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PMI | Africa IRS (AIRS) Project

Indoor Residual Spraying (IRS 2) Task Order Four

2014 BENIN
END OF SPRAY REPORT

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2014 BENIN
END OF SPRAY REPORT

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ACRONYMS

ABE	Benin Environmental Agency (*Agence Béninoise pour l'Environnement*)
AIRS	Africa Indoor Residual Spraying
BMP	Best Management Practices
CEMAS	CEM Analytical Service
CREC	Entomological Research Center of Cotonou
CS	Capsule Suspension
DAGRI	Directorate of Agriculture
DCAM	Community Development and Environment Sanitation (*Développement Communautaire et Assainissement du Milieu*)
DDEHU	Departmental Directorate for the Environment, Habitat and Urbanism (*Direction Départementale de l'Environnement, de l'Habitat et de l'Urbanisme*)
DDS	Departmental Directorate for Health (*Direction Départementale de la Santé*)
DHAB	National Directorate of Hygiene (*Direction de l'Hygiène et de l'Assainissement de Base*)
EC	Emulsified Concentrate
ECM	Environmental Compliance Manager
ECO	Environmental Compliance Officer
EIR	Entomological Inoculation Rate
EMMP	Environmental Mitigation and Management Plan
HBR	Human Biting Rate
ICC	Inventory Control Cards
IEC	Information, Education, and Communication
IRS	Indoor Residual Spraying
LLIN	Long-Lasting Insecticide-treated Net
MAEP	Ministry of Agriculture, Livestock and Fisheries (*Ministère de l'Agriculture, de l'Elevage et de la Pêche*)
M&E	Monitoring and Evaluation
MoH	Ministry of Health
NMCP	National Malaria Control Program (*Programme National de Lutte contre le Paludisme*)
PID	Pulvérisation Intra Domiciliaire d'Insecticide
PMI	President's Malaria Initiative
PPE	Personal Protective Equipment

SHAB	Community Hygiene and Sanitation Service (*Service de l'Hygiène et de l'Assainissement de Base*)
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 Four, 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 13 other sub-Saharan 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 (May 5-27, 2014) well within the scheduled timeframe designated by the National Malaria Control Program (NMCP). In 2013, the campaign took an average of 32 days.

The IRS campaign covered all nine communes in Atacora Department in northern Benin. The 2014 IRS campaign was the eighth round of IRS supported by PMI in Benin, and the fourth round of IRS in the Atacora Department. (IRS campaigns before 2011 covered Ouémé Department in southern Benin.) It was the third round conducted by Abt Associates in the country for PMI.

AIRS Benin implemented the 2014 IRS campaign in close collaboration with PMI/Benin, and with several Beninese government partners, most notably the NMCP; the Ministry of Health (MOH); the Ministry of Agriculture, Livestock and Fisheries; the Ministry of Environment, Habitat and Urbanization; the Benin Environmental Agency; the National Directorate of Agriculture; the National Directorate of Hygiene; the Department Administrative Authorities of Atacora; and the Department Directorate of Health for Atacora.

Since 2012, NMCP has participated in some 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). In addition, the NMCP was awarded a World Health Organization grant in early 2014 to develop a mentorship program in collaboration with AIRS Benin to help build capacity and to manage one of the nine communes in Atacora during the IRS campaign.

The NMCP recommended the organophosphates class for the 2014 IRS campaign for the nine communes of Atacora and specifically the pirimiphos-methyl capsuled suspension (CS) after meetings with CREC on the 2013 entomological results. The remaining pirimiphos-methyl emulsified concentrate (EC) from the 2013 IRS campaign was used in central sub-communes, where the head center is located, since city residents have easier access to other malaria control strategic interventions such as mosquito nets, case management, and intermittent preventive treatment. Nevertheless 1,324 bottles remained after the May IRS campaign; AIRS Benin made decision with NMCP to perform extra IRS operation to finish this leftover on June 7-11 and August 29-September 1, 2014.

AIRS Benin implemented a new operational approach to the campaign in 2014, doubling the number of spray operators, supervisors, and team leaders, thereby reducing the number of days of the campaign and costs in transportation and fuel; $73,407 was saved compared with 2013 expenses. In addition, AIRS Benin implemented a pilot system named mobile health (mHealth) using short message service (SMS) and the data platform, *Textit*, to collect daily IRS data from the field. A smartphone connected to the Internet was used to transmit the data to the AIRS Operation Manager. The team also piloted the use of SMS texts in Natitingou commune in order to send daily reminders to spray operators, supervisors, and the team leader about issues detected by supervisors, such as incorrect use of personal protective equipment (PPE).

Subcontracted by PMI/Benin, CREC collected entomological surveillance data to evaluate the quality and effectiveness of the 2014 IRS campaign. CREC noted that the quality of the IRS was good 24 hours after

spraying in communes sprayed with pirimiphos-methyl EC and CS, with 100% mortality rates for mosquitoes coming into contact with walls that were sprayed during the first day of IRS. CREC is compiling the data from two months after spraying, and will submit the data to PMI; AIRS will then add it to this report.

TABLE 1: SUMMARY OF 2014 IRS CAMPAIGN

Number of communes covered by the PMI-supported IRS campaign	**9 communes: Boukoumbé, Cobly, Kérou, Kouandé, Matéri, Natitingou, Péhunco, Tanguiéta, and Toucountouna**
Insecticide used	Organophosphates: Pirimiphos-methyl EC and CS
Number of structures sprayed by spray operators	254,072
Number of structures found by spray operators	265,907
2014 IRS campaign spray coverage	95.55%
Population protected by 2014 IRS campaign	789,883
Number of people trained with US Government funds to deliver IRS	1,642

Listed below are some of the lessons learned from the 2014 IRS campaign.

- Despite the NMCP involvement in the preparation of the IRS campaign, such as the selection of insecticide, the development of IRS plan of action and the validation of training curricula, and supervision and M&E tools; there was a lack of full participation of the NMCP assigned to the commune, due to overlapped activities with the mosquito net mass distribution campaign. In addition, NMCP (central level) involvement was requested for the next IRS campaign.
- Due to the high number of spray operators and team leaders at each operation base it was hard for the nine commune coordinators to handle the IRS operation; therefore closer management is recommended, such as assigning a site coordinator who will run the site area with commune coordinator tasks.
- Through the mHealth pilot approach, specifically tracking IRS operational data, AIRS was able to record insecticide consumption, IRS coverage and monitor spray operator performance on a daily basis, which was beneficial for a short campaign.
- Information, Education, and Communication (IEC) Mobilization: AIRS Benin changed their mass mobilization structure to two IEC mobilizers per spray operator team in the communes. The day before the IRS campaign began in each village, the IEC mobilizers informed the communities on the effectiveness of insecticide spraying, the scheduled arrival of the spray team, and how to prepare their houses to facilitate the spraying. On spraying day the IEC mobilizers helped beneficiaries to move their belongings out of their homes, which accelerated the spray operation and enabled spray operators to go beyond the targeted number of 12 structures per day to up to 18 per day. The new mobilization structure was well implemented and the NMCP accepted the change as the new model for mobilization.
- Visibility of IEC Mobilizers: Although IEC mobilizers were dynamic and helpful with mobilization and communicating with the village, it was difficult to identify them in the village. To help beneficiaries more readily identify IEC mobilizers, mobilizers should wear an armband or a colorful waistcoat to distinguish them from the spray operator.
- Distributing IRS Card: There continues to be a challenge with beneficiaries locating their IRS cards

from the previous year. AIRS Benin recommends handing out to the communities the day before spraying to reduce delays in scheduled spraying.

- Pump Cleaning: Until 2014 , AIRS Benin hired six persons per operation site to clean spray pumps after the daily spraying. As a result, spray operators were not sometimes aware of the quantity of leftover insecticide in their pumps, nor the condition of the pumps. Therefore, AIRS Benin suggests that spray operators take an active role in cleaning the pumps at the end of the day, increasing their awareness and saving on seasonal staff costs.

1. INTRODUCTION

Under its Task Order Four contract with the United States Agency for International Development (USAID), Abt Associates is the lead implementing partner for the President's Malaria Initiative's (PMI's) Africa Indoor Residual Spraying (AIRS) project in Benin and 13 other sub-Saharan countries. In May 2014, Abt completed its third round of indoor residual spraying (IRS) in Benin, covering all nine communes in the Atacora Department in northern Benin. The overall goal of AIRS Benin in 2014 was to continue to reduce malaria-associated morbidity and mortality in all nine communes of Atacora Department by completing IRS for an estimated 239,112 eligible structures (the number of structures found in 2013), thereby protecting as many individuals in Atacora as possible. To manage the vector resistance to insecticide, the organophosphate class (specifically the pirimiphos-methyl capsule suspension (CS) and emulsified concentrate (EC), which was leftover from the 2013 IRS campaign) was used.

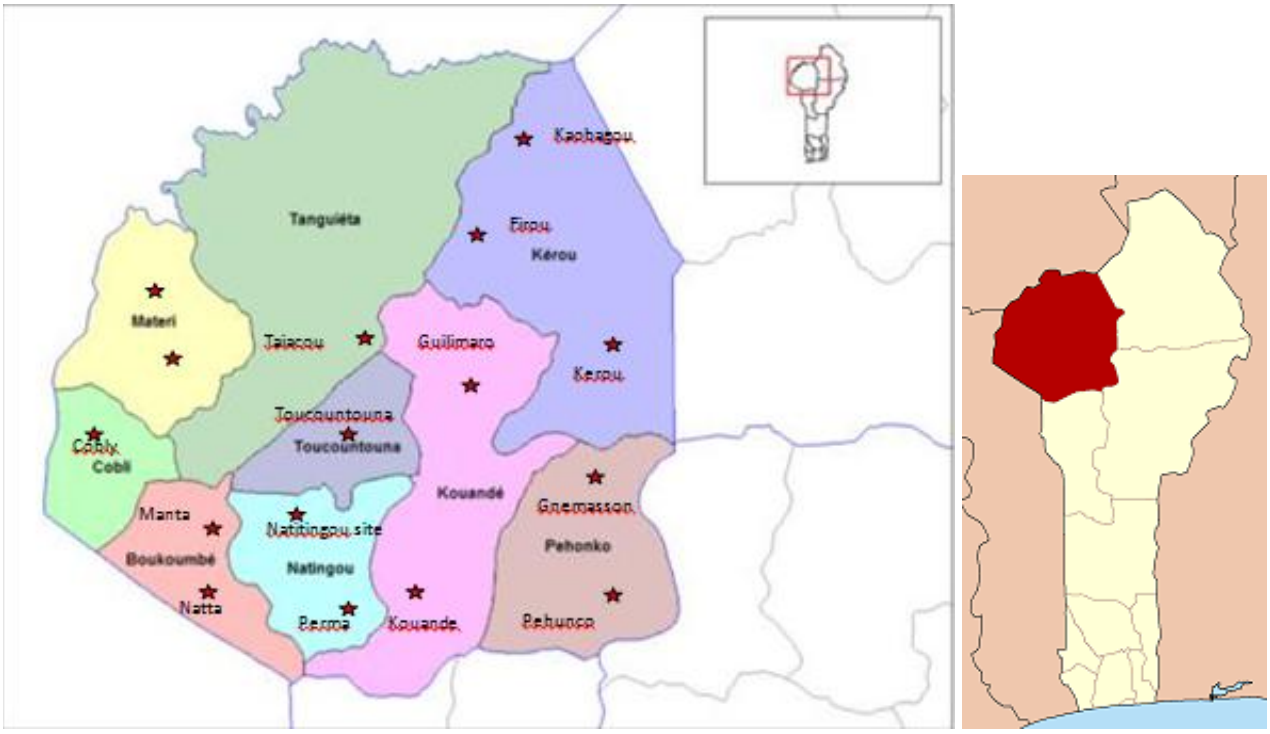
AIRS Benin completed its IRS campaign from May 5-27, 2014, spraying for 20 days and within the scheduled timeframe decided jointly by the National Malaria Control Program (NMCP) and AIRS Benin.

AIRS Benin implemented the 2014 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. This report provides a description of the planning, implementation, and monitoring of the IRS campaign operations in 2014. 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 2014 IRS campaign.

2. COUNTRY BACKGROUND

As for the last two years the 2014 IRS campaign was performed in the Atacora Department. Please see Figure , to note the location of the Atacora Department in Benin and the nine communes in the Atacora Department where IRS was completed, and the location of the operation sites used to support the 2014 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 (km²)
Boukoumbé	83,147	85,675	1,081
Kérou	98,315	101,304	3,769
Cobly	68,955	71,051	827
Kouandé	112,014	115,419	3,237
Matéri ***	111,003	114,377	1,719
Natitingou	104,010	107,172	1,348
Péhunco	78,173	80,549	2,008
Tanguiéta***	73,731	75,972	5,466
Toucountouna	39,989	41,205	1,068
Total Atacora Department	769,337	792,725	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 2013.

2.1 OBJECTIVES FOR 2014 SPRAY CAMPAIGN

As stated in the 2014 AIRS Benin work plan, the three objectives of AIRS Benin for 2014 included:

1. Cover at least 85 percent of eligible structures found in all nine communes of Atacora Department.
2. Continue efforts 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- and operation-efficient activities, to save funds and ensure ease of management.

Given these objectives, AIRS Benin aimed to cover an estimated 239,112 structures in Atacora during its IRS campaign and protect as many of the estimated 700,000 people living there as possible.

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

- The 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..
- The NMCP coordinated and provided main oversight for operations in the Tanguiéta commune
- CREC completed entomological surveillance activities under a subcontract with PMI/Benin.

3. PREPARATION FOR THE

3.1 IRS CAMPAIGN PLANNING

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

TABLE 3: IRS ACTIVITIES PLANNING

Dates	Activities	Participants or Stakeholders	Comments
October 2013-March 2014	Development of 2014 AIRS Benin Work Plan	AIRS Benin and AIRS core team	Guidance was provided by PMI/Benin and PMI/Washington, leading to the final approved work plan in April 2014.
February-May 2014	IRS Campaign Planning	AIRS Benin, NMCP, DDS Atacora, 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 11-14, 2014	IRS Action Plan Development	NMCP, DDS Atacora and AIRS Benin	The Action Plan of the nine communes and of Tanguieta (commune lead by NMCP) were finalized and validated with the NMCP and stakeholders during a workshop that took place in Porto Novo.
April 2014	Regional Partner Meeting/ IRS operation "micro" planning development	Nine commune coordinators, DDS Atacora, commune medical doctors, and nine commune mayors	1. To discuss roles in the IRS campaign,especially NMCP and DDS representative roles in Tanguieta commune. 2. To develop the exact schedule on when communities are sprayed, and to ensure that all operation systems were in place to support the IRS campaign. 3. To ensure all health centers throughout Atacora Department were prepared to treat any potential health issues arising from the IRS campaign. 4. To gain the endorsment of the nine commune mayors, DDS Atacora, commune medical doctors to conduct IRS in the region..

3.2 INNOVATIVE APPROACH: MOBILE HEALTH PILOT

In 2013, AIRS began piloting a mobile health pilot system in Angola and in 2014 expanded pilots to Benin, Mali, and Senegal. AIRS Benin implemented the first mobile health pilot during the 2014 IRS campaign by using SMS to track the daily performance of every operation site in all nine communes of Atacora and to send reminders on a daily basis to each spray operator, supervisor, and team leaders on issues detected by supervisors in the pilot commune of Natitingou.

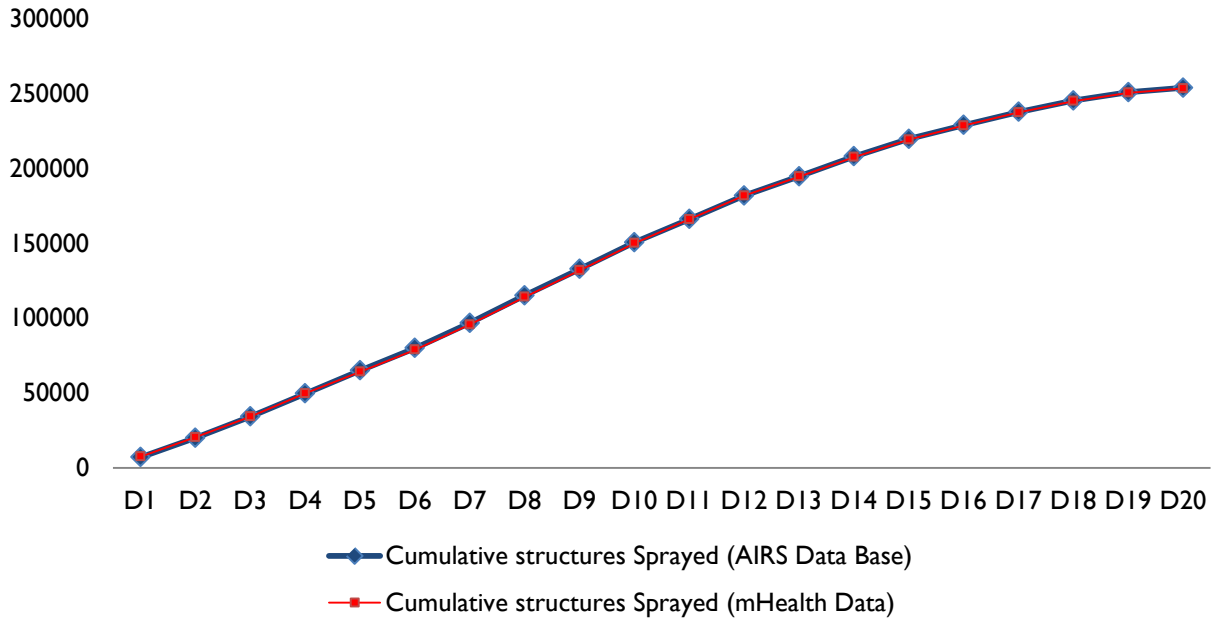
First, AIRS Benin used a mobile platform, *Textit*, to text raw operational data on a daily basis into a cloud-based database that could be accessed by staff in Benin and the AIRS home office. In 2014, the Operations Manager required storekeepers to send operational data via SMS each evening. The pilot built off this existing system but synced all the operational data together and separated it out by operation site to help the Operations Manager identify any operations issues. Second, AIRS Benin used the same mobile platform to send out daily messages to spray operators, supervisors, and team leaders in Natitingou commune. These messages reminded spray operators of issues found through supervision throughout the campaign. Both pilots were implemented with the support of Client Technology Center (CTC).

SMS Reminder: A total of 3,240 SMS reminders (18 reminders sent for the 180 actors over the IRS campaign) were sent during the IRS campaign. These SMS reminders allowed the AIRS Benin team to reach all field actors (Spray Operators & Team leaders & Supervisors) in Natitingou commune every day during the IRS campaign. The SMS reminders were focused on environmental compliance (wearing PPE correctly for instance) and spray operator's performance (recall about the number of structures to be sprayed every day to attain the goal). AIRS Benin collected the numbers during the training. After the evaluation of the pilot, The IRS coverage in Natitingou was 98.57% in 2013 and 98.11% in 2014. So no quantitative difference was shown. Compared with 2013 EOSR six out nine communes had their IRS coverage rates lower in 2014 except Toucountouna and Kérou; Natitingou had roughly the same rate. This shows a small difference between Natitingou and other communes but not significant.

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 (day of month, structures found, structures sprayed, insecticide used, insecticide balance, spray operators) to *Textit* Platform at the end of each operation day.

All expected 328 SMS have been received by AIRS Benin. A total of 253,654 structures sprayed were tracked via SMS, which represents 99.83% of the structures captured with IRS data collection forms.

FIGURE 2: COMPARATIVE CUMULATIVE STRUCTURES SPRAYED BY DATA COLLECTION



Source: AIRS data collection Form/mHealth mobile collection

3.3 INSECTICIDE SELECTION

In 2013 following entomological surveillance, CREC reported malaria vector susceptibility to carbamates as very low. In contrast, the malaria vector in Atacora had high susceptibility to pirimiphos-methyl (organophosphates class). The residual effect of both insecticides used during the 2013 IRS campaign (carbamates and organophosphates (EC)) fell below the 80 percent mortality rate for mosquitoes three months after spraying. Despite the decrease of vector susceptibility to carbamates, both insecticides (carbamates and organophosphates) are still effective in reducing entomological indicators in Atacora department.

Overall, CREC noted during its susceptibility testing in 2013 that the organophosphate class of insecticide was the most effective in Atacora Department.

Therefore, CREC recommended for the 2014 IRS campaign the use of pirimiphos-methyl capsule suspension (CS), which has longer residual effect (4-6 months), and abandon use of carbamates, which is in line with the Benin vector resistance management plan. NMCP emphasized CREC's recommendation during the meeting of the Technical Group of Vector Resistance Management on October 29, 2013, and insisted that all Atacora be sprayed with organophosphates in 2014 because the World Health Organization Pesticide Evaluation Scheme had just approved the CS formulation of pirimiphos-methyl, which has a longer residual life compared with EC formulation and carbamates. After discussions with the NMCP, it was decided to spray the central sub communes with EC and spray the CS to cover other sub communes in Atacora.

3.4 Logistics Planning and Procurement

3.4.1 PPE and Insecticide Procurement for the 2014 IRS Campaign

In January 2014, AIRS Benin reviewed its inventory of IRS equipment and commodities at the central warehouse in Natitingou. Most of the PPE and spray pumps used during the 2013 IRS campaign remained in good condition and were available for use during the 2014 IRS campaign. AIRS Benin noted the quantities of damaged or non-reusable PPE and developed a list of PPE that AIRS needed to procure locally and internationally. A full list of all PPE that was procured for the 2014 IRS campaign appears in Table 23 in the Annex.

In 2013, AIRS Benin began using Goizper pumps in the commune of Toucoutouna. In 2014, an additional 350 Goizper pumps were procured to assist with the larger numbers of spray operators.

In January, the inventory count confirmed that 19,140 bottles of pirimiphos-methyl EC were in stock and usable for the 2014 IRS campaign. AIRS Benin noted that it needed a total of 52,605 bottles of organophosphate. The project procured an additional 33,480 bottles of pirimiphos-methyl CS and used the leftover supply to cover the nine communes in Atacora. The organophosphate arrived in Benin on April 12 and the buffer stock arrived on May 23, 2014.

AIRS also received quality control test results via CEMAS laboratories for the batches of organophosphates shipped to Benin for use in the 2014 IRS campaign. CEMAS reported that all batches of organophosphates shipped to Benin 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 2014 IRS Campaign

The AIRS Benin team worked with the DDS Atacora in March to plan the logistics and transportation for implementing the 2014 IRS campaign. Several field visits were conducted with the DDS Atacora staff to meet with local authorities, 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.

Due to the change in operations during the work planning process, it was important to note that budget constraints made it impossible to spray for 32 days. Instead, the campaign was completed in 20 days and subsequently the numbers of seasonal workers (spray operators, team leaders, and supervisors) would double.

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 27 to May 3). Due to the delayed arrival of some equipment the distribution was completed the first day of spraying in Matéri, Cobly, and Boukoumbé. Despite this delay, spraying began the first day in eight communes, while spraying started in Boukoumbé the second day of the campaign.

Table 4 notes the distribution of key PPE items to each of the operation sites.

TABLE 4: DISTRIBUTION OF KEY PPE TO OPERATION SITES

Operation Sites	Overalls	Boots	Helmets	Pumps
Natitingou*	252	128	128	93
Perma**	237	121	122	96
Toucountouna	141	73	73	53
Nata	183	94	94	69
Manta	154	79	79	59
Taiacou	203	105	105	75
Matéri	235	120	120	89
Dassari	165	83	84	61
Cobly	255	131	131	95
Kouandé	177	92	91	67
Guilimaro	117	61	61	45
Ouassa Pehunco	257	131	132	97
Gnemasson	82	43	43	31
Firou	80	42	42	33
Kérou	261	133	133	97
Kaobagou	24	13	13	13
Total	2,823	1,449	1,451	1,073

* 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

AIRS Benin renewed the seasonal staff contracts, and a majority of the 2013 campaign staff was rehired, such as commune coordinators, storekeepers, logistics assistants, finance assistants, and data clerks. Job advertisements were placed only for available positions in Beninese newspapers in March and April. The IRS campaign supervisors and hygiene agents were selected by the DDS Atacora.

Spray operators, team leaders, pump technicians, and washers were recruited in each spray area by the local health department staff based on criteria developed by the AIRS Benin technical staff. 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. AIRS Benin gave priority to hiring spray operators who had performed well during the 2013 IRS campaign.

3.5.2 NUMBER OF SEASONAL STAFF HIRED

AIRS Benin hired 1,896 seasonal staff to implement the 2014 IRS campaign, which included 1,535 men and 361 women. Table 5 provides a breakdown of the number of seasonal staff hired per district. Women are counted as hired under their initial employment position; if a woman had to change roles due to pregnancy she is counted as hired under her initial role.

TABLE 5: SEASONAL STAFF HIRED FOR THE 2014 IRS CAMPAIGN PER COMMUNE
***M=MALE, F=FEMALE**

Communes	Spray Operators		Team Leaders		District Coordinators		IEC Assistants		Data Clerks		Storekeepers		Logistics Assistants		Finance Assistants		Washers		Service Technicians		Supervisors (Community agents)		IEC Mobilizers		IEC Mobilizers Team leaders		Guards	
	M	**F**	**M**	**F**	**M**	**F**	**M**	**F**	**M**	**F**	**M**	**F**	**M**	**F**	**M**	**F**	**M**	**F**	**M**	**F**	**M**	**F**	**M**	**F**	**M**	**F**	**M**	**F**
Natitingou	130	8	23	5		1					2						**0**	10	6	4	9	5	42	14			2	
Toucountouna	44	4	9	1		1					1						**0**	4	3	1	5	1	16	4			1	
Boukoumbé	105	13	20	2	1						2						**0**	**9**	8	1	11	2	36	8			2	
Cobly	82	8	13	3	1						1						**0**	**7**	6	1	8	2	31	1			1	
Matéri	135	5	22	6	1						2						**0**	10	10	0	12	2	46	10			2	
Tanguiéta	62	8	11	3	1						1						**0**	6	6	0	5	3	24	4			2	
Kouandé	121	17	21	3	1						2						**0**	11	10	1	11	3	45	3			2	
Natitingou IRS Campaign Office								1	18	22			2		2	1												
Péhunco	98	20	14	10	1							2					**0**	**9**	7	2	10	2	31	17			2	
Kérou	102	26	18	4		1					3						**0**	10	8	2	10	4	31	13			2	
TOTAL M/F	879	109	151	37	6	3	0	1	18	22	14	2	2	0	2	1	0	76	64	12	81	24	302	74	0	0	16	0
TOTAL		**988**		**188**		**9**		**1**		**40**		**16**		**2**		**3**		**76**		**76**		**105**		**376**		**0**		**16**

AIRS Benin worked to increase the participation of women in the IRS campaign. In 2014, 361 women were hired compared to 239 in 2013, a 51 percent increase. Because the AIRS Benin team also increased the total number of people hired in 2014, the proportion of women hired stayed the same in 2013 and in 2014. Some women had responsibility within the IRS operation such as team leader (19. 7%), commune coordinator (3/9) and supervisors (22.9%), in total 21.2% of leadership/ supervisory positions were assigned to the women.

Table 6 below denotes the proportion of women among several seasonal staff positions for the IRS campaign in Benin.

TABLE 6: NUMBER OF WOMEN HIRED TO WORK ON 2014 IRS CAMPAIGN

Seasonal staff	Total Seasonal Staff Hired	Total Number of Women	Proportion of Women
Service Technicians	76	12	15.8%
Washers	76	76	100.0%
Storekeepers	16	2	12.5%
Data Clerks	40	22	55.0%
District Coordinators	9	3	33.3%
Team Leaders	188	37	19.7%
Spray Operators	988	109	11.0%
IEC Assistant	1	1	100.0%
Finance Assistant	3	1	33.3%
Supervisors (Community Agents)	105	24	22.9%
IEC Mobilizers	376	74	19.7%
Logistic Assistant	2	0	0.0%
Guards	16	0	0.0%
Total number and proportion of women hired for the IRS campaign	**1,896**	**361**	**19.0%**

3.6 TRAINING

AIRS Benin organized 11 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 that should be used 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. AIRS Benin drafted a training manual that was used to lead all training sessions. All training materials were shared with and approved by the NMCP and the Departmental Service of Public Health of the DDS.

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 commune of Tanguiéta, AIRS Benin completed a four-day workshop to develop the IRS cmapign 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

Commune). The workshop included all IRS components (Operation, IEC, M&E, environmental compliance and finances).

The number of seasonal staff increased due to the operational changes. A training of trainers was completed the week before the IRS campaign in two simultaneous sessions led by the Operation Manager and the 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. In order to implement the mobile health pilot, which used SMS to track the daily performance of every operation site in all of nine communes of Atacora and to send reminders, the pilot training was taught during the training of trainers. All trainings took place from April 23 through May 4, 2014.

In total, 2,487 people, of whom 2,044 were men and 443 (17.8 percent) were women, 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 or IEC messaging.

IEC mobilizers were trained per sub-district for per campaign mobilization. Only spray operators and team leaders who received a high score on the post-training test were hired. For the IRS operation AIRS Benin rented buses to transport spray operators from the operation sites to villages; their drivers were trained on environmental compliance, especially on how to keep vehicles safe and what to do in case of an accident or spilt insecticide. Although 90 drivers were trained for the IRS campaign they were not directly hired as seasonal staff.

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 2014 IRS campaign M/F	
DDS	2	
Community Hygiene and Sanitation Service (Service de l'Hygiène et de l'Assainissement de Sites, or SHAB) regional	1	
NMCP National		
NMCP Regional	1	
DDEHU	1	
CREC	1	
District Coordinators	6	3
Health Zone Coordinator		
District chief doctors/other doctors	14	3
Chiefs of health post/midwife	40	17
Hygiene Agents	97	33
Spray Operators	1236	186
Data Clerks	18	22
Storekeepers	14	2
Logistics Assistants	2	
Service Technicians	65	9
IEC Agents	440	88

Categories of institutions/individual trained	Number of people trained for 2014 IRS campaign M/F	
Washers		79
Drivers	90	
Guards	16	
IEC assistant		1
TOTAL M/F	2044	443
TOTAL/ Trainings		**2,487**

3.6.1 Brief Description of Training Activities

Training of Trainers

During two simultaneous sessions hygiene agents and commune coordinators were trained on spray methods, completing data collection forms, and providing IEC to notify IRS beneficiaries on how to prepare their structures before the IRS campaign, and the protocol to follow after the IRS campaign. 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 spraying a targeted structure. The trainings included two days in the classroom regarding spray techniques, gaining familiarity with PPE and protocol for completing spray operations; and two days for practicing the spray technique with water on the walls of the operation sites. At all spray operator training sessions, a pre-test and post-test were 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 new procedures for mixing the organophosphate and cleaning organophosphate bottles, and precautions for spraying with organophosphates. In Natitingou, SOPs were trained to read SMS reminders and react accordingly; the process and spray operators' roles were also explained.

Goizper Spray Pump Training

With the success of the Goizper spray pump pilot in Toucountouna Commune during the 2013 IRS campaign, AIRS purchased 350 additional Goizper spray pumps in 2014. One of Goizper's Regional Managers traveled to Benin to lead part of the training of trainers. He trained the hygiene agents and commune 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 days with the Goizper spray pump under the trainers' supervision to assure they fully understood how to use and maintain the spray pump.

FIGURE 3: SPRAY OPERATORS PRACTICING SPRAY TECHNIQUE IN PEHUNCO COMMUNE

Data Capture Training

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

Logistics Training

The 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 on April 25 and April 26. The 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 and storekeepers learned to identify the different components of spray equipment, and to maintain and repair equipment in case of default. The training also covered progressive rinsing of the spray pumps, since the service technicians are responsible for rinsing the spray pumps at the end of each IRS campaign day.

Washer Training

Washers learned techniques to wash and rinse PPE correctly.

FIGURE 4: TRAINING OF WASHERS IN NATITINGOU ON MAY 04, 2014

Fire Security Training

The Natitingou fire brigade trained IRS campaign drivers, storekeepers, and guards on the fire risks associated with the IRS campaign, the correct use of fire extinguishers, and what to do in case of a fire emergency.

FIGURE 5: NATITINGOU FIRE BRIGADE LEADS TRAINING ON THE CORRECT USE OF FIRE EXTINGUISHERS FOR DRIVERS, GUARDS AND STOREKEEPERS

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.

Management Training for Insecticide Intoxication Cases

Medical and health agents (57 nurses and 17 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 Dr. Ayelo Paul, assistant Director, head of the toxicology department of the University of Abomey-Calavi.

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 of the Atacora Department about the 2014 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 2014, the AIRS Benin team reviewed its IEC materials from the previous IRS campaign and adjusted its 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 an 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) 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 their questions about the IRS campaign and provide information to promote it. 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, 1,206 community leaders participated in IRS advocacy activities, including three mayors, 44 chiefs of sub-communes, 587 village chiefs, 163 religious leaders, and 409 town criers.

FIGURE 6: THE DIRECTOR OF DDS ATACORA SENSITIZED LOCAL LEADERS

In May, AIRS Benin staff met with 200 primary school teachers and provided them with information on IRS and malaria prevention. AIRS Benin asked teachers to relay this information to their students, and where possible, develop school lessons on malaria prevention and treatment.

Mobilization

Door-to-door mobilization was carried out before each IRS campaign over the past three years. In 2014, AIRS Benin used two mobilization agents per spray team throughout the different communes. Three hundred seventy-six IEC agents were hired for the 2014 IRS campaign. All received a two-day training in early May focused around messaging and effective communication techniques, the identification of structures, and how to complete the mobilization data collection cards. They performed mobilization in the village to be sprayed the day before the spraying date and early in the morning. Mobilizers visited households and sensitized the household members on the IRS operation; they explained the benefits of IRS for malaria prevention, answered questions about the IRS campaign, informed beneficiaries about how to prepare their structures for spraying and what to do after the spray operation, and provided leaflets related to the IRS campaign. Mobilizers also helped beneficiaries remove their belongings when needed. In Kérou, Péhunco, Natitingou, and Boukoumbé communes, the IEC agents explained that a new insecticide type, organophosphate, would be used in their communities during the 2014 IRS campaign.

FIGURE 7: IEC AGENT COMPLETING MOBILIZATION

Town Criers

AIRS Benin worked with 777 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 (99.7%) visited by the IEC mobilizers agreed to have their structures sprayed during the IRS campaign. Unfortunately, during the IRS campaign some beneficiaries were absent from their structures and the spray operators were not able to spray the structure.

The most common reasons why residents were not mobilized was their absence during the mobilizer's visit; in these instances the beneficiaries were usually 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 RESULTS[2]

Commune	Total Households	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**			
Boukoumbé	10,488	10,469	99.8%	15,087	17,651	32,738	10,432	99.6%	8,848
Cobly	8,494	8,485	99.9%	10,897	13,628	24,525	8,474	99.9%	8,465
Kérou	8,766	8,715	99.4%	19,735	22,351	42,081	8,676	99.6%	8,879
Kouandé	10,601	10,536	99.4%	27,034	30,469	57,503	10,527	99.9%	10,489
Matéri	12,288	12,279	99.9%	35,957	38,391	74,348	12,235	99.6%	12,339
Natitingou	17,216	17,006	98.8%	32,067	34,114	66,181	16,936	99.6%	14,377
Péhunco	8,609	8,592	99.8%	20,042	24,181	44,223	8,571	99.8%	9,262
Tanguiéta	6,632	6,629	100.0%	12,836	14,566	27,402	6,620	99.9%	6,620
Toucountouna	3,886	3,819	98.3%	6,707	8,181	14,888	3,804	99.6%	2,054
Total	**86,980**	86,530	**99.5%**	**180,362**	**203,532**	**383,889**	**86,275**	**99.7%**	**81,333**

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

For the 2014 IRS campaign, despite the reduction in the number of paid contracts, local radio stations voluntarily continued broadcasting more programs than in 2013. The radio stations continue 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 2014, during the IRS campaign the IEC assistant 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 assistant randomly selected 279 households owners in the nine communes of 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. (The IEC assistant was a temporary staff member that the DDS had selected to support the AIRS Technical Manager.) Results of the assessment included:

- All surveyed people (279) got information on the IRS campaign.
- Pursuant to the information sources186 (67%) persons noted that they received IRS information through the town criers, 182 (65%) from mobilizers, 81 (29%) from the village chiefs, 57 (20%) by radio and 14 (5%) from schoolchildren.
- 277 (99.3%) 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. Due to the fact that AIRS Benin was able to perform the IRS campaign within 20 days and the beneficiaries were ready for the spray operation when the spray operators arrived in the village, the refusal rate in 2013 was higher (19.7%) than the 2014 one (16.5%).

FIGURE 8: COBLY COMMUNE CHIEF MEDICAL DOCTOR DISCUSSING WITH VILLAGE RESIDENTS THE IMPORTANCE OF ACCEPTING IRS IN THEIR HOUSEHOLD.

5. Implementation of IRS Campaign Activities

5.1 Spray Campaign Launch Ceremony

To emphasize the importance of the NMCP involvement in the IRS campaign management in the field, the launch ceremony was held in Tanguiéta on May 7, 2014. The launch ceremony featured speeches by various dignitaries, including the USAID/Benin Representative, who spoke on the continued partnership between the United States government and the Government of Benin to prevent and control malaria. The prefect of Atacora-Donga also gave a speech noting the engagement of local authorities to contribute in the success of the IRS operation. The Director of DDS Atacora-Donga, who represented the Minister of Health, mentioned that the IRS campaign in the commune of Tanguieta will be run by NMCP. He emphasized the efforts and importance of the Beninese government in confronting malaria, and then officially announced the start of the 2014 IRS campaign.

Other attendees of the launch ceremony included staff from the national and regional 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 AIRS Director of Operations was in Benin April 27-May 9, 2014. The purpose of the trip was to support the in-country team with the final preparations for the launch of spray activities. The general observations from the trip were: the quality of the planning and preparation for the spray campaign was excellent. Although the number of spray personnel was double that of last year, early morning timeliness was achieved at the operation sites. Due to good planning and supervision, the concerns about possible overcrowding at the operations sites did not materialize, and the new mobilization structure, which requires two mobilizers on each spray team, was successfully implemented.

5.3 Spray Operations

The 2014 IRS campaign was implemented from May 5 through May 27, 2014. Spray teams were deployed Monday through Saturday of each week. Sunday was 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 2013 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 2013
Matéri	28	33,962
Natitingou	28	31,654
Kouandé	24	33,419
Boukoumbé	22	26,888
Péhunco	24	29,501
Kérou	22	32,037
Tanguiéta	14	16,974
Cobly	16	23,116
Toucountouna	10	11,561
Total	**188**	**239,112**

5.4 IRS Spray Campaign Supervision

5.4.1 IRS Campaign Supervision by AIRS Benin Staff

The AIRS Benin staff, 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;
- Making certain that seasonal staff were paid on time;
- 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 Coordinator of Tanguieta 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 closely followed the field activities and the daily progress of the spray teams, using daily updates that the commune 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 departmental NMCP and DDS staff. 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 Natitingou.

FIGURE 9: NMCP AND DDS STAFF MEMBERS PARTICIPATING IN DAILY COORDINATION MEETINGS

5.4.2 IRS Campaign Supervision by Beninese Government Staff

Approximately 56 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.

Table 11 provides a breakdown of the supervision activities performed by the Beninese government staff during the IRS campaign.

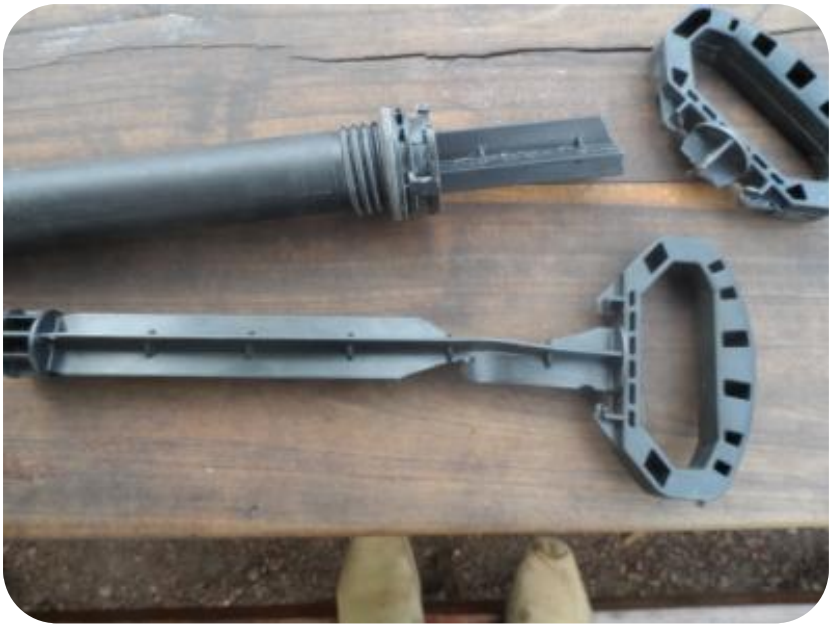
TABLE 11: BREAKDOWN OF SUPERVISION BY BENINESE GOVERNMENT AGENCIES

Government Level	Office	Number of People	Supervised Activities
National	NMCP	2	IEC and mobilization activities, environmental compliance (pre-spray, and post-spray inspection), spray operations, M&E and data collection, IRS trainings
	DHAB	1	Environmental compliance (pre-spray, mid-spray, and post-spray inspection), spray operation, IRS trainings
	DAGRI	1	Environmental compliance (pre-spray and post-spray inspection)
Departmental	NMCP-Atacora	1	IEC and mobilization, environmental compliance, spray operations, M&E, trainings
	DDEHU	2	Environmental compliance (pre-spray, mid-spray, and post-spray inspection), spray operations, IRS training
	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)	1	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 mobiliztion, environmental compliance, spray operations, M&E
	Hygiene Agents from Commune Health Centers	32	Spray operations, quality of the spraying, environmental compliance by spray operators and washers, IEC during campaign, data control.

5.5 USE OF GOIZPER SPRAY PUMPS

AIRS Benin had problems with the Goizper pumps during the first week of the 2014 campaign. The chamber part of the pump caused many problems, fortunately this was resolved as the campaign continued. The debris from the friction between collar seal and chamber clogged the four holes in the bottom of this complete system, which leads to the breaking of the handle as the SOP continued to pump. This problem was solved after the first week of the campaign. The pump technician responsible re-trained all pump technicians on how to solve this problem. For the upcoming IRS campaigns it will be better to strengthen the complete chamber to avoid this problem. The two-component house of the pumps purchased (50) last year in 2013 caused some leaks. Based on this, Goizper has changed the two-component house of the pump purchased this year.

FIGURE 10: GOIZPER PUMPS



5.6 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.

5.7 Issues Encountered and Addressed during the 2014 IRS Campaign

AIRS Benin and its stakeholders did not have any insecticide poisonings or spills, nor were any injuries reported. AIRS Benin found that communities were very receptive to having their households sprayed. The AIRS Benin team even noted that beneficiaries in the districts who had their homes sprayed with organophosphate liked the smell of the recently sprayed rooms, as the odor proved to them that the insecticide was working.

Listed below are some of the issues encountered over the 2014 IRS campaign:

- Tackling Rumors: Before the 2014 IRS campaign started, unidentified people placed a dead goat close to the warehouse of Materi. AIRS Benin was told the goat died due to the new insecticide (pirimiphos-methyl). AIRS Benin immediately requested an appointment to meet the local mayor. AIRS Benin stressed there was no insecticide in the warehouse when the goat died because of insecticide shipment delay. Furthermore, AIRS Benin asked the DDS to release on local radio stations measures to be followed and undertaken to avoid any issues with insecticide.
- Shortage of Fuel: Over the past two IRS campaigns AIRS Benin encountered issues around getting fuel in the Atacora Department, specifically in the commune of Kérou. Despite an agreement between the project and the local fuel station vendor, the vendor was not able to provide any fuel for buses transporting spray operators; therefore AIRS Benin purchased jerry cans to ship fuel from Pehunco or Natitingou to Kerou. It was an unexpected expense, but the approach resolved the problem. Regardless of whether there is an agreement with a vendor to supply fuel, it is important to investigate the local context and ensure the vendor's capacity to respond to the concern.
- Managing Supervision Tools: AIRS has developed supervision tools. Each IRS component has a supervision form. AIRS Benin was the first country to implement these forms and it was observed that the team leader had to fill out six different forms a day in addition to reviewing the IRS data of his/her team.
- Goizper Pumps: The leaks in the pumps during the first week of spraying caused delays, but the issue was resolved the second week of the campaign.
- Boots: The rubber boots began to wear down and actually became harder, causing issues with walking and having the correct PPE. For the next IRS round, socks and replacement boots will be provided to all spray operators, team leaders, and warehouse keepers.

- Heavy and important furniture in big cities: Most of time people living in "big cities" 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. Therefore, AIRS Benin will provide more plastic sheeting for the upcoming IRS campaign.
- To avoid accidents during further IRS campaigns, AIRS Benin should reinforce safe driving practices during drivers' training and recommend all seasonal workers to follow AIRS Benin instructions on security.

6. ENTOMOLOGY

As described earlier, CREC was subcontracted directly by PMI/Benin to complete entomological surveillance for the 2014 IRS campaign. Since most entomological surveillance results for the 2014 IRS campaign will be reported in the final entomological report written by CREC, this section provides a brief explanation of entomological surveillance that was completed before and during the IRS campaign.

CREC collected its data at four sentinel sites for IRS: one in Natitingou Commune, where pirimiphos-methyl EC was sprayed; and three in Tanguiéta, Kouandé, and Pehunco Communes, where pirimiphos-methyl CS was sprayed. A control site was set up in the Copargo Commune (a commune in Donga Department, which borders Atacora Department to the north, and has the same climate and topography).

6.1 ENTOMOLOGICAL SURVEILLANCE BASELINE

In February and April 2014, CREC collected baseline data for the IRS campaign. Baseline data noted that *Anopheles (An.) gambiae* s.l. was the most prevalent vector species (78.8 percent) in Atacora. *An. funestus* s.l., *Culex quinquefasciatus, Aedes aegypti,* and *Aedes vitatus* were also found, but accounted for a small percentage of the vector species found in Atacora.

Since the baseline was completed during the dry season, human biting rates for *An. gambiae* were low (10.74 bites per person per month). CREC noted a high endophagic behavior[1] of *An. gambiae*, (more than 90 percent). The infectivity of *An. gambiae* was also noted as high (25 percent of *An. gambiae* captured and analyzed via ELISA were found to have the *P. falciparum* circum-sporozoitic antigen).

6.2 INITIAL BIOASSAY TESTING

At the beginning of the IRS campaign, a quality control study was carried out to check the efficacy and homogeneity of insecticide treatment. A susceptible colony of *An. gambiae* 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 according to the World Health Organization procedures, with a susceptible strain exposed to pirimiphos-methyl EC-sprayed walls (mud and cement walls, the predominant building materials in Atacora Department) at sentinel sites in two villages in Natitingou commune. A susceptible strain was also exposed to pirimiphos-methyl CS-sprayed walls (also on mud and cement) at sentinel sites in two other villages in Tanguiéta Commune. CREC noted that the bioassay data showed 100% mortality for all mosquitoes exposed to the sprayed walls at all sentinel sties, after 24 hours. This showed that the initial spraying completed by the spray operators was of good quality and the sprayed insecticide was effectively killing mosquitoes.

One month after the initial spraying of the sentinel sites (T1; June, 2014), CREC noted from the cone bioassay test that the Pirimiphos EC and CS formulation continued to be effective on the sprayed walls. In Tanguiéta (Pirimiphos methyl CS commune) and Natitingou (Pirimiphos methyl EC commune), CREC noted 100% mortality of exposed mosquitoes within 24 hours on both mud and cement walls.

Two months after spraying the sentinel sites (T2; July 2014), CREC noted that the pirimiphos methyl CS continued to be effective on the sprayed cement and mud walls. However EC formulation continued to be effective only on the sprayed cement walls and met the minimum criteria for effectiveness (80%

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

mortality of exposed mosquitoes). In Natitingou (Pirimiphos methyl EC commune) CREC found 79.4% mortality of mosquitoes exposed to mud walls, and 87.6 % mortality of mosquitoes on cement walls. In Tanguiéta (Pirimiphos methyl CS commune), CREC noted 92.4% mortality of mosquitoes exposed to mud walls, and 97.7% mortality for mosquitoes on cement walls.

Figure 11 and 12 note the percent mortality of susceptible strains to Pirimiphos methyl CS and EC formulations at T0 through T2.

FIGURE 11: PERCENT MORTALITY OF SUSCEPTIBLE STRAIN AFTER 30-MINUTE EXPOSURE TO PIRIMIPHOS METHYL CS (ORGANOPHOSPHATE) VIA WHO BIOASSAY CONE TESTING, AT T0 (24 HOURS AFTER SPRAYING IN MAY), T1 (JUNE) AND T2 (JULY)

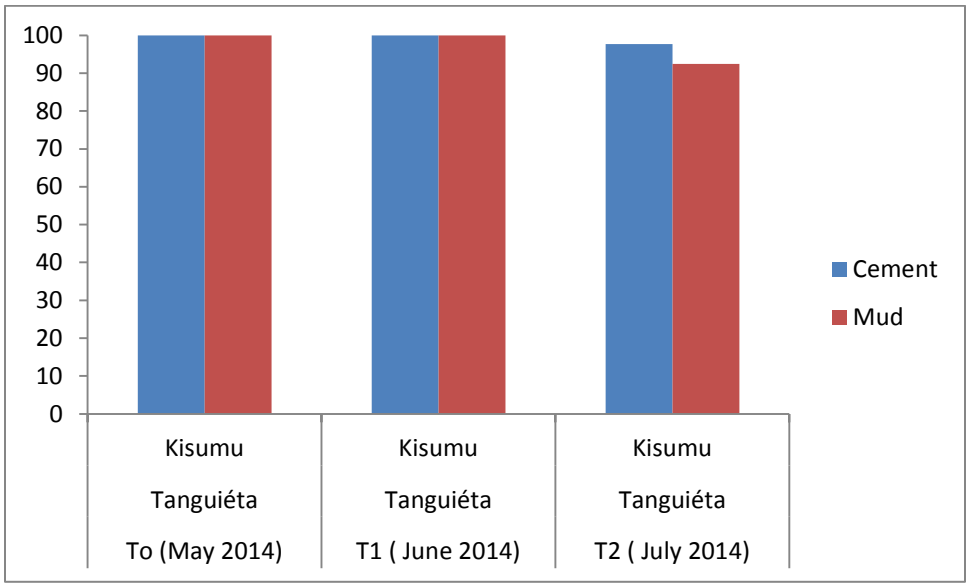
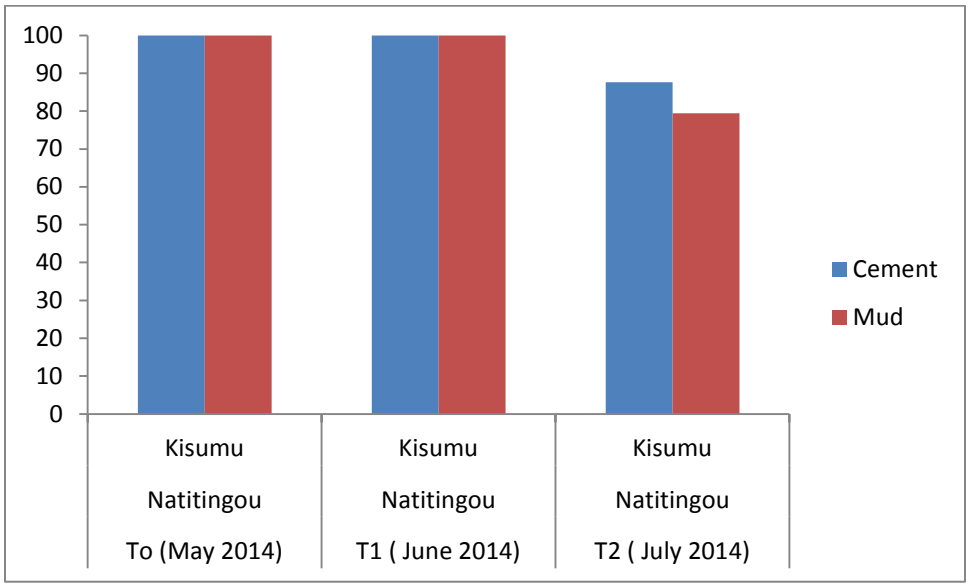


FIGURE 12: PERCENT MORTALITY OF SUSCEPTIBLE STRAIN AFTER 30-MINUTE EXPOSURE TO PIRIMIPHOS METHYL EC (ORGANOPHOSPHATE) VIA WHO BIOASSAY CONE TESTING, AT T0 (24 HOURS AFTER SPRAYING IN MAY), T1 (JUNE) AND T2 (JULY)



6.3 OTHER PRELIMINARY ENTOMOLOGICAL SURVEILLANCE FINDINGS

Other results of entomological surveillance include:

- Among the 222 *An. gambiae* s.l. captured in June and July, only 74 were caught at the Natitingou, Pehunco, Kouandé and Tanguiéta sentinel sites, as compared to the 148 *An. gambiae* s.l. collected at the control sentinel site in Copargo.
- The average density of *An. gambiae* s.l. per structure in the sprayed communes is 0.49 per structure. This density is 8.4 times lower than the average density recorded in the control commune Copargo (4.11 per structure).
- The Human Biting Rate (HBR), the sporozoitic index and the Entomological Inoculate Rate (EIR) trends were noted as the following in the treated sentinel sites and the control sentinel site:

  In the treated communes, the Human Biting Rate was 0.27 (74/276) bites per person per night or 8 bites per person per month in June and July. In the control sentinel site, the HBR was 2.18 (148/68) per person per night or 65.4 bites per person per month during the same period. People in untreated commune (Copargo sentinel site) received 8.1 times more *An.gambiae* s.l. bites than people in treated sites.

  CREC conducted further analysis via ELISA methods, looking for the circumsporozoite protein antigen for P. falciparum in the head and thoraxes of *An. gambiae*.

  As indicated in the Table 12 below, the EIR was 18.8 times lower at treated surveillance sites than in the control commune in June and July.

The EIR in treated communes was 0.018 infective bites per man per night, or 0.54 infective bites per man per month, vs. 0.338 infective bites per man per night, or 10.14 infective bites per man per month in control commune in June and July. *An.gambiae* s.l. collected in the treated sentinel sites and examined, only 6 were found parous. The parous rate was 15.8% vs 38.2 % (13/34) in the control site.

TABLE 12: HUMAN BITING RATES, SPOROZOITIC INDEX AND ENTOMOLOGICAL INOCULATE RATE

Month	Communes	Number of structures	Number of sleepers	Total *An. gambiae s.l*	Average density /structure	HBR	Number of An.gambiae s.l tested by ELISA	Number found positive	Sporozoitic Index	EIR
Jun-14	Tanguiéta	19	31	10	0,53	0,32	10	1	0,1	0,032
	Natitingou	20	30	8	0,40	0,27	8	1	0,125	0,033
	Kouandé	20	37	9	0,45	0,24	9	0	0	0
	Pehunco	18	40	14	0,78	0,35	14	1	0,071	0,025
	Copargo	18	34	69	3,83	2,03	69	13	0,188	0,382
Jul-14	Tanguiéta	19	31	7	0,37	0,23	7	0	0	0
	Natitingou	17	30	6	0,35	0,20	6	0	0	0
	Kouandé	20	37	11	0,55	0,30	11	1	0,090	0,027
	Pehunco	18	40	9	0,50	0,23	9	1	0,111	0,025
	Copargo	18	34	79	4,39	2,32	79	10	0,126	0,294
Total June-July 2014	Tanguiéta	38	62	17	0,45	0,27	17	1	0,058	0,016
	Natitingou	37	60	14	0,38	0,23	14	1	0,071	0,016
	Kouandé	40	74	20	0,50	0,27	20	1	0,05	0,013
	Pehunco	36	80	23	0,64	0,29	23	2	0,086	0,025
	Copargo	36	68	148	4,11	2,18	148	23	0,155	0,338

7. ENVIRONMENTAL COMPLIANCE

7.1 PRE-SPRAY ENVIRONMENTAL ACTIVITIES

7.1.1 ENVIRONMENT DOCUMENTATION CHANGES

Adopted in 2011, the AIRS Benin Project's Supplemental Environmental Assessment (SEA) was still valid for the 2014 IRS campaign since there were no major changes in the environmental conditions. Additionally, the 2008 Environmental Compliance Certificate for IRS insecticides delivered by the Beninese Agency for Environment (ABE) was still valid in 2014.

7.1.2 PILOTS/NEW TECHNOLOGY

The use of smartphones by an AIRS project for completing environmental compliance supervision and monitoring was initiated in Benin in 2013 and continued in 2014. Environmental compliance checklists for inspection before, during and after the AIRS campaign were uploaded to the smartphones, which also provided a GPS system to determine the geographical coordinates (latitude and longitude) of any operation site, and camera to take photos.

Prior to the 2014 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 in compliance. The information collected was uploaded and made available on the AIRS environmental compliance database. This enabled AIRS staff to view the results of the inspections and note whether the sites were ready to support the IRS campaign and/or needed any refurbishments in order to protect the environment.

During the initial PSECA, the ECO ensured that both the NMCP and DDEHU were capable of using the smartphone to collect environmental information. However, during the final PSECA and the mid- and post-spray inspections, the smartphones were not able to download the checklists, and the inspection team had to complete the assessment with paper forms (BMP checklists and supervision tools). Indeed, during the pre-spray inspection, one smartphone did not start. The second one was used to complete successfully the inspection at the first operation site. But the device did not download the checklist to be filled at the second operation site and displayed: "The application ODK Collect (process org.odk.collect.android) has stopped unexpectedly. Please try again." The ECO and AIRS Benin IT Specialist tried unsuccessfully to resolve this issue. This latter explained that it was due to a technical concern related to the device system of the smartphone used (LG). After the IRS campaign and in order to better understand the issue, AIRS tested the ODK system with the smartphone used (a Samsung ® one) for SMS Pilot and succeeded to download and fill the checklists from Cotonou. For the upcoming IRS campaign similar smartphones will be purchased and tested in the field in Natitingou to ensure their performance.

7.1.3 PRE-SPRAY ENVIRONMENTAL INSPECTION

Prior to the 2014 IRS campaign, a pre-spray environmental inspection was performed from January 14-17 for the sixteen operation sites by the AIRS Benin Environment Compliance Officer (ECO) and Logistics and Procurement Coordinator (LPC) jointly, with staff from the NMCP, MAEP, DDS Atacora, Departmental Directorate for the Environment, Habitat and Urbanism (DDEHU) Atacora; and Ministry

of Environment, Habitat, and Urbanization. Details from the pre-spray environmental inspection are found in the Letter Report that AIRS submitted to PMI and USAID Washington in March 2014.

The key objectives of the pre-spray environmental inspection were to:

- Identify issues related to environmental non-compliance for every operation base and to make recommendations as needed, and develop an implementation plan to resolve issues and ensure compliance for the upcoming IRS campaign;
- Check and confirm the availability of Kerou's storeroom for the 2014 IRS campaign since it was used by the Ministry of Agriculture for storing insecticides for cotton culture after the campaign in 2013;
- Train NMCP and DDEHU representatives on how to use the smartphones for environmental compliance data collection.

The inspection team used a checklist based on the Best Management Practices (BMP) for completing IRS to note various areas that were in good shape, and areas where further infrastructure improvement was needed (such as refurbishing soak pits and store rooms).

The inspections resulted in refurbishing rinsing/wash areas, soak pits, and showers/toilets at all operation sites and at the AIRS Benin Central Warehouse in Natitingou (which was also used as an operation site for IRS activities in Natitingou village and the surrounding area in 2014). Due to the findings of the pre-spray environmental inspection, AIRS Benin also:

- Repaired damaged barbed wire fences in Perma, which were built in 2012;
- Cleaned and added gravel at the upper component of the soak pits;
- Set up a shed at the entrance of Kouandé warehouse as an office for the store keeper to effectively make more space inside;
- Set up at each operation site a supplemental set of drying lines to ensure that all overalls are dry every day; and
- Worked with the MAEP to ensure the availability of the Kerou's warehouse.

Figure13 provides an example of supplemental drying lines for coveralls.

FIGURE 12: SUPPLEMENTAL DRYING LINES FOR COVERALLS

Table 12 notes the location of each operation site for the 2014 IRS campaign, and whether the operation sites received store room, soak pit, fencing, or soak pit cover refurbishments and/or new construction, 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 rebuilt
Natitingou	Natitingou	Central warehouse	Yes (Y)	Y	No (N)
	Perma	Health center	Y	Y	N
Toucountouna	Toucountouna	Health center	Y	Y	N
Boukoumbé	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	N
Kouandé	Kouandé	Health center	Y	Y	N
	Guilimaro	Health center	Y	Y	N
Péhunco	Ouassa	Health center	Y	Y	N

Communes	Operation site location (commune)	Facility type	Store room refurbished (*)	Soak pit refurbished	Fencing rebuilt
	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 start of IRS campaign (April 30-May 04, 2014), all future spray operators, supervisors, pump technicians and washers were submitted to medical tests in their respective districts to ensure their fitness for IRS operation. The tests essentially included physical examination and pregnancy testing. Anyone found unfit could not participate in spray activities, while the two female with positive pregnancy tests were reassigned to mobilization activities.

7.1.5 Management of Insecticide Adverse Effects

Medical and health agents (57 nurses and 17 physicians) from the nine districts 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 Dr. Ayelo Paul, assistant Director of the toxicology department of the University of Abomey-Calavi.

Additionally, during the training of trainers and afterwards SOPs and storekeepers' trainings, AIRS 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, under the AIRS Benin ECO's close supervision, DDEHU and SHAB completed a mid-spray environmental inspection of all operation sites and spraying activities, from May 14-17, 2014. The inspection team used the updated checklist forms that were based on BMP manual. Since the project's smartphones experienced some difficulties, paper forms were used. The four different topics assessed by these forms were:

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 without removing items and no sick person was inside at the time of spraying. Residents knew well precautions measures to be taken before, during, and after spraying. As evidence, when residents waited outside after the spraying of their structures, some of them had already dug a 50 cm deep hole in which they would bury dead insects and other waste. Among the 25 homeowners interviewed by the inspection team, 23 were satisfied with the IRS; the remaining two persons were not satisfied because their houses were not "well" sprayed in 2013.
- All of spray operators wore full PPE during the spray operations. However, immediately after spraying a structure, some of them removed their dust mask. The inspection team had informed them about potential risks and directed SOPs to wear full PPE throughout spray operations. This recommendation was reinforced with the SMS reminder specifically for Natitingou commune.
- Moreover, the rubber boots began to wear down and actually became harder, causing issues with walking and having the correct PPE. For the next IRS round, socks and replacement boots will be provided to all spray operators, team leaders, and warehouse keepers.
- While preparing insecticide in the 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). In Djolini Village (Firou sub-commune), two cases of pump leaks with Hudson were observed by the inspection team; the maintenance technician was immediately called and the concern was resolved.
- The inspection team did not observe any spray operator eating, drinking or smoking during the working hours. No accidents or complaints of pesticide exposure were reported by residents or operators.
- In the seven inspected storerooms where the "Storekeeper performance" was assessed, the inspection team realized that all storekeepers wore masks, gloves, boots and overalls when handling pesticides 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 two pesticides' Material Safety Data Sheets (MSDS) in use were posted. There was no insecticide beyond its expiration date and no accumulated solid waste from the former spray campaign.
- All operation sites had compliant soak pits. The inspection team checked the end-of-day IRS campaign clean-up activities and noted that rinsing areas were in compliance with their soak pits.
- The inspection team found that all drivers were compliant with AIRS project requirements, and wore PPE while driving any vehicle that contained insecticides. Additionally, all vehicles were provided with first aid kits and instructions for cleaning up an insecticide spill.

During the spray campaign, other inspection activities were completed and included:

• 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.

7.2.2 INCIDENTS

During IRS campaign, no insecticide exposure incidents were noted or registered. These results were reached thanks to trainings done and particularly to the close supervision and good application of prevention measures by different actors. Nonetheless, two traffic accidents happened to seasonal workers out of the IRS operations:

- The first accident happened on May 4th with an AIRS rented car and a motorcycle around Taiacou (Tanguiéta commune). The car bumped into a motorcyclist who drove very close to it. The two persons riding the motorcycle were injured; one had left arm and leg fractures and the second one, the hip fracture. The driver of the rented vehicle and the commune coordinator on board of the vehicle were safe. Injured people were treated at Saint Jean de Dieu Hospital and fees were covered by the rented car insurance.
- On May 8th, spray operators based out of the Perma Operation site were in Natitingou receiving their weekly pay at the local microcredit office. The mini-bus that was going to take the spray operators back to Perma was at a nearby gas station filling-up its tank. Four of the Perma spray operators decided to avoid waiting for the mini-bus and hired a taxi to immediately take them back to Perma around 08:00pm. Unfortunately, the taxi carrying the spray operators was involved in an accident in Yetapo (10km south of Natitingou), when the taxi driver tried to pass a motorcycle and hit a parked firefighter vehicle on the edge of the road. Three of the four spray operators in the vehicle sustained injuries: one spray operator fractured his femur; one spray operator received a dislocation of his forearm; and one spray operator received a neck contusion. The spray operator with the fractured femur was transported to St. Jean de Dieu hospital in Tanguieta for surgery and setting his leg in a cast. The other two injured spray operators were transported to Natitingou hospital for treatment. Seasonal staff insurance covered the fees of their treatment. All injured people are currently healed.

The project's health insurance for seasonal staff helped pay for the injuries. The AIRS Benin team called several "replacement" spray operators to fill-in for the injured spray operators. To avoid accidents during further IRS campaigns, AIRS should reinforce 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 June 2-5 by an inspection team led by NMCP and DDEHU and supervised by the AIRS Benin ECO. The inspection team also included staff from the DDS Atacora, MAEP, and MEHU. Like the first inspections, this one was compliant with the USAID's 22 CFR 216 Code and based on BMP. The main objective was to determine that operation sites were properly closed and to note any environmental issues that needed to be resolved before the 2015 IRS campaign. The findings of the post-spray environmental inspection included:

- 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, 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, 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 and allowed the use of the store room for the 2014 IRS campaign, required actions, such as looking for another warehouse, will be taken to securely resolve the storage issue in the commune of Kerou. Regarding the remaining insecticide stock, the inspection team noted that pirimiphos-methyl EC will expire in February 2015 and will not be usable for the 2015 campaign. Therefore, the EC team recommended to:
    - Make an effort to consume the remaining stock of pirimiphos-methyl EC(see table 20B); or
    - Require the expertise of Regional Institute of Industrial Engineering of Biotechnologies and Applied Sciences IRGIB/AFRICA Laboratory, based in Cotonou, to check the percentage of active matter and the possibility of using the EC insecticide in 2015.

  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 2014 IRS campaign, the project generated the following amounts of solid waste:

- 24,824 used respiratory masks
- 1,024 used operator bags
- 44,202 empty bottles of pirimiphos methyl
- 3,634 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 and used operators' bags from the 2014 IRS campaign from June 3-5. For four 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 (900 -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 DDEHU. Overall, the incineration took place without any issues.

7.4.3 Recycling of Empty Bottles

Like in 2013 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 the empty organophosphate bottles. DCAM Bethesda's work focuses on improving environmental well-being, via promoting safe water and waste disposal and improved sanitation, and assuring safe disposal of agriculture wastes. DCAM Bethesda also has more than 20 years' experience organizing and promoting recycling in Benin. 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, AIRS Benin transported the 44,202 empty organophosphate bottles to the DCAM Bethesda warehouse and recycling plant in Pahou (Ouidah Commune), on June 3, 2014. Thereafter, staff from DCAM Bethesda crushed the organophosphate bottles into fine particles which were collected into 40kg sacs. The fine particles will be melted down at DCAM Bethesda's recycling plant and molded into paving blocks.

7.4.4 Burying Wastes at a Landfill

The used rubber gloves from the 2014 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. As in 2013, AIRS Benin continued working with the Technical Direction (DST) of Cotonou municipal service which has a sanitary 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 3,634 used rubber gloves, which were then safely buried at Ouessè Sanitary Landfill Site on July 1, 2014 under the NMCP and AIRS Benin's ECO supervision.

All environmental compliance activities are summarized in the EMMP table (see Table 29) and are in line with BMP and 22 CFR 216 Code.

8. Monitoring and Evaluation of 2014 IRS Campaign

M&E for the 2014 IRS campaign closely followed the processes outlined in the 2014 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 continues to use the Microsoft Access database designed by the AIRS Benin M&E Manager in 2012, and updates it 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 noting on the spray operator card if a structure was not sprayed, as well as the reason why that was the case.

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, 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 coordinators sent the spray operator forms to the data entry center in Natitingou, where data clerks processed the forms and entered the data into the AIRS Benin database.

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

Implemented during the 2014 IRS campaign, and reinforced in 2014, 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

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 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. As of the second week of spraying, given that some villages were already covered, supervisors performed verification visits based on the coverage rate provided by the database center. These visits were helpful to detect errors and bad practices and provided corrections either in the field or through SMS to prevent repetitive errors.

FIGURE 13: TANGUIETA HEALTH ZONE COORDINATOR COMPLETING DATA COLLECTION VERIFICATION

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, 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 enforces several validation 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 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 2014 IRS Campaign

The 2014 IRS campaign sprayed 254,072 structures of the 265,907 structures found. Spray coverage was well over the 85 percent minimum threshold, as coverage was 95.55 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	**265,907**
Total number of eligible structures sprayed by spray operators	254,072
Spray coverage	95.55%

In addition the figure 14 shows the IRS coverage rates per commune, six out of nine communes had slightly a percentage lesser than in 2013 but had higher number of structures sprayed compared with 2013.

8.4 Population Protected

A total of 789,883 people, including 403,298 men and 386,585 women, were protected by the IRS campaign. Those protected included vulnerable populations: 151,497 children under five years old, including 75,464 males and 76,033 females; and 25,754 pregnant women. Table 14 provides a breakdown of the total number of people protected by IRS per commune.

TABLE 14: 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	
Boukoumbé	37,974	36,325	74,299	7,399	6,998	14,397	2,037
Cobly	34,404	33,519	67,923	6,071	6,248	12,319	1,738
Kérou	63,682	59,349	123,031	12,245	12,172	24,417	5,381
Kouandé	59,314	56,928	116,242	11,356	11,884	23,240	3,733
Matéri	52,823	52,554	105,377	8,484	8,739	17,223	2,610
Natitingou	54,749	52,114	106,863	8,520	8,397	16,917	2,449
Péhunco	59,893	54,890	114,783	13,696	13,564	27,260	6,207
Tanguiéta	20,668	20,480	41,148	3,296	3,403	6,699	799
Toucountouna	19,791	20,426	40,217	4,397	4,628	9,025	800
Totals	**403,298**	**386,585**	**789,883**	**75,464**	**76,033**	**151,497**	**25,754**

Overall, 11,835 eligible structures and an estimated 16,260 people found by spray operators during the IRS campaign were not sprayed, leading to an estimated 16,260 people who were unprotected by the IRS campaign. In 2013, it was respectively 10,161 eligible structures and 15,465 people found.

Nonetheless, even though the majority of households visited by IEC mobilizers had accepted the spraying it happened that 16.5% of structures were not sprayed due to refusal. The main cause was reluctance of people living in cities and countryside to remove their heavy furniture. In addition, in 2012,

the decision was made by NMCP with USAID recommendation to stop spraying the National Park of Pendjari. This decision displeased the ZOC the community in Tanguieta and the ZOC community has since then denied spray operation.

TABLE 15: HOUSEHOLD REFUSAL TO SPRAY OPERATION

Commune	Structures not sprayed	Structures not sprayed for refusal reason	Proportion of Structures not sprayed for refusal reason	Proportion of households having accepted the IRS during the Mobilization
Boukoumbé	1,587	443	27.9%	99.6%
Cobly	540	39	7.2%	99.9%
Kérou	471	57	12.1%	99.6%
Kouandé	2,022	381	18.8%	99.9%
Matéri	4,426	468	10.6%	99.6%
Natitingou	631	212	33.6%	99.6%
Péhunco	496	95	19.2%	99.8%
Tanguiéta	1,494	255	17.1%	99.9%
Toucountouna	168	8	4.8%	99.6%
All 9 Communes	**11,835**	**1,958**	**16.5%**	**99.7%**

8.5 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 789,883 people protected by IRS, it was noted that 579,918 (or 74 percent of the people protected) slept under LLINs. Table 16 provides a breakdown of the LLIN data collected by the spray operators (per the direction of the NMCP).

TABLE 16: LLIN USE IN STRUCTURES COVERED BY THE IRS CAMPAIGN, PER COMMUNE

Communes	Total number of people sleeping under LLINs	Total number of children under 5 years old sleeping under LLINs	Total number of pregnant women sleeping under LLINs
Boukoumbé	58,942	11,823	1,636
Cobly	58,782	10,663	1,500
Kérou	86,710	18,458	4,118
Kouandé	71,565	15,554	2,458
Matéri	65,950	12,104	1,833
Natitingou	77,294	12,991	1,765
Péhunco	100,003	24,610	5,701
Tanguiéta	30,434	5,138	599
Toucountouna	30,238	6,984	582
Total	579,918	118,325	20,192

8.6 INSECTICIDE USE AND SPRAY OPERATOR PERFORMANCE

A total of 43,368 bottles of organophosphate (CS formulation: 25,552; EC formulation: 17,816) were used during the IRS 2014 campaign to treat 254,072 eligible structures from May 5-27.

Overall, the spray operators in all communes sprayed an average of 12.8 structures per day, and 5.86 structures were treated per insecticide bottle.[2]

Table 17 provides a breakdown of the average number of structures covered by one bottle, per district.

TABLE 17: INSECTICIDE USED PER COMMUNE

Communes	Number of organophosphate bottles used	Number of structures sprayed	Number of structures covered (sprayed) per bottle
Boukoumbé	4,034	26,023	6.45
Cobly	3,608	23,245	6.44
Matéri	6,565	35,770	5.45
Toucountouna	1,825	12,378	6.78
Tanguiéta	2,459	13,625	5.54
Natitingou	7,038	32,693	4.65
Kouandé	7,180	37,573	5.23
Péhunco	5,520	36,682	6.65
Kérou	5,139	36,083	7.02
Total	**43,368**	**254,072**	**5.86**

[2] Please note that one bottle of organophosphate are is formulated to cover an average of 250m^2.

Insecticide Used for Public Buildings

AIRS Benin used 17,816 bottles of pirimiphos-methyl EC during the campaign. After the 20-day campaign, there were 1,324 bottles leftover. AIRS Benin worked with the DDS to spray public buildings, such as military barracks, jails, dormitories, and hotels in some of targeted communes of Atacora. Two additional IRS extra operations had been carried out to get rid of these leftover insecticide bottles; the first one on June 7-11 in the three main communes of Atacora: Natitingou, Kouandé, and Cobly and the second one in the communes of Péhunco, Kérou, Tanguiéta, Kouandé and Natitingou on August 29-31. In June 1,216 eligible structures were sprayed with 834 bottles. During the second IRS operation, 911 structures were treated with 490 bottles. In total 2,121 eligible structures were treated with the leftover1,324 bottles.
(see Table 19).

TABLE 18: INSECTICIDE USED IN 6 COMMUNES DURING ADDITIONAL SPRAY CAMPAIGN

Communes	Number of organophosphate EC bottles used	Number of structures sprayed	Number of structures sprayed per sachet/bottle
Cobly	92	249	2.71
Kouandé	534	511	0.96
Natitingou	382	634	1.66
Tanguiéta	4	27	6.75
Péhunco	144	250	1.74
Kérou	168	450	2.68
Total	**1,324**	**2,121**	**1.60**

9. Post-Spray Activities

9.1 Closing Ceremony

On May 27, the final day of the 2014 IRS campaign, a closing ceremony was held in Natitingou. The ceremony was hosted by the DDS, with representatives from the MoH/NMCP, DDS, some SOPs and mobilizers. The ceremony provided an opportunity for AIRS Benin to thank all seasonal spray staff, PMI, and the national, departmental, and communal government staff involved in the planning, supervising, and implementation of all IRS campaign activities.

9.2 Post-Spray Inventory

Starting mid-June, 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 2014 IRS campaign. The results of the inventory are found in the annex.

9.3 Post-Spray Campaign Radio Programs

During the week after the IRS campaign was completed, 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 had received IRS.

9.4 BRIEF Post-IRS Campaign Meeting

On July 2, AIRS Benin held a working session with the NMCP to review the 2014 IRS campaign. The meeting provided an opportunity for AIRS and the NMCP to discuss the results of the IRS campaign, key areas to be improved, and most notably, how to ensure that the NMCP and DDS become more involved in the daily management of the IRS campaign.

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.

Late 2012 the AIRS Project established a capacity building tool to assess the NMCP capacity in the 14 AIRS/PMI 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, USAID/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 the AIRS Benin mentorship program. The goal was for the NMCP to work with the AIRS Benin team on a one-on-one basis to manage one of the nine communes (Tanguiéta commune) in the Atacora region in Benin during the May 2014 IRS campaign.

The activities below show NMCP involvement and participation in the 2014 IRS campaign and also AIR Benin support:

- Building leadership skills surrounding IRS micro-macro planning and implementation; the NMCP took full responsibility (under AIRS mentorship) of the management of the commune of Tanguiéta.
- The NMCP identified the focal points (Operation Management, Environment Compliance, M&E, IEC, Logistics, Entomology and Commune Coordination) at the national and commune level to lead the activities pre-during-and post campaign.
- NMCP participated in pre 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 checklist in the Smartphone; NMCP assigned one data base manager who worked with the AIRS database manager during the IRS campaign.
- The logistic focal point identified by NMCP participated in the IRS campaign action plan development but unfortunately was absent during the IRS campaign due to the net mass distribution campaign preparation.
- The IEC/BCC focal point from the DDS fully carried out his tasks with the IEC Assistant.

To run the IRS operation in Tanguiéta MOH/NMCP assigned a nurse from the Health Zone Hospital as a commune coordinator; he participated in the IRS campaign action plan development in Porto Novo in

March 2014. The commune coordinator after attending the training of trainer on IRS technical components led the spray operators training in the commune of Tanguiéta and the mobilization one as well.

With AIRS support the commune coordinator established the IRS operation micro plan for Tanguiéta 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 coordinator was also in charge of following the mobilizer's activities and coordinating all IRS components in his geographic area. On his side the Health Zone Officer was supporting the commune coordinator specifically on supervisory activities and daily monitoring of IRS operation progress.

In general the success of the IRS campaign in Tanguiéta will enable the NMCP to manage a health zone composed of two or three communes next year. For this some key interventions should be performed:

- Continue to strengthen leadership and management at the national, departmental and commune level in spray operations, planning and implementation;
- Conduct a three-day training in data analysis for MOH and NMCP to increase the mentoring during the upcoming IRS campaign in relation to monitoring and evaluation and data analysis;
- Develop guidelines for IRS logistics including procurement and warehouse management and incorporate within the IRS guidelines and NMCP policies;
- Increase the IEC/BCC mentoring during the upcoming IRS campaign and identify other focal points.

10.2 Challenges and Lessons Learned

Administration and Logistics

- To secure salary payment AIRS Benin contracted a local institution named FECECAM (Network Institution of Funds and Credit for Agriculture) to help with payment of all seasonal staff. The institution has a representative office in the commune, which allowed for easy payment of the seasonal workers and avoided a long absence sometimes incurred for the workers to travel for payment.
- To save money and to avoid the rainy season in early June, the IRS campaign was performed within 20 days versus 32 days. Although successfully completed, the shortened timeframe was a challenge for AIRS Benin.

M&E

- Tracking the number of structures sprayed in each village versus the number of targeted structures found in 2013 by communes allowed the M&E team to make rapid corrective actions at the village level if needed.
- The Performance Tracking Sheet to be filled out on a daily basis and posted on the wall for all IRS stakeholders allowed the commune coordinator, the storekeeper, and the site supervisor to monitor closely the implementation of the operation and manage the insecticide use.

IEC

- The involvement of various community actors (town criers, religious leaders, local administrative leaders, and teachers) helped to ensure interest in and understanding of the IRS campaign. Overall, AIRS was able to spray 25,121 more structures than in 2013, which was partly attributed to better

acceptance of IRS in the Atacora Department. However, in urban areas, people were reluctant to accept IRS, because they did not want to move their possessions out of their houses. These residents were helped by the mobilizers.

Logistics

- Thanks to the planning of fuel procurement, fuel was available at almost all gas stations in the communes of Atacora during the IRS campaign. The affectation of buses to the communes depended on the type of fuel that was available in that commune. Due to the difficulty in getting fuel in Kérou, AIRS Benin needed to ensure that fuel can be procured from nearby areas, specifically in Pehunco. For future IRS campaigns, the implementing partner may consider purchasing a minimum of 15 small tanks (50 liters) made out of steel, or renting a tank with fuel in Kérou and assigning a financial assistant to manage the daily consumption. Another solution is to rent a tank truck to procure fuel for the eastern part of Atacora.
- 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 12 spray operators.

Environmental Compliance

- Until 2014, boots, helmets, face shields, and gloves were not washed on a daily basis, unlike the overalls. AIRS Benin recommends the SOPs and team leaders to do their PPE washing in the rinsing area along a queue. Accordingly, the rinsing area should be redesigned with entry and exit doors to facilitate the washing by each agent or to better equip five or more mobile soak pits.
- The health agent will inspect 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.
- As the smartphones were not able to download the checklists paper forms had been used during the mid-and post-spray inspections .

Operations/Trainings

- Good collaboration between AIRS Benin and the DDS, DDEHU, 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 one commune (Tanguieta) 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.
- Spray operators do not clean/wash their own sprayers (pumps) as it is to be done by the pump technicians. Because of this, it was observed that the spray operators have less than adequate skills in handling the equipment, and are not able to carry out tightening joints to stop leakages. For subsequent campaigns, the spray operators will be trained to wash their sprayers using the triple-rinse procedure at the end of each day. This will enhance their skills in handling and conducting basic maintenance of the equipment.

10.3 RECOMMENDATIONS

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

1. Implementing the IRS operation within only 20 days allowed AIRS Benin to reduce fuel consumption and avoid spraying on rainy days. Future campaigns should keep this duration and start the operation the last week of April.
2. As people in the countryside have issues with keeping any documents at home, the IRS card should be developed for annual use instead of using the same one two years in a row. The new card should be distributed the day before the IRS operation to avoid any loss.
3. Mobilizers will wear armbands to distinguish them from other seasonal workers during the campaign and also to make contact with the beneficiaries easier.
4. SOPs and team leaders should wash on daily basis their PPE (helmets, face shields, gloves and boots), except the coveralls, during the upcoming IRS campaign. Coveralls should be washed every other day depending on number of coveralls per spray operator.
5. AIRS Benin will redesign the rinsing areas with an entry and exit door to facilitate the washing by each agent or to better accommodate five or more mobile soak pits.
6. The health agent will inspect the operation sites during the non-spray months and note their conditions.
7. Based on the success of mobilization per campaign, future campaigns should continue to perform jointly mobilization and spray operation.
8. Campaigns should work to ensure the environmental inspections completion with smartphone in the future.
9. To facilitate the communication between technical staff and seasonal workers and to share technical and operational instructions, the SMS reminder should be extended to the other communes in Atacora.

ANNEX

ADDITIONAL FIGURES AND TABLES

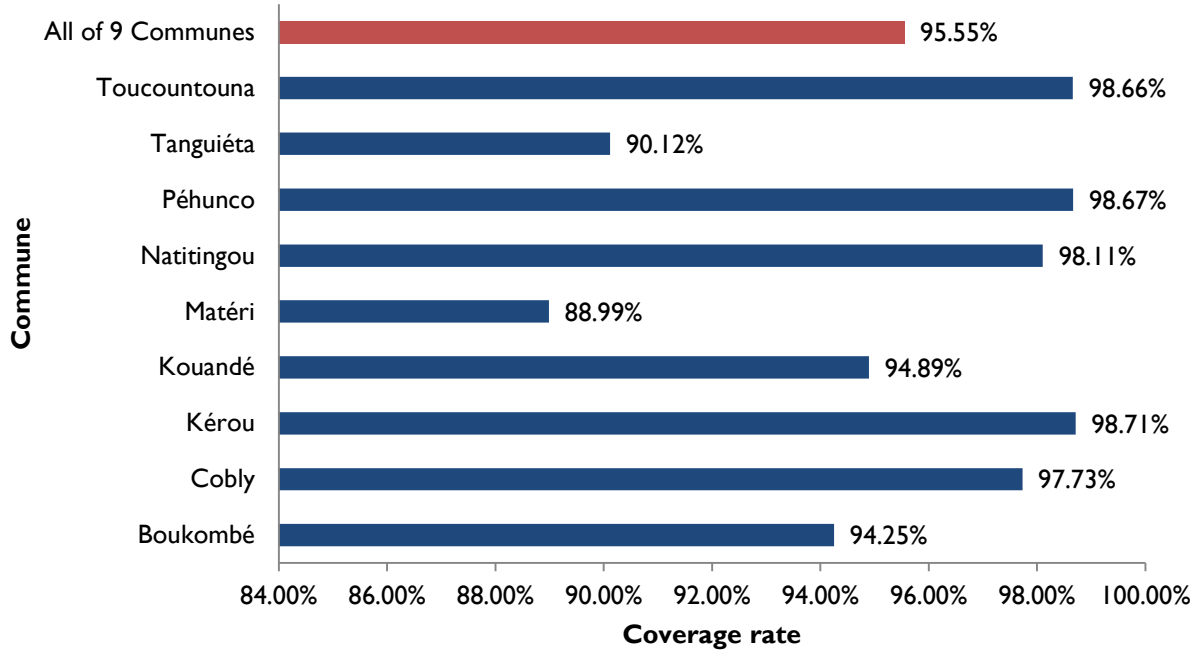
TABLE 19: IRS COMMODITIES AND INVENTORY

Item	Initial stock before IRS campaign	Number of items procured	Stock before campaign	Used/ unusable stock after IRS campaign	Usable stock remaining for 2015	Notes
Insecticide (Pirimiphos-methyl-EC)	19,140	0	19,140	19,140	0	
Insecticide (Pirimiphos-methyl-CS)	0	33,480	33,480	25,554	7,926	
Spray pumps X-PERT (Hudson)	707	0	707	32	675	32 pumps were determined to be damaged after the IRS campaign, and cannot be used in 2015 unless repaired.
Spray pumps IK12 VC (Goizper)	50	350	400	0	400	
Overalls	1,681	1,168	2,849	16	2,833	16 Overall cannot be used for future IRS Campaign.
Vest	390	100	490	326	163	
Helmet	1,296	160	1,456	119	1,337	119 helmets were found to be damaged after the IRS campaign and cannot be used in 2014.
Gumboots	927	575	1502	83	1419	83 pairs of gumboots were found to be damaged after the IRS campaign and cannot be used in 2015. Also most of gumboots purchased before the 2013 campaign are not soft anymore and are difficult to use.
Gloves for spray operator	302	2,628	2,930	2,163	767	
Gloves for washer	75	60	135	87	48	
Respirator mask	9,000	25,080	34,080	28,460	5,620	
Operator flashlight (head lamp)	0	800	845	845	0	

Item	Initial stock before IRS campaign	Number of items procured	Stock before campaign	Used/ unusable stock after IRS campaign	Usable stock remaining for 2015	Notes
Stock-keeper flashlight	9	20	29	7	22	7 were found to be damaged.
T-shirt (used for mobilization)	2	0	2	0	2	
Caps (used for mobilization)	237	0	237	110	127	
First aid kits	12	80	92	17	75	Most of the first aid kits were returned, but in most cases some of their contents had been used (such as bandages and eye drops). AIRS does not need to replace all first aid kits but it does need to restock the kits with these items, to make them complete.
Thermometers	37	0	37	4	33	
Fire extinguishers	22	4	26	3	23	Three were damaged, and cannot be used in 2015.
O ring for spray tube	479	500	979	479	500	
Filters	74	600	674	63	611	
White washers (spare part for pumps)	105	0	105	9	96	
Nozzles 8002	200	300	500	60	440	
Face shield for helmets	80	1,510	1,590	1,113	477	Due to wear and tear, will need to purchase more face shields for 2015.
Helmet cap	400	0	400	400	0	
Leaflets	43,000	50,000	93,000	76,500	16,500	
Spray regulator	150	650	800	150	650	
Pregnancy test kits	47	300	347	299	48	
Generators	1	0	1	0	1	
Buckets for spray operators	489	929	1,418	200	1,218	200 buckets were broken during the 2014 IRS campaign.
Plastic buckets for dustbin (100L)	149	10	159	2	157	2 were broken during the 2014 IRS campaign.
Two-component hose/Goizper	12	350	362	347	15	

Item	Initial stock before IRS campaign	Number of items procured	Stock before campaign	Used/ unusable stock after IRS campaign	Usable stock remaining for 2015	Notes
Valve Goizper	10	40	50	19	31	
Collar seal/Goizper	20	0	20	11	9	
Lance filter/Goizper	20	0	20	7	13	
Lance tube/Goizper	8	25	33	18	15	
Pressure regulator/Goizper	15	60	75	10	65	
Pumps Goizper/ spare parts kit	10	0	10	0	10	
Handle/Goizper	7	25	32	12	20	
Filter Goizper pump	100	0	100	34	66	
Barrel (100l)	85	0	85	1	84	One damaged
Barrel (150L)	87	0	87	1	86	One damaged
Water tank (1200L)	11	0	11	0	11	
Water tank (3000L)	04	0	4	0	4	

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



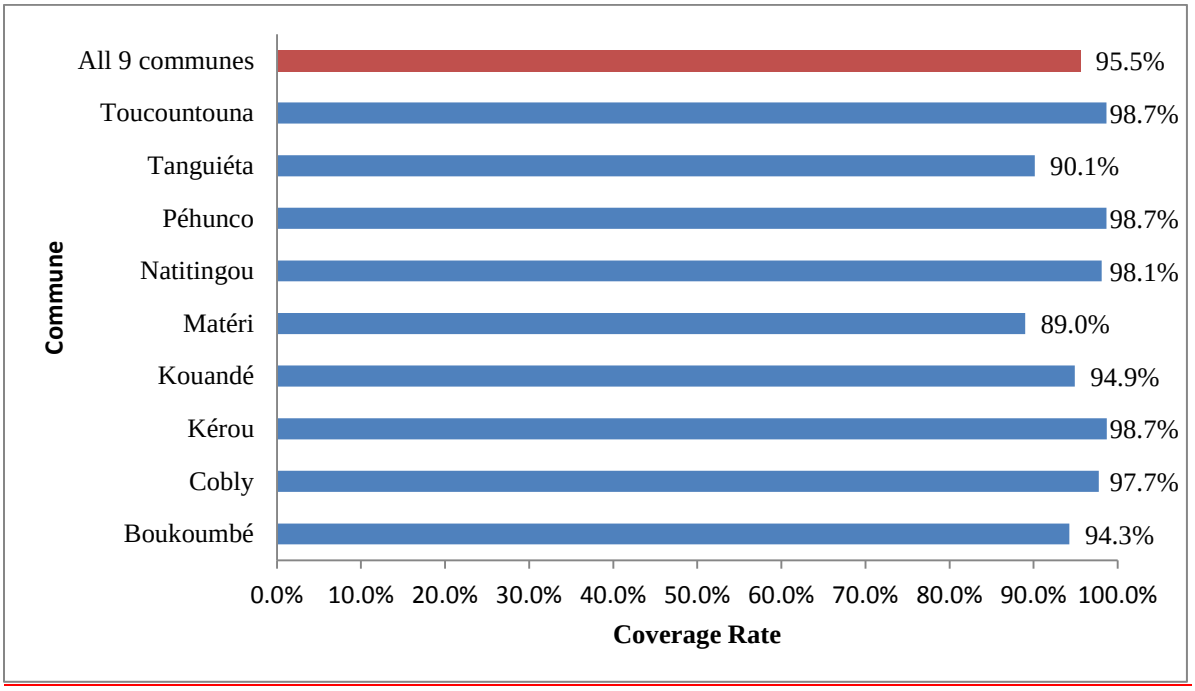


TABLE 20: SUMMARY OF MID-SPRAY ENVIRONMENTAL INSPECTIONS – STORAGE FACILITY AND SOAK PITS

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
Natitingou	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	No, the site supervisor was required to fill these drums	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	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	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	No. The inspection team sensitized the storekeeper who rearranged the storeroom	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	Yes	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	No	No	Yes	Yes	Yes
Natitingou	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes
Manta	Yes	Yes	Yes	Yes	No	No	Yes	Yes	Yes
Natta	Yes	Yes	Yes(but the site supervisor was requested to fill these barrels)	Yes	No	No	Yes	Yes	Yes
Matéri	Yes	Yes	Yes	Yes	No	No	Yes	Yes	Yes
Cobly	Yes	Yes	Yes	Yes	Yes (Occurred on May 4, 2014)	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

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)*
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
Dassari	Yes	Yes (They are labeled during the inspection)	Yes	Yes	No	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	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	
Cobly	Yes	Yes	Yes	Yes; gate removed to prevent its theft.	Yes	Yes	
Perma	Yes	Yes	Yes	Yes; gate removed to prevent its theft.	Yes	Yes	
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	
Firou	Yes	Yes	Yes	Yes; the gate is removed to prevent its theft.	Yes	Yes	The municipal government staff allowed one of their staff members to move into the store room after the IRS campaign.

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	No	Yes; the gate is removed to prevent its theft.	Yes	Not apparent concern; but the rural development manager wanted to use his store room.	AIRS Benin could not clean because the rural development manager changed locks without letting them know.
Péhunco	Yes	Yes	Yes	Yes	Yes	Yes	Municipal government staff pushed for a quick turnover of the store room, for other storing needs. Future Memoranda of Understanding should be developed to allow enough time for AIRS to thoroughly complete all close-out activities at each operation site.
Taiacou	Yes	Yes	Yes	Yes; gate removed to prevent its theft.	Yes	Yes	
Kaobagou	Yes	Yes	Yes	Yes; gete removed to prevent its theft.	Yes	Yes	

QUALITY CONTROL TEST RESULTS FOR INSECTICIDE BATCHES SENT TO BENIN

CEMAS

Certificate of Analysis

Actellic 300CS
BSN3G0280

Batch Identification	**BSN3G0280**
Product Code	**Actellic 300CS**

Chemical Analysis
(Active Ingredient Content)

– **Identity of the Active Ingredient(s)**	**confirmed**
– **Content of Pirimiphos Methyl**	**28.9 % w/w corresponding to 308 g/L**

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

Stability:

– **Recertification Date**	**End of February 2016**

Raw data, documentation, study plans, any amendments to study plans 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 Final Report, for a minimum period of three years, after which it will be returned to the Sponsor.

Study number: CEMS-6413

Authorization: 03 March 2014

J Wiles
CEMAS Ltd

REPUBLIQUE DU BENIN
DEPARTEMENT DU LITTORAL
MAIRIE DE COTONOU

DIRECTION DES SERVICES TECHNIQUES

Cotonou, le 10/07/ 2014

N° 344 /MCOT/SG/DST/DVRD/SPU/DGDSM

CERTIFICAT D'ENFOUISSEMENT

Le Directeur des Services Techniques par intérim, certifie que **AIRS BENIN PROJECT** a procédé effectivement, ce jour 1er juillet 2014, à l'enfouissement des trois mille six cent trente quatre (3634) gants usagers issus de la campagne de la pulvérisation intra-domiciliaire (PID) 2014 sur le Lieu d'Enfouissement sise à Ouessè dans la commune de Ouidah, conformément aux normes techniques requises.

En foi de quoi, je délivre le présent certificat pour servir et valoir ce que de droit.

MAIRIE DE COTONOU
LE DIRECTEUR
Direction des Services Techniques

Le Directeur par Intérim

Nikolaï-Germain DADJO

Abt Associates
Courrier Arrivée
Le 15/07/14
Enreg S/N° 1038

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	1																					
DDEHU	1																					
DAGRI																						
CREC	1																					
Districts Coordinators	6	3									6	3										
Health Zone Coordinator																						
District Chief Doctors/ Other Doctors	2										5	3			14	3						
Chiefs of Health Post/ Midwife											37	20			40	17						
Hygiene Agents	97	33																				
Spray Operators			1236	186																		
Data Clerks					18	22																
Storekeepers							14	2											14	2		
Logistics Assistants							2												2			
Service Technicians									65	9												
IEC agents													440	88								
Washers																		79				
Drivers																			90		90	
Guards																			16			
IEC Assistant		1										1										
TOTAL M/F	**111**	**37**	**1236**	**186**	**18**	**22**	**16**	**2**	**65**	**9**	**48**	**27**	**440**	**88**	**54**	**20**	**0**	**79**	**122**	**2**	**90**	
TOTAL/ training	**148**		**1422**		**40**		**18**		**74**		**75**		**528**		**74**		**79**		**124**		**90**	

TABLE 26: ENVIRONMENTAL MITIGATION AND MONITORING PLAN OF 2014 IRS CAMPAIGN

Impact	Mitigation Measures	Monitoring Indicator	2014 IRS Campaign Results of EMMP Implementation
Pre-spraying phase			
Accidental spills of insecticides during road transportation to warehouse and spray sites (human health and environmental impacts)	Ensure that the drivers identified to haul the insecticide to the spray sites are well trained on the Food and Agriculture Organization standards and guidelines for the storage, transport and stock control for pesticides.	Number of road accidents and spills reported Records showing drivers training	*Two road accidents* *End of Spray Report*
Possible environmental contamination caused by warehouse exposure due to poor siting of warehouses, pilferage, and vermin attack on the stored pesticides before spraying	Ensure the selected warehouse is sited away from a flood plain area, water course, wells, schools, markets.	Storage facility located outside of floodplain, away from nearby schools, hospitals, water courses	*Yes* *(see pre-season final inspection check list)*
	Secure the selected warehouse and apply all the guidelines for Storage and Stock Control Manual by FAO.	Storage facilities secured as per the FAO Storage and Stock Control Manual	*Yes* *(see pre-season final inspection check list)*
Accidental fires and injuries in the warehouses	All warehouses must be equipped with a fire extinguisher, thermometer, exit doors and warning signs, and materials must be stored with proper stacking position and height of stacks, as stipulated in the FAO Storage and Stock Control Manual.	Presence of firefighting equipment, warning signs and at least 3 exits accessible in the warehouse	*Compliant*
	All the workers handling pesticides or other products and equipment in the storage facilities must all have PPE including goggles, gloves, boots, overall, dust masks, etc.	Availability of PPE to all the workers	*Compliant*
	All spray operators and store managers must be trained on how to operate the fire extinguishers and what to do in case of fire. Develop an Emergency Response Plan.	Training in fire prevention and Fighting. Emergency Response Plan	*Performed* *Plan available*

Impact/Issue	Mitigation Measure(s)	Monitoring Indicators	Monitoring frequency	2014 IRS Campaign Results of EMMP Implementation
Spraying-phase potential impacts				
Fetal exposure could be caused by using expectant female operators in the spraying.	Pregnancy tests to ensure pregnant women are not on the spray teams; prohibition of breastfeeding women on spray teams	Percentage of female spray operators who took pregnancy tests	Once before spray operations begin and then every 30 days	*100% took pregnancy tests. Performed (the campaign lasted 20 days)*
		Percentage of female spray operators who indicated they were not breastfeeding		*100% of females were not breastfeeding.*
	Education of women regarding risk and presentation of consent forms	Percentage of female spray operators who have signed consent forms		*There was no consent form instituted.* *All female spray operators gave verbal consent.*
	Reassign women spray operators who become pregnant during the campaign to tasks that minimize occupational exposure to insecticides.	Number of expectant females reassigned to storekeeping work, etc.	Periodic re-assignment as the cases are identified	*Two pregnant females were reassigned to mobilizer position.*
Spray operators', drivers' and storekeepers' exposure due to negligence or lack of PPE, or unintentional exposure caused by accidents	Provide PPE to all the workers, supervisors, team leaders and store managers. Train the team leaders, sprayers, supervisors, and store keepers on emergency procedures to take if exposure occurs accidentally, i.e., dermal, eye or ingestion emergencies.	Record indicating training has been conducted Ability to respond as required when exposure incidents are encountered Availability of PPE for all spray teams including storekeepers, drivers	Training to be undertaken once during the overall ToT. Daily monitoring of operators by team leaders to ensure full use of PPE.	*Performed (EOSR)* *Performed* *PPE permanently available*

Impact/Issue	Mitigation Measure(s)	Monitoring Indicators	Monitoring frequency	2014 IRS Campaign Results of EMMP Implementation
Spraying-phase potential impacts				
	Ensure that each team leader and supervisor effectively monitors the spray operations diligently and takes action to correct any non-compliance issues noted right away.			*Performed (during IRS campaign, team leaders and supervisors made sure the spray operators always wore their PPE)*
	Procurement of sprayers manufactured according to WHO specifications; procurement and proper use of PPE by spray operators, team leaders, and supervisors (cotton overalls, face shield, dust mask, broad-brimmed hat, rubber gloves, gumboots); procurement of PPE for wash persons			*Performed*
	Prohibition of eating, drinking and smoking during work			*No spray operator was eating, drinking or smoking during work.*
Residential exposure	IEC Campaign, instruct residents to: clear homes of mats or rugs, furniture, cooking implements and foodstuffs prior to spraying	Households cleared and well-prepared before the spraying	Daily basis by the team leaders and supervisors	*In general, households followed instructions before and during spraying.*
	Move all furniture out of the house and for immovable pieces, take to the center of the house and cover accordingly.	Furniture covered and/ or moved to the center of the houses	Cases of residential exposure attributed to lack of or inadequate IEC	*Zero cases*
	Advise residents to stay outside the home during spraying and for two to four hours after spraying.	Residents stay outside of the home until the recommended time has elapsed		*Measure well followed by residents*

Impact/Issue	Mitigation Measure(s)	Monitoring Indicators	Monitoring frequency	2014 IRS Campaign Results of EMMP Implementation
Spraying-phase potential impacts				
	Move and keep all animals outside the home during spraying, and for four hours after spraying. Sweep up any insects killed from the spraying and drop them in latrine pits. Sweep floors free of any residual insecticide that may remain from the spraying.	Animals kept away from the houses until the recommended time after spraying		*Measure well followed*
	Advise not to re-plaster or paint over the sprayed walls after spraying, and keep using bed nets for protection against malaria.	Number of houses re-plastered or painted after the spraying period		*No case of re-plastered or painted walls reported or observed*
	If skin itches after re-entrance into home, wash with soap and water; for eye irritation, flush eyes with water; for respiratory irritation, leave the home for fresh air; for ingestion, contact program staff or go to nearest health facility.	Cases of reported exposures to the health facilities		*No exposure case reported*
Acute effects of pesticide exposure	Ensure treatment medicines for insecticide exposure listed in SEA mitigation section are available at the district level. Ensure first aid kits are available in the storage facilities and in the transport vehicles.	Availability of exposure treatment medicine in the hospitals Percentage of treatment medicines available at health facilities Availability of first aid kits in storage facilities and hired vehicles	Once before spraying begins and then periodically to check if the medicines are still in stock in the health centers and if the first aid kits require replacement	*Medicines available in the hospitals* *100% treatment medicines were available at Sanitary Zones and commune levels* *First kits available in all store rooms and hired vehicles*

Impact/Issue	Mitigation Measure(s)	Monitoring Indicators	Monitoring	2014 IRS Campaign Results

			frequency	of EMMP Implementation
Spraying-phase potential impacts				
Community exposure, fetal exposure	Prohibition of spraying in homes where sick persons or pregnant women are living who cannot move outside the home *and* stay outside the home during and 4 hours after spraying Prohibition of spraying in homes where food, utensils and flooring have not been removed from the house, and where furniture has not been removed outside *or* moved to the middle of the room and covered with a cloth by the spray operator	Residents outside house during spraying (previously mentioned) Residents stay outside for four hours after spraying (previously mentioned) Occurrence of skin/eye/throat irritation (previously mentioned) Food and goods outside house during spraying (previously mentioned)	Daily basis	*Measure well followed* *Not reported or observed* *Compliant*

Impact	Mitigation Measure	Monitoring Indicator	Monitoring Frequency	2014 IRS Campaign Results of EMMP Implementation
Post-spraying phase				
Pilferage and community exposure, environmental contamination from any remaining pesticides not used	Keep storage facilities up to standards described in FAO pesticide storage and stock control manual; storage of all insecticides, empty packaging, barrels and tubs in storage facilities	Presence of a dedicated and trained storekeeper Insecticide stored separately from food and medicine (previously mentioned) Stock records up to date Facility double- padlocked and guarded Facility physically secure At the end of the spray round, [stock remaining] = [stock at start] - [no. of bottles distributed]. No. bottles distributed should be equal to stock records up-to-date. Cases of theft or pilferage reported	Daily accounting of insecticide and tally of used bottles Periodic monitoring of the warehouse to ensure that it does not have structural problems	*All storekeepers were well-trained before IRS campaign began.* *No food was stocked in the store rooms.* *Stock records were constantly controlled during supervision visits and were up to date.* *All store facilities guarded 24/24, 7/7 and well-secured (double-locked).* *No management issue of insecticide or empty bottles was reported.* *No theft or pilferage cases reported.*
Community exposure from vehicles and secondary warehouses	End-of-program cleaning/decontamination of interior and exterior of vehicles End-of-program cleaning/ decontamination of the interior of all secondary warehouses Collection of all the IRS solid wastes at the secondary storage facilities and transferring to central warehouse	Evidence of interiors and exteriors of vehicles cleaned daily Evidence of cleaning of all the secondary warehouses Cases of passenger exposure	Secondary warehouses will be cleaned at the end of spray operations; however, the warehouses will be cleaned daily for hygienic reasons.	*Every day, after spray operation, vehicles were cleaned. Moreover, they were decontaminated in case of pollution by insecticide. No case of passenger exposure was reported.* *At the end of IRS campaign, all secondary warehouses were decontaminated.*

Impact	Mitigation Measure	Monitoring Indicator	Monitoring Frequency	2014 IRS Campaign Results of EMMP Implementation
		Post-spraying phase		
Environmental contamination and resident exposure from IRS spray disposal activities	Sprayer progressive rinse; spray operator bathing; washing of overalls, PPE and cloths used to cover furniture Ensure that a soak pit is constructed for disposing residual water after clean-up. Storage of empty sachets until disposal option selected by the country Procurement and distribution of barrels for progressive rinse, and wash-tubs for personal hygiene; inscription of program barrels and tubs as District Health Office property to deter sale and domestic use in event of pilferage	Reported cases of residential exposure Evidence of progressive rinsing during all post-spray clean-ups Evidence of soak pits in all the return sites for clean-up designed and constructed in the acceptable format Evidence of empty bottles stored in sealed barrels awaiting recapture by manufacturer Availability of wash barrels and tubs with program inscription	Daily	*No residential exposure case was reported.* *(For different evidence, see the final PSECA and mid-inspection checklist*
Spray operator exposure due to lack of washing after spraying	Ensure all spray sites have washrooms with adequate water and soap for washing.	Reported cases of operator exposure Soap and clean water available at all times (previously mentioned) Adequate numbers of showers/bathing facilities available for spray operators (designated wash basins at a minimum; previously mentioned)	Daily	*No case of operator exposure reported.* *Every operator was provided with enough soap, and clean water was always available.* *Every spray site is equipped with at least one shower for men and the same for women.*
Residential exposure from contact with secondary warehouses	Decontaminate by cleaning all the 16 secondary warehouses to ensure that exposure incidents are minimized. Collect all the IRS solid waste to the central warehouses for further disposal.	Level of decontamination of warehouses after spray operations end	Decontamination to occur at the end of the spray operations. Daily cleaning and collection of waste to be undertaken.	*Rinsing area and secondary warehouses were cleaned every day after spray operations.* *All secondary warehouses were cleaned with water and soap at the end of spray campaign.*

				Solid wastes were counted daily and secured in labeled barrels, and afterwards transported to the central warehouse in Natitingou for further disposal.
	Sound disposal of solid waste in line with PMI Best Management Practices	Evidence of incinerated solid waste (respiratory used masks, used spray operator bags)	End of spray campaign	*Incineration Certificate*
		Evidence of recycled solid waste (empty plastic bottles)	End of spray campaign	*Recycling Certificate*
		Evidence of buried solid waste (used rubber gloves)	End of spray campaign	*Burying Certificate*

BENIN MONITORING AND EVALUATION PLAN INDICATOR MATRIX

Benin Monitoring and Evaluation Plan Indicator Matrix

UPDATED: August 27, 2014

Performance Indicator	Indicator Definition	Project Year(s) Reporting	Data Source(s) and Reporting Frequency	Disaggregate	PMI/ AIRS Indicator	Annual Targets and Actuals					
						Year 1		Year 2		Year 3	
						Target	Results	Target[3]	Results	Target	Results
Component 1: Establish cost-effective supply chain mechanisms including procurement, distribution and storage of IRS-related commodities and execute all aspects of logistical plans for IRS-related activities.											
1.1 Procurement											
1.1.1 Number and percentage of international insecticide procurement orders delivered in country, at port of entry, at least 30 days prior to the start of spray operations	[*Numerator:* Number of international insecticide procurements delivered in country, at port of entry, at least 30 days prior to the start of spray operations] [*Denominator:* Total number of international insecticide procurements] *Calculation:* [Numerator ÷ Denominator] x 100	Y1, Y2, Y3	*Data source*: Logistics and Procurement Inventory Reports *Reporting frequency*: Each spray season	By Spray Campaign	AIRS	1; 80%	1; 100%	2; 100%	2; 100%	1; 100%	1 100%
1.1.2 Number and percentage of international procurement orders for equipment, including PPE, received at port of entry, 30 days prior to start of spray operations.	[*Numerator:* Number of international procurements for equipment, including PPE, at port of entry, 30 days prior to start of spray operations] [*Denominator*: *Total number of* international procurements for equipment, including PPE.*]* *Calculation:* [Numerator ÷ Denominator] x 100	Y1, Y2, Y3	*Data source:* Logistics Inventory Report *Reporting frequency*: Each spray season	By Spray Campaign	AIRS	1; 85%	1; 100%	1; 100%	1; 100%	1; 100%	1 100%

[3] The number of districts covered in Y2 has not been finalized; therefore Y2 target indicators may change upon Work Plan approval.

Performance Indicator	Indicator Definition	Project Year(s) Reporting	Data Source(s) and Reporting Frequency	Disaggregate	PMI/ AIRS Indicator	Annual Targets and Actuals					
						Year 1		Year 2		Year 3	
						Target	Results	Target[3]	Results	Target	Results
1.1.3 Number and percentage of local PPE procurement orders that are delivered to the main warehouse, 14 days before the start of spray operations	[*Numerator:* Number of local PPE procurements delivered 14 days before the start of spray operations] [*Denominator*: *Total number of local PPE procurements.]* *Calculation:* [Numerator ÷ Denominator] x 100	Y1, Y2, Y3	*Data source:* Logistics and Procurement Inventory Reports *Reporting frequency*: Each spray season	By Spray Campaign	AIRS	N.A; 80%	N.A.;	1; 100%	1; 100%	1; 100%	1 100%
1.1.4 Successfully completed spray operations without an insecticide stock-out	Milestone: (Completed/Not Completed)	Y1, Y2, Y3	*Data source:* Logistics Inventory Report *Reporting frequency*: Each spray season	By Spray Campaign	AIRS	Achieved	Achieved	Achieved	Achieved	Achieved	Achieved
1.2 In-country Logistics, Warehousing, and Training											
1.2.1 Number and percentage of logistics and warehouse managers trained in IRS supply chain management	*[Numerator:* Total number of logistics and warehouse managers trained in IRS supply chain management using AIRS Project resources.] *[Denominator:* Total number of AIRS logistics and warehouse managers.] *Calculation*: [Numerator ÷ Denominator] x 100	Y1, Y2, Y3	*Data source*: Routine training records *Reporting frequency*: Each spray season	By Spray Campaign By Gender	AIRS	15	18 M: 16 F: 2 12.5%	30 M: 23 F: 7 30.5%	18 M: 16 F: 2 11%	18	18 M:16 F: 2 11%

Performance Indicator	Indicator Definition	Project Year(s) Reporting	Data Source(s) and Reporting Frequency	Disaggregate	PMI/ AIRS Indicator	Annual Targets and Actuals					
						Year 1		Year 2		Year 3	
						Target	Results	Target[3]	Results	Target	Results
1.2.2 Number and percentage of base stores where physical inventories are verified with up-to-date stock records	*[Numerator:* Number of base stores where physical inventories are verified by up-to-date stock records] [*Denominator*: *Total number of base stores audited.]* *Calculation:* [Numerator ÷ Denominator] x 100 *(See PIRS for details on sample size for operational audits)*	Y2, Y3	*Data source:* Logistics and Environmental compliance reports *Reporting frequency*: Each spray season	By Spray Campaign	AIRS	N.A.	N.A.	15 out 16; 94%	16 (including central ware-house); 100%	16 (including central ware-house) 100%	16 (including central ware-house) 100%
1.2.3 Submit up-to-date inventory records to AIRS Home Office 30 days after the end of each spray campaign	Milestone: (Completed/Not Completed)	Y2, Y3	*Data source: Post-Spray* Logistics Inventory Report *Reporting frequency*: Each spray season	By Spray Campaign	AIRS	N.A.	N.A.	100%	100% (Completed)	100%	100%
Component 2: Implement safe and high-quality IRS programs and provide operational management support											
2.1 Planning and Design of IRS Programs											
2.1.1 Annual IRS country work plan developed and submitted on time	Milestone: (Completed/Not Completed)	Y1, Y2, Y3	*Data source:* Project records *Reporting frequency*: Annually		AIRS	Completed	Completed	Completed	Completed	Completed	Completed
2.2 Support of Safety and Health Best Practices and Compliance with USAID and Host Country Environmental Regulations											
2.2.1 SEA/letter report submitted on time[4]	Milestone: (Completed/Not Completed)	Y1, Y2, Y3	*Data source*: Project records – submitted SEAs/ letter reports Reporting frequency:	By Spray Campaign	AIRS	Complete	Completed	Complete	Completed	Completed	Completed

[4] In Year 1, SEAs were due 30 days prior to the commencement of spraying and letter reports were to be submitted 14 days prior to the commencement of spraying. In Year 2 and Year 3, due dates agreed upon with Washington-PMI will be noted in each country-specific Monitoring and Evaluation Plan to assess indicator 2.2.1.

Performance Indicator	Indicator Definition	Project Year(s) Reporting	Data Source(s) and Reporting Frequency	Disaggregate	PMI/ AIRS Indicator	Annual Targets and Actuals					
						Year 1		Year 2		Year 3	
						Target	Results	Target[3]	Results	Target	Results
			Each spray campaign								
2.2.2 Number and percentage of soak pits and warehouses/storerooms inspected and certified by an environmental officer/AIRS Environmental Compliance Officer prior to spraying	*[*Numerator*:* Number of soak pits and/or storehouses inspected and certified by AIRS Environmental Compliance Office] *[*Denominator*:* Total number of project soak pits and/or storehouses] Calculation*:* *[Numerator ÷ Denominator] x 100*	Y1, Y2, Y3	*Data source:* Project records – Reports submitted by environmental officers *Reporting frequency:* Each spray season	By Spray Campaign By soakpits and warehouses/ storerooms	AIRS	16 100%	16; 100%	16; 100%	16; 100%	16	16 100%
2.2.3 Number of government environmental and health officers trained in IRS environmental compliance	Total number of government environmental and health officers trained in IRS environmental compliance using AIRS Project resources	Y1, Y2, Y3	*Data source:* Training reports from Environmental Compliance Officer Reporting frequency: *Semi-annually*	By Spray Campaign By Gender	AIRS	5 M: 4 F: 1	5 M: 4 F: 1	72 M: 55 F: 17	71 M: 55 F: 16	125	148 M:111 F: 37
2.2.4 Number of spray personnel trained in environmental compliance and personal safety standards in IRS implementation	Total number of spray personnel who attend a training in environmental compliance and personal safety standards in IRS implementation using AIRS Project resources, includes all staff who received environmental compliance training - spray operators, team leaders, washpersons, storekeepers, etc.	Y1, Y2, Y3	*Data source:* Project records – Training reports *Reporting frequency:* Each spray season	By Spray Campaign By Gender	AIRS	775	836 M: 703 F: 133	914 M: 777 F; 137	823[5] M: 676 F: 147	1,669	1,723 M: 1,414 F: 309
2.2.5 Number of health workers receiving insecticide poisoning case management training	Total number of clinical personnel trained in insecticide poisoning case management using AIRS Project resources	Y2, Y3	Data source: Project records – Training reports Reporting frequency: Each spray season	By Spray Campaign By Gender	AIRS	60	69 M: 46 F: 23	60 M: 46 F: 23	54 M: 39 F: 15	60	74 M: 54 F: 20

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

Performance Indicator	Indicator Definition	Project Year(s) Reporting	Data Source(s) and Reporting Frequency	Disaggregate	PMI/ AIRS Indicator	Annual Targets and Actuals					
						Year 1		Year 2		Year 3	
						Target	Results	Target[3]	Results	Target	Results
2.2.6 Number of adverse reactions to pesticide exposure documented	Total number of incidents of pesticide exposure reported that resulted in a referral for medical care	Y1, Y2, Y3	Data source: Incident report forms that are required for each incidence of pesticide exposure Reporting frequency: Each spray season	By Spray Campaign By residential/occupational exposure	AIRS	0	0	0	0[6]	0	0
2.2.7. Number of vehicular accidents reported	Total number of vehicular accidents reported	Y1, Y2, Y3	Data source: Vehicular incident report forms that are required for each accident Reporting frequency: Each spray season	By Spray Campaign	AIRS	0	0	0	0[7]	0	2
2.3 Support Entomological Monitoring Activities and Insecticide Resistance Strategies											
2.3.1 Number of sentinel sites supported by the AIRS project	Total number of entomological sentinel sites supported by the AIRS project	Y1, Y2, Y3	Data source: Entomological reports Reporting frequency: Annually	By Spray Campaign	AIRS	6	6	5	5	5	5
2.3.2 Number and percentage of entomological monitoring sentinel sites measuring all five primary PMI entomological indicators	*[Numerator:* Number of entomological monitoring sites measuring all five primary PMI entomological indicators] *[Denominator:* Number of entomological monitoring sentinel sites] *Calculation:* [Numerator ÷ Denominator] x 100	Y1, Y2, Y3	Data source: Entomological reports *Reporting frequency:* Annually	By Spray Campaign	AIRS	5 out of 6 83.3%	5 out of 6 83.3%	2 out of 5 40%	2 out of 5 40%.	TBD	TB updated after CREC report's submitted

[6] No case of adverse reaction observed or reported
[7] No accident took place

Performance Indicator	Indicator Definition	Project Year(s) Reporting	Data Source(s) and Reporting Frequency	Disaggregate	PMI/ AIRS Indicator	Annual Targets and Actuals					
						Year 1		Year 2		Year 3	
						Target	Results	Target[3]	Results	Target	Results
2.3.3 Number and percentage of entomological monitoring sites measuring at least one secondary PMI indicator	*[Numerator:* Number of entomological monitoring sites measuring at least one secondary PMI indicator] *[Denominator:* Number of entomological monitoring sites] *Calculation:* [Numerator ÷ Denominator] x 100	Y1, Y2, Y3	Data source: Entomological reports Reporting frequency: Annually	By Spray Campaign	AIRS	N.A.	6 out of 6 100%	5 out of 5; 100%	5 out of 5 100% reports.	TBD	TB updated after CREC report's submitted
2.3.4 Number and percentage of insecticide resistance testing sites that tested at least one insecticide from each of the four classes of insecticides recommended for malaria vector control	*[Numerator:* Number of insecticide resistance testing sites that tested at least one insecticide from each of the four classes of insecticides recommended for malaria vector control.] *[Denominator:* Number of insecticide resistance testing sites] *Calculation:* [Numerator ÷ Denominator] x 100	Y1, Y2, Y3	Data source: Entomological reports Reporting frequency: Annually	By Spray Campaign By Type of Insecticide	AIRS	2	2[8]: 100%	2[6]; 100%	0[9]; 0%	TBD	TB updated after CREC report's submitted
2.3.5 Number of wall bioassays conducted within 2 weeks of spraying to evaluate the quality of IRS	Total number of wall bioassay studies conducted in established sentinel sites to evaluate quality of IRS spraying activities	Y1, Y2, Y3	Data source: Entomological reports Reporting frequency: Per spray campaign	By Spray Campaign	PMI	10 tests total 1 test on 8 treatment structures and 2 control	10 tests total 1 test on 8 treatment structures and 2 control	10 tests total 1 test on 8 treatment structures and 2 control	10 tests total 1 test on 8 treatment structures and 2 control	10 tests total 1 test on 8 treatment structures and 2 control	10 tests total 1 test on 8 treatment structures and 2 control

[8] Organochlorine class: 0 sites 0% (DDT was tested only in 2010 just before the IRS campaign by CREC. The results showed a high resistance of *An. gambiae* s.l. to DDT. Besides, the mortality rate was only 13% in Tanguiéta and 18% in Toucountouna); Organophosphates class : 5 sentinel sites; 100%; Pyrethroids class : 4 sentinel sites, 80%; Carbamates class: 5 sentinel sites, 100%

[9] Only two insecticide classes were tested - Organophosphates class : 3 sentinel sites; 60%; and Carbamates class: 3 sentinel sites, 60%

Performance Indicator	Indicator Definition	Project Year(s) Reporting	Data Source(s) and Reporting Frequency	Disaggregate	PMI/ AIRS Indicator	Annual Targets and Actuals					
						Year 1		Year 2		Year 3	
						Target	Results	Target[3]	Results	Target	Results
						structure (10 tests total)	structure (10 tests total)	structure (10 tests total)	structure (10 tests total)	structure (10 tests total)	structure (10 tests total)
2.3.6 Number of wall bioassays conducted after the completion of spraying at monthly intervals to evaluate insecticide decay	Total number of wall bioassay studies conducted at monthly intervals in established sentinel sites to evaluate the rate of insecticide decay on sprayed surfaces	Y1, Y2, Y3	*Data source:* Entomological reports Reporting frequency: *Per spray campaign*	By Spray Campaign	PMI	50 tests total 5 tests on 8 treatment structures and 2 control structure (50 tests total)	50 tests total 5 tests on 8 treatment structures and 2 control structure (50 tests total)	50 tests total 5 tests on 8 treatment structures and 2 control structure (50 tests total)	50 tests total 4 tests on 8 treatment structures and 2 control structure (40 tests total)	50 tests total 5 tests on 8 treatment structures and 2 control structure (50 tests total)	TB updated after CREC report's submitted
2.3.7 Number of vector susceptibility tests for different insecticides conducted in selected sentinel sites	Total number of vector susceptibility tests conducted to gauge the effectiveness of individual insecticides proposed for use in spray operations	Y1, Y2, Y3	Data source: Entomological reports Reporting frequency: Per spray campaign	By Spray Campaign By Type of Insecticide	PMI	1	1[10]	2[6]	1	TBD	TB updated after CREC report's submitted
2.4 Conduct Communications Activities and Community Mobilization											
2.4.1 Number of radio spots and talk shows aired	Total number of radio spots and talk shows aired in target spray districts to stress the safety and benefits of IRS, ensure successful spray coverage, timely vacating of premises and adherence to IRS safety precautions by community members	Y1, Y2, Y3	Data source: Project records Reporting frequency: Semi-annually	By Spray Campaign	AIRS	2,503	2,503	1668	5,876	5,876	7,796
2.4.2 Number of IRS print materials disseminated	Total number of IRS educational materials developed, printed and distributed to community members in target spray districts using AIRS Project resources	Y1, Y2, Y3	Data source: Project records Reporting frequency: Semi-annually	By Spray Campaign By Type of printed material and message(s)	AIRS	121,180	114,110	114,310	109,990	80,000	81,333

[10] Deltamethin, 4 sentinel sites; Bendiocarb, 5 sentinel sites; Pirimithos-methyl, 5 sentinel sites; Fenitrothion, 4 sentinel sites

Performance Indicator	Indicator Definition	Project Year(s) Reporting	Data Source(s) and Reporting Frequency	Disaggregate	PMI/ AIRS Indicator	Annual Targets and Actuals					
						Year 1		Year 2		Year 3	
						Target	Results	Target[3]	Results	Target	Results
2.4.3 Number of people reached with IRS messages via door-to-door mobilization	Total number of adults reached with IRS message during pre-spray community, door-to-door mobilization	Y1, Y2, Y3	Data source: Mobilization Data Collection Forms Reporting frequency: Daily per mobilization conducted	By Spray Campaign By Gender	AIRS	N.A	483,013 M: 226,091 F: 256,922	483,013 M: 226,091 F: 256,922	566,226 M: 268,559 F : 297,667	566,226	383,889 M: 180,362 F: 203,532
2.5 Spray Targeted Structures According to Technical Specifications											
2.5.1 Number of structures targeted for spraying	Total number of structures found in targeted spray districts by Spray Operators	Y1, Y2, Y3	Data source: Daily Spray Operator Forms Reporting frequency: Daily per spray campaign	By Spray Campaign	PMI	200,000	221,937	222,000	239,112	239,112	265,907
2.5.2 Number of structures sprayed with IRS	Total number of structures in targeted spray districts where spraying was conducted	Y1, Y2, Y3	Data source: Daily Spray Operator Forms Reporting frequency: Daily per spray campaign	By Spray Campaign	PMI	170,000	210,380	188,700	228,951	203,246	254,072
2.5.3 Percentage of total structures targeted for spraying that were sprayed with a residual insecticide (Spray Coverage)	[Numerator: Total number of structures sprayed in targeted districts] [Denominator: Total number of structures in targeted areas found by spray operators] Calculation: [Numerator ÷ Denominator] x 100	Y1, Y2, Y3	Data source: Daily Spray Operator Forms Reporting frequency: Daily per spray campaign	By Spray Campaign	PMI	85%	94.8%	85%	95.8%	85%	95.5%

Performance Indicator	Indicator Definition	Project Year(s) Reporting	Data Source(s) and Reporting Frequency	Disaggregate	PMI/ AIRS Indicator	Annual Targets and Actuals					
						Year 1		Year 2		Year 3	
						Target	Results	Target[3]	Results	Target	Results
2.5.4 Number of people residing in structures sprayed (Number of people protected by IRS)	Total number of people residing in structures sprayed (Actual numbers are collected during spray operations; population estimates are not used.)	Y1, Y2, Y3	Data source: Daily Spray Operator Forms Reporting frequency: Daily per spray campaign	By Spray Campaign By Number of pregnant women By Number of children <5 years old	PMI	600,000	652,777[11] Pregnant Women: 17,807 Children: 127,133	700,000	694,729 M: 349,856 F: 344,873 Pregnant Women: 19,818 Children: 134,045 M: 66,258 F: 67,787	700,000	789,883 M:403,298 F:386,585 25,754 M:151,497 F:76,033
Component 3: Provide ongoing monitoring and evaluation and quality control measures											
3.1 Submit Monitoring and Evaluation Plan (MEP) to PMI-Benin	*Milestone:* (Completed/Not Completed)	Y1, Y2, Y3	Data source: Project records Reporting frequency: Semi-annual		AIRS	Completed	Completed	Completed	Completed	Completed	Completed
3.2 Submit a post-spray data quality audit report to the AIRS M&E specialist in the home office within 60-180 days of completion of spray operations	*Milestone*: (Completed/Not Completed)	Y1, Y2, Y3	Data source*:* Spray Data Quality Report Reporting frequency*:* Per spray campaign	By Spray Campaign	AIRS	Completed	Complete	N.A.	N/A	Completed	Completed
3.3 Submit a country-specific Eligible Structure Definition Document to local PMI advisors and NMCP	*Milestone:* (Completed/Not Completed)	Y1	Data source:*:* Project records Reporting frequency: Semi-annually		AIRS	Completed	Completed	N.A.	N.A.	N.A.	N.A.
3.4 Supply chain review conducted by RTT	Milestone: (Completed/Not Completed)	Y1, Y2	Data source: RTT supply chain review reports	By Spray Campaign	AIRS	Completed	Completed	N.A.	N/A	N/A	N/A

[11] Children Under Five: 127,133; Pregnant Women: 17,807

Performance Indicator	Indicator Definition	Project Year(s) Reporting	Data Source(s) and Reporting Frequency	Disaggregate	PMI/ AIRS Indicator	Annual Targets and Actuals					
						Year 1		Year 2		Year 3	
						Target	Results	Target[3]	Results	Target	Results
			Reporting frequency: Semi-annually								
Component 4: Contribute to Global IRS Policy-Setting and Country-Level Policy Development of Evidence-Based IRS; Disseminate Experiences and Best Practices											
4.1 Number of guidelines/checklists/tools related to IRS operations developed or refined with project support	Total number of implementation guidelines, process checklists and program tools related to IRS operations developed or refined using the technical and/or financial resources of the AIRS Project	Y1, Y2, Y3	Data source: Project records – Activity reports Reporting frequency: Semi-annually	By Guideline/checklist/tool	AIRS	17	17	17	17	17	21
4.2 Number of articles/best practices documents published	Total number of articles or other best-practice documents that have been published in relevant journals or through PMI/USAID communications vehicles	Y2, Y3	Data source: EOSPR Reporting frequency: Semi-annually	By Spray Campaign By IRS Technical Area	AIRS	N.A.	N.A.	TBD	1[12]	0	0
4.3 Number of best practice presentations given at national/ regional/international workshops and conferences	Total number of project-related oral and poster presentations delivered in national, regional and/or international meetings related to IRS.	Y2, Y3	Data source: Project records – Activity reports Reporting frequency: Semi-annually	By IRS Technical Area	AIRS	N.A.	N.A.	6	2	0	0

[12] PMI Annual Report 2013

Performance Indicator	Indicator Definition	Project Year(s) Reporting	Data Source(s) and Reporting Frequency	Disaggregate	PMI/ AIRS Indicator	Annual Targets and Actuals					
						Year 1		Year 2		Year 3	
						Target	Results	Target[3]	Results	Target	Results
Component 5 (Cross-cutting): Capacity Building, Knowledge Transfer, Gender Inclusion											
5.1 Capacity Building (Gender Inclusion)											
5.1.1 Number of people trained in IRS implementation	Total number of personnel trained in IRS implementation using AIRS Project resources. This figure only includes spray personnel such as spray operators, team leaders, supervisors, clinicians; it excludes data clerks, IEC mobilizers, drivers, washers, porters, pump technicians, security guards, etc.	Y1, Y2, Y3	Data source: Project records – Training reports Reporting frequency: Semi-annually	By Spray Campaign By Gender Percentage of Women Trained	PMI	760	825 M: 733 F: 92 11%	824 M: 709 F: 115 14%	804 M: 697 F: 107	1,480	1,642 M:1,399 F:243 14.8%
5.1.2 Number of people trained to deliver or support IRS in target districts[13]	Total number of people trained using AIRS Project resources to implement/support elements of IRS in target districts. This figure includes all cadre that serve a role in IRS.	Y1, Y2, Y3	Data source: Project records – Training reports Reporting frequency: Semi-annually	By Spray Campaign By Gender By Role (e.g., spray operator, storekeeper) Percentage of women trained	AIRS	1671	1750 M: 1468 F: 282 16%	1656	1543 M: 12607 F: 276 17.9%	2,383	2,487 M:2,044 F:443
5.1.3 Number of personnel trained as IRS implementation trainers	Total number of personnel trained in Training of Trainers (TOT) for IRS delivery	Y1, Y2, Y3	Data source: Project records – Training reports Reporting frequency: Semi-annually	By Spray Campaign By Gender Percentage of women trained	AIRS	75	75	85 M: 62 F: 23 27,1%	72 M: 55 F: 17 23.6%	128	148 M:111 F:37 25.0%

[13] Please see Annex B for disaggregated training targets and results.

Performance Indicator	Indicator Definition	Project Year(s) Reporting	Data Source(s) and Reporting Frequency	Disaggregate	PMI/ AIRS Indicator	Annual Targets and Actuals					
						Year 1		Year 2		Year 3	
						Target	Results	Target[3]	Results	Target	Results
5.1.4 Number of government environmental and/or health officials trained in IRS oversight	Total number of national and sub-national/district government environmental and/or health officials who are trained in oversight of IRS implementation using AIRS Project resources	Y1, Y2, Y3	Data source: Project records – Training reports Reporting frequency: Semi-annually	By Spray Campaign By Gender Percentage of Women Trained Type of government official (e.g. environmental/health)	AIRS	80 DDHU, NMCP, ABE, DDS	80 M:58 F: 22 27.5% DDHU, NMCP, ABE, DDS	92 M: 64 F: 28 30% DDHU, NMCP, ABE, DDS	71 M: 55 F: 16 22.5%	128	147 M:111 F:36 24.48%
5.1.5 AIRS conducted a capacity assessment	AIRS Benin program conducted an assessment of IRS capacity among national and sub-national/district government health officials	Y1, Y2	Data source: Project records – Capacity assessment reports Reporting frequency: Semi-annually		AIRS	N.A.	N.A.	Completed	Scheduling meeting with the NMCP	Completed	Completed
5.1.6 Number of capacity-building MOUs signed by AIRS, NMCP and partners/ institutions	Total number of Memoranda of Understanding (MOU) on provision of local capacity building finalized and signed between AIRS, the Malaria and Other Parasitic Diseases Division (MOPPD), and other local partners and institutions	Y1, Y2, Y3	Data source: Project records – MOUs Reporting frequency: Semi-annually	By Spray Campaign	AIRS	N.A.	N.A.	N.A.	N/A	1	1