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PMI | Africa IRS (AIRS) Project

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2015 BENIN END OF SPRAY REPORT

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**2015 BENIN
END OF SPRAY REPORT**

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ACRONYMS

ABE	Benin Environmental Agency (<i>Agence Béninoise pour l'Environnement</i>)
AIRS	Africa Indoor Residual Spraying
BMP	Best Management Practices
CFV	Constant Flow Valve
CREC	Entomological Research Center of Cotonou (<i>Centre de Recherche en Entomologie de Cotonou</i>)
DAGRI	Ministry of Agriculture
DCAM	Community Development and Environment Sanitation (<i>Développement Communautaire et Assainissement du Milieu</i>)
DDEHU	Departmental Directorate for the Environment, Habitat and Urbanism (<i>Direction Départementale de l'Environnement, de l'Habitat et de l'Urbanisme</i>)
DDS	Departmental Directorate for Health (<i>Direction Départementale de la Santé</i>)
DHAB	National Directorate of Hygiene (<i>Direction de l'Hygiène et de l'Assainissement de Base</i>)
ECO	Environmental Compliance Officer
EMMP	Environmental Mitigation and Management Plan
IEC	Information, Education, and Communication
IRS	Indoor Residual Spraying
LLIN	Long-Lasting Insecticide Net
MAEP	Ministry of Agriculture, Livestock and Fisheries (<i>Ministère de l'Agriculture, de l'Élevage et de la Pêche</i>)
M&E	Monitoring and Evaluation
MoH	Ministry of Health
NMCP	National Malaria Control Program (<i>Programme National de Lutte contre le Paludisme</i>)
PID	<i>Pulvérisation Intra Domiciliaire d'Insecticide</i>
PMI	President's Malaria Initiative
PPE	Personal Protective Equipment
SHAB	Community Hygiene and Sanitation Service (<i>Service de l'Hygiène et de l'Assainissement de Base</i>)
SMS	Short Message Service
SOP	Spray Operator
USAID	United States Agency for International Development
WHO	World Health Organization

EXECUTIVE SUMMARY

Under the United States Agency for International Development (USAID) Task Order Six, Abt Associates has assumed the role of lead implementing agency for the President's Malaria Initiative's (PMI's) Africa Indoor Residual Spraying (AIRS) project in Benin and eleven other sub-Saharan African countries. With the primary goal of reducing malaria-associated morbidity and mortality via indoor residual spraying (IRS), AIRS Benin successfully completed its 20-day IRS campaign (April 30-May 22, 2015) well within the scheduled timeframe designated by the National Malaria Control Program (NMCP).

The 2015 IRS campaign covered all nine communes in Atacora Department in northern Benin: Natitingou, Boukoubé, Toukountouna, Cobly, Matéri, Tanguiéta, Kouandé, Kérou, and Péhonko. The 2015 IRS campaign was the ninth round of IRS supported by PMI in Benin and the fifth round of IRS in the Atacora Department (IRS campaigns before 2011 covered Ouémé Department in southern Benin), but the 2015 IRS campaign was the fourth round conducted by Abt Associates in the country for PMI. The NMCP recommended the organophosphates class for the 2015 IRS campaign for the nine communes of Atacora and specifically the pirimiphos-methyl capsuled suspension (CS).

AIRS Benin implemented the 2015 IRS campaign in close collaboration with PMI/Benin and with several Beninese government partners, most notably NMCP, Ministry of Health (MOH), Ministry of Agriculture, Livestock and Fisheries, Ministry of Environment, Habitat and Urbanization, Beninese Environmental Agency, National Directorate of Agriculture, National Directorate of Hygiene, Department Administrative Authorities of Atacora, and the Department Directorate of Health for Atacora.

Since 2012, NMCP has participated in several key components of the IRS program, such as reviewing and validating training manuals and monitoring and evaluation tools kits, and selecting the insecticides based on the entomological results provided by the Entomologic Research Center of Cotonou (CREC). To reinforce its capacity to manage and lead the IRS campaign, this year NMCP led supervisory activities for IRS operations in Tanguiéta health zone, which comprises Tanguiéta, Cobly, and Matéri communes.

In 2015, AIRS Benin enhanced and expanded the use of mobile health (mHealth) technology in IRS using short message service (SMS) and the data platform, *TextIt*, to collect daily IRS data from the field to the nine communes of Atacora. A smartphone was used to transmit data to the AIRS Operation Manager. The team also used SMS texts in the nine communes in order to send daily reminders to spray operators, supervisors, and team leaders about issues detected by supervisors, such as incorrect use of personal protective equipment (PPE) or suggestions to improve operational performance.

Contracted directly by PMI/Benin, CREC collected entomological surveillance data to evaluate the quality and effectiveness of the 2015 IRS campaign. CREC noted that the quality of the IRS was high at the baseline test performed on May 6th and 7th with 100% mortality rates for mosquitoes coming into contact with sprayed walls.

TABLE 1: SUMMARY OF 2015 IRS CAMPAIGN

Number of communes covered by the PMI-supported IRS campaign	9 communes: Boukoubé, Cobly, Kérou, Kouandé, Matéri, Natitingou, Péhunco, Tanguiéta, and Toucountouna
Insecticide	Organophosphate: Pirimiphos-methyl CS
Number of structures sprayed by PMI-supported IRS	252,706
Number of structures found by PMI-supported IRS	270,141
2015 PMI-supported IRS campaign spray coverage	93.55%
Population protected by 2015 IRS campaign	802,597
Dates of PMI-supported IRS campaign	April 30 – May 22, 2015
Length of campaign	20 days
Number of people trained with US Government funds to deliver IRS	1,500

Listed below are some lessons learned from the 2015 IRS campaign.

- Standardized use of constant flow valves and coordinated efforts to communicate requirements for household preparation led to improved quality of spraying across all communes covered by IRS.
- Through the rollout of mobile phone use to track IRS operational data, AIRS was able to record insecticide consumption, IRS coverage and monitor spray operator performance on a daily basis, which was very beneficial for a short campaign.
- Due to fuel shortages, IRS campaigns should strategically plan fuel needs and pre-negotiate contracts with local gas stations to ensure sufficient supply of gasoline throughout the campaign. Such pre-negotiated agreements can potentially mitigate an IRS campaign's vulnerability to regional fuel crisis.
- The initial mobilization and IRS card distribution was performed this year by community agents from the villages within three days before the start of spray. This lack of sufficient lead time created consistent challenges for mobilizers to help home owners prepare for IRS.
- In 2015, the management tools validation by NMCP was only completed just one month before the campaign hence not enough time was provided to AIRS Benin staff to supervise the printing. For this reason, several errors were corrected the day before the IRS operation.

I. INTRODUCTION

In May 2015, Abt Associates completed its fourth round of indoor residual spraying (IRS) in Benin under the PMI AIRS Project, covering all nine communes in Northern Benin's Atacora Department. In 2015, AIRS Benin's overall goal was to continue to reduce malaria-associated morbidity and mortality in the Atacora Department by completing IRS for an estimated 265,907 eligible structures (the number of structures found in 2014), thereby protecting as many individuals in Atacora as possible from the burden of malaria. To manage the malaria vector's resistance to insecticide, AIRS Benin used an organophosphate class of insecticide, specifically pirimiphos-methyl capsule suspension (CS).

AIRS Benin completed its 2015 IRS campaign from April 30-May 22, 2015, spraying for 20 operational days and within the scheduled timeframe decided collectively by the National Malaria Control Program (NMCP), PMI/Benin, and the PMI AIRS Project.

AIRS Benin implemented the 2015 IRS campaign in close collaboration with PMI/Benin and several government agencies, most notably the Ministry of Health (MoH)/NMCP, the Ministry of Agriculture, Livestock and Fisheries (MAEP), the Ministry of Environment, Habitat and Urbanism, the Benin Environmental Agency (ABE), the National Directorate of Agriculture (DAGRI), the National Directorate of Hygiene (DHAB), and the Departmental Administrative Authorities in Atacora, particularly the Departmental Directorate for Health (DDS). Additionally, the Entomologic Research Center of Cotonou (CREC) continued to be a valuable IRS partner through their direct implementation of entomological monitoring activities funded by PMI. This report provides a description of the planning, implementation, and monitoring of the IRS campaign operations in 2015. The report also provides the results of the key indicators for which AIRS Benin is required to report to PMI, and the preliminary entomological surveillance findings of CREC regarding the 2015 IRS campaign. The report stresses the use of mobile technology to send messages to SOPs and collect IRS data from the operation sites and environmental compliance information in the Department-wide and on a daily basis.

2. COUNTRY BACKGROUND

Since 2011, the PMI-funded IRS campaign has been performed in Northern Benin's Atacora Department. Please see Figure 1 to note the location of the Atacora Department and the nine communes where IRS has been performed. Figure 1 also shows the operational sites used to support the 2015 IRS campaign.

FIGURE 1: COMMUNES OF THE ATACORA DEPARTMENT OF BENIN



*Source: Rarelibra (online cartographer), for public domain use; stars represent operation sites.

Table 2 notes the estimated population of Atacora Department.

TABLE 2: ATACORA DEPARTMENT'S ESTIMATED POPULATION

Communes	Population from 2013 Census preliminary results*	Estimated population in 2014 (**)	Area (km ²)
Boukoubé	83,147	88,245	1,081
Kérou	98,315	104,343	3,769
Cobly	68,955	73,183	827
Kouandé	112,014	118,882	3,237
Matéri ***	111,003	117,809	1,719
Natitingou	104,010	110,387	1,348
Péhunco	78,173	82,966	2,008
Tanguiéta***	73,731	78,252	5,466
Toucountouna	39,989	42,441	1,068
Total Atacora Department	769,337	816,507	20,523

(*) No final figures until now

(**) This estimate is obtained with a 3.04 % growth rate according to the 2013 Census preliminary results

(***) Only the area within Tanguiéta and Matéri Communes, which are not part of the Pendjari Biosphere Reserve, was covered by the IRS campaign in 2015.

2.1 OBJECTIVES FOR 2015 SPRAY CAMPAIGN

As stated in the 2015 AIRS Benin work plan, the three objectives of AIRS Benin for 2015 included:

1. Cover at least 85 percent of eligible structures found in all nine communes of Atacora Department.
2. Reinforce to develop national and local capacity in organizing, planning, implementing, and evaluating IRS campaigns, with a goal of identifying a plan for sustainability.
3. Implement cost-efficient activities to save funds and ensure ease of management.

Given these objectives, AIRS Benin aimed to cover an estimated 265,907 structures in Atacora during the 2015 IRS campaign and protect as many of the estimated 750,000 people living there as possible.

To achieve these objectives, AIRS worked with several partners specifically NMCP, whose activities are summarized below.

- NMCP validated IRS management tools, assisted with the planning of the IRS campaign, trained IEC mobilizers and spray operators, performed supervision during the IRS campaign, and helped to validate data collected during the IRS campaign.
- NMCP coordinated and provided main oversight for operations in the Tanguiéta Health Zone, which includes the communes of Tanguiéta, Cobly and Matéri.

3. PREPARATION FOR THE 2015 IRS CAMPAIGN

3.1 IRS CAMPAIGN PLANNING

Listed below are the activities that were undertaken to plan and organize the 2015 IRS campaign.

TABLE 3: IRS ACTIVITIES PLANNING

Dates	Activities	Participants or Stakeholders	Comments
October 2014- March 2015	Development of 2015 AIRS Benin Work Plan	AIRS Benin and AIRS Home Office	Guidance was provided by PMI/Benin and PMI/Washington, leading to the final approved work plan on March 2, 2015.
February-May 2015	IRS Campaign Planning	AIRS Benin, NMCP, DDS Atacora, Technical working group (Tasks Force) and other IRS stakeholders	AIRS Benin staff met regularly between February and May to review the organization and planning for the IRS campaign, and made changes as needed.
March 31-April 2, 2015	IRS Action Plan Development	NMCP, DDS Atacora, USAID/PMI and AIRS Benin	The Action Plan of the nine communes including Tanguieta Health Zone (led by NMCP) were finalized and validated with the NMCP and stakeholders during a workshop that took place in Porto Novo.
April 2015	Sensitization of local authorities on IRS implementation/ Regional Partner Meeting	Six commune coordinators, five operation sites coordinators, DDS Atacora staff, commune medical doctors health zone coordinators, and nine commune mayors and/or their representatives	<ol style="list-style-type: none"> 1. To discuss roles in the IRS campaign, especially NMCP and DDS representative roles in Tanguieta health zone. 2. To ensure all health centers throughout Atacora Department were prepared to treat any potential health issues arising from the IRS campaign. 3. To gain the endorsement of the nine commune mayors, DDS Atacora, commune medical doctors and health zone coordinators to conduct IRS in the region. 4. To develop the exact schedule on when communities are sprayed, and to ensure that all operation systems were in place to support the IRS operations.

3.2 REINFORCEMENT AND EXTENSION OF PREVIOUS STRATEGIC APPROACHES

Household Preparation

The IRS spray operation's success depends on strong household preparation. During the 2015 spray campaign, IEC mobilizers facilitated spray preparations by informing beneficiaries of the impending spray operations one or two days before the village would be sprayed. Also, before the spray date town criers broadcast information to all household owners of the need to remove their belongings the day of spraying to allow spray operators to quickly carry out their tasks. To track mobilization efforts and identify those houses needing to be revisited, when beneficiaries were contacted by mobilizers houses were marked in code as to their acceptance or refusal to be sprayed.

Household preparation was emphasized during spray operations and mobilization training. Team leader and spray operator guides were distributed to spray workers to remind them of all of instructions before the spraying (e.g. removing all moveable belongings, ensuring children and animals are kept at least ten meters away from the house during the pesticide mixing and spraying, covering all immovable furniture with a plastic sheet gathered at the center of the room, etc.). In some areas, IRS mobilization was necessary by mobilizers, operators, team leaders, and coordinators to persuade beneficiaries to accept.

Generally, beneficiaries waited for spray operators' arrival in the village before starting to remove their belongings; in rural areas people were more keen to remove their items, compared to peri-urban settings. It was noted that sometimes, spray operators forgot to remove wall hangings and therefore actions were taken to remind spray teams. In such instances, AIRS Benin's supervision checklist was very helpful to take quick corrective actions, and also enforce best practices for all spray teams.

New IRS card

In 2015, AIRS Benin distributed one-year IRS cards through IEC mobilizers one or two days before the campaign, as rural communities have more challenges holding onto a multi-year IRS card.

Gender

During the last campaign AIRS Benin sought to hire more female SOPs, team leaders, and supervisors. In 2015, AIRS Benin furthered these efforts by including gender awareness and sexual harassment in the Training of Trainers (ToT) training curricula and publishing project policies against sexual harassment at all operational sites.

Daily Performance Tracking

During the ToT and training of spray operators, the importance of the daily performance tracking tool was explained to site supervisors, spray operators, and team leaders. At the end of each spraying day, each team leader completed the sheet with seven indicators, to gauge the overall performance. The indicators are: number of spray operators who worked number of structures found, number of structures sprayed, number of insecticide bottles used, insecticide stock balance, average number of structures sprayed per sachet/unit of insecticide, and average number of structures sprayed per spray operator.

Constant Flow Valve

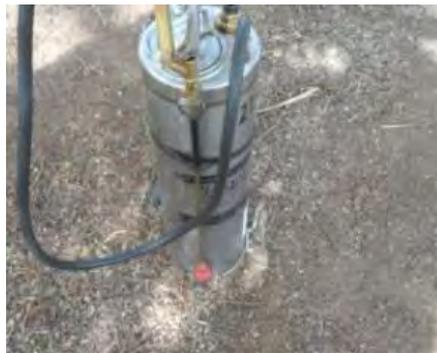
To avoid variation with insecticide application on the walls, a low pressure Constant Flow Valve (CFV) was affixed to all X-pert pumps (Hudson). Goizper pumps come with CFVs as a standard feature.

During the training of trainers and training of spray operators, the added operational efficiency from CFVs was explained to all participants and a practical exercise was completed that showed how CFVs ensure consistent coverage of insecticide when combined with a 7.5 liter mixing technique.

The CFV enabled spray operators to use uniform dosages of insecticide throughout the campaign as well as lighten the Hudson pump (less heavy than previous years which were 10 liters of solution).

The main disadvantage is the CFV prevented the spray lance from passing through the holster ring of the old type of Hudson pump, thus spray operators had difficulty to carry the Hudson pumps. To solve this problem, a rubber band was provided to the spray operators to affix the lance to the pump.

FIGURE 2: AFFIXING THE LANCE TO THE SPRAY TANK WITH A CFV



Structure Marking

In order to determine the structures visited by the spray operators, AIRS Benin taught SOPs to mark each structure according to state of the spray:

- P: structure sprayed (Pulvérisé)
- NP: unsprayed structure (Non- Pulvérisé)
- X: structure to be sprayed during mop up

FIGURE 3: STRUCTURE MARKING



This marking system was extremely helpful for mop-up operations.

Operation site coordination

In 2015, AIRS Benin with NMCP recommendation piloted close IRS activities management and supervision in the Health Zone of Natitingou which has five operations sites; hence AIRS Benin fielded a site coordinator to each operation site. This position had similar tasks as the commune coordinator but less geographical area to manage and supervise.

A new position of Health Zone Coordinator was created and recruitment carried out with NMCP. The Health Zone coordinator is a permanent position in charge of reinforcing the health zone IRS technical support to improve the health zone staff management in line with the MOH operational structure. Additionally, the position leads and manages the five operation site coordinators in Natitingou.

Expanded mHealth Use

In 2015, AIRS Benin expanded its use of a mobile health (mHealth) system throughout all nine communes of Atacora. AIRS Benin implemented the first mHealth pilot during the 2014 IRS campaign by using SMS to track the daily performance of every operation site and to send reminders on a daily basis to each spray operator, supervisor, and team leader on issues detected by supervisors in the pilot commune of Natitingou. With this mHealth system, AIRS Benin collected the raw operational data on a daily basis into a cloud-based database that could be accessed by staff in Benin and the AIRS Home Office. AIRS Benin used the same mobile platform to send out daily messages to spray operators, supervisors, and team leaders in the nine communes of Atacora. These messages reminded spray operators of issues found through supervision throughout the campaign.

Results

SMS Reminder: A total of 24,453 SMS reminders (19 reminders sent for the 1,287 seasonal staff) were sent during the IRS campaign. These SMS reminders allowed the AIRS Benin team to reach key seasonal staff (SOPs, team leaders, and supervisors) in all the nine communes every day during the IRS campaign. The SMS reminders focused on environmental compliance (e.g. wearing PPE correctly) and spray

operators' performance (e.g. remember the number of structures to be sprayed every day to attain the goal).

SMS Tracking Daily IRS Performance Data: During the SMS tracking daily IRS performance carried out in all nine communes of Atacora, storekeepers sent the summary data (spray date, structures found, structures sprayed, insecticide used, insecticide balance, and number of spray operators) to *TextIt* Platform at the end of each operation day. A total of 252,340 structures sprayed were tracked via SMS against 252,706 structures sprayed captured with IRS data collection forms; there is no huge difference but for this latter verification performed at the data entry center allowed having accurate data and information since SMS data are raw and some recording or calculation errors might occur

TABLE 4: COMPARISON OF SMS STRUCTURES TO CONFIRMED STRUCTURES

	Data Collection Form	SMS	Difference (%)
Number of structures found	270,141	270,993	0.31
Number of structures sprayed	252,706	252,340	0.15
Coverage rate	93.55%	93.12%	0.46

3.3 INSECTICIDE SELECTION

Following entomological surveillance in 2014, CREC reported high susceptibility to pirimiphos-methyl (organophosphate class), and hence it was selected to be used in the 2015 IRS campaign. NMCP emphasized CREC's recommendation during the meeting of the Technical Group of Vector Resistance Management in January 2015, and approved all Atacora Department be sprayed with pirimiphos methyl CS in 2015. The residual effect of both formulations of the pirimiphos-methyl (CS and EC) used during the 2014 IRS campaign fell below the 80 percent mortality rate for mosquitoes four months after spraying, covering the peak transmission season.

3.4 LOGISTICS PLANNING AND PROCUREMENT

3.4.1 PPE AND INSECTICIDE PROCUREMENT FOR THE 2015 IRS CAMPAIGN

In February 2015, AIRS Benin reviewed its inventory of IRS equipment at the central warehouse in Natitingou. Most of the PPE and spray pumps used during the 2014 IRS campaign remained in good condition and were available for use during the 2015 IRS campaign. AIRS Benin noted the quantities of damaged or non-reusable PPE and developed a list of PPE to procure locally and internationally. A full list of all PPE that was procured for the 2015 IRS campaign appears in Table 19 in the Annex.

In February 2015, the inventory count confirmed that 7,926 bottles of pirimiphos-methyl CS were in stock and usable for the 2015 IRS campaign. AIRS Benin noted that it needed a total of 58,500 bottles of organophosphate. The project procured an additional 50,580 bottles of pirimiphos-methyl CS and used this procurement in combination with leftover supply from 2014 to cover the nine communes in Atacora. The organophosphate shipment arrived in Benin on March 13, 2015.

AIRS Benin also received quality control test results via CEMAS laboratories for the batches of organophosphates shipped to Benin, which reported that all batches were of good quality and ready for use during IRS. The annex has the actual quality control test results from CEMAS.

3.4.2 PLANNING THE LOGISTICS AND TRANSPORTATION FOR THE 2015 IRS CAMPAIGN

In March 2015, AIRS Benin worked with the NMCP and DDS Atacora to plan the logistics and transportation for implementing the 2015 IRS campaign. Several field visits were conducted with NMCP and DDS Atacora staff to meet local authorities, to identify transportation routes, and note areas with difficult roads. These field visits led to detailed transportation plans that allowed AIRS Benin to note the length of time it would take to send re-supply trucks from the central warehouse in Natitingou to the operation sites and to note how long it would take spray operators to reach various communities.

The 2015 IRS campaign was completed in 20 days as in 2014 with roughly the same number of spray operators, team leaders, and supervisors.

3.4.3 DISTRIBUTION OF PPE TO OPERATION SITES

AIRS Benin started distributing PPE and insecticide to all operation sites the week before the IRS campaign began (April 20-25). Due to the delayed arrival of some PPE the distribution was completed the day before the spraying in some operational sites, however the campaign started as scheduled on April 30.

Table 5 notes the distribution of key PPE items to each of the operation sites.

TABLE 5: DISTRIBUTION OF KEY PPE TO OPERATION SITES

Operation Sites	Overalls	Boots	Helmets	Pumps	
				X- Pert	Goizper
Natitingou*	257	128	124		89
Perma**	241	121	120		96
Toucountouna	147	72	72		53
Nata	188	94	93	73	
Manta	156	79	79	59	
Taiacou	202	110	100	75	
Matéri	232	119	119	89	
Dassari	162	84	83	61	
Cobly	253	130	130		95
Kouandé	174	99	89		67
Guilimaro	115	61	61	45	
Ouassa Pehunco	258	131	131	97	
Gnemasson	78	42	42	31	
Firou	76	40	40	32	
Kérou	260	133	120	95	
Kaobagou	28	14	14	13	
Total	2,827	1,457	1,417	670	400

* The Central Warehouse in Natitingou also served as an operation site during the campaign for the communities near Natitingou.

** Even though Birni is within Kouandé Commune, its equipment was put in the Perma operation site store room, which is closer to Birni (about 15km by road).

3.5 HUMAN RESOURCES

3.5.1 RECRUITMENT OF IRS CAMPAIGN SEASONAL STAFF

Job advertisements were placed for commune/site coordinators, data clerks, and finance assistants in Beninese newspapers in March and April, but based on selected criteria the majority of the 2014 campaign seasonal staff were rehired. IRS campaign supervisors and hygiene agents were selected by DDS Atacora.

Spray operators, team leaders, pump technicians, and washers were recruited in each spray area by the local health department based on criteria developed by the AIRS Benin technical staff, in conjunction with the NMCP. All spray operators were required to be able to read and write, carry spray pumps for several hours per day, and to be certified by the district doctor that they were in good health to work. Additionally, all spray operators were required to be individuals known within their communities, and to have had experience working on community health activities. During recruitment, gender balance from previous years was considered and a concentrated effort was made to hire more women. AIRS Benin gave priority to hiring spray operators who had performed well during the 2014 IRS campaign.

3.5.2 NUMBER OF SEASONAL STAFF HIRED

AIRS Benin hired 2,984 seasonal staff to implement the 2015 IRS campaign, which included 2,525 men and 459 women. Table 6 provides a breakdown of the number of seasonal staff hired per district.

TABLE 6: SEASONAL STAFF HIRED FOR THE 2015 IRS CAMPAIGN PER COMMUNE

Seasonal staff	Total seasonal staff hired	Male	Female	Proportion of Women
Service technicians	66	57	9	13.6%
Washers	76	0	76	100.0%
Storekeepers	16	14	2	12.5%
Data clerks	40	22	18	45.0%
District coordinators	11	8	3	27.3%
Team leaders	188	153	35	18.6%
Spray operators	988	881	107	10.8%
IEC Consultant	0	0	1	100.0%
Finance Assistant	3	2	1	33.3%
Supervisors (Community Agents)	90	74	16	17.8%
IEC Mobilizers	1473	1281	192	13.0%
Logistic Assistant	1	1	0	0.0%
Guards	32	32	0	0.0%
Total number and Proportion of women hired for the IRS campaign	2984	2525	459	15.4%

IRS Benin worked to increase the overall participation of women in the IRS campaign. In 2015, 459 women were hired compared to 361 in 2014. While these totals represent a lower percentage of women engaged in IRS than in previous years, AIRS Benin promoted policies and practices throughout the campaign that were designed to both break social stereotypes about women’s abilities to contribute to IRS and to create more welcoming and inclusive places for women in the project’s activities. While immediate returns were lower than the project had desired, lasting results of the project’s efforts to stimulate social change through IRS should be more accurately assessed in later years.

3.6 TRAINING

AIRS Benin organized eleven trainings for all the IRS campaign’s seasonal staff to ensure that everyone was aware of their roles during the IRS campaign. Additionally, the training sessions covered the precautions to be taken when working with insecticides and what to do in case of an emergency (such as intoxication from insecticide). The trainings also reinforced the value of the staff’s work in preventing malaria transmission and emphasized a key point on gender balance and the project’s sexual awareness guidelines.

Training sessions were led by AIRS Benin staff and their government counterparts, including staff from the DDS, DHAB, and DDEHU. CREC, local firefighters, and staff from Goizper’s West Africa office also helped lead various training sessions.

Prior to the IRS campaign and in order to allow government stakeholders to lead the IRS campaign in the Tanguiéta Health Zone (Tanguiéta, Cobly and Matéri), AIRS Benin completed a four-day workshop to develop the IRS campaign plans for the NMCP and to help build their capacity. It was geared towards the IRS focal points identified by the MOH from NMCP national and departmental staff (DDS Atacora-Donga and Tanguiéta Health Zone - Tanguiéta, Cobly and Matéri). The workshop included all IRS components.

A training of trainers was completed two weeks before the IRS campaign led by the Operations Manager and Technical Manager for all commune coordinators and hygiene agents (who completed work as IRS supervisors) to enable them to lead the training of spray operators at each operation site. The mobile health approach was also included in the trainings, which, took place from April 14 through May 2, 2015.

In total, 3,333 people – of whom 2,742 were men and 591 were women (18 percent) – attended trainings. Government and health center staff attended several trainings and acted as partners in supporting the IRS campaign on issues such as understanding intoxication treatment and IEC messaging.

IEC mobilizers were trained in each sub-district for pre campaign mobilization. Only spray operators and team leaders who received a high score on the post-training test were hired. Table 7 also shows the number of people trained by institution and category.

TABLE 7: NUMBER OF PEOPLE TRAINED BY INSTITUTION AND CATEGORY

Categories of institutions/individual trained	Number of people trained for 2015 IRS campaign	
	M	F
DDS	2	0
Community Hygiene and Sanitation Service (Service de l’Hygiène et de l’Assainissement de Sites, or SHAB) regional	1	0
NMCP Regional	2	0
DDEHU	1	0

Categories of institutions/individual trained	Number of people trained for 2015 IRS campaign	
CREC	1	0
District/ Site Coordinators	8	3
District chief doctors/other doctors	7	7
Chiefs of health post/midwife	47	19
Hygiene Agents	86	21
Spray Operators	1129	165
Data Clerks	22	18
Storekeepers	14	2
Logistics Assistants	1	0
Service Technicians	57	9
IEC Agents	1,236	281
Washers	0	66
Drivers	115	0
Guards	13	0
IEC assistant	0	1
TOTAL M/F	2,742	591
TOTAL/ Trainings		3,333

3.6.1 BRIEF DESCRIPTION OF TRAINING ACTIVITIES

Training of Trainers

During this training, hygiene agents and commune and operation site coordinators were trained on spray methods, completing data collection forms, and providing IEC to IRS beneficiaries on how to prepare their structures before and after the IRS campaign. The participants were also trained on gender integration and sexual harassment awareness.

The hygiene agents and commune coordinators, in turn, trained spray operators at the 15 sub-communes the week before the IRS campaign (the 16th site is considered part of Natitingou and not part of a sub-commune).

Spray Operators Training

All spray operators traveled to their assigned training venues, where they received training over four days on all aspects of IRS. Special emphasis was placed to the project's gender approach and sexual harassment during these trainings to allow participants to better understand these concepts and shed light on women fears, doubts, and perceptions about IRS jobs. The trainings included a day and half in the classroom regarding spray techniques, gaining familiarity with PPE and protocol for completing spray operations, two and a half days for practicing the spray technique using water on the walls of the operation sites and the use of CFVs.

In addition, the training focused on the new approaches in Benin where the SOPs clean and wash their pumps and PPE, with the exception of their coveralls. At all spray operator training sessions, a pre-test and post-test was administered. Spray operators who scored the highest on the post-test were selected to become the team leaders for each spray team. Spray operators also learned procedures for mixing the organophosphate and cleaning organophosphate bottles, as well as precautions for spraying with organophosphates. SOPs of the nine communes of Atacora were trained to read SMS reminders and react accordingly; the process and spray operators' roles were also explained.

Goizper Spray Pump Training

One of Goizper's regional managers traveled to Benin to lead the practical part of ToT. He trained the hygiene agents and commune and operation coordinators implementing IRS in all nine communes on the assembly and correct use of a Goizper spray pump. Spray operators also completed practice exercises for two and a half days with the Goizper spray pump under the trainer's supervision to assure SOPs fully understood how to use and maintain the spray pump.

FIGURE 4: SPRAY OPERATORS PRACTICING SPRAY TECHNIQUE IN PEHUNCO COMMUNE



Data Capture Training

Data clerks gained familiarity with the IRS data entry forms and the database used for uploading all IRS campaign data in a one-day training. Data clerks also practiced entering data at the AIRS Benin data entry center in Natitingou.

Logistics Training

During two days (April 17 and 18), logistics assistants and storekeepers were trained on inventory management, the value of completing and updating stock cards, the correct protocol for storing PPE and insecticide, and filling out the performance tracking sheet. Additional training was provided for storekeepers on how to store the full and empty organophosphate bottles. The storekeepers were also trained on how to send the daily IRS data to the *TextIt* platform. This training focused on the SMS mechanism and the six variables to be captured: day of month, number of spray operators, number of structures found, number of structures sprayed, number of insecticides used, and insecticide balance.

Spray Pump Maintenance Training

Service technicians learned to identify the different components of spray equipment and how to maintain and repair equipment in case of breakdown. The four days of training (April 21 to 24) also covered progressive rinsing of the spray pumps since the service technicians supervise rinsing the spray pumps by SOPs, and are responsible for spray pumps calibration at the end of each IRS campaign day.

Washer Training

On April 29, 2015, washers were trained on personal and environmental protection. They learned that when handling contaminated coveralls, they may be contaminated and moreover pollute the environment if required precautions are not taken. They were taught how insecticide can enter the human body and how the proper use of PPE can be an effective personal protection solution.

FIGURE 5: TRAINING OF WASHERS IN NATITINGOU ON APRIL 29, 2015



Fire Security Training

The Natitingou fire brigade trained IRS campaign drivers, storekeepers, and guards on the fire risks and first aids on April 29, 2015. The 130 seasonal workers who attended this training learned to distinguish different types of fire extinguishers, how to effectively use them, and how to move injured persons from vehicles in case of traffic accident.

FIGURE 6: NATITINGOU FIRE BRIGADE LEADS TRAINING ON FIRST RESPONSE TECHNIQUES IN CASE OF ACCIDENT



Transport Security Training

In 2015, 115 drivers in total and one assistant logistician participated in the transport security training. Drivers and seasonal logistics staff learned correct methods to secure and safely handle insecticides. Participants also learned how to manage an insecticide spill and how to prevent traffic accidents.

Management Training for Insecticide Intoxication Cases

Medical and health agents (66 nurses and 14 physicians) from the nine communes of Atacora Department were trained on how to manage cases of potential intoxication from contact with organophosphate. The course focused on the mechanism of inhibition of acetyl cholinesterase, physiological implications of this inhibition, clinical diagnosis of intoxication, and case management of poisoning, including symptoms and antidotal treatment. The training was led by the Head of Toxicology Department of the Medical School of Cotonou.

4. ADVOCACY/IEC ACTIVITIES

Before and during the IRS campaign, AIRS Benin organized an IEC campaign on IRS and malaria prevention activities. AIRS Benin shared malaria vector control information with beneficiaries, mainly IRS guidelines and benefits. Different actors at the community level were involved in activities (teachers, local leaders, town criers, community health workers) and many channels of individual and mass communication were used (local radio, town criers, flyers, and door-to-door communication).

AIRS Benin also worked with mass media channels, produced and distributed various promotional materials, and directly reached out to individuals through mobilization to inform the population in Atacora Department about the 2015 IRS campaign. All communication activities and key messaging were discussed and planned with the NMCP and were reviewed and approved by the Departmental Service of Public Health.

In March 2015, AIRS Benin reviewed IEC materials from the previous year's IRS campaign and adjusted IRS training manuals. The IEC materials included leaflets distributed to persons living in the targeted structures, messages broadcast on the radio, and messages delivered by town criers that included information on IRS involving organophosphates. AIRS Benin particularly wanted to note that unlike carbamates, organophosphates sprayed on structures have a stronger odor.

4.1 DESCRIPTION OF ADVOCACY/IEC ACTIVITIES

Advocacy Activities and Community Mobilization

The week before the IRS campaign and throughout the IRS campaign, staff from the DDS (including Departmental NMCP staff) and AIRS Benin met with commune administrators to go over the IRS campaign schedule and reinforce the benefits of IRS. In turn, commune administrators and AIRS Benin staff spoke with community leaders to ensure beneficiaries were informed and ready for the IRS campaign. Additionally, several meetings were held with community leaders, particularly the village chiefs and public criers, to answer questions about the IRS campaign and provide information to promote the campaign. Information was also provided on the schedule of the IRS campaign, the activities the beneficiaries should complete to make structures ready for IRS, and the protocol to follow once their structures were sprayed. In total, 900 community leaders participated in IRS advocacy activities, including 42 chiefs of sub-communes, 436 village chiefs, 101 religious leaders, and 321 town criers.

FIGURE 7: NMCP FOCAL POINT SENSITIZED LOCAL LEADERS IN BIRNI/KOUANDE



Mobilization

Door-to-door mobilization has been carried out before each IRS campaign over the past three years. In 2015, mass mobilization was combined with the IRS card distribution and took place up to three days before IRS in each village. One thousand five hundred and sixty (1,560) IEC agents were hired from their respective villages for the 2015 IRS campaign. All received a two-day training in April focusing on messaging and effective communication techniques, the identification of structures, and how to complete the mobilization data collection cards and the IRS card. IEC Mobilizers performed mobilization in the village to be sprayed one to three days before the spraying date and early in the morning. Mobilizers visited households and sensitized the household members who were at home on the IRS campaign and provided leaflets related to the IRS campaign and IRS card. Mobilizers also helped beneficiaries remove their belongings on the day of spray when needed.

Town Criers

AIRS Benin worked with 546 town criers who walked through a community the day before the houses would be sprayed announcing that the IRS campaign would begin the next day. They urged community members to accept IRS in their eligible structures, reminded everyone how to prepare their structures for the IRS campaign, and what to do after their structures are sprayed.

Radio Broadcasts

Six radio stations in Atacora were used for broadcasting IEC messages. All radio messages were broadcast in French and in local languages. Additionally, AIRS Benin staff and commune and department officials participated in call-in shows and on-air presentations on IRS. Radio stations broadcast the IRS schedule for the different parts of the city and villages that would be covered by the IRS campaign the next day. Various broadcasts also stressed the benefits of IRS in helping to control malaria. Additionally, local radio stations covered the IRS campaign launch and closing ceremonies.

4.2 RESULTS OF IEC ACTIVITIES

Nearly all household owners (99.65%) sensitized by the IEC mobilizers agreed to have their structures sprayed during the IRS campaign. However, some beneficiaries refused the spraying due to the odor of the pirimiphos-methyl EC they experienced last year; some were also absent from their structures and the spray operators were not able to spray the structure. The most common reason why residents were not mobilized was because in most cases the beneficiaries were working in their fields.

Table 8 provides details on the results of the mass mobilization completed by the IEC mobilizers.

TABLE 8: OVERVIEW OF MOBILIZATION RESULTS²

Commune	Total Households (eligible structures)	Total households sensitized	Proportion of Households sensitized	Population Sensitized			Total households accepting IRS	Proportion of households accepting IRS	Number of leaflets distributed
				Men sensitized	Women sensitized	Total population sensitized			
Boukoubé	13,032	13,006	99.80%	23,285	25,713	48,998	12,974	99.75%	12,247
Cobly	10,343	10,333	99.90%	19,716	22,198	41,914	10,325	99.92%	10,118
Kérou	5,956	5,941	99.75%	15,947	17,025	32,972	5,882	99.01%	5,832
Kouandé	10,324	10,313	99.89%	31,302	32,483	63,785	10,268	99.56%	9,589
Matéri	14,407	14,385	99.85%	42,705	45,359	88,064	14,349	99.75%	14,894
Natitingou	14,513	14,418	99.35%	30,102	32,148	62,250	14,356	99.57%	14,438
Péhunco	7,694	7,687	99.91%	22,287	24,494	46,781	7,646	99.47%	7,349
Tanguiéta	6,763	6,761	99.97%	13,055	14,517	27,572	6,753	99.88%	6,823
Toucountouna	4,851	4,844	99.86%	12,207	13,171	25,378	4,826	99.63%	4,855
Total	87,883	87,688	99.78%	210,606	227,108	437,714	87,379	99.65%	86,145

²AIRS Benin entered mobilization data only by total line per mobilization form; mobilization data was not double-entered. Households consist of multiple structures.

For the 2015 IRS campaign, the radio stations continued to play more spots than contracted for, indicating their commitment to support the IRS campaigns.

Table 9 notes the number of radio programs that were aired and the frequency of the radio programs.

TABLE 9: IEC ACTIVITIES CONDUCTED BY RADIO STATIONS

Activities	Number of Broadcasts
Short radio spots (French and national languages)	5,758
IRS schedule announcements/invitations for local leaders to attend IRS planning meetings (French and national languages)	1,721
Debates and discussion shows	158
IRS campaign information covered in local news stories	100
Interviews of IRS campaign staff	33
News magazine shows describing malaria and methods to treat and prevent malaria	26

4.2.1 RAPID ASSESSMENTS OF IEC ACTIVITIES

In May 2015, during the IRS campaign the IEC consultant and the NMCP IEC focal person conducted a rapid assessment of the IEC activities' role in informing community members about the IRS campaign and ensuring their readiness for the campaign. The IEC consultant and the NMCP focal person randomly selected 140 households owners in six communes in Atacora and interviewed the heads of the households or other persons who were present during the IEC mobilization activities. The interview was completed via an evaluation form designed by the AIRS Technical Manager.

Results of the assessment included:

- All surveyed people (140) got information on the IRS campaign;
- Pursuant to the information sources 63 (45%) persons noted that they received IRS information through the town criers, 61 (43.6%) from mobilizers, 16 (11.4%) from the village chiefs, four (2.9%) by the religious leaders and two (1.4%) by radio; and
- 137 (98%) persons, due to the IEC mobilization, had completed the necessary precautions to make certain their structures were ready for spraying (moved furniture and belongings out of the structures, made sure animals were not allowed to access the structure, etc.) before the spray operators arrived.

The results of rapid assessment of the IEC activities showed that interpersonal communication and radio had increased beneficiaries' adherence to precautions to be taken before, during, and after IRS operation as AIRS Benin found that communities were receptive to having their households sprayed.

5. IMPLEMENTATION OF IRS CAMPAIGN ACTIVITIES

5.1 SPRAY CAMPAIGN LAUNCH CEREMONY

On May 6th the IRS launch ceremony occurred in Toucountouna. The launch ceremony featured speeches by various dignitaries, including one of the PMI/Benin Resident Advisor who spoke on the continued partnership between the United States Government and the Government of Benin to prevent and control malaria. The Director of DDS Atacora-Donga stressed the full commitment of his team to learn and participate in the campaign notably in the health zone of Tanguiéta. The prefect of Atacora-Donga represented the Minister of Health and gave a speech noting the engagement of local authorities to contribute in the success of the IRS operation. He emphasized the efforts of the Beninese Government in confronting malaria before officially announcing the start of the 2015 IRS campaign.

Other attendees of the launch ceremony included staff from the NMCP, DDS staff members, mayors from various communes, staff from district health centers, and various community and religious leaders.

5.2 SHORT-TERM TECHNICAL ASSISTANCE

The PMI AIRS Benin Technical Program Manager was in Benin April 28 – May 9, 2015. The purpose of the trip was to support the in-country team with the final preparations for IRS activities. In general, his observations from the trip were that the quality of the planning and preparation for the spray campaign was excellent. Despite fuel shortage during ten days AIRS Benin was able to carry out the IRS campaign.

5.3 SPRAY OPERATIONS

The 2015 IRS campaign was implemented from April 30 through May 22. Spray teams were deployed Monday through Saturday of each week while Sundays were designated as a day off for rest and for repairing spray equipment. The 988 spray operators were divided into 188 spray teams, each composed of five to six spray operators. Each team was supervised by a team leader, who was responsible for his/her team's performance and organization. The number of spray teams per district was determined by the estimated number of targeted eligible structures found in each district (based on the number of structures found by spray operators during the 2015 IRS campaign). A breakdown of the distribution of spray teams is found below in Table 10.

TABLE 10: DISTRIBUTION OF SPRAY TEAMS BY COMMUNE

Communes	No. of spray teams	No. of eligible structures found by spray operators in 2014
Matéri	28	40,196
Natitingou	28	33,324
Kouandé	24	39,595
Boukoubé	22	27,610
Péhunco	24	37,178
Kérou	22	36,554
Tanguiéta	14	15,119
Cobly	16	23,785
Toucountouna	10	12,546
Total	188	265,907

5.4 IRS SPRAY CAMPAIGN SUPERVISION

5.4.1 IRS CAMPAIGN SUPERVISION BY AIRS BENIN STAFF

The AIRS Benin staff, most notably the Chief of Party, Operations Manager, Technical Manager, ECO, Logistics and Procurement Coordinator, and M&E Manager based themselves in Natitingou during the IRS campaign. Every day, according to the supervision plan, the entire AIRS Benin staff traveled to the field to provide direct IRS campaign supervision and monitor and observe the work of the spray teams, washers, service technicians, data clerks, and all other seasonal staff to ensure that the IRS campaign was completed correctly and efficiently. Some of the specific technical and operations supervision activities completed by the AIRS Benin staff included:

- Observing the spray operators to make sure they informed beneficiaries about the IRS campaign, sprayed a structure correctly, and filled in their spray cards;
- Ensuring that appropriate quantities of PPE and insecticide were available at the operation sites for the use of spray teams;
- Making sure that stock cards and inventory forms were completed correctly and matched inventory in stock at each operation site's store room;
- Reinforcing the importance of environmental compliance best practices for the storage, use, and disposal of PPE and insecticide;
- Resolving the concerns of beneficiaries, the community, seasonal staff, and DDS;
- Checking the performance of each spray operator team at the operation site, using the daily performance tracking sheet;
- Making sure that the commune coordinators under NMCP management (Tanguiéta, Cobly and Matéri) performed according to the IRS best practices: warehouse management, mobilization, IRS card, IRS supervision, and data collection; and
- Checking that IRS campaign data was of high quality, and entered daily and efficiently.

The AIRS Benin team and NMCP closely followed the field activities and the daily progress of the spray teams using daily updates that the commune and operation site coordinators sent via SMS pilot platform to the AIRS Benin Operations Manager. These messages noted the estimated number of structures sprayed each day (based on the coordinator’s review of the spray cards turned in daily) and any issues that arose in the field. This reporting allowed the AIRS Benin team to track its progress as compared to the IRS program’s schedule and to identify any IRS campaign issues that needed a quick resolution from the AIRS Benin team.

In addition to the daily SMS report generated by *TextIt*, the 16 storekeepers sent variables from the Performance Tracking Sheet by SMS to the platform located in Natitingou. Every day around 5:30 p.m. a debriefing and coordination meeting was organized by the AIRS Benin team and IRS campaign supervisors from the national, departmental NMCP and DDS staff, as well as PMI Resident Advisor when in Atacora. The meetings provided a forum for AIRS Benin and their government counterparts to update each other on IRS campaign progress, discuss various issues/adjustments that needed to be addressed and resolved the following day, and determine what new daily reminders would be sent out in the nine communes.

FIGURE 8: NMCP AND DDS STAFF MEMBERS PARTICIPATING IN DAILY COORDINATION MEETINGS



5.4.2 IRS CAMPAIGN SUPERVISION BY BENINESE GOVERNMENT STAFF

Approximately 51 Beninese government staff from national, departmental, and commune health and environment offices provided daily supervision of spray operations in the field during the IRS campaign. NMCP led the spray campaign in the three communes of Tanguiéta Health Zone including operations, IEC, logistics, and M&E activities that they followed closely in the field. This was an expansion of NMCP's involvement in the IRS campaign, since in 2014 NMCP led spray activities in only one commune.

Table II provides a breakdown of the supervision activities performed by the Beninese government staff during the IRS campaign.

TABLE II: BREAKDOWN OF SUPERVISION BY BENINESE GOVERNMENT AGENCIES

Government Level	Office	Number of People	Supervised Activities
National	NMCP	7	IEC and mobilization activities, environmental compliance (pre-spray, and post-spray inspection), spray operations, M&E and data collection, IRS trainings
	DAGRI	1	Environmental compliance (pre-spray and post-spray inspection)
Departmental	NMCP-Atacora	2	IEC and mobilization, environmental compliance, spray operations, M&E, trainings
	DDEHU	2	Environmental compliance (pre-spray, mid-spray, and post-spray inspection), spray operations
	DDS	1	Spray operations, IEC mass mobilization, M&E, IRS trainings
	The Monitoring, Evaluation and Planning Service	2	IEC and mobilization, spray operations, data entry, M&E, IRS trainings
	Public Health Service	1	IEC and mobilization, spray operation, M&E, IRS trainings
	Community Hygiene and Sanitation Coordination (SHAB)	2	IEC and mobilization, environmental compliance (pre-spray, mid-spray, and post-spray inspection), spray operation, IRS trainings
Commune	Health Zone Coordinator	3	IRS training, mass mobilization, spray operations, M&E
	Commune Chief Doctors	9	IRS training, mass mobilization, environmental compliance, spray operations, M&E
	Hygiene Agents from Commune Health Centers	21	Spray operations, quality of the spraying, environmental compliance by spray operators and washers, IEC during campaign, data control.

5.5 STOCK MANAGEMENT DURING THE IRS CAMPAIGN

AIRS Benin used inventory control cards (ICC) to keep track of each item in the central warehouse and operation sites. Storekeepers updated the ICC daily regarding the movement of stock from each store room. Storekeepers were also required to conduct daily routine physical stock counts to ensure that the actual stock in store rooms matched the ICC record.

At the beginning of each IRS campaign day, insecticide bottles were issued only to team leaders, who documented the number of bottles that they received. Thereafter, the storekeeper immediately entered the amount provided to the team leaders on the ICC to ensure accurate stock balances. In the warehouses, where the two formulations of insecticides (EC and CS) were used, two different ICC were established to track each type of insecticide.

At the end of each IRS campaign day, spray operators turned in their stock of bottles (used and unused) to the team leader, who collated these and submitted them to a storekeeper. The storekeeper recorded the full bottles on the ICC as a positive adjustment, updated the stock balance, and registered the used bottles on a daily utilization record form. The data on this form helped AIRS Benin calculate trends in use of insecticide. To validate the insecticide inventory, storekeepers worked with AIRS Benin logistics staff to compare the ICC for the unused insecticide bottles with the daily utilization records. This comparison also allowed the AIRS Benin team to note if spray operators were using too little or too much insecticide during their spraying and if various operation sites needed more insecticide.

Regarding PPE, every morning during the IRS campaign the team leaders with the storekeepers would organize, distribute, and sign out all PPE to be used for the spray operations. The warehouse managers also organized and distributed all PPE to the washers and other IRS staff as needed. At the end of each day, all PPE was turned over to the washers for cleaning. After the PPE was washed, the washers turned the PPE over to the storekeepers and team leaders who completed another inventory to ensure that all the equipment was returned.

Additionally, the storekeepers prepared a comprehensive weekly stock report and submitted it to the AIRS Benin Logistics Manager, who then generated aggregated total stock balances for the IRS campaign and noted where PPE and insecticide needed to be sent from the central warehouse to prevent stock-outs.

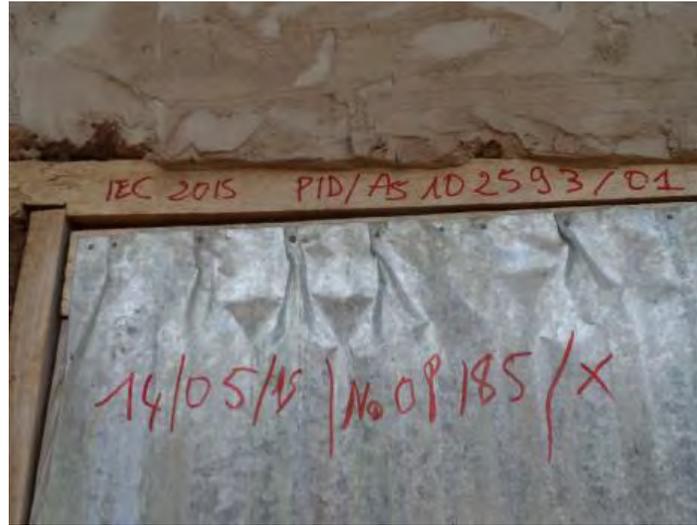
Every day, the store keepers sent the amount of insecticide used and remaining insecticide balance to the mHealth platform through SMS.

5.6 ISSUES ENCOUNTERED AND ADDRESSED DURING THE 2015 IRS CAMPAIGN

Listed below are some of the issues encountered over the 2015 IRS campaign:

- **National fuel shortage:** This unexpected event happened the last ten days of the campaign and had effects on the SOPs transportation such as delay of IRS operation in the morning and inability to reach out some villages due to less fuel in the tank. Nonetheless, thanks to the contract established between AIRS Benin and the gas station managers most of the vehicles achieved their daily tasks.
- **Oversight of structure marking by SOPs:** Some SOPs forgot to mark the structures sprayed with “S”, “NS” or “X” to make easier the mop-up. Therefore SMS reminders were sent to SOPs, team leaders to correct the mistake.

FIGURE 9: CORRECTING STRUCTURE MARKINGS USING SMS



- **Managing Supervision Tools:** AIRS has developed supervision tools, where each IRS component has a supervision form. It was observed that the Hygiene Agent in charge of close supervision had to fill out four different forms a day in addition to reviewing the IRS data of his/her team. Generally, this was not well done due to work load. The use of Smartphone-based supervisory tools will resolve this issue before the next spray campaign.
- **Heavy and important furniture in peri-urban areas:** Most of time people living in peri-urban areas have more belongings and furniture. Removing heavy furniture requires strong people and is almost impossible to do during the campaign. This is one of the causes of spray refusal.
- **Two traffic accidents and two insecticide spills happened during the IRS campaigns.** All incidents were reported to AIRS Home Office and PMI's COR Team; fortunately, there were no serious cases.
- **IRS Refusals:** some beneficiaries whose structures were sprayed in 2014 with pirimiphos-methyl EC complained that the insecticide applied smells bad and the odor persists to date. AIRS Benin visited these households, explained them that the pirimiphos-methyl CS used for 2015 IRS campaign has a relatively less pungent odor than the EC formulation and invited beneficiaries to visit their neighbor houses recently sprayed with pirimiphos methyl CS. In most cases, this remedied the refusal.
- **Combining IRS card distribution with the mass mobilization made difficult the spray team progress** mainly when the spray team plan had been modified due to market days or funerals.
- **Challenges in coordination and effectiveness of IEC and social mobilization and how it translated into awareness and readiness of households to be sprayed**

6. ENTOMOLOGY

CREC was contracted directly by PMI/Benin to complete entomological surveillance for the 2015 IRS campaign. This section provides a brief explanation of entomological surveillance that was completed before and during the IRS campaign.

The data were collected at four sentinel sites all sprayed with pirimiphos-methyl CS: Natitingou, Tanguiéta, Kouandé, and Toucountouna. A control site was set up in the Copargo Commune, a non-sprayed commune in Donga Department, which borders Atacora Department and has the same climate and topography.

6.1 ENTOMOLOGICAL SURVEILLANCE BASELINE

In March and April 2015, CREC collected baseline data for the IRS campaign. Even though the baseline was completed during the dry season, the human biting rates inside rooms in IRS area for *An. gambiae* s.l. was relatively high (30.46 bites per person per month). CREC noted a high endophagic behavior¹ of *An. gambiae*, s.l. (95 percent). The infectivity of *An. gambiae* was also noted as high: 32.23 percent of *An. gambiae* s.l. captured and analyzed via ELISA were found to have the *P. falciparum* circum-sporozoitic antigen.

6.2 INITIAL BIOASSAY TESTING

A susceptible colony of *An. gambiae* s.l. was used to assess the quality of spraying and insecticide persistence after spraying as per the World Health Organization recommendation. Bioassays were performed 24 hours after IRS activities, with a susceptible strain exposed to pirimiphos-methyl CS-sprayed walls (mostly mud and cement walls, the predominant building materials in Atacora Department) at sentinel sites in two villages in Natitingou and Tanguieta communes. CREC noted that after 24 hours the bioassay data showed 100% mortality for all mosquitoes exposed to the sprayed walls at all sentinel sites. This showed that the initial spraying completed by the spray operators was of sufficiently good quality and the sprayed insecticide was effectively killing mosquitoes.

¹ Endophagic refers to the preference of the mosquitoes to feed indoors.

7. ENVIRONMENTAL COMPLIANCE

7.1 PRE-SPRAY ENVIRONMENTAL ACTIVITIES

7.1.1 ENVIRONMENT DOCUMENTATION CHANGES

Approved on May 4, 2011, the AIRS Benin Project's Supplemental Environmental Assessment (SEA) is valid through April 2016, so no change was needed for the 2015 IRS campaign. Additionally, the 2008 Environmental Compliance Certificate for IRS insecticides delivered by the Benin Agency for Environment (ABE) is still valid.

7.1.2 NEW TECHNOLOGY

Since 2013, AIRS Benin uses smartphones to complete environmental compliance supervision and monitoring. With the new technology, environmental compliance checklists for inspection before, during, and after the IRS campaign were uploaded to the smartphones, which also records GPS coordinates (latitude and longitude) of any operation site, as well as prompts the user to take photos with the camera.

Prior to the 2015 IRS campaign, the ECO performed the initial pre-season environmental compliance assessment (PSECA) with smartphones to determine the conditions of all 16 operation sites and guarantee the IRS campaign was compliant with the USAID's 22 CFR 216 Code. The information collected was uploaded and made available on the PMI AIRS Project's environmental compliance database. This enabled PMI AIRS staff to view the results of the inspections and note which refurbishments were needed in different operation sites in order to protect the environment.

During the initial PSECA, the ECO ensured that both the NMCP and DDEGCC were able to use the smartphone to collect environmental information. After rehabilitation activities, the same electronic device enabled also the inspection team to collect required information for decision to allow AIRS Benin to start the IRS campaign.

7.1.3 PRE-SPRAY ENVIRONMENTAL INSPECTION

Prior to the 2015 IRS campaign, a pre-spray environmental inspection was conducted from January 20 to January 23 throughout the 16 operation sites by NMCP under the Environmental Compliance Officer's close supervision along with the AIRS Benin field logistician and representatives from MAEP, MOE, DDS and DDEGCC. Details from the pre-spray environmental inspection are found in the Letter Report that AIRS Benin submitted to PMI and USAID/Washington early March 2015.

The three main activities of the pre-spray inspection were to:

- Identify the possible causes of non-environmental compliance at each operational site and make recommendations as needed to assure compliance for the 2015 IRS campaign;
- Check and confirm the Kerou's secondary storeroom would be used for 2015 IRS campaign since it

was occupied by the Ministry of Agriculture; and

- Reinforce all partners' skills, especially the representative of NMCP in handling smartphone to collect environmental compliance data

The pre-spray environmental assessment was completed using a checklist based on the BMP, which complies with the US Code 22 CFR 216 and the Benin Law 98-030 on Environment. All inspection partners were trained on the BMP, the checklist, and the importance of gaining required documentation to bolster all findings.

Overall, the pre-spray inspection detected that all operation sites needed refurbishments before the IRS campaign. This included site cleaning, repairing of cement cracks in soak pits and rinsing areas, washing basins, and showers/toilets. The metallic covers atop the soak pits were painted to protect them. All refurbishments for the base sites were completed in April 2015.

Additionally, the inspection allowed AIRS Benin to collect the number of first-aid kits needed and other PPE for each operation site and to assure that all operation sites have access to guidelines on how to clean up insecticide spills and treat any intoxication cases.

An activity no less important consisted in enhancing partners capacities, in particular NMCP by reinforcing its representatives' skills on environmental inspection. Thus, they were able to collect environmental information and data in various operation bases under the ECO's surveillance.

The Kerou storeroom is loaned to the Project from the Ministry of Agriculture, and initially it was full of fertilizers during the pre-inspection. However, thanks to successful negotiations the storeroom was available for the IRS campaign.

Table 12 notes the location of each operation site for the 2015 IRS campaign, and whether the operation sites received store room, soak pit, fencing, or soak pit cover refurbishments, following the pre-spray environmental inspection.

TABLE 12: LOCATIONS OF OPERATION SITES

Communes	Operation site location (commune)	Facility type	Store room refurbished (*)	Soak pit refurbished	Fencing refurbished
Natitingou	Natitingou	Central warehouse	Yes (Y)	Y	No (N)
	Perma	Health center	Y	Y	N
Toucountouna	Toucountouna	Health center	Y	Y	N
Boukoubé	Natta	Municipal building, provided by community	Y	Y	N
	Manta	Health center	Y	Y	N
Tanguiéta	Taiacou	Youth center	Y	Y	N
Matéri	Matéri	Municipal building, provided by community	Y	Y	N
	Dassari	Health center	Y	Y	N
Cobly	Cobly	Health center	Y	Y	Y
Kouandé	Kouandé	Health center	Y	Y	N
	Guilimaro	Health center	Y	Y	N

Communes	Operation site location (commune)	Facility type	Store room refurbished (*)	Soak pit refurbished	Fencing refurbished
Péhunco	Ouassa	Health center	Y	Y	N
	Gnemasson	Health center	Y	Y	N
Kérou	Firou	Community building		Y	N
	Kaobagou	Health center	Y	Y	N
	Kérou	MAEP building	Y	Y	Y

(*) Small maintenance according to the store room conditions: on roof, doors, windows, locks or floor.

7.1.4 MEDICAL CLEARANCES

A few days before the IRS campaign (April 23-29, 2015), all spray operators, supervisors, pump technicians, and washers had medical tests completed in their respective districts to ensure their fitness for IRS operations. The tests included physical examination and pregnancy testing. Anyone found unfit could not participate in spray activities; the five females with positive pregnancy tests.

7.1.5 MANAGEMENT OF INSECTICIDE ADVERSE EFFECTS

Medical and health agents (66 nurses and 14 physicians) from the nine districts of Atacora Department were trained on how to manage cases of potential intoxication from contact with organophosphate. The training focused on the mechanism of inhibition of acetyl cholinesterase, physiological implications of this inhibition, clinical diagnosis of intoxication, and case management of poisoning, including symptoms and antidotal treatment. The training was led by the Head of Toxicology Department of the Medical School of Cotonou. Additionally, during the training of trainers and afterwards, AIRS Benin staff highlighted the insecticide adverse effects, measures to be taken to prevent intoxication, and what to do when cases occur.

7.2 MID-SPRAY ENVIRONMENTAL ACTIVITIES

7.2.1 MID-SPRAY ENVIRONMENTAL INSPECTIONS

During the spray campaign from May 11 to 14, 2015, DDEGCC and SHAB completed a mid-spray environmental inspection, using updated checklists, for all operation sites and spraying activities under the AIRS Benin ECO's close supervision. The four topics assessed by these forms are:

1. Spray Operator Morning Mobilization;
2. Homeowner Preparation and Spray Operator Performance;
3. Storekeeper Performance;
4. End of Day Cleanup

The inspection team reported the following findings during their mid-spray inspection:

- In all villages where the “homeowner preparation and spray operator performance” was monitored, residents were aware in advance of spray activities. Most of them removed belongings from the houses and heavy items were adequately covered with a plastic sheet. The inspection team found that no food store was sprayed and no sick person was inside at the time of spraying. Residents knew well precautions measures to be taken before, during, and after spraying.
- All of spray operators monitored by the inspection team wore full PPE during the spray operations.
- While preparing insecticide in the spray tanks, the SOPs triple-rinsed the bottles and they met the required pump pressure (55 psi for Hudson; safety valve and red marker for Goizper). But sometimes, the triple-rinse was not effective because it was executed too quickly. In these cases, SOPs and team leaders were further trained by the inspection team.
- The inspection team did not observe any spray operator eating, drinking, or smoking during the working hours.
- Two incidents of pesticide exposure happened in Natitingou and Toucountouna. Both incidents were reported; the injured people were treated and healed afterward.
- When handling pesticides all storekeepers wore full PPE and no one was eating, drinking, or smoking inside the warehouse. Every storage facility was provided with a spill kit, a fire extinguisher, and a thermometer for temperature monitoring inside, and the pesticide’s Material Safety Data Sheet (MSDS) in use was posted. There was no insecticide beyond its expiration date.
- The inspection team checked the end-of-day IRS campaign clean-up activities and noted that rinsing areas, along with their soak pit, were compliant. However, a soak pit overflow issue occurred at Perma operation site and was effectively fixed by adding second soak pit.

FIGURE 10: NEW SOAK PIT AT PERMA OPERATIONAL SITE



- Regarding drivers ensuring SOP transport, all of them had a cell phone and wore PPE when driving spray teams to villages and cleaned their vehicles. Additionally, all vehicles were provided with first aid kits and instructions for cleaning up an insecticide spill.

7.2.2 INCIDENTS

Over the 2015 IRS campaign, two insecticide exposure incidents were reported:

- The first incident took place in Natitingou on May 5 and involved a spray operator (SOP) who received insecticide splashed in his face and eyes. He was duly treated in the Commune Health Center of Natitingou and he fully recovered.
- The second one was due to a pump tube connection issue of a SOP from the Dassari spray team, whose overalls and visor were slightly splashed on May 11 in Sechenega village. He confirmed he did neither receive insecticide anywhere nor experience side effects.

Moreover the above exposure incidents, two traffic accidents were reported:

- On April 26, two young motorcyclists riding very fast in Natitingou city bumped into the left side of the project vehicle and fell down. One of them had few scratches in the arm while the second had scratches on the foot. They were cared for at Natitingou Health Zone Hospital and they are doing very well. No injury was done to project staff operating the vehicle.
- On May 14, when driving back with motorbike from Batitamou village in Toucountouna commune, the Site Coordinator of Toucountouna and the Communication Consultant had an accident one kilometer out of that village. The motorbike slipped due to driving too fast on a road in bad condition: the two motorcyclists were thrown down with scratches on their arms and knees. They were cared at Toucountouna Health Center and are fully recovered.

The project's health insurance for seasonal staff was charged when taking care of injuries. To avoid accidents during further IRS campaigns, AIRS Benin should insist on safe driving practices during drivers' training and recommend all seasonal workers to follow AIRS Benin instructions on security. For further information, see the annex's summary of the findings of the mid-spray environmental inspection.

7.3 POST-SPRAY ENVIRONMENTAL ASSESSMENT/ACTIVITIES

The post-spray environmental inspection was performed from May 26 to 29 by an inspection team led by NMCP and supervised by the AIRS Benin ECO. The inspection team also included staff from the DDS Atacora and MAEP. The post-spray inspection was compliant with the USAID's 22 CFR 216 Code and based on BMP. The main objective was to check if all operation sites were properly closed and to note any environmental issues that needed to be resolved before the 2016 IRS campaign. The findings of the post-spray environmental inspection are detailed below:

- All of the IRS campaign commodities (including PPE and leftover insecticides) were transported back to the central warehouse in Natitingou for storage until the next campaign.
- All secondary store rooms were decontaminated thoroughly with water and soap, including Matéri, Cobly, Dassari and Perma where the inspection team personally supervised its decontamination while post-inspection occurred.
- All rinsing/wash areas at operation sites remained in good condition. The soak pits also remained in good condition and all were covered and thoroughly secured via two locks. The barbed wire enclosures around the rinse areas and soak pits were intact. However, AIRS

Benin did note that like last year doors of most rinsing areas were removed and secured inside store rooms to prevent theft of the doors during the “off-season.”

The relationship between AIRS Benin and the owners of the store rooms (municipal governments and the DDS) remains strong as spaces are donated, with both parties displaying interest in allowing AIRS Benin to use the store rooms next year. However, although the AIRS Benin relationship with the Commune Agriculture Officer of Kerou was a bit improved, required actions, specifically putting in place a small storage facility, will be taken to securely resolve the storage issue in the commune of Kerou. For further information, please reference the annex section for a summary of the findings of the post-spray environmental assessment.

7.4 SOLID WASTE DISPOSAL

During the 2015 IRS campaign, the project generated the following amounts of solid waste:

- 16,401 used respiratory masks
- 45,664 empty bottles of pirimiphos-methyl
- 3,422 used plastic gloves

7.4.1 DISPOSAL METHODS

In order to minimize environmental risks regarding the disposal of the solid wastes, three different methods, based on PMI BMP from USAID 22 CFR 216 Code and the Environmental Mitigation and Monitoring Plan (EMMP), were used to dispose of solid wastes. These methods included incineration, recycling (for solid wastes with high-density polyethylene, mainly organophosphate bottles), and burying used gloves (since they are composed of low-density polyethylene) at the Directorate of Technical Service of Cotonou Town Hall landfill in Ouessè (Ouidah). AIRS Benin made sure the ECO was present at all disposal processes and received confirmation letters noting when the disposals occurred.

7.4.2 INCINERATION OF SOLID WASTE

AIRS Benin completed the incineration of used respirator masks from the 2015 IRS campaign from May 26 to 27. For five consecutive years, the IRS program in Atacora used the incinerator at St. Jean de Dieu Hospital in Tanguiéta. The incinerator had already been reviewed by the AIRS ECO for its capacity, its ability to reach high enough temperatures (1,000 degrees Celsius) for incineration of IRS solid wastes, and its low level of smoke emissions. All loading of solid waste and the actual incineration were closely supervised by the AIRS Benin ECO, Logistics and Procurement Coordinator, and staff from the DDS and NMCP. Overall, the incineration took place without any issues.

7.4.3 RECYCLING OF EMPTY BOTTLES

In 2015, AIRS Benin continued working with the environmental non-governmental organization Community Development and Environmental Sanitation (*Développement Communautaire et Assainissement du Milieu* (DCAM))/ Bethesda, a non-profit NGO located in Cotonou, to recycle empty organophosphate bottles. After triple-rinsing all of the empty organophosphate bottles in the field and decontaminating them with soap and water at the AIRS Benin central warehouse in Natitingou, on June 6, 2015 AIRS Benin transported the 45,664 empty organophosphate bottles to the DCAM Bethesda warehouse and recycling plant in Pahou (Ouidah Commune). Currently, staff from DCAM Bethesda has finished cleaning and crushing empty bottles in small pieces; the crushing operation took place on June 22, 2015. The AIRS Benin ECO and other members of the staff are monitoring the process.

7.4.4 BURYING WASTES AT A LANDFILL

The used rubber gloves from the 2015 IRS campaign contain low-density polyethylene, which releases gas by-products that are carcinogenic when incinerated. Therefore, the AIRS project's Environmental Compliance Manager has advised all project countries to thoroughly wash the gloves and contact local authorities to find out the safest place to dispose of them. AIRS Benin continued working with the Technical Direction (DST) of Cotonou municipal service which manages a landfill in Ouessè Ouidah Commune, fully compliant with the Law No 98-030 related to the framework law on environment in Benin. AIRS Benin thoroughly washed the 3,422 used rubber gloves, which were then safely buried at Ouessè Landfill Site on June 17, 2015 under the NMCP and AIRS Benin's ECO supervision.

All environmental compliance activities are summarized in the EMMP table (see Table 26 in the Annex).

8. MONITORING AND EVALUATION

M&E for the 2015 IRS campaign closely followed the processes outlined in the 2015 AIRS Benin Work Plan, the M&E Plan, and the M&E Concept Paper developed by the AIRS core team. M&E activities were led by the AIRS Benin M&E and Database Managers.

The AIRS Benin project continued to use the Microsoft Access database designed by the AIRS Benin M&E Manager in 2012, which was updated before the IRS campaign to facilitate easy and rapid data checking during the entry process. The AIRS Benin database used several logic checks and controls to validate data entries and minimize data entry error.

8.1 DATA MANAGEMENT

IRS campaign data was entered each time a spray operator visited a structure. This includes recording on the spray operator card if a structure was not sprayed, as well as the reason why.

Data quality assurance protocols were followed to check the accuracy of all spray operator data collected. After the end of each IRS campaign day, the spray operators provided their completed spray operator forms to the team leaders. The team leaders then checked the accuracy of the spray operator's forms using the Error Eliminator (printed on the backside of the Spray operator data collection form for facilitate use), and assured that all totals on the spray operator forms added up correctly. Thereafter, the team leaders sent the spray operator forms to the operation site supervisor, who also checked the accuracy of the spray operators' forms with the Error Eliminator and finally sent the spray operator forms to the commune coordinators to complete a final check and validation of all spray operator forms. The commune and operation site coordinators sent the spray operator forms and the Team Leader forms to the data entry center in Natitingou, where data clerks processed the forms and entered the data into the AIRS Benin database. The data clerk entered the IRS data by totals and details to ensure data consistency.

Additionally, the M&E Manager and Database Manager checked the accuracy of data entered by data clerks daily by randomly selecting 10 percent of the spray operator cards collected during a week and comparing the information on the cards with the data entered into the AIRS Benin database.

8.2 DATA QUALITY ASSURANCE

The AIRS project supervisory tools have improved the data quality assurance activities for both data collection and data entry verification. AIRS found that these forms helped formalize self-audits of the IRS campaign's data to ensure better data quality and reduce the number of errors found on Daily Spray Operator Forms and in the M&E database. Although AIRS Benin has only anecdotal evidence, data entry clerks mentioned that the spray operator forms came from the field with less data missing and fewer errors in logic.

Error Eliminator

All AIRS technical staff, supervisors, team leaders, and government staff used the Error Eliminator Form on a daily basis to detect and correct common errors on mobilizer and spray operator forms before they were transported to the data center. Common errors included arithmetic mistakes and failure to complete all data points on the data collection forms.

Data Collection Verification Form

Supervisors, such as AIRS technical staff, commune and operation site coordinators, operation site supervisors, and government staff (national, regional, and local) used the Data Collection Verification (DCV) tool to interview households to verify spray coverage data. In total, AIRS supervisors used the DCV for 73 village of the total 780 village (9.4%) spray by the Spray Operators to check the data quality.

Supervisors performed verification visits based on the coverage rate provided by the database center. As a priority, the data quality control was focused on villages where the coverage rate exceeds 85%.

These visits were helpful to detect errors and bad practices and provided corrections either in the field or through SMS to prevent repetitive errors. Additionally, the audit information made easier the mop-up operations. The villages where the coverage rate was less than 85% are systematically scheduled for the mop up.

Data Entry Verification Form

The M&E and Database Managers used the Data Entry Verification tool to verify that the data entered into the database matched the data on the Daily Spray Operator Forms. Some errors had been detected, such as wrong village or date selected during the verification or mistyping household codes. To further ensure the data collection forms have been completed and entered correctly, the M&E Manager and Database Manager oversaw the verification of all records entered to detect omitted spray operator's cards. In addition to the Data Entry Verification Form, the database enforced several logic rules (e.g., the number of pregnant women in the structure cannot exceed the number of women in the structure). Furthermore, AIRS Benin also provided each data clerk with their own data cleaner tool. This tool allowed the data entry clerks to run error reports and correct data entry mistakes each day before leaving the office. Due to the sufficiency of staff and time, data was entered and cleaned in "real-time" (within 24 hours of spray) daily.

At the end of every week, the AIRS Benin M&E Manager and Technical Manager provided feedback regarding errors found on spray operator cards and gave recommendations to the AIRS Benin Operations Manager, commune and operation site coordinators, and spray team leaders, in order to minimize future data errors on the spray operator cards.

8.3 NUMBER OF STRUCTURES COVERED BY THE 2015 IRS CAMPAIGN

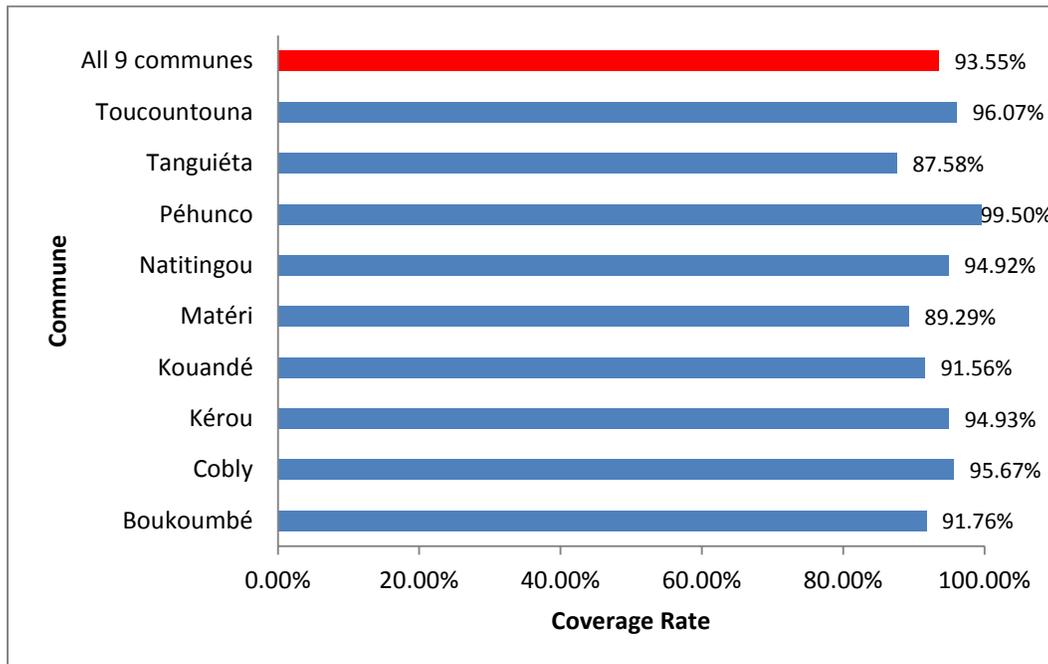
The 2015 IRS campaign sprayed 252,705 structures of the 270,141 structures found. Spray coverage was well over the 85 percent minimum threshold, as coverage was 93.55 percent for the total number of eligible structures found by spray operators. Table 13 describes the overall spray coverage rate.

TABLE 13: SUMMARY OF IRS COVERAGE

Total number of eligible structures found by spray operators	270,141
Total number of eligible structures sprayed by spray operators	252,706
Spray coverage	93.55%

Figure 11 shows the IRS coverage rates per commune.

FIGURE 11: SPRAY COVERAGE BASED ON STRUCTURES FOUND BY SPRAY OPERATORS PER COMMUNE



The Figure 12 below shows the progress of daily coverage rate. The coverage rate (# eligible sprayed structures / # eligible structures found) has evolved from 89.6% (Day 1) to 98.3% (Day 20). Indeed, the coverage rate has increased significantly the last three days of the campaign, from 95.7% (Day 17) to 98.3% (Day 20) due to the mop-up performed the last days of the campaign. In total, all eligible structures visited during the last three (3) days of the campaign were sprayed.

FIGURE 12: PERCENTAGE OF DAILY SPRAYED STRUCTURES VS. FOUND

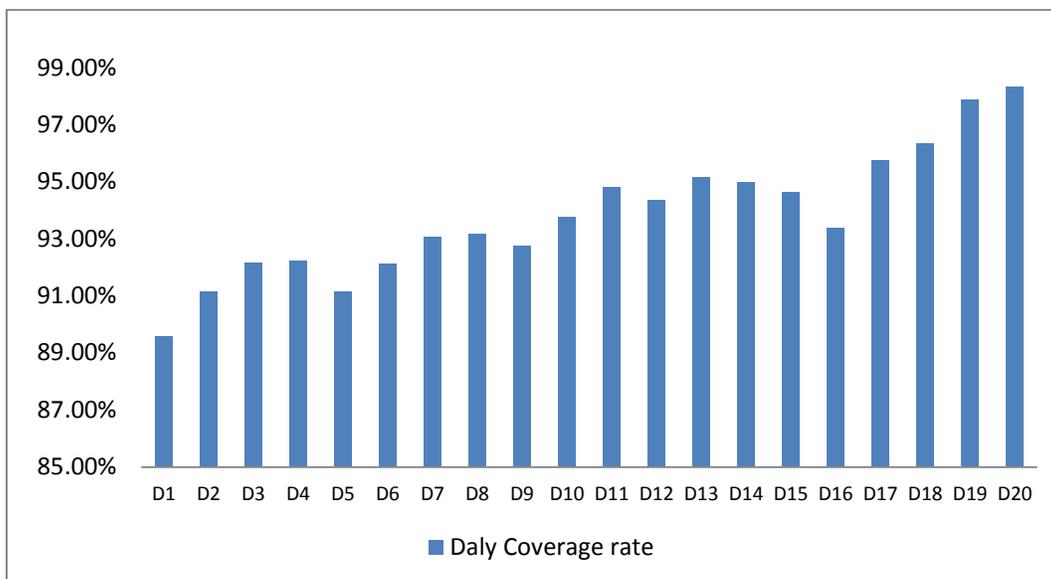


TABLE 14: SPRAY COVERAGE BASED ON STRUCTURES FOUND BY SPRAY OPERATORS PER COMMUNE

Commune	Structures Found by SOPs	Structures Sprayed 2015	Coverage Rate 2015
Boukoubé	29,090	26,694	91.76%
Cobly	22,044	21,089	95.67%
Kérou	40,328	38,285	94.93%
Kouandé	44,275	40,538	91.56%
Matéri	41,474	37,031	89.29%
Natitingou	29,385	27,891	94.92%
Péhunco	37,137	36,953	99.50%
Tanguiéta	13,490	11,815	87.58%
Toucountouna	12,918	12,410	96.07%
Total	270,141	252,706	93.55%

8.4 FEMALE SOP PERFORMANCE

According to the Table 15 female SOPs performed better in Natitingou, Materi and Tanguiéta and equally as well as men in Pehunco. In general, women sprayed at the same rate as men. These results should be used to bolster women's recruitment efforts to strengthen gender equity in IRS during future spray campaigns.

TABLE 15: FEMALE SOP PERFORMANCE

Commune	Number of structures sprayed by sex		Number of SOPs by sex		Structures sprayed per day per sex(*)	
	Female	Male	Female	Male	Female	Male
Boukoubé	2449	24245	13	105	9.4	11.5
Cobly	1685	19404	8	82	10.5	11.8
Kérou	5145	33140	18	110	14.3	15.1
Kouandé	2789	37749	10	128	13.9	14.7
Matéri	1635	35396	6	134	13.6	13.2
Natitingou	3514	24377	17	121	10.3	10.1
Péhunco	4704	32249	15	103	15.7	15.7
Tanguiéta	2427	9388	14	56	8.7	8.4
Toucountouna	1479	10931	6	42	12.3	13.0
Total	25827	226879	107	881	12.1	12.9
	252706		988		12.8	

(*) Target structures per day: 15

8.5 POPULATION PROTECTED

A total of 802,597 people, including 406,862 men and 395,735 women, were protected by the IRS campaign. Those protected included vulnerable populations: 156,863 children under five years old, including 78,216 males and 78,647 females; and 30,454 pregnant women. Table 16 provides a breakdown of the total number of people protected by IRS per commune.

TABLE 16: PEOPLE PROTECTED BY THE IRS CAMPAIGN PER COMMUNE

Communes	Total population protected			Children <5 years protected			Pregnant women protected
	Men	Women	Total	Male	Female	Total	
Boukoubé	39,341	38,746	78,087	7,628	7,293	14,921	1,852
Cobly	31,844	31,012	62,856	5,222	4,902	10,124	1,803
Kérou	71,353	65,482	136,835	14,724	13,752	28,476	7,084
Kouandé	65,321	62,980	128,301	12,985	13,703	26,688	5,257
Matéri	54,775	54,250	109,025	8,629	8,719	17,348	2,718
Natitingou	46,897	45,675	92,572	7,594	7,270	14,864	2,653
Péhunco	58,379	58,357	116,736	14,084	15,439	29,523	7,212
Tanguiéta	18,586	18,300	36,886	2,958	3,069	6,027	827
Toucountouna	20,366	20,933	41,299	4,392	4,500	8,892	1,048
Totals	406,862	395,735	802,597	78,216	78,647	156,863	30,454

Overall, 17,435 eligible structures and an estimated 40,194 people found by spray operators during the IRS campaign were not sprayed.

The three major reasons of non-sprayed structures are: eligible structures had been transformed into granaries during the time of spray (41.9%), structures were closed and locked (26.3%), and home owners refused treatment (22.2%)

8.6 USE OF LONG-LASTING INSECTICIDE-TREATED NETS (LLINs)

As required by the NMCP, spray operators collected data on the number of people in Atacora (particularly children under five years old and pregnant women) sleeping under LLINs. Spray operators asked for this information at each structure that was sprayed, recorded it on the spray operator card, and entered it into the AIRS Benin database.

Among the **802,597** people protected by IRS, it was noted that **697,931** (or 86.9 percent of the people protected) slept under LLINs. Table 17 provides a breakdown of the LLIN data collected by the spray operators (per the direction of the NMCP).

TABLE 17: BREAKDOWN OF LLIN DATA COLLECTED BY SOPS

Communes	Total number of people (in sprayed structures) sleeping under LLINs		Total number of children under 5 years of age (in sprayed structures old sleeping under LLINs)		Total number of pregnant women (in sprayed structures) sleeping under LLINs	
	N	(%)	N	(%)	N	(%)
Boukoubé	73,074	93.6	13,935	93.4	1,609	86.9
Cobly	61,437	97.7	9,768	96.5	1,657	91.9
Kérou	108,220	79.1	24,450	85.9	5,917	83.5
Kouandé	104,266	81.3	23,059	86.4	4,425	84.2
Matéri	101,446	93.0	16,518	95.2	2,526	92.9
Natitingou	73,201	79.1	12,368	83.2	2,110	79.5
Péhunco	107,081	91.7	27,373	92.7	6,579	91.2
Tanguiéta	32,831	89.0	5,440	90.3	730	88.3
Toucountouna	36,375	88.1	8,208	92.3	942	89.9
Total	697,931	86.9	141,119	90.0	26,495	87.0

8.7 INSECTICIDE USE AND SPRAY OPERATOR PERFORMANCE

A total of 45,664 bottles of organophosphate CS formulation were used during the IRS 2015 campaign to treat 252,706 eligible structures from April 30 to May 22.

Overall, the spray operators in all communes sprayed an average of 12.8 structures per day, and 5.53 structures were treated per insecticide bottle.²

Table 18 provides a breakdown of the average number of structures covered by one bottle, per district.

² Please note that one bottle of organophosphate are is formulated to cover an average of 250m².

TABLE 18: INSECTICIDE USED PER COMMUNE

Communes	Number of organophosphate bottles used	Number of structures sprayed	Number of structures covered (sprayed) per bottle
Boukoubé	4,731	26,694	5.6
Cobly	3,720	21,089	5.7
Matéri	7,050	37,031	5.3
Toucountouna	2,000	12,410	6.2
Tanguiéta	2,320	11,815	5.1
Natitingou	5,910	27,891	4.7
Kouandé	7,674	40,538	5.3
Péhunco	5,856	36,953	6.3
Kérou	6,403	38,285	6.0
Total	45,664	252,706	5.5

9. POST-SPRAY ACTIVITIES

9.1 POST-SPRAY INVENTORY

Starting June 30, as PPE and insecticide were returned to the central warehouse in Natitingou, the AIRS Benin logistics manager and warehouse managers completed an inventory of all remaining commodities from the 2015 IRS campaign. The results of the inventory are found in the annex.

9.2 POST-SPRAY CAMPAIGN RADIO PROGRAMS

During the six weeks immediately after the IRS campaign, radio stations throughout Atacora continued IRS messaging, chiefly broadcasting information on the benefits of using structures covered by the IRS campaign and noting that beneficiaries should not apply paint, plaster, or other materials to walls within a structure that received IRS.

10. LESSONS LEARNED & CHALLENGES

10.1 NMCP CAPACITY

When AIRS began planning and implementing IRS campaigns in 2012, one of its objectives was to enhance NMCP competencies in IRS program management. The 2012 work plan addresses basic activities that AIRS would work on regarding capacity building, such as validation of training manuals, IRS action plan and management tools like IRS cards, communication and education leaflets, and supervision forms. In addition, AIRS Benin worked with the NMCP throughout the micro-planning process and the NMCP contributed in the training of trainers of spray operators and participated in IRS operation supervision.

In late 2012, the PMI AIRS Project established a capacity building tool to assess the NMCP capacity in the fourteen PMI AIRS countries. AIRS Benin carried out the assessment in July 2013 and shared the results with USAID, CDC, and NMCP, respectively, in December 2013 and early 2014. The findings showed that the government's strongest areas are entomology, monitoring/evaluation and spray operation planning. Nonetheless, additional support was needed with logistics, procurement, spray operation implementation, environmental compliance and communication materials and messaging.

While developing the 2013 Malaria Operation Plan, PMI stressed the importance of NMCP capacity building for future ownership of the IRS program. The planning field visits also reinforced the decision to improve NMCP capacity to manage the IRS program. As a result, in 2014, the NMCP was granted \$50,000 from WHO to help improve their IRS program management capacity building under AIRS Benin's mentorship program.

In 2015, NMCP did not receive any financial support from WHO, nonetheless through the memorandum of understanding between AIRS Benin and NMCP resources were made available to this latter to perform IRS activities in the health zone of Tanguiéta- Coby- Matéri.

The activities below show NMCP involvement and participation in the 2015 IRS campaign and also AIRS Benin's support:

- Building leadership skills surrounding IRS micro-macro planning and implementation; the NMCP took full responsibility (under AIRS Benin's mentorship) of the management of the health zone of Tanguiéta (with three communes: Tanguiéta, Coby and Matéri);
- NMCP participated in pre-, mid-, and post-spray EC inspections. Since 2012 the NMCP environmentalist was instrumental in validating the EC tools and performing all requested inspections using the paper forms or the smartphone checklist. NMCP assigned one data base manager who worked with the AIRS database manager during the IRS campaign;
- NMCP's logistics focal point participated in the IRS campaign action plan development and had been working with the AIRS Benin logistics coordinator to solve the fuel shortage during the IRS operation; and
- The IEC/BCC focal point from the DDS fully carried out his tasks with the IEC consultant.

To run the IRS operation in Tanguiéta health zone, MOH/NMCP assigned three nurses from the Health Zone Hospital as commune coordinator respectively for each commune; they participated in the IRS campaign action plan development in Porto Novo in April 2015. The commune coordinators after

attending the training of trainer on IRS technical components led the spray operators training in the three respective communes of Tanguiéta health zone and the mobilization one as well.

With AIRS Benin's support, the commune coordinators established the IRS operation micro plan for Tanguiéta health zone and ran the IRS activities such as looking after of the secondary warehouse with the store keeper, preparing the SOP teams field work, supervising their work, validating the recorded IRS data and sending them every day. In addition, the commune coordinators were also in charge of following the mobilizer's activities and coordinating all IRS components in their respective geographic area. The Health Zone Officer (from the government) was supporting the commune coordinators specifically on supervisory activities and daily monitoring of IRS operation progress.

In general, the IRS coverage in the three communes of Tanguiéta are all above the objective stated by the National Malaria Strategic Plan even though it was lower as in the previous years in Tanguieta due to the National Pendjari Park and reluctance in urban area and in Materi because of more structures transformed to granaries (39% of structures not sprayed due to being transformed into a granary in Atacora happened in Materi) Nevertheless some key interventions should be improved such as:

- Strengthen leadership and management at the national, departmental, and commune level in spray operations, planning, and implementation;
- Conduct close supervision and reinforce field activities coordination to improve results;
- Identify the best role(s) for NMCP (national, departmental, and commune) staff that strengthens and maximizes IRS in Benin, given existing strengths and human resource limitations;
- Increase leadership in determining long- and short-term strategies envisioned for IRS in Benin.
- Train the M&E staff (focal point) on data base management;

Reinforce NMCP competences on site prospection and rinsing area installation;

10.2 CHALLENGES AND LESSONS LEARNED

Administration and Logistics

- The relocation of financial assistants in the three health zones made easier the organization of the 2015 IRS campaign as follows:
 - The financial assistant was in direct contact with site and commune coordinators to collect in time the attendance lists of spray operators in order to perform the update of the payment statements weekly;
 - The financial assistants facilitated the fuel procurement at the gas stations; and
 - This decentralization had mainly solved the security issue because in the previous years financial assistants had to come back very late in Natitingou every day.
- Another good point is that this year, FECECAM, the local micro finance institution with which AIRS Benin contracted for seasonal agents payment, paid the field workers on short notice, without waiting for the PMI AIRS Project wire transfer which might take time.
 - However, the transportation of the finance team had difficulties due to the limited number of vehicles in the approved work plan budget; and
 - Another difficulty during this campaign was the delay in gathering the mobilization agents attendance lists, due to the lack of organization between the head nurses and commune/operation site coordinators.

M&E

- Tracking the number of structures sprayed in each village versus the number of targeted structures found in 2014 by communes allowed the M&E team to make rapid corrective actions at the village level, if needed.

IEC

- Combining IRS card distribution with the campaign mass mobilization was hard to manage. During the campaign site or commune coordinator changed the schedule due to funeral or market and mobilization schedule in fact did not match afterwards with the spray schedule.
- The use of a colored IRS card allowed the household owners to recognize quickly the IRS card of the current year. Also, the new annual numbering IRS card was helpful to record structure codes by the spray operators.

Logistics

- Fuel was not available at almost all gas stations in the communes of Atacora during the IRS campaign due to the national fuel shortage caused by regional events in Nigeria. For future IRS campaigns, the implementing partner may consider purchasing a minimum of 16 small tanks (200 liters) made out of steel, or renting a tank with fuel and assigning a financial assistant to manage the daily consumption. Another solution is to rent a tank truck to procure fuel.
- In some communes, during the IRS campaign, spray operators were squeezed tightly in buses. More vehicles should be planned for in the upcoming IRS campaign in order to transport up to most twelve spray operators.

Environmental Compliance

- Over the 2015 IRS campaign, boots, helmets, face shields, and gloves were washed on a daily basis by the SOPs in the rinsing area along a queue, and sometimes, some of the SOPs rushed in rinsing. AIRS Benin will take layouts for more discipline in the future.
- The health agent will continue inspecting the operation sites during the non-spray months and note their conditions. This information will help note what type of refurbishments many need to take place before the next IRS campaign.
- Due to the overflow issue experienced in 2015 with the soak pit at Perma operation site, all materials acting as filters (sawdust, charcoal, porous stones) will be renewed in 2016 in all existing operation sites.
- In order to avoid overcrowding at level of Perma rinsing area and to reduce transportation costs, AIRS Benin recommends creating an operation site in Birni before the 2016 IRS campaign.

Operations/Trainings

- Good collaboration between AIRS Benin and the DDS, DDEGCC, and mayors of the spray communes led to government staff becoming more interested and involved in the planning of the IRS campaign and participating in IRS campaign supervision. This was noted during the active participation of NMCP and DDS staff during review meetings held by the AIRS Benin team on a daily basis during the IRS campaign.
- Mentoring of NMCP to conduct successfully a spray campaign in three communes (Tanguieta-Cobly-Materi) for the first time was a challenge due to all of the IRS components to be managed: coordination, IEC/BCC, M&E, logistics, and EC.

- Heavy and important furniture in peri-urban areas is one of the causes of spray refusal. Therefore for upcoming campaign AIRS Benin will require strong and solid individual per mobilization team to help home owners to remove their belongings during the campaign.

Gender

- AIRS Benin will continue to emphasize the importance of increasing the numbers of women contributing to and benefiting from the IRS campaign. Lower literacy levels of rural women relative to men constrain recruitment efforts for women to work as SOPs, storekeepers, and team leaders. To ensure the project continues to increase the number of women hired, the project will work with and train local village mayors and chiefs to recruit and hire more women.

10.3 RECOMMENDATIONS

The recommendations listed below are suggestions to help improve the efficiency and effectiveness of IRS programming for future IRS campaigns.

1. IEC activities should start one week before the campaign and continue throughout the campaign.
2. Each spray team should have a carrier to help home owners (old, sick, alone, or disabled) to remove their belongings to prepare for spray as needed.
3. Traditional IRS is expensive because of the extensive use of vehicles to transport spray teams, commodities, and supervisors. However, despite their expense vehicles are often the largest variable in IRS operations; drivers often spend the day waiting for spray team to complete their work once they've transported the spray team to the day's target village. PMI should consider piloting a community-based IRS model in Benin where SOPs and mobilizers reside in beneficiary communities.
4. To increase women participation in the upcoming IRS operation, advocacy and training for local authorities (administrative, health system, opinion leaders) will be carried out four months before the spray campaign in order to get their support for a gender integrated approach. In addition, AIRS Benin will closely follow up the recruitment process by putting an expected quota for women.

ANNEX

ADDITIONAL TABLES

TABLE 19: IRS COMMODITIES AND INVENTORY

Item	Initial stock before IRS campaign	Number of items procured	Stock before campaign	Unusable stock after IRS campaign	Usable stock remaining for 2016
Insecticide (Pirimiphos-methyl-CS)	7,926	50,580	58,506	45,664	12,842
Spray pumps X-PERT (Hudson)	675	0	675	0	675
Spray pumps IK12 VC (Goizper)	400	0	400	0	400
Overalls	2,833	0	2,833	10	2,823
Vest	162	130	292	2	290
Helmet	1,337	160	1,497	2	1,495
Gumboots	947	600	1,547	18	1,529
Gloves for spray operator	723	1,800	2,523	1,173	1,350
Gloves for washer	48	50	98	1	97
Respirator mask	5,080	32,725	37,805	16,565	21,240
Operator flashlight (head lamp)	0	1,500	1,500	1,340	160
Stock-keeper flashlight	8	0	8	0	8
Caps (used for mobilization)	127	0	127	60	67
First aid kits	75	60	135	7	128
Thermometers	33	0	33	0	33
Fire extinguishers	26	4	30	2	28
O ring for spray tube	500	100	600	65	535

Filters x PER	566	0	566	563	3
White washers (spare part for pumps)	96	0	96	70	26
Nozzles goizper	50	0	50	0	50
Face shield for helmets	1,084	500	1,584	1,347	237
Helmet cap	0	500	500	40	460
Leaflets	16,500	76,500	93,000	93,000	0
Pregnancy test kits	0	328	328	328	0
Generators	1	1	2	0	2
Buckets for spray operators	1,218	988	2,206	196	2,010
Plastic buckets for dustbin (100L)	157	0	157	3	154
Two-component hose/Goizper	15	70	85	9	76
Valve Goizper	31	130	161	104	57
Collar seal/Goizper	9	50	59	37	22
Lance filter/Goizper	13	0	13	0	13
Lance tube/Goizper	15	0	15	0	15
Pressure regulator/Goizper	65	50	115	43	72
Pressure regulator/Hudson	800	750	1,550	715	835
Pumps Goizper/ spare parts kit	10	0	10	0	10
Handle/Goizper	20	50	70	36	34
Filter Goizper pump	66	0	66	0	66
Barrel (100l)	84	0	84	0	84
Barrel (150L)	84	0	84	0	84
Water tank (1200L)	11	0	11	0	11
Water tank (3000L)	4	0	4	1	3
Motorcycles	0	5	5	0	5



Certificate of Analysis

**Actellic 300CS
BSN5A0680**

Batch Identification **BSN5A0680**
Product Code **Actellic 300CS**

**Chemical Analysis
(Active Ingredient Content)**

- **Identity of the Active Ingredient(s)** **confirmed**
- **Content of Pirimiphos Methyl** **27.1 % w/w corresponding to 289 g/L**

The Active Ingredient(s) content is within the FAO limits.

Stability:

- **Recertification Date** **16 January 2017**

Raw data, documentation and reports pertaining to this/these study/studies are stored under the study number(s) referenced below within the archives of the CEMAS GLP Archive within two months of issue of the Certificate of Analysis, for a minimum period of three years, after which it will be returned to the Sponsor.

Study number: **CEMS-6942**

Authorization: **20 January 2015**

**P Jutsum
CEMAS Ltd**

TABLE 20: SUMMARY OF MID-SPRAY ENVIRONMENTAL INSPECTIONS – STORAGE FACILITY AND SOAK PITS

Operation Sites	Are the storekeepers, spray operators and washers wearing appropriate PPE?	Is the current pesticide Material Safety Data Sheet posted?	Are overalls washed daily, and dried over the soak pit?	Do workers have access to end-of-day washing (including soap and water)?	Are spray operators fed before start of spray (before wearing of PPE)?	Is the store well arranged? (height of arranged items, allowing for free movement; proper stacking of items, allowing for ventilation)	Are warning signs correctly displayed? (danger sign, insecticide safety notice)	Is there a fire extinguisher (not expired) and a spill kit?	Is there a thermometer to measure daily temperature in the store? Are lighting and ventilation adequate (can you see your way through the store during the day)?	Is there a well-stocked first aid kit in the store? (eye wash, vitamin E cream)	Is the soak pit used to dispose of all contaminated water?	Is the roof leak-proof and the floor impermeable?	Does the soak pit adsorb all the effluent waste without creating a puddle and/or run-off?	Are the # 2, 4, and 6 drums filled with water?	Are contents of drums 1, 3, 5, and 7 emptied into spray pumps before spray operators depart for field?
Toucountouna	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Natingou	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Manta	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Natta	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes.	Yes	Yes	Yes	Yes	Yes	Yes
Matéri	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Cobly	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Taiacou	yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Perma + Birni	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No: Over-flow issue; materials replaced; 2 nd soakpit put in place	Yes	Yes
Guilimaro	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Kouandé	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firou	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Gnémasson	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Kérou	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Dassari	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Kaoubagou	Yes	Yes	Yes	Yes.	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Péhunco	Yes	Yes	Yes	Yes	Yes	No: Height>2m; Rectification done immediately	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

**TABLE 21: SUMMARY OF MID-SPRAY ENVIRONMENTAL INSPECTIONS –
HOMEOWNER PREPARATION**

Operation Sites	Have all personal belongings, animals, and sick persons been removed from the house?	Have all items that cannot be removed been properly covered with plastic sheeting?	Are the residents instructed on what to do during and after spraying?
Toucountouna	Yes	Yes	Yes
Natitingou	Yes	Yes	Yes
Manta	Yes	Yes	Yes
Natta	Yes	Yes	Yes
Matéri	Yes	Yes	Yes
Cobly	Yes	Yes	Yes
Taiacou	Yes	Yes	Yes
Perma	Yes	Yes	Yes
Guilimaro	Yes	Yes	Yes
Kouandé	Yes	Yes	Yes
Firou	Yes	Yes	Yes
Gnémasson	Yes	Yes	Yes
Kérou	Yes	Yes	Yes
Dassari	Yes	Yes	Yes
Kaoubagou	Yes	Yes	Yes
Péhunco	Yes	Yes	Yes

**TABLE 22: SUMMARY OF MID-SPRAY ENVIRONMENTAL INSPECTIONS –
SPRAY OPERATOR PERFORMANCE**

Operation sites	Are spray operators in full PPE? (helmet, overalls, boots, gloves, mask)	Is mixing of the insecticide witnessed by any household resident?	Are spray operators spraying only the recommended surfaces?	Do spray operators correctly record household details?	Is any spray operator observed eating/drinking/smoking while at work?	Are the spray operators spraying floors, metal roofs, doors, glass, inside of cupboards, wallpaper, food granaries, curtains, latrines, animal pens?
Toucountouna	Yes	Yes	Yes	Yes	No	No
Natitingou	Yes	Yes	Yes	Yes	No	No
Manta	Yes	Yes	Yes	Yes	No	No
Natta	Yes	Yes	Yes	Yes	No	No
Matéri	Yes	Yes	Yes	Yes	No	No
Cobly	Yes	Yes	Yes	Yes	No	No
Taiacou	Yes	Yes	Yes	Yes	No	No
Perma	Yes	Yes	Yes	Yes	No	No
Guilimaro	Yes	Yes	Yes	Yes	No	No
Kouandé	Yes	Yes	Yes	Yes	No	No
Firou	Yes	Yes	Yes	Yes	No	No
Gnésmasson	Yes	Yes	Yes	Yes	No	No
Kérou	Yes	Yes	Yes	Yes	No	No
Dassari	Yes	Yes	Yes	Yes	No	No
Kaoubagou	Yes	Yes	Yes	Yes	No	No
Péhunco	Yes	Yes	Yes	Yes	No	No

**TABLE 23: SUMMARY OF MID-SPRAY ENVIRONMENTAL INSPECTIONS –
OBSERVATIONS OF SPRAY OPERATORS AT OPERATION SITES AFTER COMPLETING SPRAYING**

Operation Sites	At the end of the shift, are both full and empty sachets returned, counted, and recorded in inventory?	Are #7 barrels placed and arranged on an impermeable ground or plastic sheet (for permeable grounds) along the wash bay?	Do barrels #2, 4, and 6 contain enough water for triple-rinsing?	Do spray operators correctly conduct triple-rinsing while wearing PPE?	Have there been any reported accidents?	Have any spray operators complained of irritation (throat, skin, etc.)?	Are spray operators provided with soap to wash and bathe?	Do spray teams bathe after the day's work?	Are the insecticide usage rate and average no. of houses sprayed per spray operator within acceptable limits? (at least 2.5-3 and 10 houses/spray operator/day)*
Touncountouna	Yes	Yes	Yes	Yes	Yes (5/14/15; 5/18/15)	No	Yes	Yes	Yes
Natitingou	Yes	Yes	Yes	Yes	Yes (4/26/15; 5/05/15)	No	Yes	Yes	Yes
Manta	Yes	Yes	Yes	Yes	No	No	Yes	Yes	Yes
Natta	Yes	Yes	Yes	Yes	No	No	Yes	Yes	Yes
Matéri	Yes	Yes	Yes	Yes	No	No	Yes	Yes	Yes
Cobly	Yes	Yes	Yes	Yes	No	No	Yes	Yes	Yes
Taiacou	Yes	Yes	Yes	Yes	No	No	Yes	Yes	Yes
Perma	Yes	Yes	Yes	Yes	No	No	Yes	Yes	Yes
Guilimaro	Yes	Yes	Yes	Yes	No	No	Yes	Yes	Yes
Kouandé	Yes	Yes	Yes	Yes	No	No	Yes	Yes	Yes
Firou	Yes	Yes	Yes	Yes	No	No	Yes	Yes	Yes
Gnémasson	Yes	Yes	Yes	Yes	No	No	Yes	Yes	Yes
Kérou	Yes	Yes	Yes	Yes	No	No	Yes	Yes	Yes

Operation Sites	At the end of the shift, are both full and empty sachets returned, counted, and recorded in inventory?	Are #7 barrels placed and arranged on an impermeable ground or plastic sheet (for permeable grounds) along the wash bay?	Do barrels #2, 4, and 6 contain enough water for triple-rinsing?	Do spray operators correctly conduct triple-rinsing while wearing PPE?	Have there been any reported accidents?	Have any spray operators complained of irritation (throat, skin, etc.)?	Are spray operators provided with soap to wash and bathe?	Do spray teams bathe after the day's work?	Are the insecticide usage rate and average no. of houses sprayed per spray operator within acceptable limits? (at least 2.5-3 and 10 houses/spray operator/day)*
Dassari	Yes	Yes (They are labeled during the inspection)	Yes	Yes	Yes (Occurred on May 11)	No	Yes	Yes	Yes
Kaoubagou	Yes	Yes	Yes	Yes	No	No	Yes	Yes	Yes
Péhunco	Yes	Yes	Yes	Yes	No	No	Yes	Yes	Yes

*The insecticide usage rate and average no. of houses sprayed per spray operator within acceptable limits: 2.8 big structures/sachet or bottle; 4.5 small structures/sachet or bottle; 15 structures sprayed/spray operator/day.

TABLE 24: SUMMARY OF POST-SPRAY ENVIRONMENTAL INSPECTIONS

Operation sites	Is this a temporary store?	Have all of the IRS items, insecticides, and wastes been returned to the central store?	Was the store cleaned before being handed over to the owners?	Is the soak pit covered and the gate closed and locked?	Were the soak pit and its surroundings left clean?	Was the working relationship between the IRS team and owners of the store good?	Additional comments
Touncountouna	Yes	Yes	Yes	Yes: the gate is removed to prevent its theft	Yes	Yes	
Natitingou	Yes	Yes	Yes	Yes	Yes	Yes	The central warehouse is located there.
Dassari	Yes	Yes	Yes	Yes	Yes	Yes	
Natta	Yes	Yes	Yes	Yes; the gate is removed to prevent its theft.	Yes	Yes	
Matéri	Yes	Yes	Yes	Yes; gate removed to prevent its theft.	Yes	Yes	Store cleaned during the post-inspection
Cobly	Yes	Yes	Yes	Yes; gate removed to prevent its theft.	Yes	Yes	Store cleaned during the post-inspection
Perma	Yes	Yes	Yes	Yes; gate removed to prevent its theft.	Yes	Yes	Store cleaned during the post-inspection
Manta	Yes	Yes	Yes	Yes; the gate is removed to prevent its theft.	Yes	Yes	
Guilimaro	Yes	Yes	Yes	Yes	Yes	Yes	
Kouandé	Yes	Yes	Yes	Yes	Yes	Yes	Store cleaned during the post-inspection
Firou	Yes	Yes	Yes	Yes; the gate is removed to prevent its theft.	Yes	Yes	

Operation sites	Is this a temporary store?	Have all of the IRS items, insecticides, and wastes been returned to the central store?	Was the store cleaned before being handed over to the owners?	Is the soak pit covered and the gate closed and locked?	Were the soak pit and its surroundings left clean?	Was the working relationship between the IRS team and owners of the store good?	Additional comments
Gnémasson	Yes	Yes	Yes	Yes	Yes	Yes	
Kérou	Yes	Yes	Yes	Yes; the gate is removed to prevent its theft.	Yes	No apparent concern; but the rural development manager has a constant need of the storeroom	
Péhunco	Yes	Yes	Yes	Yes	Yes	Yes	
Taiacou	Yes	Yes	Yes	Yes; gate kept in the central warehouse to prevent its theft.	Yes	Yes	
Kaobagou	Yes	Yes	Yes	Yes; gate removed by the inspection team to prevent its theft.	Yes	Yes	Store cleaned during the postinspection

TABLE 25: NUMBER OF PEOPLE TRAINED BY TYPE OF TRAINING

Categories of Individuals Trained	Training of Trainers		Spraying Operations		Data Capture		Logistics Training		Technical Maintenance		Mobilization/ IEC Training of Trainers		Mobilization/ IEC Training		Medical Treatment of Intoxication Cases		Washer Activities		Fire Security		Transport Security	
	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F
DDS- (AD / OP)	2																					
SHAB Regional	1																					
NMCP National																						
NMCP Regional	2																					
DDEHU	1																					
DAGRI																						
CREC	1																					
Districts Coordinators	8	3									7	3										
Health Zone Coordinator	1																					
District Chief Doctors/ Other Doctors	4	4									4	4			7	7						
Chiefs of Health Post/ Midwife											47	18			47	19						
Hygiene Agents	86	21																				
Spray Operators			1129	165																		
Data Clerks					22	18																
Storekeepers							14	2											2	0		
Logistics Assistants							1	0														
Service Technicians									57	9												
IEC agents													1236	281								
Washers																	66					
Drivers																			115	0	115	0
Guards																			13	0		
TOTAL M/F	106	28	1129	165	22	18	15	2	57	9	58	25	1236	281	54	26	0	66	130	0	115	0
TOTAL/ training	134		1294		40		18		66		83		1517		80		66		130		115	

**TABLE 26: ENVIRONMENTAL MITIGATION AND MONITORING PLAN OF
2015 IRS CAMPAIGN**

Part 1 - Environmental Mitigation and Monitoring Plan (EMMP)

Category of Activity	Describe specific environmental threats of your organization's activities	Description of Mitigation Measures	Who is responsible for monitoring	Monitoring Indicator	Monitoring Method	Frequency of Monitoring
Use of insecticides	1. Occupational risks for workers involved in IRS campaigns (e.g., risks from insecticide exposure and vehicular accidents), including women of child-bearing age	<p>a. Inspect and certify vehicles used for pesticide or spray team transport prior to contract.</p> <p>b. Train drivers</p> <p>c. Provide personal protective equipment (PPE) and spill kits during pesticide transportation, and accept only drivers with cell phone.</p> <p>d. Pregnancy</p>	<p>a-d. Abt Environmental Compliance Officer (ECO).</p> <p>e-g. Abt Operations Manager (OM).</p> <p>h. ECO</p> <p>i. Chief of Party (COP), Technical Project Manager (TM) and headquarters environmental staff.</p>	<p>a. Transport vehicles have a valid inspection certificate on-board.</p> <p>b. Drivers have a certificate of training completion.</p> <p>c. Transport vehicles are equipped with cell phone, spill kit, and PPE.</p> <p>d. Storekeeper has records of pregnancy</p>	<p>a-c. ECO inspection of vehicles in the field.</p> <p>d-e. ECO inspection of health records at IRS operational sites.</p> <p>f-h. ECO performs pre-spray inspections of inventories and training records, and mid-spray inspections of</p>	<p>a-c. 2 inspections per week.</p> <p>d-e. One inspection per campaign, additional inspection if new hires.</p> <p>f-h. ECO pre-spray inspections 2/campaign, ECO mid-spray inspections 3 times/week. OM 2/week</p> <p>i. Weekly</p>

Category of Activity	Describe specific environmental threats of your organization's activities	Description of Mitigation Measures	Who is responsible for monitoring	Monitoring Indicator	Monitoring Method	Frequency of Monitoring
		<p>testing for female candidates for jobs with potential pesticide contact.</p> <p>d'. Reassign female with positive tests to mobilization activities</p> <p>e. Health test all spray team members for duty fitness.</p> <p>f. Procure, distribute, and train all workers with potential pesticide contact on the use of PPE.</p> <p>g. Train operators on mixing pesticides and the</p>		<p>testing for all female team members.</p> <p>d'. Females with positive tests work in mobilization activities.</p> <p>Storekeeper has medical exam results for all team members.</p> <p>f. Spray operators wear complete PPE during spraying and clean-up.</p> <p>g. Operators mix pesticide properly, and the pump does not leak.</p> <p>h. All facilities are compliant, and materials required for</p>	<p>PPE use and spray operator performance.</p> <p>i. Monitoring of on-line database for submission of inspection reports.</p>	

Category of Activity	Describe specific environmental threats of your organization's activities	Description of Mitigation Measures	Who is responsible for monitoring	Monitoring Indicator	Monitoring Method	Frequency of Monitoring
		<p>proper use and maintenance of spray pumps.</p> <p>h. Provide adequate facilities and supplies for end-of-day cleanup.</p> <p>i. Enforce clean-up procedures of PPE, pumps and rinsing areas.</p>		<p>clean-up are present.</p> <p>i. Inspections are performed as scheduled, corrective action is taken as needed.</p>		
	2. Safety risks for residents of sprayed houses (e.g., risks from inhalation and ingestion of insecticides)	<p>a. IEC campaigns to inform homeowners of responsibilities and precautions.</p> <p>b. Prohibit spraying houses that are not</p>	<p>a-b. IEC officers, OM, ECO</p> <p>c. ECO</p> <p>d. Spray operators (SO) and Team Leaders (TL)</p>	<p>a. Pre-spray IEC campaigns were executed. Homeowners know responsibilities.</p> <p>b. All houses being sprayed are properly</p>	<p>a. OM- IEC work records,</p> <p>ECO- mid-spray inspections.</p> <p>b-d. ECO mid-spray inspections</p>	<p>a. Inspect work records 1/campaign,</p> <p>b-d. ECO mid-spray inspections 3/wk.</p>

Category of Activity	Describe specific environmental threats of your organization's activities	Description of Mitigation Measures	Who is responsible for monitoring	Monitoring Indicator	Monitoring Method	Frequency of Monitoring
		<p>properly prepared.</p> <p>c. Two-hour exclusion from house after spraying</p> <p>d. Instruct homeowners to wash itchy skin and go to health center if symptoms do not subside.</p>		<p>prepared.</p> <p>c. Homeowners observe 2 hour exclusion.</p> <p>d. Lack of incident reports, or incident reports with proper response noted.</p>		
	<p>3. Ecological risk to non-target species and water bodies from use of insecticides (during mixing and spraying)</p>	<p>a. Spray indoors only.</p> <p>b. Train operators on proper spray technique.</p> <p>c. Maintain pumps.</p> <p>d. Enforce clean-up procedure of</p>	<p>a-c. TL, Abt District Coordinator (DC), OM, ECO</p>	<p>a. Operators spray only inside of houses.</p> <p>b. Operators are trained and know and use proper spray techniques.</p> <p>c. Pumps are maintained and</p>	<p>a. ECO mid-spray inspections.</p> <p>b-d. Training records, ECO mid-spray inspections</p>	<p>a. ECO inspections 3/wk.</p> <p>b. ECO inspection of training records 1/campaign.</p> <p>b-d. ECO mid-spray inspections 5/wk.</p>

Category of Activity	Describe specific environmental threats of your organization's activities	Description of Mitigation Measures	Who is responsible for monitoring	Monitoring Indicator	Monitoring Method	Frequency of Monitoring
		rinsing/wash areas		operated to eliminate leaks and erratic spraying. d. Rinsing/wash areas are safely cleaned every day		
	4. Environmental risk from disposal of insecticide (both liquid and solid waste)	<p>a. Choose sites for disposal of liquid wastes according to PMI BMPs.</p> <p>b. Construct soak pits with charcoal and sawdust to adsorb pesticide from rinse water.</p> <p>c. Maintain soak pits as necessary during season.</p> <p>d. Inspect and</p>	<p>a-c. Abt OM, ECO, DC</p> <p>d-f. Abt ECO</p>	<p>a. Operations sites meet PMI BMPs.</p> <p>b. Soak pits are constructed according to the AIRS BMP manual.</p> <p>c. Soak pits perform properly throughout the spray season.</p> <p>d. Disposal sites have the capacity and policies to properly dispose of wastes.</p>	<p>a-b. ECO Pre-spray inspections</p> <p>c-f. ECO mid- and post-spray inspections and monitoring.</p>	<p>a.2/campaign</p> <p>b.1/campaign</p> <p>c. 5/week</p> <p>d. 1/campaign</p> <p>e. 3/week</p> <p>f. Continuous during disposal</p>

Category of Activity	Describe specific environmental threats of your organization's activities	Description of Mitigation Measures	Who is responsible for monitoring	Monitoring Indicator	Monitoring Method	Frequency of Monitoring
		<p>certify solid waste disposal sites before spray campaign.</p> <p>e. Monitor waste storage and management during campaign.</p> <p>f. Monitor disposal procedures post-campaign.</p>		<p>e. Wastes are stored and managed according to PMI BMPs.</p> <p>f. Waste disposal sites meet disposal agreements and PMI requirements.</p>		
	5. Risk of diversion of insecticides for unintended or uncontrolled use	<p>a. Maintain records of all pesticide receipts, issuance, and return of empty bottles.</p> <p>b. Reconcile number of houses sprayed vs. number</p>	a-d. Storekeepers, Communes/sites coordinators, Logistics coordinator, OM, ECO	a-d. All pesticide management records are reconciled.	<p>a-b, d. Inspection of pesticide management records. Storekeeper performance checklists.</p> <p>c. ECO mid-spray</p>	<p>a-b, d. Daily monitoring by storekeeper or site supervisor. Weekly monitoring by Communes/sites Coordinators</p> <p>c. 1/campaign by country</p>

Category of Activity	Describe specific environmental threats of your organization's activities	Description of Mitigation Measures	Who is responsible for monitoring	Monitoring Indicator	Monitoring Method	Frequency of Monitoring
		<p>of bottles used.</p> <p>c. Examine houses sprayed to confirm spray application.</p> <p>d. Perform physical inventory counts during the spray season.</p>			inspections.	<p>headquarters. 2/campaign by ECO</p> <p>d. 2/campaign/ store-room</p>

TABLE 27: ENVIRONMENTAL MITIGATION AND MONITORING REPORT (EMMR)

Mitigation Measure	Status of Mitigation Measures	Outstanding issues relating to required conditions	Remarks
1a. Pre-contract inspection and certification of vehicles used for pesticide or spray team transport.	All transport vehicles had inspection certificate on-board	None	
1b. Driver training	It took place on May 29 and involved all of transport vehicles drivers	None	
1c. Cell phone, personal protective equipment (PPE) and spill kits on board during pesticide transportation.	100% of transport vehicle drivers had their cell phone and PPE on board; every transport vehicle was provided with a spill kit	None	Every driver came with his cell phone
1d. Pregnancy testing for female candidates for jobs with potential pesticide contact.	All of female candidates for jobs with pregnancy testing were submitted to pregnancy testing	Five from the total number were tested positive	Testing performed from April 23 to April 29
1d'. Female with positive tests in mobilization activities	Females tested positive could not be recruited	None	Forgetting to re-assign them in mobilization activities
1e. Health fitness testing for all operators	All operators were submitted to health fitness testing	Only operators tested negative were retained for spray activities; their fitness tests were deposited in respective storerooms	Testing completed from April 23 to April 29

1f. Procurement of, distribution to, and training on the use of PPE for all workers with potential pesticide contact.	Spray operators wore complete PPE during spraying and clean-up	Operators or storekeepers not wearing complete PPE were recalled and sensitized for immediate use	
1g. Training on mixing pesticides and the proper use and maintenance of spray pumps.	Operators were trained and properly mixed pesticide; they also used and most of them correctly maintained spray pumps	Major maintenance issues were resolved by maintenance agents	
1h. Provision of adequate facilities and supplies for end-of-day cleanup,	Compliant rinsing areas and drums with sufficient water for end-of-day cleanup were present	None	
1i. Enforce clean-up procedures of PPE, pumps and rinsing areas.	PPE, pumps and rinsing areas clean-up procedures were enforced during trainings and applied at 100% of operation sites over the IRS campaign	None	PPE and pumps clean-up on the rinsing areas were conducted by team leaders
2a. IEC campaigns to inform homeowners of responsibilities and precautions.	Pre-spray IEC campaigns were executed. Homeowners knew their responsibilities	A few beneficiaries declared not to be informed: the SOPs and other supervisors provided them with due information	
2b. Prohibition of spraying houses that are not properly prepared.	No house improperly prepared was sprayed	None	IEC mobilizers and SOPs, if needed, helped properly prepare houses before spraying
2c. Two-hour exclusion from house after spraying	Beneficiaries observed 2 hours (and even more) exclusion	None	
2d. Instruct homeowners to wash itchy skin and go to health clinic if symptoms do not subside.	Instructions were given; no incident related to skin issue was noted or reported	None	

3a. Indoor spraying only.	No spray operator was observed spraying outside the house	None	
3b. Training on proper spray technique	All operators were well trained and applied proper spray technique	None	
3c. Maintenance of pumps	Pumps were maintained by SOPs and maintenance technicians; very few leaks were noted and repaired	None	
3d. Enforce clean-up procedure of rinsing/wash areas	Anywhere, rinsing/wash areas were safely cleaned on a day basis	None	
4a. Choose sites for disposal of liquid wastes according to PMI BMPs.	The current 16 operation sites take PMI BMPs into account	None	
4b. Construct soak pits with charcoal and sawdust to adsorb pesticide from rinse water.	PMI AIRS Benin soak pits perfectly comply with the BMP guidelines	None	
4c. Maintain soak pits as necessary during season.	All soak pits performed properly over the spray season	Perma soak pit experienced an overflow issue that was quickly and effectively resolved	All materials of the first soak pit were renewed, and a second one was constructed to prevent any similar issue
4d. Inspection and certification of solid waste disposal sites before spray campaign.	The disposal site of Tanguieta used since 2011, was confirmed before spray campaign due to its technical characteristics	None	Solid waste incineration was completed as soon as the IRS campaign ended
4e. Monitoring waste storage and management during campaign.	During campaign, solid waste were stored and managed in compliance with the PMI BMPs	None	

4f. Monitoring disposal procedures post-campaign.	All solid waste disposal procedures were monitored and they are in line with PMI requirements	None	
5a. Maintain records of all pesticide receipts, issuance, and return of empty sachets/bottles.	All pesticide, masks and empty bottles movements were properly recorded over campaign	None	Monitoring completed during supervision and mid-spray inspection
5b. Reconciliation of number of houses sprayed vs. number of sachets/bottles used.	These numbers were reconciled thanks to the tracking sheet monitoring completed during campaign	None	Monitoring completed during supervision and mid-spray inspection
5c. Visual examination of houses sprayed to confirm pesticide application.	100% of examined houses were effectively sprayed with insecticide	None	Monitoring completed over mid-spray inspection
5d. Perform physical inventory counts during the spray season.	Physical inventories of insecticide and empty bottles performed during campaign matched with the quantities recorded	None	Inventories completed during IRS supervision

TABLE 28: BENIN MONITORING AND EVALUATION PLAN INDICATOR MATRIX

Last Updated: 16 June 2015

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 spray campaign	<i>Data source:</i> Project records – insecticide procurements <i>Reporting frequency:</i> Each spray campaign	By Spray Campaign	1; 100%	1; 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	1; 100%	1; 100%	TBD; 100%		TBD; 100%	
I.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	<i>Data source:</i> Project records <i>Reporting frequency:</i> Each spray campaign	By Spray Campaign	1; 100%	2; 100%	TBD; 100%		TBD; 100%	
I.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%	

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
1.1.5 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 2 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	<i>Data source:</i> Training records <i>Reporting frequency:</i> Each spray campaign	By Spray Campaign By Gender	18; 100%	17; 94%	TBD; 100%		TBD; 100%	
1.3.2 Number and percentage of base stores where physical inventories are verified by up-to-date stock records	<i>Data source:</i> Project records <i>Reporting frequency:</i> Each spray campaign	By Spray Campaign	16 (including central ware-house); 100%	16; 100%	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%	

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 .	<i>Data source:</i> Project financial records <i>Reporting frequency:</i> Annually	By Spray Campaign	5%	1.65%	5%		5%	
2.2 Support of Safety and Health Best Practices and Compliance with USAID and Host Country Environmental Regulations								
2.2.1 SEA/letter reports 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	<i>Data source:</i> Project records – Training reports <i>Reporting frequency:</i> Each spray season	By Spray Campaign By Gender	1584 ³	1577	TBD		TBD	

³ This number includes: spray operators, team leaders, storekeepers, logistic assistants, service technicians, and washers

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
2.2.3 Number of health workers receiving insecticide poisoning case management training	Data source: Project records – Training reports Reporting frequency: Each spray season	By Spray Campaign By Gender	75	80	TBD		TBD	
2.2.4 Number of adverse reactions to pesticide exposure documented	Data source: Incident report forms Reporting frequency: Each spray campaign	By Spray Campaign By Residential/occupational exposure	0	1	0		0	
2.2.5 Number and percentage of soak pits and storehouses inspected and approved prior to spraying	Data source: Project records – Reports submitted by district environmental officers Reporting frequency: Each spray season	By Spray Campaign By Soak Pit By Storehouse	33; 100% 16 17	33; 100% 16 17	TBD; 100%		TBD; 100%	

2.3 Conduct Communications Activities and Community Mobilization								
2.3.1 Number of radio spots and talk shows aired	Data source: Project records Reporting frequency: Per spray campaign	By Spray Campaign	7,796	7,796	TBD		TBD	
2.3.2 Number of IRS print materials disseminated	Data source: Project records Reporting frequency: Semi-annually	By Spray Campaign By Type of printed material and message(s)	165,500	165,500 Leaflets: 74,500 IRS cards: 91,000	TBD		TBD	
2.3.3. Number of people reached with IRS messages via door-to-door mobilization	Data source: Mobilization Data Collection Forms Reporting frequency: Daily per mobilization conducted	By Spray Campaign By Gender	383,889	437,714 M: 210,606 F: 227,108	TBD		TBD	
2.4 Spray Targeted Structures According to Technical Specifications								
2.4.1 Number of structures targeted for spraying	Data source: Previous spray campaign data, enumeration data (targets); Daily Spray Operator Forms (results) Reporting frequency: Daily per spray campaign	By Spray Campaign	265,907	270,141	TBD		TBD	
2.4.2 Number of structures sprayed with IRS	Data source: Daily Spray Operator Forms Reporting frequency: Daily per	By Spray Campaign	226,020	252,706	TBD		TBD	

	spray campaign							
2.4.3 Percentage of total structures targeted for spraying that were sprayed with a residual insecticide (Spray Coverage)	Data source: Daily Spray Operator Forms Reporting frequency: Daily per spray campaign	By Spray Campaign	85%	93.55%	85%		85%	
2.4.4 Number of people residing in structures sprayed (Number of people protected by IRS)	Data source: Daily Spray Operator Forms Reporting frequency: Daily per spray campaign	By Spray Campaign By Gender By pregnant women By children <5 years old	790,000	802,597 M: 406,862 F: 395735 30,454 156,863	TBD		TBD	TBD
Component 3: Ongoing Monitoring and Evaluation and Quality Control Measures								
3.1 Submit PMI-approved M&E plan to PMI-BENIN for approval	Data source: Project records Reporting frequency: Semi-annual	By Spray Campaign	Completed	Completed	Completed		Completed	
3.2 Conduct a post-spray data quality audit within 60 days of completion of spray operations	Data source: Spray operations reports Reporting frequency: Per spray campaign	By Spray Campaign	N.A	N.A	Completed		Completed	

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	Data source: Project records – Activity reports Reporting frequency: Semi-annually	By Spray Campaign By Guideline/checklist/tool	19 7 Environment Checklist 4 M&E supervision tools 1 Environment tool 3 AIRS operation guideline 3 operation checklist 1 mhealth checklist	9	TBD		TBD	
4.2 Number of articles/best practices documents published	Data source: Project records – Activity reports Reporting frequency: Semi-annually	By Spray Campaign By IRS Technical Area	1 Epidemiology	1 Epidemiology	TBD		TBD	
4.3 Number of best practice presentations given at national/regional/international workshops and conferences	Data source: Project records – Activity reports Reporting frequency: Semi-annually	By Spray Campaign By IRS Technical Area	3 1 epidemiology 1 environment 1 Operation	2	TBD		TBD	
4.4 Number of enterprises engaged through public-private partnerships	Data source: Project records – Activity reports Reporting frequency: Semi-	By Spray Campaign	0	0	TBD		TBD	

	annually							
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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)	Data source: Entomological reports Reporting frequency: Annually	By Spray Campaign	5	N/A	TBD		TBD	
5.1.2 Number and percentage of entomological monitoring sentinel sites measuring all the five primary PMI entomological monitoring indicators	Data source: Entomological reports Reporting frequency: Annually	By Spray Campaign	5; 100%	N/A	TBD		TBD	
5.1.3 Number and percentage of entomological monitoring sites measuring at least one secondary PMI indicator	Data source: Entomological reports Reporting frequency: Annually	By Spray Campaign	5; 100%	N/A	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	Data source: Entomological reports Reporting frequency: Annually	By Spray Campaign	4; 100%	N/A	TBD		TBD	

5.1.5 Number of wall bioassays conducted within 2 weeks of spraying to evaluate the quality of IRS*	Data source: Entomological reports Reporting frequency: Per spray campaign	By Spray Campaign	18 18 tests total 1 test on 16 treatment structures and 2 control structure	N/A	TBD		TBD	
5.1.6 Number of wall bioassays conducted after the completion of spraying at monthly intervals to evaluate insecticide decay*	Data source: Entomological reports Reporting frequency: Per spray campaign	By Spray Campaign	108	N/A	TBD		TBD	
5.1.7 Number of vector susceptibility tests for different insecticides conducted in selected sentinel sites*	Data source: Entomological reports Reporting frequency: Per spray campaign	By Spray Campaign By Type of Insecticide	1 1 test for pyrethroid class 1 test for carbamate 1 test for organophosphate 1 test for organochlorine	N/A	TBD		TBD	

5.2 Support Epidemiological Malaria Data Collection and Analysis

5.2.1 Collect routine epidemiological data	Data source: <i>Project Reports</i> Reporting Frequency: Annually	By Spray Campaign	1 per trimester	1	TBD		TBD	
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5.2.2 Number of targeted health facilities with routine epidemiological malaria data collection supported by the PMI AIRS Project	Data source: Epidemiological reports Reporting frequency: Annually	By Spray Campaign	30 Atacora 16 Banicoara 14	33 Atacora 17 Banicoara 16	TBD		TBD	
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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 *	Data source: Project records – Training reports Reporting frequency: Semi-annually	By Spray Campaign By Gender Percentage of Women Trained	1,495	1,500 M: 1,285 F: 215 14.3%	TBD		TBD	
6.1.2 Total number of people trained to support IRS in target districts	Data source: Project records – Training reports Reporting frequency: Semi-annually	By Spray Campaign By Gender Percentage of women trained	3,627	3,333 M: 2,663 F: 559 16.8%	TBD		TBD	
6.1.3 Number of women recruited for IRS employment	Data source: Project records – Recruitment reports	By Country	907	559	TBD		TBD	

	Reporting frequency: Semi-annually	By Percentage of women recruited	19.0%	16.8%				
6.1.4 Number of people trained as IRS Training of Trainers	Data source: Project records – Training reports Reporting frequency: Semi-annually	By Spray Campaign By Gender Percentage of women trained	128	134 M: 106 F: 28 20.8%	TBD		TBD	
6.1.5 Total number of people hired to support IRS in target districts	Data source: Project records – Contracts signed Reporting frequency: <i>Semi-annually</i>	By Spray Campaign Gender Percentage of women hired	3,061 19.0%	2,984 M : 2,525 F: 459 15.4%	TBD		TBD	
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)	Data source: Project records – Contracts signed Reporting frequency: <i>Semi-annually</i>	By Spray Campaign Percentage of women hired	64 ⁴ 21,2%	54 Team Leaders:35 District Coordinators : 3 Supervisors: 16	TBD		TBD	

⁴ This number includes Team Leaders, district coordinator, site coordinator, supervisors

				18.7%				
6.1.7 Number of staff (permanent and seasonal) who have completed gender awareness training	Data source: Project records – Training reports Reporting frequency: <i>Annually</i>	By Spray Campaign Gender Percentage of women hired	1	1,431 Seasonal: 1,428 Permanent: 3 M: 1,236 F: 195	TBD		TBD	
6.2 Capacity Building								
6.2.1 Number of government officials trained in IRS oversight	Data source: Project records – Training reports Reporting frequency: <i>annually</i>	By Spray Campaign By Gender Percentage of Women Trained	219	111 M: 79 F: 32 28.8%	TBD		TBD	
6.2. Implement all activities outlined in their yearly Capacity Building Action Plan	Data source: Project records – Capacity assessment reports Reporting frequency: <i>Semi-annually</i>	By Spray Campaign	Completed	Completed	Completed		Completed	
6.2.3 Benin government implements at least one aspect of the IRS program independently.	Data source: Project records – MOUs Reporting frequency: <i>Semi-annually</i>	By Spray Campaign	Completed	Completed	TBD		TBD	