private partnership (PPP) to implement IRS in Geita town in early June, covering 20,000 structures. PMI will provide the insecticide and technical support while GGM will provide financial resources to cover implementation costs. Geita Town Council will provide the operations sites and co-supervise the campaign. AIRS Tanzania will submit an EOSR addendum to report on the Geita spray campaign upon completion of the campaign.

The following are project achievements and key highlights of the February – April 2016 spray campaign (see Table 1), which lasted 51 operational days:

- The Project exceeded its target of spraying 482,934 structures in Tanzania and Zanzibar. Overall, the Project sprayed 515,217 structures out of 543,865 structures that spray operators found in the targeted districts in mainland and Zanzibar, accounting for a coverage rate of 94.7%. The Project protected 2,042,561 residents, including 400,314 children under five years of age and 61,822 pregnant women.
- In Zanzibar, the Project sprayed 27,664 structures out of 30,095 structures that spray operators found in the targeted districts, accounting for a coverage rate of 91.9%. The Project protected 130,170 residents, including 21,623 children under five and 3,253 pregnant women.
- In mainland Tanzania, the Project sprayed 487,553 structures out of 513,770 structures that spray operators found in the targeted districts, accounting for a coverage rate of 94.9%. The Project protected 1,912,391 residents, including 378,691 children under five and 58,569 pregnant women.
- The Project trained 3,297 individuals to deliver IRS in the 15 districts of mainland Tanzania and Zanzibar. Of these, 2,653 were spray operators (SOPs) (1,483 males and 1,170 females), 82 were supervisors (58 males and 24 females), 505 were team leaders (335 males, and 170 females), and 57 were clinicians (33 males and 24 females). Females accounted for 44.10% of SOPs trained to implement IRS. Overall, 36.98% (1,816) of all IRS trained personnel for the February – April 2016 campaigns were female.

- The Project used 175,173 bottles of Actellic 300CS insecticide to spray 515,217 structures in the 15 IRS districts, with a utilization ratio of approximately 2.9 structures sprayed per bottle of insecticide.
- The Project will safely dispose of all IRS insecticide contaminated wastes, including 175,173 empty high density polyethylene (HDPE) bottles and used masks. A National Environment Management Council (NEMC)-certified recycling company will recycle the bottles. The AIRS Tanzania Project incineration plants in Mwanza and Zanzibar will incinerate the masks. The Project will use best management practices to dispose of other wastes, including used gloves, boots, and assorted plastic items (40 damaged barrels and 20 jerry cans).
- Wall bioassays conducted within one week of spraying in February to April 2016 to assess the quality of spraying in the target districts recorded mortalities of susceptible *An. gambiae* Kisumu strain ranging from 90.8% - 100%.

TABLE I: AIRS TANZANIA CAMPAIGN SUMMARY

	Zanzibar	Tanzania Mainland	Total
Number of districts sprayed by PMI-supported IRS in 2016	7 (Chakechake, Micheweni, Central, North A, North B, South, West)	8 (Bukoba Rural, Missenyi, Ngara, Chato, Sengerema, Kwimba, Butiama, Musoma rural)	15
Insecticide	Pirimiphos methyl (Actellic 300CS)	Pirimiphos methyl (Actellic 300CS)	
Number of structures targeted by PMI-supported IRS	29,528	453,406	482,934*
Number of structures found by SOPs	30,095	513,770	543,865*
Number of structures sprayed by PMI-supported IRS	27,664	487,553	515,217*
Spray Coverage	91.9%	94.9%	94.7%
Total population protected by PMI-supported IRS	130,170	1,912,391	2,042,561
• Pregnant women protected	3,253	58,569	61,822
• Children under 5 protected	21,623	378,691	400,314
Dates of PMI-supported IRS campaign	March 01 – 16, 2016	February 03 – 27, 2016 March 09 – April 04, 2016	
Length of Campaign (in days)	14	44	51**
Total number of people trained with USG funds to deliver IRS***	326	2,971	3,297
• Spray Operators	259	2,394	2,653
• Team Leaders	50	455	505
• Supervisors	8	74	82
• Clinicians	9	48	57

Note:

*These numbers do not include the partnership with the Geita Gold Mine which is targeting an additional 20,000 structures

**The last 7 days of the Zanzibar campaign overlapped with the March 9 Mainland campaign.

***This is based on the PMI indicator definition. It includes only spray staff such as spray operators, team leaders, supervisors, and clinicians. It excludes data clerks, mobilizers, drivers, washers, porters, pump technicians, and security guards.

I. COUNTRY BACKGROUND

The United Republic of Tanzania has a total area of 947,480 km², of which 883,349 km² constitute land. The remainder is made up of water bodies. The 2016 population is estimated at 49,981,414. The country has two ministries of health and two programs supporting malaria control on mainland Tanzania and the Islands of Zanzibar. The NMCP is responsible for the mainland, while the Zanzibar Malaria Elimination Programme (ZAMEP) is responsible for Zanzibar malaria control.

Mainland Tanzania

The malaria situation in mainland Tanzania has been changing over time. The latest description in the national malaria strategy proposed for the period 2008-2013 [NMCP, 2008] notes three important transmission strata: a) Unstable, seasonal malaria in more than 20% of the country, largely in the arid central plateau; b) Stable malaria with seasonal variations in the southern parts of the country with a single main rainy season (March-May) or in northern and western Tanzania with bimodal rainfall (November-January and March-May); c) Perennial malaria along the coastal fringes, southern lowlands, and regions bordering Lake Victoria, where malaria transmission is stable with high transmission intensities.

There is increasing evidence that malaria prevalence dropped significantly over the last decade following scaling up of interventions to achieve universal coverage. The latest national representative malaria indicator surveys (THMIS, 2008 and 2012) show that malaria prevalence in children 6–59 months old halved (from 18.1% to 9.5%) between 2008 and 2012. The proportion of Tanzania's population living in areas of intense transmission (PAPfPR₂₋₁₀ ≥ 50%) declined from 11.6% in 2008 to only 2.3% by 2010. While in 2000 only 30% of Tanzania's population lived in areas where transmission is regarded as hypo-endemic (parasitaemia 0 - <10 %), this proportion increased to almost 60% by 2010. However, such dramatic declines in malaria transmission intensity have not occurred everywhere. Areas that have experienced such an epidemiological transition are in the Southern zone and parts of the Northwestern regions of Tanzania.

Zanzibar

Zanzibar is an archipelago, 25-50 kilometers (16-31 miles) off the coast, northeast of the Tanzania mainland. It consists of numerous small islands in the Indian Ocean and two large ones; (Unguja the main, formally referred to as Zanzibar, and Pemba). The islands cover 2,461 square kilometers (950 square miles). Zanzibar currently has an estimated population of 1,303,568.

The two islands of Zanzibar experience differences in annual rainfall, temperature, and humidity. Similarly, there is variation of vegetation from north and south districts and between the western and the eastern coastlines. The distribution and density of the main vector is associated with these ecological differences, potentially resulting in varying natural malaria epidemiological patterns.

From 2011, malaria incidence has been consistently higher in Unguja compared with Pemba. Of late, the highest malaria incidence has been in West and Central districts, which are linked to irrigation schemes and seasonal labor. In Pemba, ZAMEP documented higher incidences of malaria cases in the Chakechake and Micheweni districts.

Throughout implementation of the Malaria Early Epidemic Detection System (MEEDS) and Malaria Case Notification (MCN), the ZAMEP has been identifying *Shenias* that are malaria hotspots with continued malaria transmission. By the end of November 2015, the top 23 hotspots were all from Unguja, with an incidence rate above 12.7 malaria cases/1,000 population (from Jan-Nov, 2015).

In April 2015, PMI contracted with Abt Associates to implement IRS in Tanzania as an addition to the IRS 2 TO 6 portfolio. The 2016 IRS operation currently being reported is the first to be implemented by Abt Associates in the Tanzania mainland and Zanzibar. This project was transitioned from an earlier implementer who conducted IRS in Tanzania from 2007-2015 in Zanzibar and mainland Tanzania.

The Project implemented the February – April 2016 spray campaign in eight districts in mainland Tanzania and seven in Zanzibar. Districts the Project sprayed on the mainland include Bukoba Rural, Missenyi and Ngara (in Kagera), Sengerema and Kwimba (in Mwanza), Musoma rural and Butiama (in Mara), and Chato (in Geita). In Zanzibar, the Project sprayed Central, North A, North B, South, and West (on Unguja island) and Chakechake and Micheweni (on Pemba island). The campaign spray targets were 453,406 structures on the mainland and 29,528 structures on Zanzibar.

The AIRS Tanzania Project set out to provide technical support through the following activities:

- Conduct IRS aimed at achieving coverage of at least 85% of the targeted structures on mainland Tanzania and Zanzibar
- Ensure compliance with environmental regulations and establish best practices in the target districts for IRS insecticide handling and application
- Support training, capacity building, and advocacy at various levels to achieve IRS sustainability. This included building the capacity of government, counterparts, and partners to undertake high-quality IRS
- Work to increase districts', the NMCP's, and the ZAMEP's role in supervising IRS, including training them on the use of a smartphone application for spray supervision
- Provide regular monitoring and evaluation (M&E) for the Project, including a daily mobile-based Performance Monitoring Tracker
- Carry out a logistics assessment in all districts and arrange all procurement, shipping, delivery, and storage of IRS commodities, including spray tanks, spare parts, insecticides, and personal protective equipment (PPE)
- Ensure safe and correct insecticide application to thus minimize 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)
- Coordinate information, education, and communication (IEC) and behavior change communication (BCC) sensitization and mobilization activities with other stakeholders to raise community awareness of IRS and to encourage beneficiary and stakeholder ownership
- Help the National Institute for Medical Research (NIMR) and ZAMEP conduct routine entomological monitoring, including: assessing malaria vector density and species composition in intervention areas; establishing vector feeding time and location; monitoring the quality of insecticide application and insecticide decay rates; and assessing vector susceptibility and mechanisms of resistance
- Train entomology sentinel site technicians in entomological techniques as needed
- Promote cost efficiency through due diligence and efficiency of operations

1.1 ZANZIBAR

1.1.1 SELECTION OF ZANZIBAR INTERVENTION AREAS

The FY 2015 Malaria Operational Plan (MOP) stated that ZAMEP was to use proactive and reactive spraying of “hot spots.” This means that AIRS Tanzania is to spray known hot spots from the previous year and spray areas this year that meet the “hot spot” criteria during the course of the transmission season. The criteria include Shehias reporting at least four or more weekly cases and a 150% increase in weekly cases compared with the average from the previous three weeks.

The Project used a combination of Malaria Early Epidemic Detection System (MEEDS) and Malaria Case Notification (MCN) to generate data on incidence. The Project expresses incidence as cases per 1,000 population and uses that calculation for selection of intervention areas at the Shehia level. The MEEDS provides weekly malaria cases reported by health facilities, while MCN provides a system to notify ZAMEP and health facilities about individual cases, which enables health facilities to follow up under the supervision of ZAMEP. MCN can track cases up to the household level to give a more accurate picture of where the cases originate. The Project ranked incidence data covering the period from January to November 2015 for all Shehias. The Project ceased data collection when the sum of structures reached the target number of 30,000 structures. The Project selected a total of 55 Shehias from two and five districts of Pemba and Unguja, respectively. The selected Shehias therefore, had malaria incidence ≥ 8.2 cases per 1,000 population.

1.1.2 RECENT HISTORY OF IRS IN ZANZIBAR

The recent history of IRS in Zanzibar dates back to 2006, when USAID awarded Research Triangle International (RTI) a cooperative agreement for IRS implementation and related services. RTI conducted IRS in Zanzibar from 2006 - 2015. Pyrethroids were the insecticides of choice from 2006 to 2011. This period constituted six annual blanket coverage rounds, each involving about 200,000 structures and protecting almost 1.2 million people. Starting in 2013, IRS was scaled down in accordance with the PMI FY 2012 MOP, primarily due to the switch from pyrethroids to the more expensive carbamates in 2012 and 2013. PMI and ZAMEP also changed the IRS approach from blanket to targeted/focal spraying in Zanzibar. This new approach led to a significant reduction in the number of sprayed structures to 51,904 from the 200,000 structures targeted in previous years. In the 2014 and 2015 spray periods, the number of structures sprayed was around 62,000 as per MOP guidelines. The Project used the organophosphate, pirimiphos-methyl (Actellic 300CS) in the last two years as the insecticide of choice. This colossal IRS effort, together with other malaria control interventions, has contributed significantly to reducing malaria prevalence to less than 1%, setting the stage for advancing Zanzibar to a pre-elimination phase.

1.2 MAINLAND TANZANIA

1.2.1 SELECTION OF INTERVENTION AREAS

The NMCP, in conjunction with PMI and other key malaria vector control stakeholders, selected the 2016 intervention areas. The key criterion they used to select spray districts was epidemiological data on malaria incidence derived from the District Health Information System 2 (DHIS2) platform. The NMCP selected the following eight districts with the highest malaria burden in Lake Zone, to receive blanket IRS: Ngara, Musoma rural, Missenyi, Kwimba, Sengerema, Chato, Butiama, and Bukoba rural.

1.2.2 RECENT HISTORY OF IRS

The recent history of IRS in mainland Tanzania dates back to 2006, when the USAID awarded RTI International a Cooperative Agreement under the PMI to implement IRS and other malaria control and prevention activities. Between 2007 and July 2010, RTI conducted IRS in the Kagera Region in the Lake Zone of Mainland Tanzania.

In 2010, USAID/PMI expanded IRS to cover two additional Lake Zone regions, Mwanza and Mara. Over the course of the 2010–2012 IRS spray seasons, the Project sprayed more than 1.2 million structures annually in 18 districts of the Lake Zone, including 7 districts in the Kagera Region, 6 districts in the Mwanza Region, and 5 districts in the Mara Region. Pyrethroids were the insecticides of choice from 2006 to 2012. The Project switched to carbamates in 2013 for one year. In 2013, the NMCP and PMI scaled down IRS in accordance with the PMI FY 2012 MOP. The NMCP in partnership with PMI proposed a change in IRS approach from blanket to targeted spraying in Mainland Tanzania. Targeted spraying involves spraying selected high burden wards within the district, while blanket spraying entails spraying the entire district. This approach led to a 40% reduction in the number of sprayed structures, bringing the figure down to 773,929. In 2014 and 2015, PMI further reduced the annual coverage of structures on the Mainland to around 400,000, however implemented blanket spraying in those districts, which continues to date. The Project sprayed the organophosphate pirimiphos-methyl (Actellic 300CS) in the last two years as the insecticide of choice.

In 2015, USAID awarded Abt a contract to implement IRS in Tanzania through the PMI AIRS Project. Abt's first implementation is the 2016 spray round being reported herein.

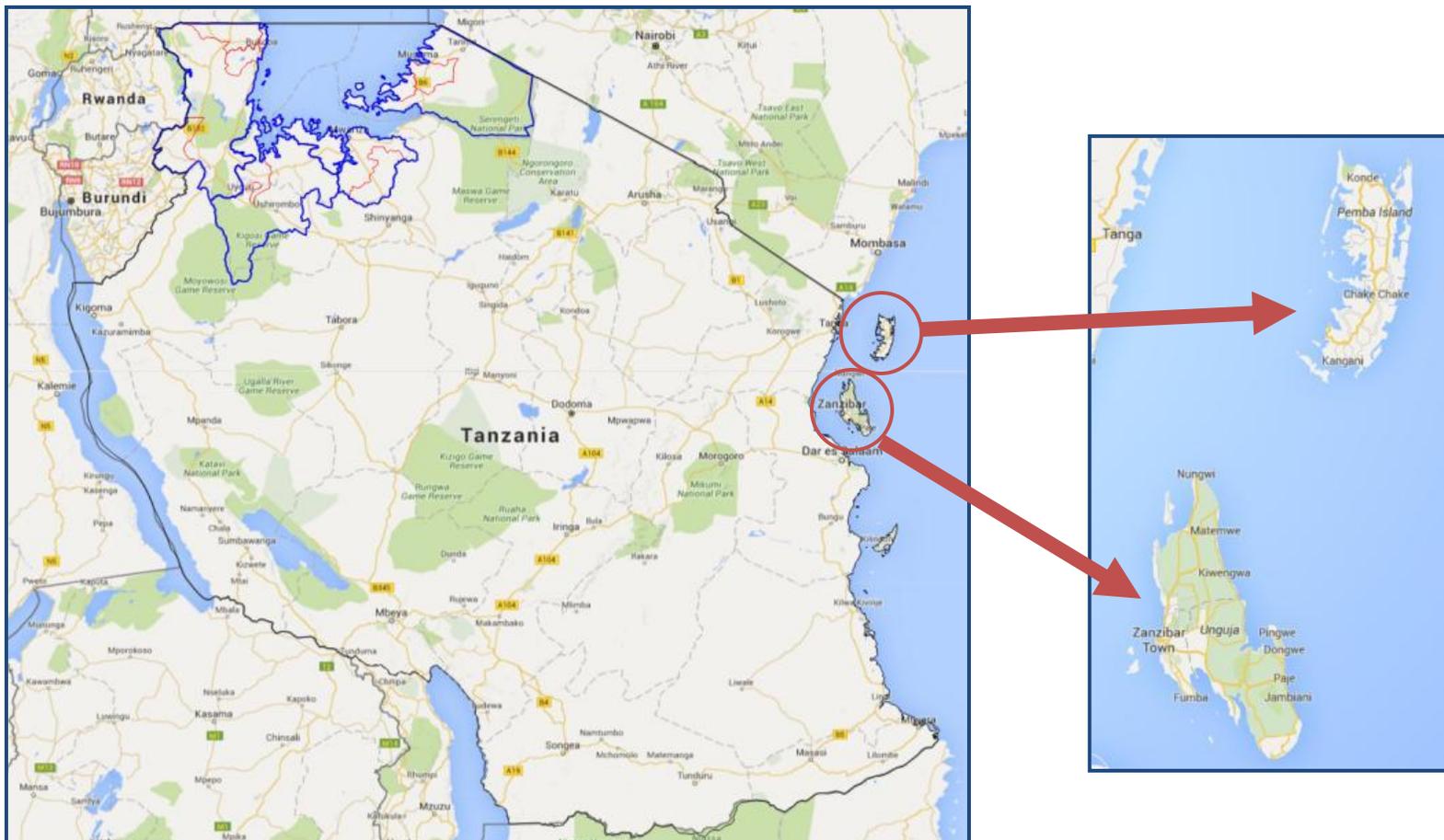
2. PRE-SPRAY ACTIVITIES

2.1 DISTRICT AND INSECTICIDE SELECTION

In mainland Tanzania and Zanzibar, selection of IRS districts entirely depends on malaria burden, resource availability, community willingness, and location of the area, preferably in rural settings. Details of district selection are provided in sections 1.1.2 and 1.2.2 above.

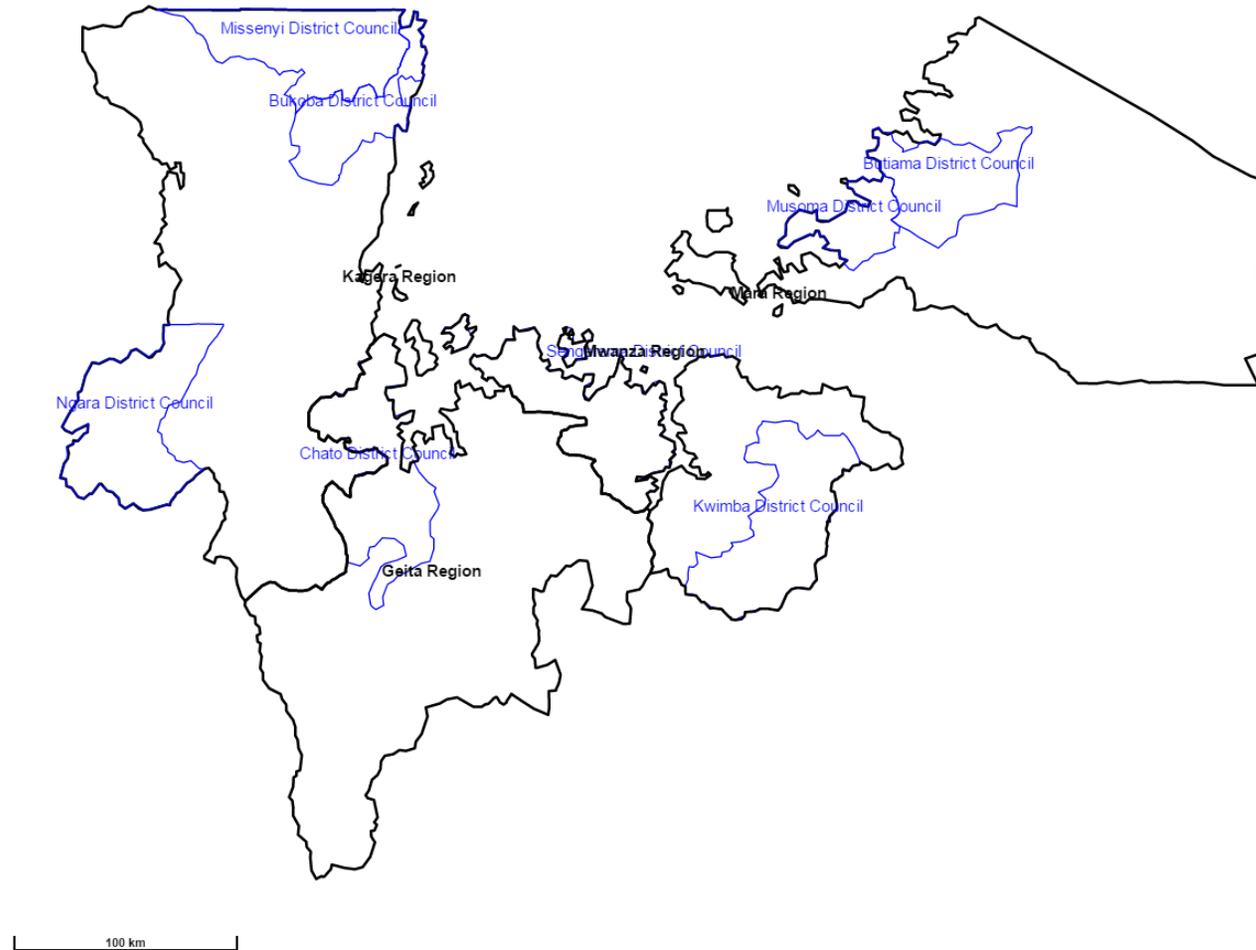
The NMCP, ZAMEP and PMI chose pirimiphos-methyl (Actellic 300CS) for the 2016 IRS campaign in mainland Tanzania and Zanzibar in accordance with the respective interim insecticide resistance monitoring and management plans for Tanzania and Zanzibar. The same insecticide had been effective, lasting over eight months post spray during the previous year. Insecticide susceptibility surveys were conducted in three of the eight districts with pirimiphos-methyl. Susceptibility levels were 82.5% in Geita (pending confirmation), 100% in Musoma; and 100% in Ngara. Figures 1 and 2 show maps of Tanzania highlighting locations of the Lake Zone districts and Unguja and Pemba islands in the Indian Ocean. Table 2 below shows details of each target district indicating population size and respective estimates of numbers of structures.

FIGURE I: MAP OF TANZANIA MAINLAND AND ZANZIBAR SHOWING IRS TARGETED ZONES AND REGIONS'



1 Image source: DHIS2 TANZANIA, <https://hmisportal.moh.go.tz/training/dhis-web-mapping/index.html> and Google Map <https://www.google.co.tz/maps/@-5.5585476,39.8049807,9z?hl=en>

FIGURE 2 : CLOSE TANZANIA MAINLAND MAP SHOWING IRS TARGETED DISTRICTS²



² Image source: DHIS2 TANZANIA, <https://hmisportal.moh.go.tz/training/dhis-web-mapping/index.html>

TABLE 2: TARGET STRUCTURES AND PROJECTED POPULATION IN THE 15 DISTRICTS

Region/Zone	District	Population*	Number of Target Structures
Kagera	Ngara	179,421	54,578
	Missenyi	222,713**	40,813
	Bukoba rural	304,226**	62,730
Geita	Chato	315,736	62,337
Mara	Musoma rural	189,551**	31,824
	Butiama	250,579**	47,577
Mwanza	Sengerema	636,161	91,547
	Kwimba	406,824	62,000
Unguja	Central	26,301	6,148
	North A	2,881	623
	North B	24,520	5,112
	South	17,893	4,073
	West	47,744	10,380
Pemba	Chakechake	1,285	278
	Micheweni	13,347	2,914
Total	15	2,639,182	482,934

2.2 PLANNING AND PREPARATION

AIRS Tanzania in collaboration with PMI, NMCP and ZAMEP developed and disseminated an IRS activity calendar to all staff and stakeholders for review and later planning for the IRS campaign. The IRS calendar ensured harmonization of spray schedules to protect vulnerable populations during historic peak transmission seasons based on malaria morbidity data trends that the NMCP had collected. The calendar identified schedules for recruitment, procurement, advocacy, micro planning meetings, and launch of the IRS campaign. The calendar also included logistics arrangements, materials distribution, start date, and the environmental compliance assessment, among other things.

AIRS Tanzania planned to have two consecutive spray campaigns of 22 operational spray days each in the Mainland and 14 operational days for the Zanzibar campaign. Due to the expected earlier onset of rains, the Kagera region (including three districts) began on February 3 and lasted 22 operational days. The Zanzibar spray campaign began on March 1. The last spray campaign, in Mwanza, Geita, and Mara (including a total of five districts), began on March 9 and lasted 22 operational days. The timing of the spray campaigns enabled coverage of the key transmission periods in both the Lake Zone and Zanzibar.

* 2015 Population

** National Bureau of Statistics, 2012. Projected population based on annual growth rate of 3.2% for Kagera and 2.5% for Mara regions.

2.3 REGIONAL AND DISTRICT SENSITIZATION MEETINGS

During spray preparation, the Project held regional and district advocacy meetings in both mainland and Zanzibar to orient regional and district health management team members, regional and district administrative leaders, national security officers, and NMCP, ZAMEP, NEMC and ZEMA representatives. Planning meetings focused on the following agenda items:

- Inform stakeholders at the district level about the AIRS Tanzania project's objectives, goals, and planned activities
- Assess previous IRS challenges, learn, and make recommendation to improve performance of the 2016 IRS campaign
- Share and review the 2016 IRS operation plan and make recommendations for improvement
- Share how best to engage and solicit community participation and involvement prior, during, and after the spray campaign
- Evaluate methods used in BCC before and during the campaign
- Outline the role and involvement of community leaders and district supervisors during the IRS campaign
- Obtain collective administrative and political will, commitment, and collaboration for implementation of the project

As a follow-up to these sensitization meetings, AIRS Tanzania and the NMCP organized pre-spray village advocacy meetings, which involved community leaders from district, ward, shehia, village, and hamlet levels. Participants at these meetings were Ward Councilors, Ward Executive Officers, Shehas, Village Executive Officers, Village Chairpersons, mobilizers, and District IRS Technical Teams (DITT).

2.3.1 MICRO PLANNING MEETINGS

Following regional and district advocacy and sensitization meeting, AIRS Tanzania conducted district micro planning meetings in all target districts. The main objective was to discuss roll out and implementation of the IRS operational plan in the districts. Participants at the meetings included District Malaria Focal Persons (DMFP), District IEC Officers (DIECO), District Vector Control Officer (DVCO), and District Health Officers (DHO). They constituted the District IRS Technical Team (DITT) during the campaign. They discussed the following issues:

- Progress in implementation of the planned activities
- IRS calendar
- Recruitment of temporary IRS staffs
- Districts' roles and responsibilities in provision of stores in all operational sites
- Role of local leaders in supervision of IRS activities during the operations
- Multi-sectoral roles and responsibilities in IRS operations
- Renovation of IRS sites
- Community mobilization plan for IRS
- IRS approach to be deployed

It was agreed that regular feedback was a cornerstone for success at each stage during project implementation.

2.4 PROCUREMENT OF IRS MATERIALS AND EQUIPMENT

The Project separated procurement of IRS commodities into international and local procurements to ensure cost effectiveness and timely delivery of commodities. The Project procured all services locally.

2.4.1 LOCAL PROCUREMENT

Local procurement involved an open competitive tendering process in which the AIRS Tanzania Project released a solicitation for quotes for services and materials. The AIRS Tanzania Project procurement committee managed the vendor competition process. The committee based awards on the lowest cost and technically acceptable bid according to the solicitation criteria. The services/items that the committee procured locally included the following.

- Transportation services for IRS distribution, operations, and supervision
- Printed materials for IEC, IRS data collection, and commodity tracking
- Personal protective equipment materials
- Food for spray teams' breakfast supplies
- IT equipment, including laptop computers and mobile phones for M&E data collection
- Operation site refurbishment materials, including materials for soak pits

Annex A provides details of local purchases, indicating quantities procured for each item.

2.4.2 INTERNATIONAL PROCUREMENT

The services/items that the committee procured internationally included the following.

- Gloves and masks
- Insecticide (Actellic 300CS)
- Control flow valves (CFVs)
- Hudson Pump spare parts and nozzles

Table 3 below provides details of overseas purchases, indicating quantities procured for each item.

TABLE 3: INTERNATIONAL PURCHASES

Description	Quantity / Number
International Procurement	
CFVss and Seals	3,215
Gasket Nozzle	2,500
Kit F/3 & 4 Gal X-perts	100
19" Gloves	2,364
Nose Masks (boxes)	661
Insecticide - Actellic 300CS (bottles)	207,306
Navy Coverall	2

2.5 LOGISTICS AND STOCK MANAGEMENT

AIRS Tanzania set up 102 operational sites to support IRS on the mainland and Zanzibar. The Project hired 102 storekeepers to be the custodians of the operational site stores and 8 additional storekeepers for the regional and central warehouses.

In line with PMI's Best Management Practices (BMPs), AIRS Tanzania trained 119 storekeepers (comprising 102 site storekeepers, 7 regional/district storekeepers and 10 reserve site store keepers) on IRS warehouse management, IRS storekeeping, and inventory control prior to the campaign. The Project conducted a pre-test to measure the level of understanding of warehouse management and storekeeping. Storekeeper training lasted three days, after which trainers administered a post-test. The best 102 performers qualified as site storekeepers, and the Project hired them. The rest became reserve storekeepers and were only paid if utilized during the campaign.

Four months before the campaign, AIRS Tanzania received 196,306 insecticide bottles for mainland Tanzania and 11,000 for Zanzibar and stored them in regional and central warehouses. To comply with the importation requirement, Project personnel brought a sample of insecticide bottles for quality assay to the Tropical Pesticides Research Institute (TPRI) in Arusha. The TPRI found the Actellic 300CS to be the required quality, with pirimiphos-methyl content estimated at 30.2%. That compares well with the World Health Organization/United Nations Food and Agriculture Organization (WHO/FAO) specified range of 28.5 – 31.5%. A copy of the certificate of analysis is in Annex E for reference.

FIGURE 3: BOTTLES OF ACTELIC 300CS BEING OFFLOADED FOR STORAGE AT THE CENTRAL WAREHOUSE, MWANZA AND THE SAME IN STORAGE AT THE MWANZA WAREHOUSE



A week before the IRS, campaign materials and insecticides were available at the operational sites. Spray operator and supervision vehicles were at operational sites and respective districts one day before commencement of the IRS operation.

During the IRS Campaign, supervisors [COP, operational manager, districts and regional coordinators, NMCP, DITTs, NEMC, Zanzibar Environmental Management Agency (ZEMA), and Environmental Compliance Officers (ECO)] conducted daily warehouse inspections in every operational site. This was done to monitor movement of materials and insecticides and to ensure environmental compliance. Supervisors ensured that storekeepers promptly updated their records and that records matched physical stock counts in the stores. AIRS Tanzania project gave special attention to insecticide stocks, including empty bottles that spray operators returned from the field.

2.6 IRS TRAININGS

During the preparation period, the AIRS Tanzania Project staff and national IRS facilitators, with the aid of the AIRS Mwanza Head Office, prepared and reviewed IRS training documents, forms, guidelines, and practical assessments. AIRS Tanzania shared final training materials among staff and national facilitators, who later facilitated their respective components. Table 4 below provides details of the types of training, targeted cadres, and the number of participants from each region of mainland Tanzania and Zanzibar, disaggregated by sex. The Project held training for all cadres of staff. The key topics the training covered included the following:

- IRS concepts and planning
- Environmental compliance and personal safety
- Monitoring and evaluation of IRS
- Gender awareness
- Behavior change concepts, communication, and information transfer techniques
- Management of operational sites
- Insecticide and equipment handling
- Spray techniques and proper use of PPE
- Logistics, storage, and management of IRS materials

Table 4 below provides details of the types of training and key topics covered. Further below, Table 5 provides summary of number of trainees for each type of training and staff cadre trained, segregated by sex.

TABLE 4: IRS TOPICS COVERED DURING TRAININGS

Type of Training	Key Topics Covered
Training of Trainers for IRS District Coordinators, Supervisors, and Team Leaders	IRS planning; insecticide selection; logistics, storage, safe handling, and safety issues in IRS; IEC and community mobilization; compression pump components, use, and maintenance; spray techniques; monitoring and supervision; data quality assurance; gender awareness
One day dedicated training for Kagera Team Leaders	Team Leaders' roles and responsibilities as first line supervisors of IRS operation, time keeping, daily health checks for spray operators, proper handling of spray equipment and materials, team and spray operator performance targets, use of PPE, household mobilization and safety, supervising insecticide mixing and pressurizing the sprayer, supervising spraying techniques, triple rinsing procedure, first aid, repair and maintenance of spray pumps in the field, and supervision of end-of-day clean-up
Spray Operators	Insecticide and equipment handling, PPE usage; hazard management; environmental risk awareness; spray techniques; data collection; waste management; gender awareness
Enumeration Supervisor / Enumerator Training (three new districts only)	Key IRS concepts; human, health, and environmental safety; behavior change concepts; communication and information transfer techniques; M&E
Mobilizers	Key IRS concepts; human, health and environmental safety; behavior change concepts; communication and information transfer techniques; IEC/BCC; M&E
Storekeepers	First expired/first out arrangement; stock card management; PMI IRS BMPs on warehousing; environmental compliance and safety issues; managing operational sites
Pump Maintenance Technicians	Spray pump handling and planned preventive maintenance; calibration of spray equipment; assembling and maintenance of control flow valves
Washers	Environmental and personal safety during washing of coveralls
Security Guards	Security and safety
Drivers	Journey management; terrain of operational area; safe handling and transport of insecticides; human, personal health, and environmental safety; handling IRS commodities; spill management
Finance Assistants	Effective payment of field staff; payment documentation
Data Entry Clerks/M&E Assistants	Database error checking methods; data validation, search/edit functions
Health Workers	Insecticide poisoning management; poisoning prevention and mitigation practices; health hazard and side-effect management

TABLE 5: IRS TRAININGS AND PARTICIPANTS, MAINLAND AND ZANZIBAR

Cadres of People Trained	Training on IRS Delivery						Other Trainings																		Total		
	TOT		Spray Operations		Insecticide Poisoning Management		Enumeration		Mobilization		Store Management		Pump Maintenance		Washing		Security		Driving		Finance & Administration		M&E			Gender Awareness	
	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M		F	M
National representatives	4	15																							4	15	19
Abt Permanent Staff	10	24																							10	24	34
DMFP and DITT	3	8																							3	8	11
Supervisors	24	58																							24	58	82
Team Leaders	170	335																							170	335	505
Spray Operators			1170	1483																					1170	1483	2653
Clinicians (HCWs)					24	33																			24	33	57
Enumeration Supervisors							6	28																	6	28	34
Enumerators							60	143																	60	143	203
Mobilizers									173	332															173	332	505
Storekeepers											45	74													45	74	119
Pump Technicians													0	82											0	82	82
Washers															73	30									73	30	103
Security Guards																	12	194							12	194	206
Drivers																			0	222					0	222	222
Finance Assistants																					1	1			0	0	2
M&E Assistants																							2	8	2	8	10
Data Clerks																							50	50	50	50	100
TOTAL M/F	211	440	1170	1483	24	33	66	171	173	332	45	74	0	82	73	30	12	194	0	222	0	0	52	58	1826	3119	4947
TOTAL/ training	651		2653		57		237		505		119		82		103		206		222		0		110		4945		4947

2.7 IRS HUMAN RESOURCES

The human resource requirements at the district level consisted of two groups: 1) District Council full-time staff (District Operations Coordinators (DOCs), District supervisors) and 2) temporary staff, including M&E Assistants, IEC Supervisors, enumerators, mobilizers, data entry clerks, site storekeepers, site supervisors, Team Leaders, SOPs, finance assistants, pump maintenance technicians, washers, water fetchers, and security guards. Table 6 below shows details of seasonal staff hired indicating for each cadre the number during the 2016 campaign, disaggregated by sex. The proportion of women hired for each cadre is indicated in the last column. Women hired to work at a supervisory level such as site supervisors, team leaders, and M&E assistants accounted for 33.0% of all staff hired into supervisory positions. Overall, the Project hired 4,754 seasonal staff to support IRS in 2016.

TABLE 6: SEASONAL STAFF HIRED

Cadre	Female	Male	Total	% of Female Hired
Supervisors	24	58	82	29.3%
Team Leaders	170	335	505	33.7%
SOPs	1023	1494	2517	40.6%
Enumeration Supervisors	6	28	34	17.6%
Enumerators	60	141	201	29.9%
Mobilizers	173	332	505	34.3%
Storekeepers	40	69	109	36.7%
Pump Maintenance Technicians	0	82	82	0.0%
Washers	73	29	102	71.6%
Water fetcher	19	76	95	20.0%
Security Guards	12	194	206	5.8%
Drivers	0	222	222	0.0%
Finance Assistants	1	1	2	50.0%
M&E Assistants	3	7	10	30.0%
Data Entry Clerks	38	44	82	46.3%
TOTAL	1,642	3,112	4,754	34.5%

3. INFORMATION, EDUCATION AND COMMUNICATION

AIRS Tanzania started the design of IEC activities by first meeting with the BCC/IEC implementer in-country, the Johns Hopkins University Center for Communications Programs (JHU CCP). JHU CCP assisted AIRS Tanzania in revising IEC materials and customized them to suit the need according to the messages that the program considered relevant to the beneficiary communities.

The materials that JHU CCP updated were;

- Four radio spots titled “Tunahama Tena,” “Jingle,” “Dawa ya Ukoko,” and “Bao”
- IRS posters, tear off sheets, and a questions and answers (Q&A) brochure

JHU CCP also harmonized their malaria schedule in the Lake zone to include IRS messages in their Mobile Video Units (MVU). Table 7 below shows the details of avenues used (radio spots, fact sheets, Q&A sheets, and posters) to disseminate IRS messages in each district.

3.1 ADVOCACY MEETINGS

AIRS Tanzania went beyond electronic and print media to communicate IRS messages at the village level and conducted village/shehia advocacy meetings in all IRS regions in Mainland and Zanzibar. These meetings involved community leaders such as Councilors, Ward Executive Officers (WEO), Village Executive Officers (VEO), and village mobilizers (Community Change Agents). Following these community leader advocacy meetings, the district IEC focal person helped village leaders conduct public meetings in every village in all IRS districts. The meetings at the village level and the higher level advocacy meetings at regional and district levels had the same objective and purpose: increasing community engagement before the IRS operation. The timing of these meetings depended on the start date of IRS in the districts.

3.2 TRAINING

The Project trained enumerators before the spray campaign. One of the enumerators’ selection criteria was to be from or reside in the same community since they utilized a door to door approach during the enumeration exercise, which was only conducted in the new districts. Mobilizers received training on the basics of IRS and on other key IRS concepts: human, health, and environmental safety; behavior change concepts; communication and information transfer techniques; IEC/BCC; and M&E with a focus on the following:

- Basic behavior change concepts and communication- and information-transfer techniques
- Advocacy techniques to address the community on benefits and refute common myths about the IRS campaign
- Identification of eligible structures for spraying

- Promote understanding and acceptance of IRS by educating the community about the purpose of the IRS campaign
- Inform and educate householders regarding details on preparing their homes for spraying

3.3 IEC AND BCC MATERIAL AND INFORMATION

The program engaged the local radios in Kagera, Mwanza, Mara, and Geita to air the 18 radio spots in each IRS region. A total of 48 spots aired in Zanzibar, 28 in Unguja, and 20 in Pemba. The spots aired at intervals that maximized the duration and coverage pre- and mid-spray. The local radios the Project engaged were:

- Radio Kwizera – Ngara
- Radio Vision – Bukoba DC and Missenyi
- Radio Free Africa – Mara/Kwimba
- Radio Sengerema – Sengerema
- Radio Storm FM – Geita
- Zanzibar Broadcasting Corporation (ZBC) – Unguja
- Micheweni Community Radio (Radio Jamii) – Pemba

Overall, AIRS Tanzania aired a total of 138 radio spots in IRS districts during the operation. Table 7 below shows details of IRS message dissemination channels broken down by district. Messages for Missenyi and Bukoba rural aired on the same radio station through 18 radio spots received in both districts. Likewise, messages for Musoma rural, Butiama, and Kwimba aired from the same station through 18 radio spots received in the three districts. In addition, AIRS Tanzania distributed 9,933 fact sheets and 1,540 Q&A sheets and put up 677 posters in the operation districts.

TABLE 7: AIRS TANZANIA MESSAGE DISSEMINATION CHANNELS IN EACH OPERATION DISTRICT

Zone/Region	Location	Radio Spots	Fact Sheets	Q & A Sheets	IRS Posters
Kagera	Ngara	18	6,461	660	300
	Missenyi	18			
	Bukoba rural				
Geita	Chato	18	160	95	95
Mara	Musoma rural	18	524	655	152
	Butiama				
Mwanza	Kwimba		52	35	35
	Sengerema	18	236	95	95
Mainland Total		90	7,433	1,540	677
Zanzibar	Unguja	28	2000	-	-
	Pemba	20	500	-	-
Zanzibar Total		48	2,500	0	0
Grand Total		138	9,933	1,540	677

3.4 ENUMERATION

AIRS Tanzania conducted an enumeration exercise in the new districts of Butiama, Musoma, and Kwimba from February 5–19, 2016, using a door-to-door approach. The Project trained enumerators to mobilize communities, identify eligible structures, clarify IRS misconceptions, and collect information on eligible structures within districts. This exercise’s goal was to ascertain a more accurate number of structures in each district to support target setting for the respective districts. Table 8 below shows the outcome of the enumeration in the districts.

TABLE 8: AIRS TANZANIA ENUMERATION RESULTS

District	Households Sensitized	Adults Reached with IRS Messages		Households Accepting IRS	% Households Accepting IRS
		Male	Female		
Butiama	25,474	42,180	50,883	25,387	99.7%
Musoma rural	16,044	29,385	32,126	16,015	99.8%
Kwimba	33,253	57,594	63,988	33,253	100.0%
TOTAL	74,771	129,159	146,997	74,655	99.8%

3.5 WORLD MALARIA DAY

To commemorate the 2016 World Malaria Day (WMD), AIRS Tanzania worked closely with the IRS regional authorities to host live radio phone-in programs during which IRS was emphasized. The team implemented four such radio phone-in programs lasting one hour each in Kagera, Geita, Mara, and Mwanza regions. There was no WMD commemoration in Zanzibar.

4. IMPLEMENTATION OF IRS ACTIVITIES

AIRS Tanzania carried out IRS activities in three phases between February 3 and April 4, covering 15 districts in Mainland Tanzania and Zanzibar. Phase one lasted 22 operational days from February 3-27, 2016, in three districts of the Kagera region: Bukoba Rural, Missenyi, and Ngara. The second phase lasted 14 operational days in Zanzibar from March 1-16, 2016, covering 57 Shehias in five districts of Unguja (Central, North A, North B, South, and West) and two districts of Pemba (Chakechake and Micheweni). The third phase lasted 22 operational days from March 9, 2016, to April 4, 2016, in five districts of Sengerema and Kwimba in the Mwanza region; Musoma rural and Butiama in the Mara region, and Chato in the Geita region.

4.1 OVERALL APPROACH/LOGISTICS OF IMPLEMENTATION

The IRS implementation approach focused on site identification and repair of IRS operation sites and distribution of IRS materials and supplies in a timely manner. This requirement complied with the approach of distributing the IRS materials and supplies from regional warehouses to the IRS operation stores. Adherence to this approach enabled all IRS districts to start IRS operations on the scheduled date. AIRS Tanzania used three IRS approaches in different districts. They included the standard district based IRS, community-based IRS (CBIRS), and a new innovation of quasi-community-based IRS that the Project piloted in Tanzania for the first time (see sections below). To improve the quality of spray, AIRS Tanzania fitted all pumps with control flow valves (CFVs) and successfully used the CFVs for the first time in Tanzania.

4.1.1 COMMUNITY-BASED IRS

CBIRS is an approach designed to decentralize the operations down to the community level. This design entails increasing the number of operation sites in a district to minimize distances to village communities. This model reduces considerably spray operator travel distance from the operation sites to the houses, and the spray operators can either walk or use bicycles to reach houses to spray. This design can stimulate community participation as spray operators can come from the target communities, villages, or hamlets. This design also cuts costs since there is no need to hire a vehicle for transportation. This year, the Project implemented CBIRS in the Chato district of the Geita region. In the vein of discovering potential areas for cost savings, AIRS Tanzania plans on implementing a project-wide cost analysis to understand where the Project can continue to improve, which will include an assessment of this IRS approach.

Figure 4: Spray operators using bicycle transport to reach structures in target villages of Chato District where CBIRS was implemented

FIGURE 4: SPRAY OPERATORS USING BICYCLE TRANSPORT TO REACH STRUCTURES



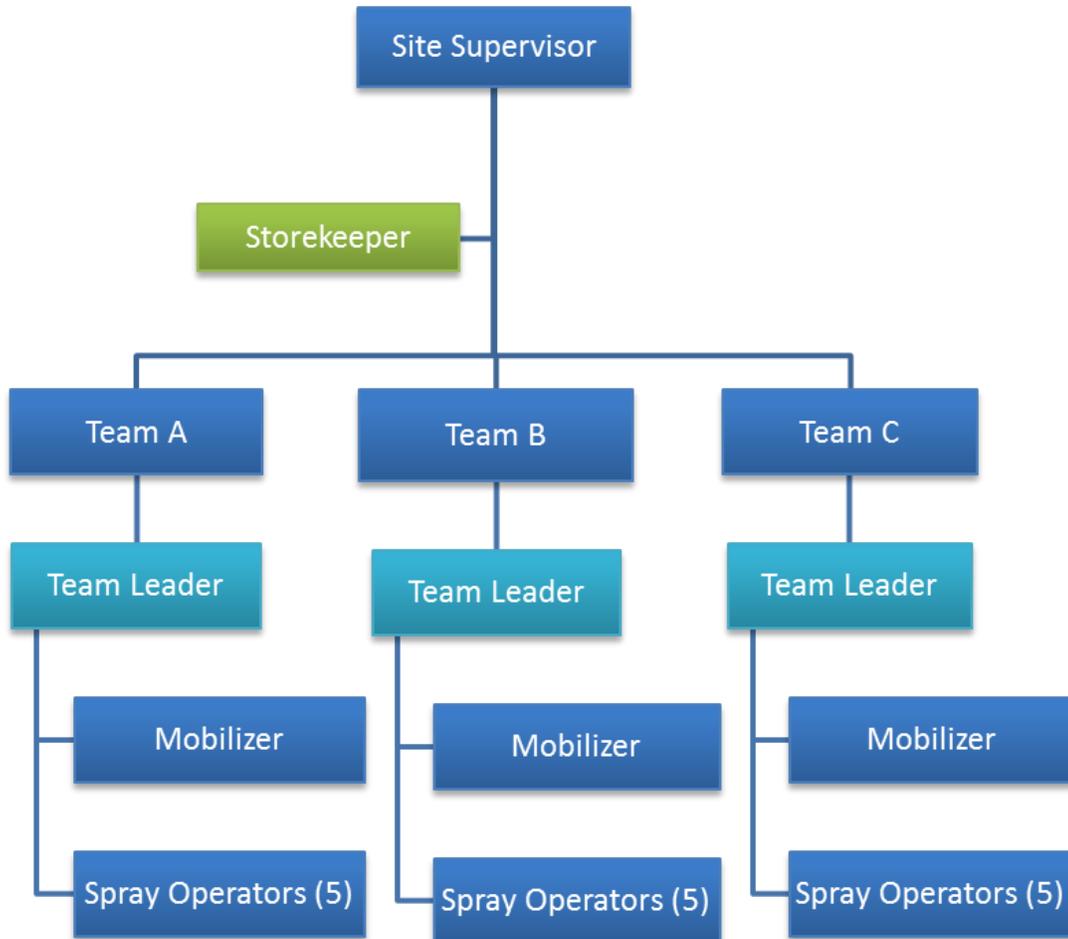
4.1.2 QUASI-COMMUNITY BASED IRS

Quasi-community based IRS is an innovative blend of the district-based and community-based IRS approaches. It entails conducting the first half of the 22-day operation as a district IRS model using rented vehicles. Once the Project sprays the distant village areas, the second part will use a CBIRS approach, relying on bicycles. This approach will reduce costs associated with vehicle rentals for the duration of the campaign while using the smaller number of operational centers in the district-based approach. The rationale is that mid-way into the spray campaign (having started from the distant areas), the coverage would be such that the spray teams could continue with bicycles and not exceed a radius of 10km per day. The Project conducted the quasi-community-based IRS in Bukoba rural in the Kagera region, Kwimba and Sengerema in the Mwanza region, and Butiama in the Mara region.

4.2 COMPOSITION AND MANAGEMENT OF SPRAY TEAMS

In every operation site, the composition of IRS staff included the following cadres: one supervisor managing the spray teams in the field, a storekeeper, a pump technician, site guards, a cleaner/washer, a water fetcher, and a Team Leader heading a team of spray operators and a mobilizer. Each team had an average of five spray operators. Spray operators reported directly to the Team Leader, who in-turn reported to the supervisor (See Figure 5 below).

FIGURE 5: SITES' ORGANIZATION CHART



Note: Numerical values represent # people of IRS cadres

4.3 PAYMENT OF SEASONAL STAFF

Before the start of the spray operations, AIRS Tanzania contracted with Vodacom's MPESA online mobile money system for the mainland operation. The Project chose the Vodacom network based on its expansive network coverage and wider availability of agents for cash redemption throughout Tanzania. The system is reliable, has a user friendly interface for making payments, and has attentive customer service. The system also generates detailed, auditable reports for all payments. The Project used MPESA, a mobile money transfer service offered by Vodacom mobile network, to pay all seasonal staff during IRS training and field operations. The Project made a bulk transfer of funds to each person's cell phone number.

The Project hired Finance Assistants at the Mwanza Main Office and Bukoba Office to help AIRS Office Coordinators compile payment lists, cross check sign-in sheets, and verify phone numbers before payment. The Project initiated all payments in the AIRS Mwanza Office. Office Coordinator and Finance Assistant responsibilities included:

- Distribution and collection of signed contracts from all seasonal staff lined up for payment (malaria focal persons, SOPs, Team Leaders, supervisors, washers, water fetchers, storekeepers, security guards, and mobilizers)
- Collection of all timesheets for seasonal staff before preparing payrolls
- Preparation of payrolls that the malaria focal persons approved and the Regional Coordinators submitted

Due to the lack of reliable mobile payment options in Zanzibar, the Project paid seasonal workers in cash during training and the 14-day spray campaign. All seasonal workers received pay once at the end of the campaign. AIRS's Finance Assistant disbursed the payments. A police escort and the Zanzibar Zonal Coordinator accompanied the Finance Assistant.

4.4 MHEALTH

AIRS Tanzania introduced the mHealth system before the beginning of the campaign. The system enabled AIRS Tanzania staff and district supervisors to conduct standard supportive supervision, access daily spray data quickly, conduct data verification at the household level, and remind temporary staff about regulations and operational procedures. The system minimized paperwork, enabled real time sharing of data, and increased both the use of mobile technology and results-based decision making.

Together with Dimagi LLC, AIRS Tanzania managed the supervision system through CommCare, monitored supervision activities and data verification through CloudCare, and monitored site-level spray progress through Telerivet.

The team oriented m-Health focal persons on the mHealth systems. These members later became system facilitators for other staff during Training of Trainers (ToT) and storekeeper training.

The mHealth reporting tools for data collection and verification, which the Project used throughout the campaign, included:

- **Performance Monitoring Tracker:**

After a day's spray activities, Team leaders summarized spray results of their respective teams' on Team Leader forms. The team leader forms were of the sources of PMT reports. Storekeepers aggregated PMT daily reports on four operational indicators and sent them to the gateway phone linked to the Telerivet system. The indicators were: total number of spray operators who worked on that day; total number of structures found by spray operators; total number of structures sprayed; and the total number of insecticide bottles used at the operational site. The gateway phone then sent the data to the Dimagi server for processing and storage. The PMT information was shared daily with District Malaria Focal Persons, Regional Coordinators and AIRS Tanzania project supervisory staff. PMT data provided a spray progress overview and timely information for decision making purposes.

- **Supervisory Application:**

Supervisors filled out the CommCare application forms on morning mobilization and transportation, household preparation and spray operator's performance, storekeeper's performance, and end of day clean-up. These forms were filled and submitted to the CommCare system and provided information on field activities, spray performance and red flags during the campaign. Some of the red flags raised were refusals, pump leakages, spray operators missing flashlights, and antidote not being available at the nearest health facilities.

- **Data Collection Verification (DCV):**

The Project collected information through DCV forms at the household level on household spray status. The Project randomly selected households to provide a sample population. The Project then verified this information with households' information as entered into the AIRS database by tracking IRS card numbers. After filtering households' data from the database, Monitoring and Evaluation assistants compared them with DCV form findings to match head of household, structures and rooms found, and spray status. Data collected using DCVs were 97% as accurate as what was uploaded in the AIRS database. Households' population was not observed during comparison because it was subject to change, but was used as a guide to note any extreme differences of the two sources.

- **Job Aid Messages:**

Supervisors, spray operators, team leaders, storekeepers and district malaria focal persons received SMS messages to remind them about topics such as gender awareness, the daily number of targeted structures, donning personal protective equipment, and avoiding consuming food while on duty

4.5 JOB AIDS

AIRS Tanzania printed job aids for three categories of field staff: SOPs, Team Leaders, and storekeepers. The Project customized the booklets for each cadre of staff and used the booklets during the spray operation as reference guides. All booklets were in Swahili.

5. POST-SEASON ACTIVITIES

5.1 POST-SPRAY EVALUATION

AIRS Tanzania conducted feedback meetings at the Regional level to: 1) review the overall IRS programmatic implementation, experience, and achievements for the 2016 spray round and 2) review IRS challenges and lessons learned in the target districts to draft recommendations for improvement and the way forward for future spray campaigns.

The AIRS Regional Offices in collaboration with Regional Medical Officers (RMO) convened the review meetings. Due to the small size of the operation in Zanzibar, the Project held only one meeting, which brought together delegates from Unguja and Pemba. ZAMEP convened the meeting with support from the AIRS Coordination office in Zanzibar. The aim of these meetings was to review the implementation of the IRS operations at the district level and to share experiences, challenges, and lessons learned to generate ideas on improving future spray operations. The post-spray review meetings were attended by the following:

- National: Representatives from NMCP and NEMC in Mainland; and ZEMA and ZAMEP in Zanzibar
- Regional level: RMO, Regional Health Officer, and Regional Malaria Focal Person
- District level: DITT members, including District Malaria Focal Person
- Representatives of each field IRS cadre, including those voted as best IRS performers from each district or region

In the conclusion of this report, the Project incorporated observations, challenges, and recommendations shared during these review meetings. The Project presented recognition certificates at the meetings to the best performing category of field staff in each district of the mainland and in Zanzibar.

5.2 INVENTORY ASSESSMENT

Immediately after the end of the spray campaign, all warehouses conducted a post-IRS inventory assessment. The inventory assessment report provides an update on the commodities the Project used during the campaign and those remaining for future use. The report further indicates quantities of new, used, or damaged (requiring service or repair) items. In addition, it provides a list of items scheduled for disposal. Annex C shows the most current post-IRS inventory.

5.3 DEMOBILIZATION

Immediately after the conclusion of the IRS operation, the Project cleaned and left to dry all IRS materials. The Project then transported materials from IRS sites to regional warehouses for future use. The AIRS Tanzania Environmental Compliance Officer (ECO) with support of AIRS Tanzania Regional Coordinators conducted post-spray site decontamination, decommissioning, and environmental compliance inspections in all IRS sites. The purpose of the post-IRS inspections was to ensure the collection and safe disposal of all wastes from each operational site, leaving the sites in an environmentally compliant condition. After the AIRS Tanzania restored the sites to a well-maintained state and made them safe for the surrounding communities, the ECO formally handed the sites back to the local authorities for safe custody until the next IRS operation.

6. ENVIRONMENTAL COMPLIANCE

6.1 TRAINING AND CAPACITY BUILDING

Prior to the spray campaign in Mainland Tanzania and Zanzibar, the Project trained cadres recruited to implement IRS on various aspects of environmental compliance as provided in the BMP manual. The training employed a cascade approach whereby the supervisors and team leaders who received training in turn trained spray operators. From the BMP manual, the Project developed a simplified Swahili version of environmental compliance to aid understanding among staff who were not well versed in English. Such aids included: instructions for washers, instructions for site guards, instructions to drivers, emergency care in IRS, insecticide spill management, IRS site closure, and IRS site decommissioning. Environmental Compliance trainings were given to Spray Operators, Team Leaders, Supervisors, Storekeepers, Washers, Site Guards and Drivers. Details on number of staff trained in these categories can be found in Table 5 above.

6.2 PRE-, MID- AND POST-SEASON ASSESSMENT

Before the IRS campaign (November to December 2015), a team of two Environmental Compliance Officers (ECOs) and two AIRS Regional coordinators conducted an environmental assessment to establish the status of old IRS staging sites. The assessment mainly evaluated the storage facilities and effluent waste disposal systems and identified the gaps that diverged from BMP. Furthermore, the assessment looked into the proposed IRS temporary staging sites and identified gaps that required amendments before IRS. The ECO filled a predesigned electronic data form on smartphones for every IRS staging site. The ECO then submitted the scored information to a central database on an automated server at Abt's Bethesda office. The server analyzed the submitted data and graded the sites as qualifying or non-qualifying for hosting IRS operations. Figure 6 below shows a permanent standard site. The server also provided a list of gaps to address on every site. The ECO shared this information with the Chief of Party, Operations Manager, and ECO. The team assessed 128 sites in 15 districts (eight from Mainland Tanzania and seven from Zanzibar) that implemented AIRS in 2016. A summary of the number of sites, type, and prior IRS requirements for repairs is in Table 9 below.

FIGURE 6: STANDARD IRS SITE TO SHOW WASHING SLAB, SOAK PIT, WATER RESERVOIR AND ABLUTION FACILITIES



TABLE 9: IRS SITES THAT WERE REFURBISHED PRIOR TO 2016 IRS CAMPAIGN

District	Permanent Sites	Temporary Sites	Site Refurbished or Established (soak pit, storeroom, fence, etc.)
Bukoba	9	1	9 effluent waste disposal systems refurbished 1 new effluent waste disposal system established 10 storage facilities refurbished
Missenyi	5	2	5 effluent waste disposal systems refurbished 2 new effluent waste disposal systems established 7 storage facilities refurbished
Ngara	7	2	7 effluent waste disposal systems refurbished 2 new effluent waste disposal systems established 9 storage facilities refurbished
Chato	10	20	10 effluent waste disposal systems refurbished 20 new effluent waste disposal systems established 30 storage facilities refurbished
Sengerema	14	2	14 effluent waste disposal systems refurbished 2 new effluent waste disposal systems established 16 storage facilities refurbished
Kwimba	10	0	10 effluent waste disposal systems refurbished 10 storage facilities refurbished

District	Permanent Sites	Temporary Sites	Site Refurbished or Established (soak pit, storeroom, fence, etc.)
Butiama	6	2	6 effluent waste disposal systems refurbished 2 new temporary effluent waste disposal systems established 8 storage facilities refurbished
Musoma Rural	5	0	5 effluent waste disposal system refurbished 5 storage facilities refurbished
Micheweni	1	0	1 effluent waste disposal system refurbished 1 storage facility refurbished
Central	2	0	2 effluent waste disposal systems refurbished 2 storage facilities refurbished
North A	0	0	Merged with North B
North B	1	0	1 effluent waste disposal system refurbished 1 storage facility refurbished
South	1	0	1 effluent waste disposal system refurbished 1 storage facility refurbished
West	3	0	3 effluent waste disposal systems refurbished 3 storage facilities refurbished

At the end of the operation, the Project collected empty bottles from each operational site and brought them to the regional and central warehouse for storage. The Project collected 166,561 empty bottles in Lake Zone and them to the shredding company for disposal. Meanwhile, a total of 22,528 bottles of Actellic 300CS (excluding 7,500 bottles set aside for the Geita Gold Mine IRS campaign) remained unused and are safely stored in warehouses on the mainland for the 2017 campaign.

In Zanzibar, 2,355 bottles of Actellic 300Cs remained unused and are safely stored for use in future operations while 8,612 empty bottles are safely stored for disposal.

6.3 WASTE MANAGEMENT

AIRS Tanzania planned to manage waste from IRS operations differently depending on the category or nature of the waste. AIRS Tanzania managed the contaminated effluents on IRS staging sites using soak pits installed with layers of gravel, stones, wood charcoal, and saw dust. These layers minimize insecticide spillage from effluents and dispose them safely in the low levels of the soil horizon. These techniques comply with BMP manual standards, which the WHO, USAID, and the Government of Tanzania accept.

Highly contaminated solid wastes can be disposed of through incineration, recycling, or municipal landfills. One such type of waste is the empty HDPE bottles that previously contained Actellic 300CS insecticide. The Project collected 166,561 empty bottles from the mainland and 8,612 from Zanzibar for disposal. AIRS Tanzania has contracted with a local recycling company in Mwanza, certified by the National Environmental Management Council (NEMC), to recycle the empty insecticide bottles. The recycled product will be used for production of sewer pipes for use in gold mines. The NEMC Mwanza Office will provide supervision to ensure compliance by the recycling company.

The cardboard that made up packaging for insecticide (Actellic 300CS) bottles will be recycled into cardboard boxes. The process to recruit a company for this task is currently under way. Meanwhile, the Project will safely store the material in our warehouses.

The Project will incinerate contaminated masks in the Project incinerator, which has the capacity to heat up to 1000 degrees centigrade (°C). The Project will shred other wastes such as unusable gloves and boots that generate dioxins when burned before taking the wastes to a municipal landfill for final disposal. However, gloves and boots that have minor damage but are still usable will be donated to district groups that are engaged in street cleaning in the respective districts.

6.4 WORKER AND RESIDENT SAFETY

Various measures were put in place to ensure workers' and residents' safety during the 2016 IRS campaign in Tanzania.

The first safety measure was dissemination of information and knowledge on precautions to take for ensuring safety during the IRS operation. The Project trained all staff involved in IRS on safety precautions in the BMP manual. The Project informed the community of its responsibilities for household preparation and post-spray requirements through an IEC package the mobilization teams designed and delivered. In addition to safety information, the workers received training on first aid in case of accidental intoxication with the insecticide.

The other measure was training of one clinician per health facility from each of the six selected health facilities in a district. In Zanzibar, the Project selected six and three clinicians from Unguja and Pemba, respectively. The Project selected these health facilities in consultation with the respective District Medical Officers. The preference was for those close to spray areas for ease of access by spray teams in the unlikely event of intoxication or side effect. The district health authorities had the responsibility to provide atropine, an antidote against organophosphate poisoning. However, they were unable to provide them for the campaign. Other important safety measures were ensuring an adequate supply of PPE and strict supervision on its use. Training of drivers included observing compliance with speed limits. Training of site guards included observing the readiness of site guards to manage accidental insecticide spillage while alone at the site.

All sites and vehicles for SOPs and insecticide transport had a first aid box, material safety data sheets, spill kit, emergency procedures, spill cleanup procedures, and telephone contacts for emergency numbers of fire brigade, police, and ECO in case staff needed support.

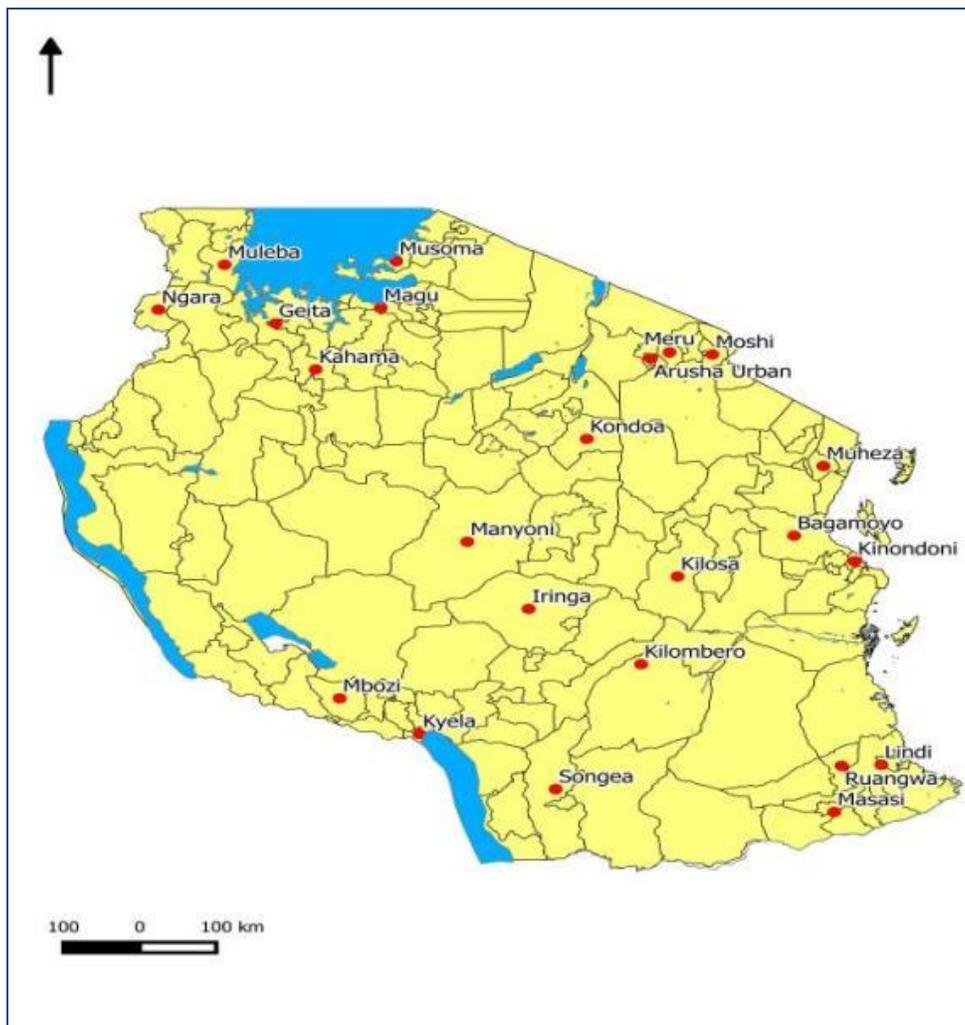
In addition, AIRS Tanzania drafted a motorcycle policy to regulate speed and ensure compliance with safety protocols for the site supervisors and mobilizers. These two categories of staff had authority to use motorcycles during the spray campaign.

7. ENTOMOLOGY

7.1 ENTOMOLOGY (MAINLAND ONLY)

Entomological surveillance is essential to determine the impact of vector control interventions, including IRS. AIRS Tanzania has put in place a subcontract mechanism with NIMR Mwanza and Amani Centers, which are undertaking all entomological monitoring activities. The centers will test susceptibility of local vectors to WHO-recommended insecticides. The NMCP will use the resulting data to decide which insecticides to use for IRS. AIRS Tanzania conducted cone bioassays to assess the quality of spraying and will do them monthly to assess the decay rate of insecticide on walls.

FIGURE 7: MAP TO SHOW THE DISTRIBUTION OF ALL THE 23 INSECTICIDE RESISTANCE SENTINEL DISTRICTS ON TANZANIA MAINLAND



The NIMR Amani Centre is conducting annual monitoring of vector susceptibility to WHO-approved insecticides in 11 out of the 23 sentinel sites in mainland Tanzania. The 11 sentinel districts chosen this year include Arumeru, Muleba, Kilombero, Ngara, Bagamoyo, Ruangwa, Geita, Songea rural, Kyela, Sengerema, and Musoma. The criteria for choosing the 11 sentinel sites were: locations not sampled in 2015, those with increased tolerance to pirimiphos-methyl in 2015, IRS coverage with Actellic 300CS in 2016, or resistance to pyrethroids and/or carbamates in 2015. Wherever the Amani Centre detects resistance or tolerance, it will perform laboratory assays to determine the prevailing resistance mechanisms. Table 10 below shows site location (village) identified as sentinel sites for each respective operation and control district and the type of data to be collected from each sentinel site. These include biochemical and molecular biology techniques in addition to Centers for Disease Control and Prevention (CDC) bottle synergistic assays. In 2016, The NIMR Amani Centre will use WHO tube tests to test deltamethrin (0.05%), bendiocarb (0.1%), alphacypermethrin (0.05%), permethrin (0.75%), pirimiphos-methyl (0.25%), and DDT (4%) treated papers. The Centre will conduct resistance intensity testing using CDC bottle bioassays with 1X, 2X, 5X and 10X (or more) the diagnostic concentration of permethrin, the most commonly used insecticide on long-lasting insecticidal nets in Tanzania. The Centre could test other insecticides based on the observed resistance pattern. NIMR Amani Centre field teams are currently conducting resistance testing, and no data are currently available for reporting.

TABLE 10: LOCATION OF SENTINEL SITES FOR ENTOMOLOGICAL SURVEILLANCE, SPRAY STATUS AND DATA TO BE COLLECTED FROM EACH SITE

Region	District	Site Location (Village)	Intervention Status	Data to be Collected On Indicators
Kagera	Ngara	Nterungwe	Sprayed	Species composition; vector abundance, distribution and seasonality; feeding time and location
	Bukoba rural	Buturage	Sprayed	Species composition; vector abundance, distribution and seasonality; feeding time and location
	Missenyi	Gabulanga	Sprayed	Species composition; vector abundance, distribution and seasonality; feeding time and location; comparison of Prokopac with Pyrethrum spray catch (PSC)
Geita	Chato	Nyamirembe	Sprayed	IRS quality of spray; species composition; vector abundance, distribution and seasonality; feeding time and location; comparison of Prokopac with PSC
Mara	Musoma rural	Etaro	Sprayed	IRS quality of spray; species composition; vector abundance, distribution and seasonality; feeding time and location; comparison of Prokopac with PSC
	Butiama	Bisumwa	Sprayed	IRS quality of spray; species composition; vector abundance, distribution and seasonality; feeding time and location;
Mwanza	Sengerema	Nyamatongo	Sprayed	Species composition; vector abundance, distribution and seasonality; feeding time and location; comparison of Prokopac with PSC
	Kwimba	Kilyaboya	Sprayed	Species composition; vector abundance, distribution and seasonality; feeding time and location
Geita	Bukombe	Lyambamgongo	Unsprayed control	Species composition; vector abundance, distribution and seasonality; feeding time and location
Simiyu	Busega	Kalago	Unsprayed control	Species composition; vector abundance, distribution and seasonality; feeding time and location

7.2 INSECTARY AND LABORATORY SUPPORT

AIRS Tanzania project is providing support to insectary and entomology laboratory facilities to both NIMR partner institutions. Mwanza Centre has received a new humidifier for the adult mosquito rearing room. The humidifier will help standardize rearing conditions and increase production of mosquitoes needed for field bioassays. AIRS Tanzania has ordered laboratory reagents and consumables for running the laboratory. NIMR Mwanza already has received other equipment, including CDC light traps, rotating bottle mosquito traps, Prokopak aspirators, and their accessories.

The Amani Centre partner has received laboratory support that includes state-of-the-art PCR equipment (Thermo Scientific Mycel Imager, Prime Pro 48 PCR System), WHO cylinder kits, and insecticide treated papers. AIRS Tanzania has provided Wheaton bottles and insecticide for CDC intensity assays for vector resistance monitoring studies. With AIRS Tanzania, NIMR Amani Centre conducted training of field teams in preparation for insecticide susceptibility field work. Teams are currently out in the field undertaking the tests. The Project will include results from these field assays in the next report.

7.3 IRS QUALITY ASSAYS

The NIMR Mwanza Centre conducted cone bioassays to provide important feedback on the quality of spraying. The Centre conducted spray quality assessments in all eight districts of the Lake Zone. Spray quality assessment of the five districts in Zanzibar was done by ZAMEP and reported directly to PMI. Only results for the mainland are included in this report.

The Centre sampled one village from each district for wall bioassay tests (Table 10). To minimize possible bias arising from spray operator skills, they chose for testing houses sprayed by different spray operators and spray teams and with different wall substrates. The Centre randomly chose three houses of each wall surface type commonly found in the area for cone bioassay in each assessment sentinel site. The most common wall surface finishing in sentinel sites were mud, cement, white wash, painted, and burnt brick. Furthermore, the NIMR team tested two rooms in each house (bed room and sitting room). To assess the spray quality on the different wall surfaces in each room, they tested two walls of the room by fixing each of the cones at about 1.0m and 2.0m high on each wall. The Centre carried out four cone assays in any one house using 10 adult female *Anopheles gambiae* mosquitoes per cone.

The NIMR Mwanza Centre did a control cone bioassay for every house bioassay tests on unsprayed surfaces by exposing mosquitoes to the unsprayed surface of a similar substrate. To avoid the possibility of the control mortality increasing due to the airborne effect of the Actellic 300CS formulations, the NIMR team did a bioassay on an unsprayed portable surface far away from any sprayed house or surfaces.

The Centre carried out cone bioassays according to WHO guidelines. The tests used a susceptible *Anopheles gambiae* s.s. Kisumu strain of mosquitoes reared at the NIMR, Mwanza Centre. The NIMR team exposed sucrose-fed, insectary-reared mosquitoes from two to five days old to the sprayed wall surfaces. The bioassays exposed batches of 10 mosquitoes for 30 minutes at two different points of sprayed wall surfaces (a lower level 1 meter high and the upper level 2 meters high) in each of the two rooms sampled in a house. At the end of the test, the team transferred mosquitoes using a pooter to insecticide free paper cups and supplied them with sugar solution. They placed cups in a wooden box covered with a damp towel. The NIMR team assessed knockdown 60 minutes after the end of exposure and scored mortality counts 24 hours after exposure. A mosquito was considered as alive if it could fly. When control mortality was between 5% and 20%, the NIMR team corrected experimental mortality using Abbott's formula (Abbott, 1925).

7.4 RESULTS

The sprayed surfaces mainly encountered and tested in the districts were mud, cement, white wash, oil painted and burnt brick. The Centre estimated the spray quality from the percentage mortality of the exposed mosquitoes from the WHO cone bioassay on the different types of sprayed surfaces.

Mortalities scored from various wall surfaces ranged from 90.8% to 100%. Mortality in the majority of sentinel houses was 100% and indicated that spray quality was acceptable in the houses tested. The NIMR Mwanza Centre will conduct bioassays monthly to determine the longevity of Actellic CS on the various wall substrates.

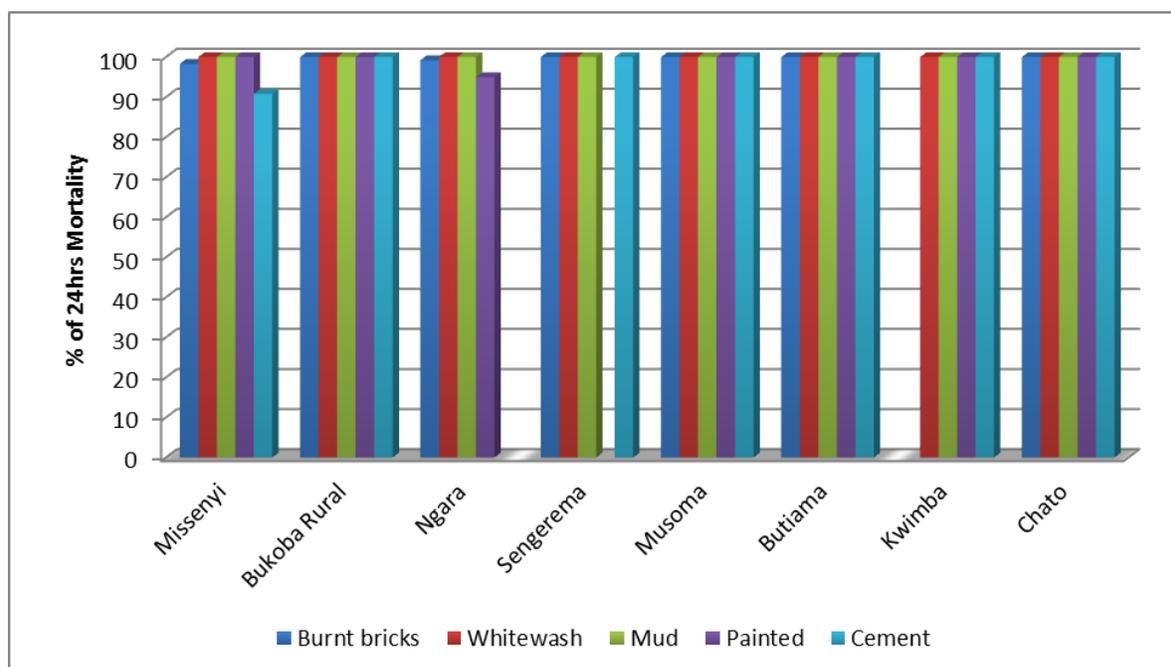
TABLE II: IRS QUALITY ASSAY RESULTS EXPRESSED AS MORTALITY RATE WITHIN 24 HOURS, TANZANIA MAINLAND

Surface Type	24 Hrs. Mortality in Percentage (%) Following 30 Minutes Exposure to Sprayed Surface (# Tested)							
	*Missenyi	*Bukoba Rural	*Ngara	*Sengerema	*Musoma	*Butiama	*Kwimba	*Chato
Burnt bricks	98.3(120)	100(120)	99.2(120)	100(120)	100(120)	100(80)	NA	100(120)
Cement	90.8(120)	100(120)	NA	100(120)	100(120)	100(80)	100(120)	100(120)
Whitewash	100(120)	100(100)	100(120)	100(120)	100(120)	100(80)	100(40)	100(120)
Mud	100(120)	100(120)	100(120)	100(120)	100(120)	100(120)	100(120)	100(120)
Painted	100(120)	100(120)	95(120)	NA	100(120)	100(40)	100(40)	100(120)

*Villages sampled include: Buturage in Missenyi; Bulinda in Bukoba rural; Mukirehe in Ngara; Etaru in Musoma rural; Bisumwa in Butiama; Irunda in Sengerema; Ilumba in Kwimba and Nyamirembe in Chato

IRS Quality assay results are summarized on Table II above and Figure 8 below.

FIGURE 8: MORTALITY RATE WITHIN 24 HOURS, TANZANIA MAINLAND



Insecticide decay rate on sprayed wall surfaces

Monitoring of insecticide decay rate through WHO cone bioassays on different surface types sprayed with Actellic 300CS in mainland Tanzania shows that test mortality rates ranged from 97.5-100% in all sites two months after spraying. The lowest score of 97% mortality was recorded from a cement wall surface in Ngara only, the rest of the surfaces scored 100% mortality. Monthly wall bioassay monitoring is scheduled to continue until mortality drops to <80% for two consecutive months.

8. MONITORING AND EVALUATION

Monitoring and evaluation for the 2016 IRS campaign closely followed the processes outlined in the annual AIRS Tanzania Work Plans and the AIRS M&E Plan, which the AIRS Home Office M&E team developed.

8.1 KEY OBJECTIVES

The key objectives of AIRS Tanzania M&E activities are:

- Emphasizing accuracy of both the data collection and the data entry process through comprehensive training and supervision at all levels
- Streamlining and standardizing data flow to minimize errors and facilitate timely reporting
- Ensuring IRS data security and storage for future reference through establishment and enforcement of proper protocols

8.2 APPROACH AND OBJECTIVES

AIRS Tanzania implemented M&E using standard procedures and incorporated lessons learned from previous spray campaigns. During the campaign, the AIRS Tanzania M&E system provided accurate data through paper-based forms, a centralized Access database, PMT messages, and supervisory monitoring reports. They provided timely decisions and guidance to spray activities. AIRS Tanzania observed a high level of data quality throughout the campaign by using the following standards:

- a. Emphasis on the accuracy of both the data collection and the data entry process through comprehensive training and supervision at all levels
- b. Streamlined and standardized data flow to minimize errors and facilitate timely reporting
- c. IRS data security and storage for future reference through establishment and enforcement of proper protocols

8.3 REPORTING INDICATORS

AIRS Tanzania's M&E Plan (MEP) provided proper data collection and reporting of all approved core and other indicators. AIRS Tanzania used indicator targets to assess the project's progress during the campaign and will use the same data at the end of the project. AIRS Tanzania used quality assurance methods and tools to ensure high-quality IRS program implementation.

8.4 M&E DATA COLLECTION AND VERIFICATION TOOLS

Spray operators collected data using standardized data collection forms designed to capture all core PMI indicators.

The AIRS Tanzania M&E Manager incorporated all AIRS M&E protocol updates, including enhancements to the data collection tools (see table 12 below for details), before the start of the campaign to ensure the collection, management, and reporting of high-quality data. The database served as a tool for implementation and management by tracking key performance and output indicators. The database helped M&E and technical staff to produce real-time reports for quick feedback. The database also helped reconcile errors and prevent additional errors in data collection and entry through programmed audit checks and other data quality assurance measures.

Spray operators collected spray data. Team leaders and supervisors verified the data. Supervisors transported it to the data entry centers for entry. Data clerks performed a final verification of spray form data and arithmetic before entering the data into the database. At the end of each day, the M&E Assistants and M&E Managers reviewed the data entered for anomalies and addressed issues with data center staff. For quality control purposes and timely generation of weekly client spray progress reports, the standard was to enter all data within 48 hours of spraying. Data entry clerks filed and archived Daily Spray Operator Forms at each of the data centers. Meeting the 48-hour data entry turnaround posed a challenge in many of the districts. Lessons learned in this regard will help improve the next spray campaign. At the end of each day, data entry clerks backed up all databases electronically. The data entry clerks performed backup in three different ways: first, into a backup folder on each server that served as the district data entry server; second, into a cloud backup system (Dropbox); and third, onto an external memory card/MicroSD adapter inserted into each server. All servers and external memory cards are secured in the IT offices in Mwanza and Zanzibar.

TABLE 12: TANZANIA IRS 2016 DATA COLLECTION TOOLS

Data Collection Tool	Used by Whom And When
Training Participants Registration Form	Used by lead trainer at training workshop to capture category and number of people trained disaggregated by sex
Enumeration/Mobilization Form	Used by mobilizers during pre-spray house-to-house enumeration/mobilization to collect data on the number of structures in target areas and number of people reached with the IRS sensitization messaging
IRS Card	Enumerators captured house/household information during house-to-house mobilization. Also used by spray operators to record spray data. Data captured by the IRS cards includes: name of head of household, data of mobilization, name of mobilizer, data of spray, number of eligible structures, number of structures sprayed, and signature of spray operator
Daily Spray Operator Form	Used by spray operators during spray operations to capture structures found, structures sprayed and not sprayed, population protected and not protected.

8.4.1 DATABASE PREPARATION

The AIRS Tanzania M&E team performed the following activities in preparation for the spray campaign:

- Worked in close collaboration with the Client Technology Centre during database development. This included translating the database screens/forms from English to Swahili, reviewing and testing the database, and providing necessary recommendations to ensure data quality at all levels and proper control of IRS data
- Ensured IRS data security and storage for future reference through establishment and enforcement of proper protocols
- Streamlined and standardized data information flow to minimize errors and facilitate timely reporting
- Emphasized accuracy of both the data collection/verification and the data entry process through comprehensive training and supervision at all levels
- Facilitated recruitment and training of data entry clerks and M&E Assistants on the database, data entry, and data management

The M&E Manager calculated spray coverage as the percentage of the number of structures sprayed of the total number of structures spray operators found during the 2016 campaign. Spray progress was a percentage of the number of sprayed structures out of the total number of targeted structures. A final count of “structures found” from the last spray campaign served as targets for tracking spray progress and performance at the sector- and district-levels.

8.4.2 DATA QUALITY ASSURANCE AND CONTROL

Standardized data quality assurance tools, the Error Eliminator (EE) and Data Collection Verification (DCV), helped improve supervision and ultimately the quality of data collection and data entry during the 2016 spray campaigns. Approximately 12,450 of these forms were filled out by Team Leaders, Supervisors, and Monitoring and Evaluation Assistants. The forms were used to assess the accuracy and completeness of SOP forms as well as to verify household data. Table 13 describes the tools, their purpose, and their users. To ensure data integrity, AIRS Tanzania used a number of quality assurance and control tools described in Tables 13 – 15 below.

TABLE 13: DATA QUALITY ASSURANCE TOOLS

Tool	Purpose, Used by Whom and When
Error Eliminator Form	Purpose: <ul style="list-style-type: none"> • To check the completeness and correctness of data collected in the field • To identify quickly and highlight common data collection errors, make corrections, and provide re-training by the supervisor Used by: <ul style="list-style-type: none"> • Team leaders on daily basis to check 100% of the forms the SOPs under their supervision filled out • Supervisors, District Coordinators, M&E Assistants, Operations Manager, Database Manager, and M&E Manager when visiting the field

Tool	Purpose, Used by Whom and When
Data Collection Verification Form	Purpose: <ul style="list-style-type: none"> Used during randomized household visits to check the accuracy of data collected in the field, i.e., to ensure that the data written on the Daily SOP Forms matches the information households reported and/or the data recorded on the IRS Cards disseminated to households Used by: <ul style="list-style-type: none"> M&E Assistants, predominately District and Regional Coordinators Database Manager and the M&E Manager

TABLE 14: USE OF DCV FORM: COMMON ISSUES FOUND AND CORRECTIVE ACTIONS TAKEN

Errors/Issues Observed	Corrective Actions Taken
<p>Understatement of total number of eligible structures found by SOPs. In compounds where some structures were locked, SOPs did not always count them as part of the total number of eligible structures found.</p>	<p>The M&E team provided correction regarding this error to SOPs, Team Leaders, and Field Supervisors. The team emphasized that all eligible structures were part of the count whether locked or open. Spray teams were to probe further concerning the eligibility of structures especially, when the structure was locked. This was spotted early on, thus avoiding larger oversight during the campaign.</p>
<p>Overstatement of total number of eligible structures found. In some compounds, some new SOPs overcounted the number of eligible structures by counting the number of rooms as though they were structures. Also, some SOPs overcounted the total number of eligible structures by counting food stores and traditional shrines (especially when these structures were locked at the time of visit). Additionally, in some compounds, households convinced SOPs that structures that were under construction at the time of visit would be ready for occupancy in the next few days and thus eligible. These structures were counted as eligible with the hope that they would be ready for spraying during a revisit, but many were not completed in time to be covered and thus should not have been counted as eligible. This was a negligible amount of structures.</p>	<p>The M&E team addressed SOPs, Team Leaders, and Field Supervisors, asking them to take note of these common errors and to be careful in determining the eligibility of structures before recording them. Spray teams were reminded that the eligibility of a structure is based on evidence at the time of the visit, not on its expected future eligibility. There is a need to strengthen SOP training next year to avoid some of the shortcomings observed.</p>
<p>Undercounting of number of structures sprayed In some compounds the number of sprayed structures were undercounted. This was specific to very large compounds where SOPs had to make their way through different courtyards in the same compounds.</p>	<p>The M&E team asked SOPs, Team Leaders, and Field Supervisors to note this error and to be careful in counting both eligible and sprayed structures especially in large compounds with different courtyards. In the future, SOP will be given practical exercises during training before they can qualify to be SOPs.</p>

TABLE 15: DATA QUALITY ASSURANCE AND CONTROL

Issue	Method/Tools for Quality Assurance
Spray data integrity	<ul style="list-style-type: none"> • Use of standardized data collection forms. • Comprehensive training for spray data capture. • Multiple levels of supervision. • SOPs supervised directly by their Team Leaders. • Supervisors monitored the Team Leaders and verified SOP forms. • M&E Manager, Database Manager, and District M&E Assistants monitor and verified data captured by SOPs, Team Leaders, and Supervisors. • Structure spot checks to cross-check daily spray data captured by SOPs. • Database designed with locks and validation checks. • Use of EE and DCV forms to ensure complete and accurate data collection.
Spray data entry and management	<ul style="list-style-type: none"> • Data entry training for all Data Entry Clerks and M&E Assistants. • Prompt field data entry and transfer; data collection forms arrived at data entry sites daily and daily data entry • Data entry via double-data entry method <ul style="list-style-type: none"> ▪ Initial data entry of totals per data collection form ▪ Follow-up entry of details data, i.e., data per individual household/compound • Data scan for irregularities by Database Manager and IRS supervisory staff • Use of Microsoft Access-based IRS Cleaning/Reporting tool to clean data daily
Data security	<ul style="list-style-type: none"> • Data collection forms printed on durable sheets • Paper data collection forms filed systematically in arc files • Database designed with passwords to restrict unauthorized entry • Databases backed up daily on the server laptop, on Dropbox, and on external memory cards

8.5 M&E DATA ENTRY, TRACKING, STORAGE AND SECURITY

AIRS Tanzania employed 82 data entry clerks (10 in Chato, 10 in Bukoba Rural, nine in Ngara, seven in Missenyi, five in Musoma Rural, eight in Butiama, 15 in Sengerema, 10 in Kwimba, seven in Unguja (Central, North A, North B, South, West districts and one in Pemba’s Chakechake and Micheweni districts) to enter all spray data generated from the 15 districts. AIRS Tanzania used laptops for the 2016 spray round data entry. The database setup entailed using a server in each district data entry center. The Project installed the 2016 AIRS Tanzania database on each laptop. The Project carried out data entry at two levels, first by “Totals” (i.e., data entry by the total lines of each form) for quick reporting and feedback, then by “Details” (i.e., data entry by detail data for each structure) for more accurate data entry and verification.

8.5.4 DATA STORAGE

The Project used box files to store paper-based forms such as spray operator forms, team leader daily summary forms, and supervisor forms. Team leaders had their own box files with their name tags while supervisors and M&E assistants had one box file to file both supervisor forms and data collection verification forms. Team leaders filed spray operator forms by spray date in their files. At the end of each day, all databases were backed up electronically. The system used three backup methods: first, into a backup folder on the laptop that served as the district data entry server; second, into a cloud backup system (Dropbox); and third, onto an external memory card/MicroSD adapter inserted into each server. All computer and flash drives are secured in IT offices in Mwanza and Zanzibar.

8.5.5 DATA CLEANING

Data entry clerks at the district level performed data cleaning, which involved the following:

- Ensuring correct entry of data cards by the double entry method (entered first by totals and then by details)
- Ensuring completion of all necessary corrections so that the data entered by totals and details balance
- Checking and removing duplicate records
- Identifying and entering missing records

The data clerks used a Microsoft Access-based IRS Cleaning/Reporting tool for data cleaning. The data entry clerks cleaned spray data daily throughout the spray campaign with final data cleaning completed within five days of the end of the Lake Zone campaign and three days of the of the Pemba campaign. However, this timeline was extended for Kagera and Unguja due to data entry and cleaning challenges. The lessons learned from this will serve to improve the next campaign.

9. RESULTS

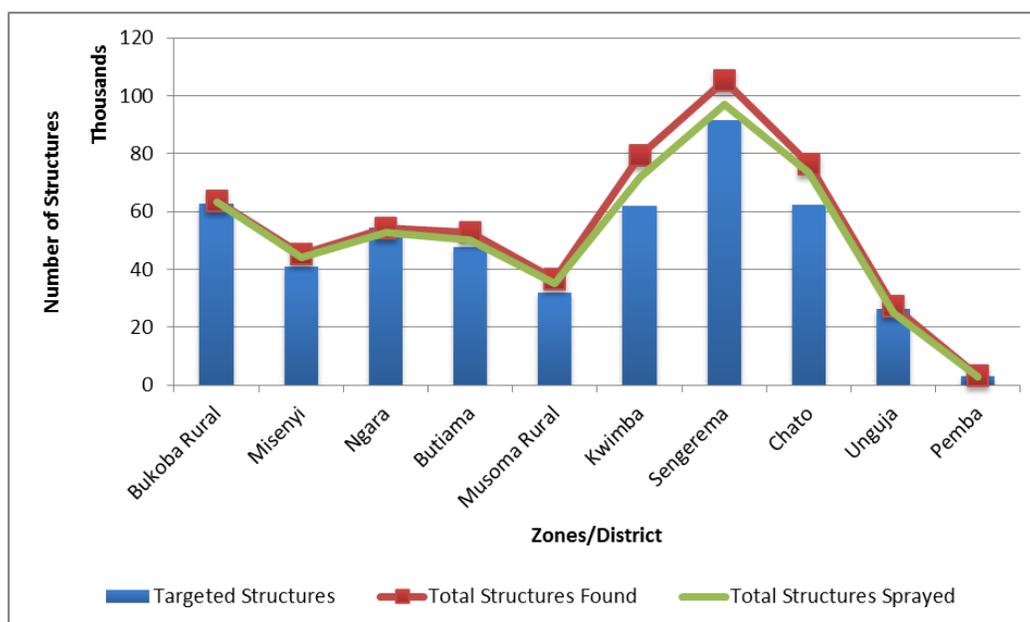
9.1 POPULATION AND STRUCTURES FOUND

The spray campaign covered 515,217 structures out of the 543,865 structures found, resulting in 94.7% spray coverage (and 106% spray progress). The campaign protected 2,042,561 people, including 61,822 pregnant women and 400,314 children under five years of age (see Table 16 and Figure 9 below).

TABLE 16: SUMMARY OF TANZANIA IRS RESULTS FOR 2016 CAMPAIGN

District	Targeted Structures	Total Structures Found	Total Structures Sprayed	Spray Progress (%)	Spray Coverage (%)
Bukoba Rural	62,730	63,744	63,346	101.0%	99.4%
Misenyi	40,813	45,344	44,111	108.1%	97.3%
Ngara	54,578	54,211	52,885	96.9%	97.6%
Butiama	47,577	52,748	50,066	105.2%	94.9%
Musoma Rural	31,824	36,682	35,151	110.5%	95.8%
Kwimba	62,000	79,430	71,733	115.7%	90.3%
Sengerema	91,547	105,129	97,012	106.0%	92.3%
Chato	62,337	76,482	73,249	117.5%	95.8%
Mainland Total	453,406	513,770	487,553	107.5%	94.9%
Unguja	26,336	27,000	24,989	94.9%	92.6%
Pemba	3,192	3,095	2,675	83.8%	86.4%
Zanzibar Total	29,528	30,095	27,664	93.7%	91.9%
Grand Total	482,934	543,865	515,217	106.7%	94.7%

FIGURE 9: AIRS TANZANIA SPRAY RESULTS AGAINST TARGETED STRUCTURES



9.2 POPULATION PROTECTED

There were 2,137,988 people enumerated as living in the structures SOPs found. Of this number, 95.5% (2,042,561 people) received protection through IRS. The number of people protected included 61,822 pregnant women and 400,314 children under five. Table 17 below provides a detailed summary of total population in each district, proportion protected, and total population protected; segregated into pregnant women and children under five.

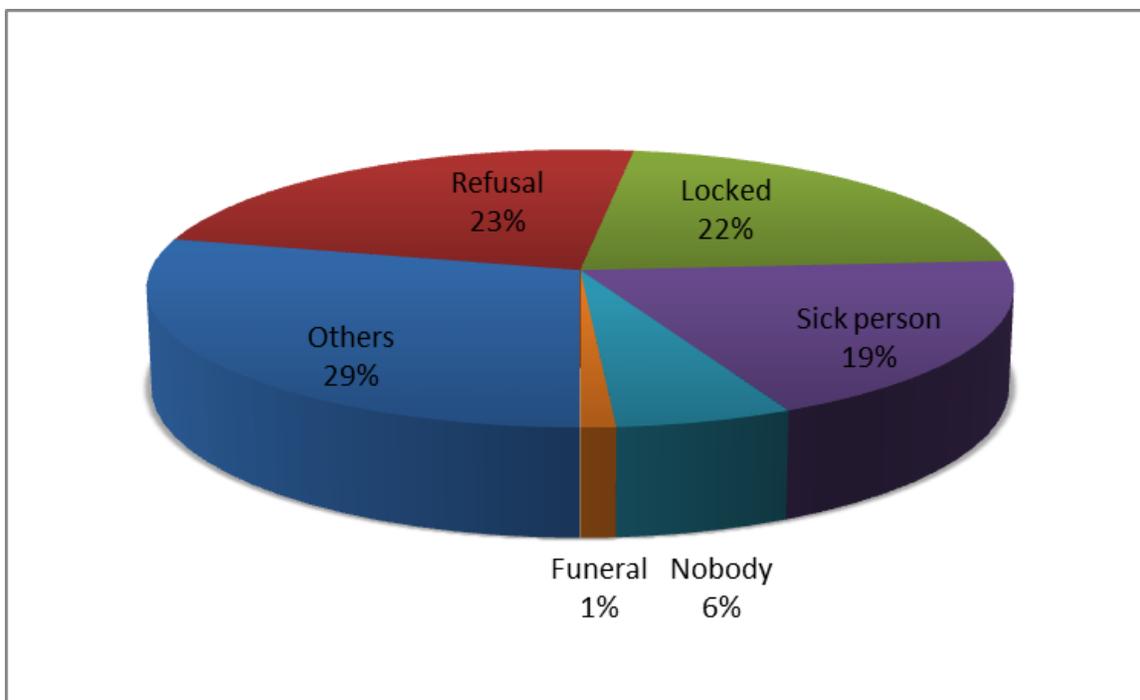
TABLE 17: PEOPLE PROTECTED DURING IRS TANZANIA 2016 CAMPAIGN

District	Total Population	# of People Protected	% of Pop. Protected	Pregnant Women Protected	Children Under 5 Protected
Bukoba rural	271,088	269,679	99.5%	5,541	39,152
Missenyi	188,543	184,634	97.9%	4,975	28,639
Ngara	237,478	232,189	97.8%	6,136	42,947
Butiama	181,533	172,743	95.2%	6,009	35,323
Musoma rural	153,502	147,778	96.3%	3,903	32,102
Kwimba	313,276	286,954	91.6%	8,833	63,325
Sengerema	372,538	348,244	93.5%	13,087	77,205
Chato	279,289	270,170	96.7%	10,085	59,998
Mainland Total	1,997,247	1,912,391	95.8%	58,569	378,691
Unguja	123,708	115,332	93.2%	2,836	18,665
Pemba	17,033	14,838	87.1%	417	2,958
Zanzibar Total	140,741	130,170	92.5%	3,253	21,623
Grand Total	2,137,988	2,042,561	95.5%	61,822	400,314

9.2.1 REFUSALS AND STRUCTURES NOT SPRAYED

During the 2016 spray campaign, the Project did not spray 28,648 structures. Three common reasons were: “other unspecified reasons” for 8,234 (28%), refusals for 6,734 (23.5%), and closed structures for 6,202 (21.6%). Additional reasons included sick person in the house for 5,469 (19.1%), nobody present at home for 1,678 (5.9%) and holding funerals for 331(1.2%) structures³. Figure 10 below provides detailed reasons for each district. Common causes behind refusals were limited involvement of hamlet leaders on the Tanzania mainland and political interference in Zanzibar. The Project revisited unsprayed structures for mop-up spraying in the last two days of the campaign, further improving coverage.

FIGURE 10: STRUCTURES NOT SPRAYED DURING 2016 IRS CAMPAIGN



³ These reasons also include revisits and the reasons why those revisits weren't successful, for structures that were eventually sprayed. This is why the total of the reasons cited is larger than the total number of structures not sprayed.

9.3 USE OF INSECTICIDES

Spray operators used 175,173 insecticide bottles during the 2016 spray campaign to spray 515,217 structures. On average, one bottle sprayed 2.9 structures. Spray operators used an average of 3.5 bottles a day, and each operator on average sprayed 10.3 structures a day. Table 18 below shows details of insecticide consumption broken down by district.

TABLE 18: INSECTICIDE USAGE

District	Total Structures Sprayed	Total Bottles Used	Average Number of Structures sprayed per Bottle	Average Number of Bottles per SOP per Day	Number of Structures sprayed per day per SOP
Bukoba rural	63,346	23,376	2.7	3.6	9.7
Missenyi	44,111	14,287	3.1	3.4	10.5
Ngara	52,885	18,346	2.9	3.3	9.5
Butiama	50,066	16,459	3.0	3.2	9.7
Musoma rural	35,151	14,360	2.4	4.3	10.5
Kwimba	71,733	24,955	2.9	3.9	11.2
Sengerema	97,012	30,103	3.2	3.5	11.1
Chato	73,249	24,675	3.0	3.7	11.1
Mainland Total	487,553	166,561	2.9	3.6	10.5
Unguja	24,989	7,820	3.2	2.6	8.3
Pemba	2,675	792	3.4	2.1	7.1
Zanzibar Total	27,664	8,612	3.2	2.5	8.2
Grand Total	515,217	175,173	2.9	3.5	10.3

At the end of the operation, 22,536 bottles of Actellic 300CS (excluding 7,500 bottles set aside for GGM spraying) remained unused and are safely stored in warehouses on the mainland for use in forthcoming operations. In Zanzibar, 2,355 bottles of Actellic 300Cs remain for use in future operations.

9.4 COMMUNITY SENSITIZATION RESULTS

AIRS Tanzania conducted IRS community sensitization through community meetings and mass media. The Project used community and commercial FM radio stations for communication before and after the spray campaign. The Project also held community meetings with local leaders, including ward executive officers, Village Executive Officers (VEO), village chairpersons, and Council and Community Health Agents (CCA). Following ward meetings, each ward CCA in collaboration with the village chairpersons and Village executive officer developed a community sensitization schedule at the village level to reach communities at the hamlet level. Table 19 below provides a summary of number of community meetings conducted and total number of participants for each district.

TABLE 19: COMMUNITY SENSITIZATION MEETINGS, AIRS 2016 CAMPAIGN

District	Number of Community meetings	Total participants
Bukoba rural	92	1878
Missenyi	77	634
Ngara	77	462
Butiama	18	808
Musoma rural	21	531
Kwimba	46	625
Sengerema	30	430
Chato	6	808
Mainland Total	367	6176
Unguja	1	210
Pemba	2	100
Zanzibar Total	3	310
Grand Total	370	6486

10. CAPACITY BUILDING OF THE MINISTRY OF HEALTH

10.1 CAPACITY BUILDING DURING IRS TRAINING AND OPERATION

The PMI AIRS Project continues to build the capacities of local staff and government counterparts. This includes the recent environmental compliance training, which took place in Senegal and in which the Project ECO and ZEMA expert participated. A participant from NEMC was cleared to participate but failed to show up due to administrative constraints. In addition, AIRS Tanzania has contributed to building capacity in all Lake Zone districts and Zanzibar, exposing them to new ways and ideas for IRS implementation. To operationalize these ideas, the Project involved District Vector Control officers, Zonal Environmental Officers, District Public Health personnel, and Malaria Focal Persons in all training, including TOTs, spray operator training, and advocacy meetings. After the training, the trainees used what they had learned in IRS implementation.

As part of a hands-on approach to capacity building, the DMO's office (including the Vector Control Officer, District IEC Coordinator, District Health Officer and District Malaria Focal Person) was fully involved in the supervision of IRS in their respective districts. In addition, to strengthen ownership, a team of regional and district administrators accompanied by their respective District Medical Officer and Regional Medical Officer participated in IRS supervision. These included the Regional Commissioner, Regional Administrative Secretary and Regional Malaria Focal Person from each region. Those from the district level included the District Commissioner and District Executive Director.

In the fall 2016, AIRS Tanzania will complete an NMCP capacity assessment. The assessment will measure their competencies in several areas of IRS including: procurement/logistics, environmental compliance, planning, monitoring and evaluation, entomology, and IEC/BCC.

II. GENDER

To comply with the PMI/USAID policy of gender equality and women empowerment, AIRS Tanzania management made an effort to increase women's participation in the 2016 spray campaign. The policy aims to improve lives of citizens around the world by advancing equality between men and women and empowering women and girls to participate fully and benefit from their society's development.

Tanzania, among other African countries, faces negative stereotypes for women who participate in the IRS campaign. So the Project developed a gender operational plan aimed at achieving a percentage of women in the Project of 25% in 2016. To achieve the goal, one of the strategies was to introduce gender awareness by starting with districts and regional advocacy meetings, then addressing the issue at the community level. The meetings emphasized the USAID/PMI requirements on gender inclusion.

The participants were ambassadors to their villages and work places, encouraging women to apply for vacancies announced during the AIRS campaign preparations. The recruitment process was open and stressed fair dealing by ensuring all job advertisements were in the local language "Kiswahili" and encouraged women to apply. Priority was given to women applicants in the event that a female candidate had equal merit to a male candidate.

All operational sites made a provision for secure and separate changing rooms and toilets for men and women to create a work environment that was conducive to the inclusion of women SOPs.

In the first year of PMI AIRS operations, out of 4,754 temporary staff employed, 1,642 (34.5%) were women filling different posts, including supervisors, storekeepers, mobilizers, team leaders, spray operators, washers, security guards, data entry clerk, monitoring, evaluation, and pump technicians.

II.1 GENDER TRAINING

AIRS Tanzania ensured all permanent and temporary staff had training on gender awareness and inclusion to create ownership and involvement at all levels before starting the spray campaign. The Project incorporated gender awareness and inclusion in all IRS pre-spray training documents, which focused on PMI anti-sexual harassment guidelines. Project staff facilitated gender awareness for team leaders, site supervisors, storekeepers, spray operators, and all other temporary staff, including government personnel who were to work with the Project during the spray campaign. Training was in Kiswahili so that all participants could understand it. Gender training established communication channels and hotlines to report any sexual harassment and gender-based violence among temporary staff.

FIGURE 11: FEMALE PARTICIPATION IN KAGERA AIRS TANZANIA SPRAY CAMPAIGN 2016



11.2 GENDER INCLUSION IMPLEMENTATION

To standardize a gender-equitable working environment, the Project translated PMI/USAID AIRS Project anti-sexual harassment guidelines into Kiswahili, printed them on big Plexiglas posters, and during the spray campaign distributed them to all Abt offices and sites (i.e., regional and central offices, warehouses, and all 102 operational sites). The Project positioned the posters so that they were visible to every person visiting the site, enabling visitors and workers to read them.

The guideline on sexual harassment had a big impact on many of our workers and reduced the potential for sexual harassment at all stages of project implementation, from recruitment and hiring to field work for all cadres. During the campaign, women and men who were interviewed said that having sexual harassment guidelines in place, with big posters hung at each site, eliminated sexual and other work related harassment and contributed to a safe and enjoyable working environment.

12. CHALLENGES, LESSONS LEARNED AND RECOMMENDATIONS

12.1 CHALLENGES AND LESSONS LEARNED

The main challenges experienced and lessons learned during the 2016 IRS campaign included the following:

12.1.1 CHALLENGES

- The Project could not spray some structures for various reasons, ranging from householders being away to having a very sick person in the house, funeral ceremonies, or a simple refusal to have a house sprayed. The Project schedule revisits during mop-up in the last two days of the operation.
- Hamlet leaders were uncooperative during the spray campaign because unlike in previous spray campaigns, they did not receive a per diem because mobilizers were performing what the leaders presumed to be their roles.
- SOPs were not recording and marking structures correctly in the first week of the Kagera spray campaign.
- Competing government functions/meetings during IRS at the ward and village level requiring participation of mobilizers and village/hamlet leaders led to occasional interruption of spray operations.
- Some structures/rooms in structures were used for storage of harvested food and this limited their availability for spraying.
- High rate of refusals was recorded in some areas particularly in more urban settings such as Buseresere and Sengerema.
- Some of the mobilizers were not from the village where they were working, resulting in poor response and refusals from the communities.
- Misconception and myths regarding relationship between IRS and bedbugs led to short-lived refusals in some districts.
- There was a challenge on allocation and spray operators' use of IRS cards in the first days of the campaign. This experience warrants a thorough review of quantification and use of the cards in subsequent IRS operations.
- Absence of some households during time of spraying because of farming, market days, work days, funerals, and some refusals meant that some structures could not be covered, even after mop-up.
- Shortage of resources from the district as part of their contribution in implementation of the project; e.g., Sengerema district did not have enough vehicles to support the project.
- Project equipment, particularly a number of old Hudson pumps were faulty, often interrupting smooth running of the campaign. A thorough maintenance or removal of unusable equipment should be done before the next operation.

12.1.2 LESSONS LEARNED:

- Engaging all relevant stakeholders such as district administrators, police, and the anti-corruption bureau in the recruitment process for all cadres at district level was helpful. It ensured transparency and proper selection of competent seasonal workers based on their interview performance.
- Building the capacity of government leaders and health managers by training them on all components of IRS operations enhanced their interest and ownership of the Project activities.
- Informal engagement of community mobilizers from different Shehias for IEC made a significant contribution to the mobilization process.
- The timing of spray campaigns should not be very close to election periods as this could result in politically motivated refusals by communities.
- Regular feedback meetings were instrumental to the smooth implementation and achievement of the high spray coverage recorded.
- Payments through MPESA in the Kagera campaign were delayed as the team learned to balance the timely submission and cross check of sign-in lists with the need to make timely payments to all workers. The subsequent campaigns in Chato, Mwanza and Mara were able to make payments to workers on the dates promised.
- Local procurement of PPE was fraught with challenges. Local vendors required constant follow up to deliver their items and the Project changed several vendors late in the procurement process to get all quantities needed for the campaign. Further, the vendors originally selected for masks and gloves attempted to deliver items not in compliance with their original sample. In the end, a large portion of the masks and gloves needed for the campaign were sourced internationally with the remaining quantities sourced from multiple vendors locally.
- Vehicles used for transport were not comfortable for users. Canter trucks are preferable to Hiace vans as they have more space for pump stowage between legs.

12.2 RECOMMENDATIONS

- For quasi-based IRS, the number of days allocated for using bicycles or going on foot should be relevant to geographical areas.
- Micro planning should broaden involvement of district technical personnel and share work plan and campaign costs with RMOs and DMOs to create transparency, ownership, and common understanding of IRS implementation.
- Before starting the IRS campaign, distribute updated information on the identified or estimated number of eligible structures.
- Supervisors who were not consistent in meeting their weekly targets of mobile supervisory forms should be held accountable for their actions.
- Utilize hamlet leaders to mobilize their communities in subsequent spray campaigns

ANNEX A: LOCAL PROCUREMENT

Description	Quantity
IRS Transportation	
Rented Vehicles used in Distribution (15 days)	44
Rented Vehicles used in Distribution (18 days)	34
Rented Vehicles used in Distribution Zanzibar (10 days)	3
Rented Vehicles used in Distribution (5 days)	18
Rented Vehicles used in Distribution (4 days)	5
Rented Vehicles used in Distribution (2 days)	2
Rented Vehicles used in IRS implementation (Mainland and	222
IRS Supervision vehicles (Country Office)	21
Printed Materials	
Store Stationary	
Attendance Register (book)	115
Visitors Book (book)	115
Daily Insecticide Tracking Sheet (A4)	2,610
Daily Temperature log sheet (A4)	405
Issue Vouchers	270
Insecticides stock tracking sheet (A4)	2,610
Goods received note (A4)	1,310
Daily Distribution forms (A4)	2,610
Bin Cards (A4 Cardstock)	2,970
Store Ledger (book)	224
PMI Sexual Harassment Guidelines board (English)	15
PMI Sexual Harassment Guidelines board (Swahili)	111
M&E Forms	
IRS Cards (A5 - White Card Stock)	506,138
Enumeration/Mobilization Forms	4,525
SOP forms	74,754
Team Leader forms with EE	13,923
EE forms – Enumeration	1,000
EE forms – Spraying	5,000
IEC Materials	
Illustrative fact sheet	9,000
Q&A brochures	2,500
IRS Posters	1,000

Description	Quantity
Assorted Materials	
	(per item unless noted)
Aprons	120
Box Files	1,275
Breakfast – Juices	91,762
Breakfast – Biscuits	91,762
Register	198
Calculators	176
Clear Bags	3,030
Coveralls	7,184
First Aid Kits	335
Handkerchiefs	3,030
Haversacks	3,030
Liquid Washing Soap (Gallon jug)	510
Lubricant Oil	100
Nose Masks	26,500
Padlocks	348
Plastic Bags for Packing Material	500
Plastic cover sheets	1,385
Short Gloves	3,143
Sisal Rope	54
Socks	3,030
Stationary- ID Card Holder	1,520
Stationary- Pen	4,000
Stationary - Permanent Marker Pens (Boxes)	83
Toilet Papers	1,800
Tool Kits	413
Tooth Brushes	505
Torches	40
Towel	3,030
Slashers or Cutlasses	50
Rake	15
Whistle for security	25
Shovels	30
Chalk (boxes)	412
Equipment	
Computers for Servers	10
Computers for Data Entry Clerks and M&E Assistants	95
Phones for Supervisors/Storekeepers	140
USB Modem	20
SD Memory Card	20
Sim Cards for Modem	20
Power Bank 16,000 MH	30
Power Adapter	20
Extension Cable	10

ANNEX B: INTERNATIONAL PROCUREMENT

Description	Quantity
International Procurement	
CFVs and Seals	3,215
Gasket Nozzle	2,500
Kit F/3 & 4 Gal X-perts	100
19" Gloves	2,364
Nose Masks (boxes)	661
Insecticide - Actellic 300CS (bottles)	207,306
Navy Coverall	2

ANNEX C: STOCK UPDATE

Item Name	UOM ⁴	From RTI	Procured	Total Before IRS	Issued During IRS	Total Available After IRS
PPE						
Coverall	Pc	2143	7184	9327	6282	8,972
Masks	Pc	9632	105880	115512	70353	45,159
Gumboots	Pair	4893	0	4893	2845	4,342
Gloves New	Pair	216	3143	3359	2874	485
Gloves Used	Pair	0	0	0	0	2,504
Long Gloves for Washers	Pair	0	204	204	204	198
Helmet, Complete	Set	2759	0	2759	2759	2,759
Helmet With Harness	Set	798	0	798	0	798
Helmet, incomplete	Pc	1813	0	1813	1017	1,813
Helmet Harness	Pc	1039	0	1039	0	1,019
Face Shield	Pc	3749	0	3749	3155	3,670
Shield Adaptor	Pc	14319	0	14,319	3445	13,610
Other Equipment for Operations						
Strainer	Pc	2554	0	2554	563	1,961
Handkerchief	Pc	0	3030	3030	2368	662
Socks	pc	0	3030	3030	3030	0
Small Towels	Pc	0	3030	3030	3030	0
Plastic/Leather Bag	Pc	640	0	640	640	486
Haversack	Pc	0	3030	3030	2750	2,608
Racksack	Pc	2585	0	2585	584	2,001
Clip Board	Pc	991	0	991	0	991
Plastic cup	Pc	2363	0	2363	2363	1,985
Mine Torch	Pc	1752	0	1752	0	1,752
Tool kits	kit	175	413	588	588	501
Basin 80 Lts	Pc	1534	0	1534	1131	1,487

⁴ Unit of Measurement

Item Name	UOM ⁴	From RTI	Procured	Total Before IRS	Issued During IRS	Total Available After IRS
Barrel for liquid waste	Pc	186	0	186	157	164
Hoe	Pc	12	0	12	12	12
Spade	Pc	7	0	7	7	7
Panga	Pc	0	0	0	0	0
Slashes	Pc	60	50	110	110	102
Rakes	Pc	46	45	91	91	91
Plastic Buckets 20 Lts	Pc	2377	0	2377	1421	2,057
Plastic Buckets 10 Lts	Pc	21	0	21	0	21
Jug 1.5 Lts for basin	Pc	0	0	0	0	0
Jug 1 Lts for buckets	Pc	3224	0	3224	1527	1,877
Thermometer	Pc	180	0	180	180	140
Moper Bucket, moper (Cleansing Set)	Set	710	0	710	318	589
Squeezer	Pc	588	0	588	318	458
Soft Broom	Pc	93	0	93	14	79
Hard Broom	Pc	433	0	433	318	319
Local Broom (Fagio)	Pc	0	0	0	0	0
Mega Phone	Pc	122	0	122	0	122
Calibrated jug 2Lts	Pc	318	0	318	189	274
"Tooth brush" for nozzle cleaning	Pc	123	505	628	482	297
Color Coded Vest Yellow	Pc	709	0	709	1085	612
Color Coded Vest Orange	Pc	376	0	376		279
Washing Brush	Pc	280	0	280	280	255
Plastic Apron	Pc	66	120	186	170	140
Consumables						
Battery per watchmen (Size MU-I)	Pc	7243	0	7243	1083	5,161
Powder Soap	Kg	45	0	45	13	32
Liquid soap		0	510	510	510	0
Bar Soap	Bar	5890	0	5890	743	4,106
Toilet Paper	Pc	0	1800	1800	1756	44
Oil	Liter	10	100	110	102	8
Pregnancy Test	Strip	1150	341	1491	1388	103

Item Name	UOM ⁴	From RTI	Procured	Total Before IRS	Issued During IRS	Total Available After IRS
Spray Equipment						
Hudson Pump - 8 lts	Pc	2540	0	2540	2880	2,540
Hudson Pump - 10 lts	Pc	1753	0	1753		1753
TOTAL Hudson pump	Pc	4298	0	4293		4,293
Pump hanger	Pc	153	0	153	102	139
Pallets		641	0	641	108	402
Hudson pump spare parts						
Hudson spare kits	kits	0	100	100	100	97
Hose connector 115-950	Pc	154	0	154	154	0
8L Extension tube assembly only 141-967	Pc	864	0	864	0	864
Hose pipe/Hose only 115-902 (Hose 5' Long)	Pc	610	0	610	532	78
Plunger tube and handle only 147-501	Pc	75	0	75	0	75
Shutoff valve body cap 115-733	Pc	179	0	179	107	72
Teflon bearing for valve pin 110-234	Pc	113	0	113	113	0
Strainer Assembly complete 146-617	Pc	975	0	975	60	915
O ring gasket for male strainer fitting 805-310	Pc	1000	0	1000	0	1,000
Strainer housing assembly 146-627	Pc	2445	0	2445	681	1,764
Nozzle body 114-791	Pc	2589	0	2589	0	2,589
Shutoff cock 806-428	Pc	279	0	279	279	0
Supply tube 129-074 - 3 gallon tank	Pc	1777	0	1777	560	1,217
Supply tube 129-074 - 4 gallon tank	Pc	531	0	531	192	339
CF Valve (Green) 98668	Pc	100	0	100	0	100
CF Valve (Blue) 98667	Pc	100	0	100	0	100
CF Valve (Red) 98666	Pc	100	3215	3315	3215	2,579
CF Valve (Yellow) 98665	Pc	100	0	100	0	100
Male fitting for strainer housing 114-905	Pc	775	0	775	300	475
Nut wing 115-970	Pc	397	0	397	285	112
No. 8002E Hardened stainless steel Nozzle tip (TIP T-JET) 805-855	Pc	2495	0	2495	1839	656
Nozzle body cap (Nozzle nut) 115-680	Pc	2514	0	2514	1273	1241
Hose adaptor assembly (stop cock) 148-704	Pc	0	0	0	0	0
Hose adaptor 115-960	Pc	237	0	237	237	0

Item Name	UOM ⁴	From RTI	Procured	Total Before IRS	Issued During IRS	Total Available After IRS
Supply tube adapter with wing fitting 115-968	Pc	269	0	269	41	228
Pump cylinder assembly, complete (Brass cylinder assembly xp) 147-202	Pc	165	0	165	123	42
Shutoff assembly complete thrustless (thrustless sub assembly) 149-706	Pc	70	0	70	70	0
Shoulder strap "2" wide 152-829	Pc	447	0	447	317	130
Hose with thrustless, shutoff and strainer assembly (Hose assembly) 146-689	Pc	146	0	146	146	0
100-Lb Pressure Gauge 803-311	Pc	1736	0	1736	748	988
Filter assembly for pressure gauge 146-605	Pc	585	0	585	497	88
Plunger assembly, complete for 3/4 gallon unit (147-538) 147-541	Pc	507	0	507	56	451
Cup replacement kit 148-833	Pc	422	0	422	173	249
Shutoff valve body 113-377	Pc	146	0	146	146	0
Cover assembly complete 140-205	Pc	254	0	254	254	0
Plug for gauge adaptor fitting (Plug) 114-152	Pc	5506	0	5506	1299	4,207
Cotter Pin, 3/32 x 7/8 - 801-419	Pc	393	0	393	0	393
1/8 x1/2 Cotter Pin 801-423	Pc	1711	0	1711	264	1,447
Polyethylene nozzle gasket 123-950	Pc	762	0	762	762	465
Extension tube and nozzle assembly 141-966	Pc	0	0	0	0	0
Nozzle assembly complete 141-989	Pc	923	0	923	593	330
Supply tube only for 4 gallon tank 129-075	Pc	0	0	0	0	0
Strainer (Filter) 152-356 (152 -135)	Pc	1288	0	1288	1288	0
Bumper pad 151-028	Pc	814	0	814	52	762
cup retainer 153-816	Pc	505	0	505	80	425
Washer 123-908	Pc	1078	0	1078	400	678
Cup leather only 154-007	Pc	1291	0	1291	1276	15
Hose clamp 803 623	Pc	932	0	932	272	660
Valve Pin assembly 143-000	Pc	5020	0	5020	1205	3,815
cover chain 116-426	Pc	1040	0	1040	272	768
Valve body cap, with O ring gaskets 149-702	Pc	491	0	491	377	114

Item Name	UOM ⁴	From RTI	Procured	Total Before IRS	Issued During IRS	Total Available After IRS
Housing for pump cylinder 110-790	Pc	995	0	995	135	860
Shutoff valve pin 115-716	Pc	637	0	637	224	413
Shutoff valve pin washer 123 -911	Pc	3687	0	3687	2747	940
Pump cylinder check valve assembly 140-054	Pc	4511	0	4511	206	4,305
Bumper spring 150-409	Pc	269	0	269	54	215
Shutoff valve pin spring 150-400	Pc	1196	0	1196	1134	62
Spring for pump cylinder check valve 150-604	Pc	3942	0	3942	936	3,006
Valve pin spring 150-605	Pc	4508	0	4508	688	3,820
Pump cap assembly, brass 149-102	Pc	226	0	226	128	98
Valve body cap O ring 805-309	Pc	4018	0	4018	698	3,320
O ring gasket for extension tube (805 -337)	Pc	0	0	0	0	0
Plunger adaptor 153-812	Pc	1076	0	1076	444	832
O ring gasket for hose connector 805-307	Pc	2722	0	2722	900	1,897
O ring for supply tube 805-312	Pc	2365	0	2365	0	2,365
Shutoff valve pin packing 151-016	Pc	3253	0	3253	328	2,925
Teflon valve pin sparer 118-243	Pc	208	0	208	140	68
Valve body cap O ring for valve pin 805-335	Pc	3275	0	3275	377	2,898
Cover gasket 151-401	Pc	999	0	999	555	444
Plier spanner	Pc	38	0	38	17	21
Adjustable spanner	Pc	43	0	43	28	15
Screw driver	Pc	52	0	52	23	29
Pump cylinder gasket 151-030	Pc	3027	0	3027	0	3,027
Shut-off operating lever 123-899	Pc	1803	0	1803	1013	790
Instruction Booklet - 871-596B	Pc	38	0	38	35	3
Instruction Booklet - 871-598	Pc	41	100	141	97	44

Item Name	UOM ⁴	From RTI	Procured	Total Before IRS	Issued During IRS	Total Available After IRS
Insecticide:						
Actellic 300 CS	Bottles	0	207,306 ⁵	207,324	174,941	32,383
Environmental Compliance and Mitigation Devices:						
Plastic sheets	Pc	190	1385	1575	1575	1575
Empty sachet container	Pc	4223	0	4223	2130	2,093
Whistle for security	Pc	89	25	114	114	83
Emergency Medication Kit	Pc	20	335	355	300	55
Torch for security guards	Pc	100	40	140	126	69
Fire Extinguisher 5 Kg	Pc	28	0	28	102	28
Fire Extinguisher 9 Kg	Pc	169	0	169		169
Red Tin Bucket 10 liters for sand	Pc	191	0	191	109	191
Shovel	Pc	75	30	105	102	91
Safety Signs and Labelling	Pc	112	0	112	102	112
Water Pump	Pc	0	0	0	0	0
Water Tank 210Lt	Pc	132	0	132	102	66
Water Tank 500Lt	Pc	6	0	6	0	6
Water Tank 550Lt	Pc	10	0	10	5	5
Water Tank 1000Lt	Pc	29	0	29	29	49 ⁶
Water Tank 2000Lt	Pc	3	0	3	3	3
Water Tank 3000Lt	Pc	0	0	0	0	0
Generator	Pc	2	0	2	0	2
Door Locks	Pc	86	348	434	392	282
File Shelf	Pc	2	0	2	0	2
Heavy duty shelf	Pc	84	0	84	0	84
Information System:						
Calculator	Pc	513	176	689	408	405
IRS cards by SOPs	Pc	0	506138	506138	506138	0
Chalks white	Pc	0	20600	20600	18600	966
Chalks colored	Pc	0	0	0		0
SOPs form	Pc	0	74754	74754	61282	8,964

⁵ The manufacturer supplied 18 extra bottles apart from what was ordered.

⁶ Twenty extra were discovered in the field which RTI did not include in the handover inventory

Item Name	UOM ⁴	From RTI	Procured	Total Before IRS	Issued During IRS	Total Available After IRS
PMT forms by storekeepers	Pc	0	303	303	303	0
Team Leaders forms (with Error Eliminators forms at the back)	Pc	0	13923	13923	11693	1,250
Bin cards	Pc	0	7429	7429	7429	474
Store Ledger Book	Pc	14	224	238	204	113
Daily distribution form	Pc	0	2610	2610	2313	277
Goods received note (GRN)	Pc	0	1310	1310	1310	0
Issue Vouchers	Pc	0	270	270	141	129
Daily Insecticide tracking sheets	Pc	0	2610	2610	2610	0
Daily monitoring form for insecticide consumption	Pc	0	2610	2610	2610	0
Daily temperature Log sheet	Pc	0	405	405	204	201
Attendance Register	Pc	0	313	313	102	211
Visitor's Book	Pc	15	115	130	102	28
My clear bag	Pc	437	3030	3467	3030	2,555
ID Card Holder	Pc	3363	1520	4883	4716	1,377
Box Files	Pc	52	1275	1327	204	901
Pens	Pc	0	4000	4000	847	742
Punch Machine	Pc	36	0	36	36	36
Stapler Machine	pc	41	0	41	41	31
My pocket guides for storekeepers	Pc	0	102	102	102	102
My pocket guides for Team Leaders	Pc	0	505	505	505	284
My pocket guides for Spray Operators	Pc	0	2515	2515	2515	363
Envelope A4	Pc	0	0	0	0	0
Participant Attendance List	Pc	0	186	186	186	0
Rubber Band	B10	0	0	0	0	0
Stapler Pin Size 24/6	PI000	133	0	133	102	31

ANNEX D: ENVIRONMENTAL MITIGATION AND MONITORING REPORT

Mitigation Measure	Status of Mitigation Measures	Outstanding issues relating to required conditions	Remarks
1. Pre-contract inspection and certification of vehicles used for pesticide or spray team transport.	<p>ECO and logistic coordinator inspected vehicles to be used during IRS operations to see if they met IRS standard requirements.</p> <p>They inspected 261 vehicles hired to support IRS operations in the 15 districts.</p>	The Project did not contract vehicles that did not meet PMI and IRS requirements or local regulations on vehicle road worthiness, such as the driver having a valid driving license, road license, and insurance or strong benches for SOPs to sit on. Old and expired fire extinguishers were replaced with new ones.	
2. Driver training	261 drivers were trained on safety issues, including wearing coveralls while on IRS field operations.	A few drivers were not adhering to instructions on the use of coveralls. In general, there was a high degree of compliance, but warnings were immediately issued to non-compliant drivers.	

Mitigation Measure	Status of Mitigation Measures	Outstanding issues relating to required conditions	Remarks
3. Cell phone, PPE, and spill kits on board during pesticide transportation.	Initial inspection of spray operator transportation vehicles revealed that most vehicles did not have spill kits on board during transportation of spray operators (349/845). In addition, there were many records of not having full PPE (1,566/6,216). It should be noted that a flashlight was one of the desirable tools for ensuring good application but it was not provided to SOPs.	The vehicles had plastic containers with spade but no sand. They were instructed during the training to get sand from the ground in the event of any spillage. The absence of sand in the plastic containers was captured by several supervisors as lacking a spill kit. PPE inspection included flashlights that were not provided.	In future operations they will be asked to put sand inside the plastic containers in the vehicle rather than obtain from the ground in the event of any spill. Inclusion of flash light as PPE will be removed from the checklist.
4. Pregnancy testing for female candidates for jobs with potential pesticide contact (washers, spray operators, team leaders, storekeepers, and supervisors)	Those found pregnant were given positions that did not expose them to insecticides. These included mobilization of households for IRS.	There were no outstanding issues of concern.	
Health fitness testing for all operators	All IRS workers potentially to be exposed to insecticide were tested for fitness. These included SOP, washers, Team Leaders, storekeepers and supervisors. A total of 3,042 personnel were tested and found to be physically fit for IRS work.	There were no outstanding issues of concern.	
5. Procurement of, distribution to, and training on the use of PPE for all workers with potential pesticide contact.	The outstanding challenge on PPE use was the small size of coveralls. The supplier of coveralls sourced them from China, where large and extra large did not mean the same in Tanzania. This caused some of our workers to have tight fitting coveralls and others not to have coveralls that fit them at all initially (larger sizes were provided or the overall were taken to tailors for alteration).	There were no outstanding issues of concern.	Next sourcing of PPE and especially coveralls should consider the physical size of local staff.
Training on mixing pesticides and proper use and maintenance of spray pumps.	All SOPs were trained on mixing pesticides before spraying. Pump technicians were trained on pump maintenance and repair.	There were no outstanding issues of concern.	
Provision of adequate facilities and supplies for end-of-day cleanup.	From cell phone reporting, a total of 178 washing events were reported, out of which one case reported inadequate washing facilities.	One case did not meet the requirements of the day clean up supplies.	Logistics team to ensure supplies are adequate throughout the operations sites.

Mitigation Measure	Status of Mitigation Measures	Outstanding issues relating to required conditions	Remarks
6. Enforce clean-up procedures.	The end-of-day clean up activities were to be supervised by the Team Leaders to ensure compliance with all required procedures. Out of 174 inspected events reported via cell phone, 5 events took place without supervision of Team Leaders.	Day clean ups that were not supervised by Team Leaders raise suspicion of poor compliance.	This will be emphasized not to happen in the future.
7. IEC campaigns to inform homeowners of responsibilities and precautions.	IEC/BCC campaigns carried out before IRS were effective. Three approaches were employed: (i) house-to-house visits by team mobilizers; (ii) information through media; and (iii) use of the public address system. Out of 7,641 household members interviewed during the operation, only 1.8% had no information prior to the arrival of the spray operator.	There were no outstanding issues of concern.	
8. Prohibition of spraying houses that are not properly prepared.	Most of the households (98%) had their eligible structures prepared for IRS before spraying	37 cases out of 7,748 that were inspected did not comply. Responsible SOPs were tracked and instructed to comply with house preparations on subsequent spraying.	
9. Two-hour exclusion from house after spraying.	Supervisors informed homeowners of a two-hour exclusion from their homes after spraying. Out of 7,763 reported events, only 11 cases were found not to comply.	Getting back into the house before two hours after spraying may lead to household members being overexposed to insecticide.	Emphasis was made during the operation to check on this setback.
10. Instruct homeowners to wash itchy skin and go to a health clinic if symptoms persist.	The cell phone report revealed that out of 7,731 household members interviewed, few (0.65%) did not know that they had to wash their skin in case of accidental contact with insecticide.	No outstanding issue as no skin irritation due to contact with insecticide was reported.	
11. Indoor spraying only	District coordinators and supervisors emphasized indoor spraying only. However, there were 36 reported cases (out of 7,746 total inspections) of the SOP spraying the wrong surfaces.	The affected SOPs were immediately provided with retraining on the right surfaces to spray.	Training in this area will be enhanced for future campaigns.

Mitigation Measure	Status of Mitigation Measures	Outstanding issues relating to required conditions	Remarks
12. Training on proper spray technique	Training of SOPs emphasized spray application techniques. There were 22 cases of SOPs not complying with proper spraying techniques. Some common mistakes were using the wrong speed, wrong distance from the wall, or wrong pump compression pressure.	IRS supervisors immediately addressed the few issues raised on spraying techniques.	This component will be emphasized more in future operations.
13. Maintenance of pumps	Each main IRS site had a pump technician to service pumps and fix problems related to pumps during the operation. However, there were many leaking pumps reported during the operation. A total of 1,205 SOPs reported leaking pumps out of 6,577 SOPs interviewed/inspected on pump serviceability.	Some of the problems were fixed immediately after reporting. The fixes included soldering and provision of new spare parts.	Most pumps inherited from the previous implementer are old, requiring replacement or major rehabilitation. Greater effort will be made to ensure that leaks are repaired before deployment to the field. Operators will be trained to report leaks and get them repaired.
14. Choose sites for disposal of liquid wastes according to PMI BMPs.	Contaminated liquid wastes were disposed of in soak pits. All soak pits for the disposal of liquid waste were chosen and inspected and determined to be ready for operations before the spray campaign. The pre-seasonal environmental compliance inspection covered 103 IRS staging sites. Various needs for repair and construction of soak pits were identified and undertaken.	There were no outstanding issues of concern.	
15. Construct soak pits with charcoal to absorb pesticide from rinsewater.	Re-construction of new soak pits was done before spraying operations. Rehabilitation and reconstruction of some soak pits was done, all based on PMI BMP guidelines.	There were no outstanding issues of concern.	
16. Maintain soak pits as necessary during the season.	There were two reported cases of the soak pit not adequately draining water (Murusagamba in the Ngara District and Kahumo site in the Chato District).	The Kahumo site will be changed in line with post-IRS inspection recommendations while the Murusagamba site will have a new soak pit as the old one has been closed.	

Mitigation Measure	Status of Mitigation Measures	Outstanding issues relating to required conditions	Remarks
17. Inspection and certification of solid waste disposal sites before spray campaign.	The program inherited the two incineration machines, which were qualified by SEA for incineration of masks and contaminated linens. The empty Actellic bottles have been sent to an NEMC-certified company for recycling into industrial sewer pipes. The NEMC will schedule an inspection to ensure the company complies with agreed recycled products. Efforts are underway to identify a recycling company for cardboard. Unusable gloves and boots will be disposed in municipal landfills while the damaged but still usable ones will be cleaned and donated to groups that can make good use of the PPE such as street cleaners.	There were no outstanding issues of concern	
18. Monitoring waste storage and management during the campaign.	Waste generated out of IRS campaign is kept under strict rules of store procedure, which include record keeping on bin cards and ledger and using issue vouchers while transferring them from field stores to the main warehouse.	There were no outstanding issues of concern.	
19. Monitoring disposal procedures post-campaign.	All IRS wastes to be disposed in the municipal council landfills will be accompanied by a team including the ECO from Abt, NEMC, and the relevant city/town council authorities	There were no outstanding issues of concern.	
20. Maintain records of all pesticide receipts, issuance, and return of empty sachets/bottles.	Storekeepers are to maintain and check all records of the stock regularly during IRS operations. During the 1,092 storekeeper performance inspections, there were two instances of non-compliance with stock-keeping guidelines (ledgers not updated). These cases were all addressed immediately.	There were no outstanding issues of concern.	Non-compliance with stock-keeping guidelines cases were all addressed immediately
21. Reconciliation of the number of houses sprayed vs. number of sachets/bottles used.	Daily checking of the spray performance sheet to verify insecticide usage rate was done by a team of supervisors	There were no outstanding issues of concern.	

Mitigation Measure	Status of Mitigation Measures	Outstanding issues relating to required conditions	Remarks
22. Visual examination of houses sprayed to confirm pesticide application.	Quality control wall bioassay tests were conducted by an independent qualified institution, the National Institute for Medical Research. It adhered to PMI guidelines, and WHO standards were the cutoff points. All eight districts in Mainland Tanzania were subject to the evaluation, and five districts were sampled in Zanzibar. Most of the tests registered 100% mortality after 24 hours and few registered 90.8 – 99.2% on some of the tested surfaces.	There were no outstanding issues of concern.	The quality of spray met the required standard.
23. Perform physical inventory counts during the spray season.	Inventory check was done by coordinators, storekeepers, and supervisors during the spraying periods in all districts. Emphasis was on insecticide inventory.	In a few IRS operations sites where inventory checks were done by supervisors, records of the stock was not proper due to inexperience of new storekeepers who lacked proper stock recording knowledge. These issues were addressed immediately by supervisors.	Though no major setbacks were encountered during stores inspection, the few that were found imply the requirement for more training and focused supervision in this area.

ANNEX E: INSECTICIDE QUALITY ASSURANCE CERTIFICATE

Form Parts-5


THE UNITED REPUBLIC OF TANZANIA

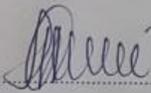
MINISTRY OF AGRICULTURE, FOOD SECURITY AND COOPERATIVES
Plant Protection Division Pesticides Registration and Control
P.O. Box 9071, Dar es Salaam – Tanzania

No. 00001103

CERTIFICATE OF ANALYSIS
(Under Regulation 22)
(To be filled in Quadruplicate)

I hereby declare that I have made a proper analysis of the sample of **Actellic 300cs**.....
Batch No. **BSNSH2780**, Sample Lab No. **81 - 83** (3 Samples)
submitted to the Pesticides Registration and Control Analytical Laboratory by **Abt Associate**.....
P O Box 1212, MWANZA
on (Date) **21st**..... (Month) **January**..... Year **2016**..... the
result of the analysis being as follows:
Pirimiphos-methyl content: 30.2% w/v (average)

Remarks **The results meet the specified range.**
WHO/FAO specification: 28.5 - 31.5%

Name and Signature of Analysis in Charge: **T Hangali** 
Designation: **Analyst I/C**
Laboratory and Address: **TPRI, P O Box 3024, ARUSHA.**
Date: **29/1/2016**

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ANNEX F. AIRS TANZANIA MONITORING AND EVALUATION PLAN (MEP)⁶

Last Updated: 6 May 2016

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
Component I: Establish cost-effective supply chain mechanisms and execute logistical plans								
I.1 Procurement								
I.1.1 Number and percentage of insecticide procurements that had a pre-shipment QA/QC test at least 60 days prior to the spray campaign	<i>Data source:</i> Project records – insecticide procurements <i>Reporting frequency:</i> Each spray campaign	By spray campaign	I; 100%	I; 100%	TBD; 100%		TBD; 100%	
I.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	<i>Data source:</i> Project records – international procurements <i>Reporting frequency:</i> Each spray campaign	By spray campaign	I; 100%	I; 100%	TBD; 100%		TBD; 100%	

⁶ Results shown do not include Geita Gold Mine supported 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
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 ⁷	<i>Data source:</i> Project records <i>Reporting frequency:</i> Each spray campaign	By spray campaign	1; 100%	1; 100%	TBD; 100%		TBD; 100%	
1.1.4 Number and percentage of local procurements for PPE delivered 14 days before the start of spray operations	<i>Data source:</i> Project records <i>Reporting frequency:</i> Each spray campaign	By spray campaign	1; 100%	1; 100%	TBD; 100%		TBD; 100%	
1.1.5 Successfully completed spray operations without an insecticide stock-out	<i>Data source:</i> Project records <i>Reporting frequency:</i> Each spray campaign	By spray campaign	Completed	Completed	Completed		Completed	
1.2 In-Country Exemption and Custom Clearance Process								
1.2.1 Complete exemption and clearance process within the minimum two weeks	<i>Data source:</i> Project records <i>Reporting frequency:</i> Each spray campaign	By spray campaign	Completed	Completed	Completed		Completed	
1.3 In-Country Logistics, Warehousing, and Training								
1.3.1 Number and percentage of logistics and warehouse managers trained in IRS supply chain management ⁸	<i>Data source:</i> Training records <i>Reporting frequency:</i>	By spray campaign By gender	116; 100%	119; 102.6% 45 female	TBD; 100%		TBD; 100%	

⁷ Long gloves, control flow valves and Hudson pumps fall under international procurement

⁸ sites storekeepers and central stores storekeepers

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
	Each spray campaign			74 male				
1.3.2 Number and percentage of base stores where physical inventories are verified by up-to-date stock records ⁹	<i>Data source:</i> Project records <i>Reporting frequency:</i> Each spray campaign	By spray campaign	116; 100%	109 ¹⁰ ; 94.0%	TBD; 100%		TBD; 100%	
1.3.3 Submit up-to-date inventory records 30 days after the end of each spray campaign	<i>Data source:</i> Project records <i>Reporting frequency:</i> Each spray campaign	By spray campaign	Completed	Completed	TBD; 100%		TBD; 100%	

⁹ site stores and central stores

¹⁰ Does not include the 7 sites for the Geita Gold Mine 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
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	<i>Data source:</i> Project records <i>Reporting frequency:</i> Annually	By spray campaign	Completed	Completed	Completed		Completed	
2.1.2 Percentage reduction in project operational expenses per structure from the previous year, excluding insecticide costs ¹¹	<i>Data source:</i> Project financial records <i>Reporting frequency:</i> Annually	By spray campaign	N/A	N/A	5%		5%	

¹¹ For year 1 we are at baseline, hence we have no comparison expenses from the previous year

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
2.2 Support of Safety and Health Best Practices and Compliance with USAID and Host Country Environmental Regulations								
2.2.1 SEA/letter reports submitted on time based on schedule agreed upon with the PMI COR team	<i>Data source:</i> Project records – submitted SEAs/ letter reports <i>Reporting frequency:</i> Each spray campaign	By spray campaign	Completed	Completed	Completed		Completed	
2.2.2 Number of spray personnel trained in environmental compliance and personal safety standards in IRS implementation ¹²	<i>Data source:</i> Project records – Training reports <i>Reporting frequency:</i> Each spray season	By spray campaign By gender	3,458	3,359 1,315 female 2,044 male	TBD		TBD	
2.2.3 Number of health workers receiving insecticide poisoning case management training	<i>Data source:</i> Project records – Training reports <i>Reporting frequency:</i> Each spray season	By spray campaign By gender	62	57 24 female 33 male	TBD		TBD	
2.2.4 Number of adverse reactions to pesticide exposure documented	<i>Data source:</i> Incident report forms <i>Reporting frequency:</i> Each spray campaign	By spray campaign By residential/ occupational exposure	0	0	0		0	

¹² SOPs, Team Leaders, Supervisors and Store keepers

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
2.2.5 Number and percentage of soak pits and storehouses inspected and approved prior to spraying	<i>Data source:</i> Project records – Reports submitted by district environmental officers <i>Reporting frequency:</i> Each spray season	By spray campaign By soak pit By storehouse	109 Soak pits; 100%	102 Soak pits; 93.6%	TBD; 100%		TBD; 100%	
2.3 Conduct Communications Activities and Community Mobilization								
2.3.1 Number of radio spots and talk shows aired	<i>Data source:</i> Project records <i>Reporting frequency:</i> Per spray campaign	By spray campaign	60 Radio Spots 4 Talk Shows	138 Radio spots 4 Talk shows	TBD		TBD	
2.3.2 Number of IRS print materials disseminated ¹³	<i>Data source:</i> Project records <i>Reporting frequency:</i> Semi-annually	By spray campaign By type of printed material and message(s)	10,000	12,150 1,540 Q&A brochures 9,933 fact sheets 677 posters	NA		NA	

¹³ Illustrated fact sheets, Q&A brochures and IRS 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
2.3.3. Number of people reached with IRS messages via door-to-door mobilization ¹⁴	<i>Data source:</i> Mobilization Data Collection Forms <i>Reporting frequency:</i> Daily per mobilization conducted	By spray campaign By gender	846,954	276,156 ¹⁵ Female 146,997 Male 129,157	NA		NA	
2.4 Spray Targeted Structures According to Technical Specifications								
2.4.1 Number of structures targeted for spraying	<i>Data source:</i> Previous spray campaign data, enumeration data (targets); daily spray operator forms (results) <i>Reporting frequency:</i> Daily per spray campaign	By spray campaign	502,934 ¹⁶	543,865 ¹⁷	TBD		TBD	
2.4.2 Number of structures sprayed with IRS ¹⁸	<i>Data source:</i> Daily spray operator forms <i>Reporting frequency:</i> Daily per spray campaign	By spray campaign	427,494	515,217	TBD		TBD	

¹⁴ From Table 2; Total Population in enumeration districts (Kwimba, Butiama and Musoma)

¹⁵ This was the number found by the enumerators. However, the SOPs recorded 650,934 in the same area.

¹⁶ Overall targeted structures (Geita = 20,000 and the rest 482,934)

¹⁷ This figure does include structures that will be found during the Geita Gold Mine campaign

¹⁸ 85% of the 502,934 targeted structures

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
2.4.3 Percentage of total structures targeted for spraying that were sprayed with a residual insecticide (spray coverage)	<i>Data source:</i> Daily spray operator forms <i>Reporting frequency:</i> Daily per spray campaign	By spray campaign	85%	94.7%	85%		85%	
2.4.4 Number of people residing in structures sprayed (number of people protected by IRS) ¹⁹	<i>Data source:</i> Daily spray operator forms <i>Reporting frequency:</i> Daily per spray campaign	By spray campaign By gender By pregnant women By children <5 years old	2,243,305	2,042,561 Female 1,047,834 Male 994,727 ²⁰ 61,822 pregnant women 400,314 childer <5 years old	TBD		TBD	TBD

¹⁹ From Table 2; 85% of the Total Population

²⁰ Tanzania 2012 Population and Housing Census; population ratios between male and female were 48.7% and 51.3%, respectively.

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
COMPONENT 3: ONGOING MONITORING AND EVALUATION AND QUALITY CONTROL MEASURES								
3.1 Submit AIRS country M&E Plan to PMI for approval	<i>Data source:</i> Project records <i>Reporting frequency:</i> Semi-annual	By spray campaign	Completed	Completed	Completed		Completed	
3.2 Conduct a post-spray data quality audit data collection within 60 days of completion of spray operations	<i>Data source:</i> Spray operations reports <i>Reporting frequency:</i> Per spray campaign	By spray campaign	N/A	N/A	Completed or N.A.		Completed or N.A.	
COMPONENT 4: CONTRIBUTE TO GLOBAL AND COUNTRY-LEVEL IRS POLICY SETTING AND DEVELOP AND DISSEMINATE EXPERIENCES AND BEST PRACTICES								
4.1 Number of guidelines/checklists/tools related to IRS operations developed or refined with project support	<i>Data source:</i> Project records – activity reports <i>Reporting frequency:</i> Semi-annually	By spray campaign By guideline/checklist/tool	11	14 ²¹	TBD		TBD	
4.2 Number of articles/best practices documents published	<i>Data source:</i> Project records – activity reports <i>Reporting frequency:</i> Semi-annually	By spray campaign By IRS technical area	1	0	TBD		TBD	

²¹ Structure definition document, EE forms, DVC forms, 4 supervision forms, PSECA forms, IRS cards, Mobilization forms, SOP forms, Job Aids for SOPs, Team Leaders and Store Keepers.

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
4.3 Number of best practice presentations given at national/ regional/international workshops and conferences	<i>Data source:</i> Project records – activity reports <i>Reporting frequency:</i> Semi-annually	By spray campaign By IRS technical area	1	0	TBD		TBD	
4.4 Number of enterprises engaged through public-private partnerships	<i>Data source:</i> Project records – activity reports <i>Reporting frequency:</i> Semi-annually	By spray campaign	1	1	TBD		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 vector bionomics and behavior (vector species, distribution, seasonality, feeding time, and location)	<i>Data source:</i> Entomological reports <i>Reporting frequency:</i> Annually	By spray campaign	10	10 ²²	TBD		TBD	
5.1.2 Number and percentage of entomological monitoring sentinel sites measuring all the five primary PMI entomological monitoring indicators	<i>Data source:</i> Entomological reports <i>Reporting frequency:</i> Annually	By spray campaign	3; 100%	3; 100%	TBD		TBD	

²² Trial for Bionomics (includes feeding time and location), Control for Bionomics.

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
5.1.3 Number and percentage of entomological monitoring sites measuring at least one secondary PMI indicator	<i>Data source:</i> Entomological reports <i>Reporting frequency:</i> Annually	By spray campaign	10; 100%	10; 100%	TBD		TBD	
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	<i>Data source:</i> Entomological reports <i>Reporting frequency:</i> Annually	By spray campaign By insecticide class	11; 100%	11; 100%	TBD		TBD	
5.1.5 Number of wall bioassays conducted within two weeks of spraying to evaluate the quality of IRS	<i>Data source:</i> Entomological reports <i>Reporting frequency:</i> Per spray campaign	By spray campaign	80	80	TBD		TBD	
5.1.6 Number of wall bioassays conducted after the completion of spraying at monthly intervals to evaluate insecticide decay	<i>Data source:</i> Entomological reports <i>Reporting frequency:</i> Per spray campaign	By spray campaign	96 ²³	40 ²⁴	TBD		TBD	

²³ Number of monthly bioassays

²⁴ Shortfall due to contractual reasons that delayed commencement of the activity

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
5.1.7 Number of vector susceptibility tests for different insecticides conducted in selected sentinel sites	<i>Data source:</i> Entomological reports <i>Reporting frequency:</i> Per spray campaign	By spray campaign	55 ²⁵	0	TBD		TBD	
5.2 Support Epidemiological Malaria Data Collection and Analysis								
5.2.1 Collect routine epidemiological data	<i>Data source:</i> Project Reports <i>Reporting frequency:</i> Annually	By spray campaign	N/A	N/A	TBD		TBD	
5.2.2 Number of targeted health facilities with routine epidemiological malaria data collection supported by AIRS Tanzania	<i>Data source:</i> Epidemiological reports <i>Reporting frequency:</i> Annually	By spray campaign	N/A	N/A	TBD		TBD	

²⁵ 5 insecticides for each of the 11 sentinel sites

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
Component 6 (Cross-cutting): Capacity Building, Knowledge Transfer, Gender Inclusion								
6.1 Increasing the Role of Women and Addressing Gender Barriers								
6.1.1 Number of people trained to deliver IRS in target districts	<i>Data source:</i> Project records – training reports <i>Reporting frequency:</i> Semi-annually	By spray campaign By spray campaign By gender Percentage of women trained	3,411	3,297 ²⁶ 1,294 Females 2,003 Males 39.3% Female	TBD		TBD	
6.1.2 Total number of people trained to support IRS in target districts	<i>Data source:</i> Project records – training reports <i>Reporting frequency:</i> Semi-annually	By spray campaign By spray campaign By gender Percentage of women trained	5084	4,911 ²⁷ 1,816 Females 3,095 Males 36.98%	TBD		TBD	

²⁶ SOPs, Team Leaders, Supervisors, and Health Care Workers

²⁷ SOPs, Team Leaders, Spray and Enumeration Supervisors, District Coordinators, enumerators, Mobilizers, store keepers, washers, pump technicians, drivers, Finance Assistants, DECs, M&E Assistants, HCW, Security Guards and Government officials (NMCP, NEMC, ZAMEP, and ZEMA).

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
6.1.3 Number and percentage of women recruited (i.e., number/percentage of women on the selection list) for IRS employment ²⁸	<i>Data source:</i> Project records – Recruitment reports reports <i>Reporting frequency:</i> Semi-annually	By country	1,253; 25%	1,642; 34.5%	TBD		TBD	
6.1.4 Number of people trained as IRS Training of Trainers	<i>Data source:</i> Project records – training reports <i>Reporting frequency:</i> Semi-annually	By spray campaign By gender Percentage of women trained	645	617 201 female 416 male	TBD		TBD	
6.1.5 Total number of people hired to support IRS in target districts ²⁹	<i>Data source:</i> Project records – contracts signed <i>Reporting frequency:</i> Semi-annually	By spray campaign By gender Percentage of women hired	5,013	4,754 1,642 female; 3,112 male	TBD		TBD	

²⁸ 25% of Indicator 6.1.5.

²⁹ SOPs, Team Leaders, Spray and Enumeration Supervisors, District Coordinators, enumerators, Mobilizers, store keepers, washers, pump technicians, drivers, Finance Assistants, Security Guards, DECAs, and 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
6.1.6 Number of women hired in supervisory roles in target districts (this number includes site supervisors, team leaders, M&E assistants, and others who supervise seasonal staff) ³⁰	<i>Data source:</i> Project records – contracts signed <i>Reporting frequency:</i> Semi-annually	By spray campaign Percentage of women hired By role	136	197 24 Supervisors 170 Team Leaders 3 M&E Assistants	TBD		TBD	
6.1.7 Number of staff (permanent and seasonal) who have completed gender awareness training	<i>Data source:</i> Project records – training reports <i>Reporting frequency:</i> Semi-annually	By spray campaign By gender Percentage of women	5,108	4,945 ³¹ 1,826 Females 3,119 Males 36.9% Female	TBD		TBD	
6.2 Capacity Building								
6.2.1 Number of government officials trained in IRS oversight	<i>Data source:</i> Project records – training reports <i>Reporting frequency:</i> Semi-annually	By spray campaign By gender Percentage of women	18	30 ³² 7 Females 23 Males 23.3% Female	TBD		TBD	

³⁰ 20% of Team Leaders, Supervisors and M&E Asst.

³¹ SOPs, Team Leaders, Spray and Enumeration Supervisors, District Coordinators, enumerators, Mobilizers, store keepers, washers, pump technicians, drivers, Security Guards, Finance Assistants, DECs, M&E Assistants, HCWs and Abt. Permanent staff.

³² Government officials (NMCP, NEMC, ZAMEP, ZEMA) and (District Coordinators, I Geita Gold Mine)

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
6.2.2 Implement all activities outlined in their yearly Capacity Building Action Plan	<i>Data source:</i> Project records – capacity assessment reports <i>Reporting frequency:</i> Semi-annually	By spray campaign	Completed	Completed	Completed		Completed	
6.2.3 Tanzania government implements at least one aspect of the IRS program independently.	<i>Data source:</i> Project records – MOUs <i>Reporting frequency:</i> Semi-annually	By spray campaign	Completed	Supervision of Training of Spray Operators and training of clinicians	Completed		Completed	

ANNEX G: M&E METHODS: QUALITY ASSURANCE METHODS AND TOOLS

QA/QC Issue	Method/Tools for Quality Assurance	Party Responsible at Country Level
Insecticide Procurement	<ul style="list-style-type: none"> Pre-shipment testing 	<ul style="list-style-type: none"> Procurement/Logistics Manager
Spray Operator Safety	<ul style="list-style-type: none"> Pre-spray training Spray operations checklist Field supervision Adverse incidence reports 	<ul style="list-style-type: none"> Operations Manager District/Field Coordinator Spray Team Supervisor Team Leaders
Insecticide Warehousing/Transport	<ul style="list-style-type: none"> Store manager/driver training Warehousing Operations Manual Spot checks 	<ul style="list-style-type: none"> Operations Manager Procurement/Logistics Coordinator District/Field Coordinators
Warehouse/Stores and Logistics	<ul style="list-style-type: none"> Monthly/bi-weekly physical stock audit and comparison with stock movement records Inventory tracking systems 	<ul style="list-style-type: none"> Procurement/Logistics Coordinator District/Field Coordinators Spray Team Supervisors
Environmental Compliance	<ul style="list-style-type: none"> Pre-spray training Geographical Information Systems (GIS) mapping Spot checks during spray operations 	<ul style="list-style-type: none"> Environmental Compliance Officer District Environmental Health Officer
Spray Data Integrity	<ul style="list-style-type: none"> Error Eliminator Form: Paper checklist formatted form used by Team Leaders to check the completeness and correctness of Spray Operator data before leaving the field. Data Collection Verification Form: Tool used in structure spot checks to interview households about IRS treatment and the number of people protected so that it can be used to cross-check data reported on the daily spray operator forms Number of bottles issued to spray operator vs. reported structures sprayed Average number of structures sprayed per bottle Average number of structures sprayed daily by spray operator Multiple level of data verification to eliminate errors: Team Leader, field supervisor, site manager, M&E coordinator and data clerk 	<ul style="list-style-type: none"> Country Operations Manager M&E Manager District/Field Coordinators Spray Team Supervisors

QA/QC Issue	Method/Tools for Quality Assurance	Party Responsible at Country Level
Spray Data Entry and Management	<ul style="list-style-type: none"> • Prompt field data entry and transfer • Data entry training • Database Cleaning Tool that identifies data entry inconsistencies between total and detail data • Database validation, search/edit functions • Daily spray data cleaning and filing 	<ul style="list-style-type: none"> • District Coordinator • Data Entry Clerk • Database Manager • M&E manager
Entomological Monitoring	<ul style="list-style-type: none"> • Needs assessment of entomological needs and resources • Technical assistance for NIMR and ZAMEP 	<ul style="list-style-type: none"> • Technical Manager
Spray Operator Payment	<ul style="list-style-type: none"> • Spray operator identity codes and database • Mobile banking and/or direct deposits 	<ul style="list-style-type: none"> • F&A Manager
Consumer Satisfaction	<ul style="list-style-type: none"> • Post-spray survey and interviews with households 	<ul style="list-style-type: none"> • M&E Manager
Seasonal Laborer Satisfaction	<ul style="list-style-type: none"> • Labor Survey • District-based human resources 	<ul style="list-style-type: none"> • M&E Manager • District Coordinator