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PMI | Africa IRS (AIRS) Project

Indoor Residual Spraying (IRS 2) Task Order Six

2017 BENIN
END OF SPRAY REPORT

SPRAY DATES: MAY 03 – 27 AND MAY 15 – JUNE 8, 2017

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2017 AIRS BENIN
END OF SPRAY REPORT

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ACRONYMS

ABE	Benin Environmental Agency (*Agence Béninoise pour l'Environnement*)
ABMS	Beninese Association of Social Marketing *(Association Béninoise du Marketing Social)*
AIRS	Africa Indoor Residual Spraying
BMP	Best Management Practices
CDC-HAB	Department Coordination for Hygiene and basic sanitation *(Coordination Départementale Composante Hygiène et Assainissement de Base)*
COP	Chief of Party
CREC	Entomological Research Center of Cotonou *(Centre de Recherche Entomologique de Cotonou)*
CS	Capsule Suspension
DAGRI	National Directorate of Agriculture *(Direction de l'Agriculture)*
DCAM	Community Development and Environmental Sanitation (*Développement Communautaire et Assainissement du Milieu*)
DCV	Data Collection Verification
DDCVDD	Department Directorate of Living Environment and Sustainable Development (*Direction Départementale du Cadre de Vie et du Développement Durable)*
DDEGCC-AD	Department Directorate of Environment and Climate Change Management - Atacora-Donga (*Direction Départementale de l'Environnement et de la Gestion des Changements Climatiques - Atacora-Donga*)
DDEHU	Department Directorate for the Environment, Habitat and Urbanism (*Direction Départementale de l'Environnement, de l'Habitat et de l'Urbanisme*)
DDS	Health Department Directorate (*Direction Départementale de la Santé*)
DEC	Data Entry Clerk
DHAB	National Directorate of Hygiene (*Direction de l'Hygiène et de l'Assainissement de Base*)
DOS	Directly Observed Spraying
ECO	Environmental Compliance Officer
EE	Error Eliminator
GoB	Government of Benin
ICC	Inventory Control Card
IEC	Information, Education, and Communication

IRS	Indoor Residual Spraying
LLIN	Long-Lasting Insecticide Net
MAEP	Ministry of Agriculture, Livestock and Fishing (*Ministère de l'Agriculture, de l'Elevage et de la Pêche*)
M&E	Monitoring and Evaluation
mHealth	Mobile Health
MOH	Ministry of Health
NGO	Non-Governmental Organization
NMCP	National Malaria Control Program (*Programme National de Lutte Contre le Paludisme*)
PMI	President's Malaria Initiative
PPE	Personal Protective Equipment
PSECA	Pre-Spray Environmental Compliance Assessment
SEA	Supplemental Environment Assessment
SHAB	Community Hygiene and Sanitation Service (*Service de l'Hygiène et de l'Assainissement de Base*)
SMS	Short Message Service
SOP	Spray Operator
STTA	Short-Term Technical Assistance
ToT	Training of Trainers
USAID	United States Agency for International Development

EXECUTIVE SUMMARY

This End of Spray Report details the planning, implementation, and outcomes of the 2017 Indoor Residual Spraying (IRS) campaign in northern Benin's Departments of Atacora, Donga and Alibori. The intervention area was divided into two zones with the following respective municipalities: Zone 1 (Pehunco, Kerou, Djougou, Ouaké and Copargo), and Zone 2 (Kandi, Gogounou and Segbana). Spraying began in Zone 1 on May 3, 2017 and ended on May 27, 2017, and began in Zone 2 on May 15, 2017 and ended on June 8, 2017. In both zones, the campaign was conducted in collaboration with the National Malaria Control Program (NMCP) and completed in 22 days as planned. After six years of IRS implementation in the 9 communes of the department of Atacora, the Ministry of Health made the decision to transition IRS activities to two new departments (Alibori and Donga) where the level of malaria transmission was still relatively high. In addition to the new departments of Alibori and Donga, 2 (Kerou and Pehunco) out of the 9 communes of Atacora were maintained as they received fewer spray rounds compared to the other 7 communes.

In 2017, Africa Indoor Residual Spraying (AIRS) Benin was among the AIRS countries that benefited from the NgenIRS support in the procurement of insecticide. Through this support, AIRS Benin procured Actellic 300CS insecticide at a co-payment price of $15 per insecticide bottle instead of the market price of $23.50 per bottle. This insecticide co-payment made it possible to reach and protect 43% more people in 2017 compared to the 2016 spray campaign. The 2016 campaign sprayed 269,179 structures and protected a total of 858,113 people in nine communes while the 2017 spray campaign sprayed 384,761 structures and protected a total of 1,227,536 people in eight communes. This included six new communes (Djougou, Ouaké, Copargo, Kandi, Gogounou and Segbana) and two former IRS communes (Pehunco and Kerou). The eight municipalities extended over three departments, Atacora (Pehunco and Kerou), Donga (Djougou, Ouaké, and Copargo) and Alibori (Kandi, Gogounou, and Segbana). As in 2016, organophosphates, specifically the pirimiphos-methyl capsule suspension (CS), were used for the 2017 IRS campaign.

The main tasks for AIRS Benin during the spraying campaign were to:

- Provide strategic, technical, management, and operational support for IRS activities in the eight communes of the three departments.
- Build local capacity of the NMCP by assigning two spray communes (Copargo and Gogonou) under the full supervision of NMCP staff, while providing them with technical assistance from the AIRS team as necessary.
- Cover at least 85% of the targeted 443,044 structures with residual insecticide in the eight communes.
- Protect pregnant women and children under five years of age against malaria within the eight communes.

In total, AIRS Benin sprayed 384,761 out of a total of 419,785 eligible structures found, resulting in a 91.7% coverage rate.

Specific activities led by AIRS Benin during the 2017 IRS campaign were:

- Procuring IRS operational equipment as needed.
- Providing financial support for IRS management and operations.

- Providing planning, operational, technical, and supervisory support for IRS.
- Collecting, analyzing and disseminating information for tracking progress against IRS core indicators and for decision-making purposes.
- Enhancing and expanding the use of mobile phones to collect real-time data/information in the field in relations to regular monitoring/supervision and data collection, which allowed the team to record the spray teams' performance on a daily basis. .

Contracted directly by PMI/Benin, the Entomological Research Center of Cotonou (CREC) collected entomological surveillance data to evaluate the quality and effectiveness of the 2017 IRS campaign. CREC found that the quality of IRS was high in the baseline test of 40 structures performed on May 15 and 16, 2017 with 100% mortality rate for 600 mosquitoes coming into contact with sprayed walls. This test was carried out only in zone 1 (Djougou and Copargo).

AIRS Benin implemented the 2017 IRS campaign in close collaboration with PMI/Benin and with several Beninese governmental partners, notably: the NMCP; Ministry of Health (MOH); Ministry of Agriculture, Livestock and Fisheries (MAEP); Ministry of Environment, Beninese Environmental Agency; National Directorate of Agriculture; National Directorate of Hygiene; Department of Administrative Authorities of Atacora, Donga and Alibori; and the Department Directorate of Health for Atacora, Donga, and Alibori.

NMCP as the primary partner was involved in all of the main activities including: development of the operational plan, macro and microplanning meetings, seasonal staff recruitment and training, and environmental compliance assessment.

This report summarizes the activities, achievements, lessons learned, and recommendations during this round and informs future IRS programs.

TABLE 1: SUMMARY OF 2017 IRS CAMPAIGN RESULTS

Number of communes covered by the PMI-supported IRS campaign	8 communes: Djougou, Ouake, Copargo, Kerou, Péhunco, Kandi, Gogounou and Segbana in 3 Departments (Atacora, Donga and Alibori)
Insecticide	Organophosphate: Pirimiphos-methyl CS
Number of structures sprayed by PMI-supported IRS	384,761
Number of structures found by PMI-supported IRS	419,785
2017 PMI-supported IRS campaign spray coverage	91.7%
Population protected by 2017 IRS campaign - Pregnant women - Children under five years	1,227,536 46,169 (3,8% of total protected population) 234,984 (19,1% of total protected population)
Dates of PMI-supported IRS campaign	May 3 – May 27, 2017 (Zone 1) May 15 – June 8, 2017 (Zone 2)
Length of campaign	22 days per Zone
Number of people trained with US Government funds to deliver IRS	3,814 (female = 728, 19.1%)

Key lessons from the 2017 IRS campaign were as follows:

- The involvement of political, religious and opinion leaders, in addition to the local media, made it possible to address cases of refusal and increase the coverage of IRS.
- In areas where there is heavy pesticide use for agricultural purposes, the tendency to steal insecticide was higher since operators were exposed to solicitation from farmers. Specific actions for the control and monitoring of insecticide should be identified and strengthened.
- In remote villages that were not close to the operational sites, such as within the Alibori department, mobile soak pits were of great help in addressing logistical challenges.
- The transition to a new IRS area posed challenges in estimating needs. 28,615 bottles of insecticide remained after the 2017 IRS campaign because the quantity of insecticide procured was based on last year's average number of structures sprayed per insecticide bottle. However, structures in the new spray areas of Donga and Alibori were much smaller than those sprayed last year in Atacora.

1. INTRODUCTION

The 2017 IRS was conducted in response to the resolutions of an inter-sectoral consensus workshop on IRS in Benin held on October 1- 2, 2015. The campaign covered eight communes, six of which were new to AIRS Benin and two former IRS communes (Pehunco and Kerou). These communes are located in three departments: Atacora (Pehunco and Kerou), Donga (Djougou, Ouaké and Copargo), and Alibori (Kandi, Gogounou and Segbana). A total of 1,227,536 people were protected compared to 858,113 people in the 2016 spray campaign, for an increase of 43%. The insecticide co-payment provided by UNITAID/ NgenIRS that decreased the cost of insecticide from $23.50 per bottle to $15 per bottle played a role in the expansion of spray coverage.

The overall goal of AIRS Benin was to continue to reduce malaria transmission in Benin via IRS, and thus contribute to the reduction of malaria-associated morbidity and mortality in the three departments of the intervention zones. The target number of structures to be sprayed was an estimated 443, 044 based on the enumeration of structures conducted in 2016. AIRS Benin continued to use organophosphates (OP), specifically pirimiphos-methyl CS, as it remains effective against wild mosquito strains in the intervention area.

AIRS Benin implemented the 2017 IRS campaign from May 3 to 27, 2017 in Zone 1 (Pehunco, Kerou, Djougou, Ouaké and Copargo), and from May 15 to June 8, 2017 in Zone 2 (Kandi, Gogounou and Segbana), with 22 operational days in each zone.

As in previous years, AIRS Benin implemented the 2017 IRS campaign in close collaboration with PMI/Benin and several government agencies, most notably the MOH/NMCP, the 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, DAGRI continued to be a valuable IRS partner through their direct implementation of entomological monitoring activities funded by PMI.

The primary partner, NMCP, was involved in all main activities including: development of the operational plan, macro- and microplanning meetings, recruitment and training of seasonal staff, and environmental compliance assessment. Moreover, the NMCP coordinated IRS implementation, monitoring and data collection in two communes: Copargo and Gogounou.

This report describes the planning, implementation, and monitoring of the IRS campaign operations in 2017. The report also provides the results for the key indicators that AIRS Benin is required to report to PMI, as well as the preliminary entomological surveillance findings from CREC. The report highlights the use of mobile phone application to send messages to spray operator (SOPs), and to collect IRS data from operation sites and environmental compliance information on daily basis.

2. COUNTRY BACKGROUND

Benin is among the 17 countries that receive funding under the PMI AIRS project. PMI has been supporting Benin's National Program for Malaria Control (PNLP) since 2008. The program started in the department of Ouémé-Plateau then shifted northward to the Department of Atacora in 2011. In 2017, the PMI-funded IRS campaign was performed in Northern Benin's Departments of Atacora, Donga and Alibori. See Figure 1 for the location of the operational sites used to support the 2017 IRS campaign. Table 2 contains population estimates for the targeted communes in the three departments. For both communes of Atacora, the projection data of the census made in 2013 (INSAE, RGPH4 2015) was used; while for the communes of Alibori and Donga, the project carried out its own enumeration.

FIGURE 1: OPERATIONAL SITES FOR INDOOR RESIDUAL SPRAYING FOR MALARIA PREVENTION IN BENIN

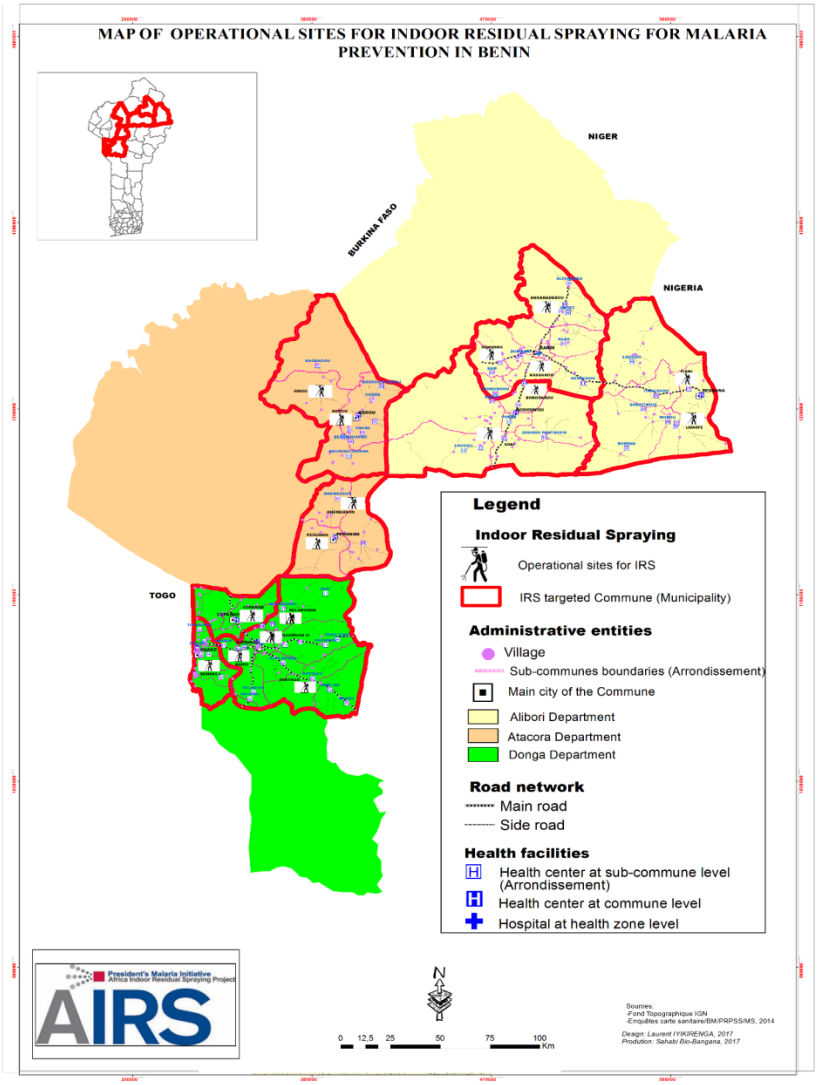


TABLE 2: ESTIMATED POPULATION IN TARGETED COMMUNES OF ATACORA, DONGA AND ALIBORI DEPARTMENTS.

Department	Communes	Population from 2013 Census*	Population from 2016 Enumeration**	Area (km²)
Atacora	Kérou	100,197	149,929	3,796
	Péhunco	78,217	115,601	1,932
Donga	Copargo	70,938	64,376	868
	Djougou	267,812	357,410	3,928
	Ouaké	74,289	72,642	741
Alibori	Gogounou	117,523	160,370	4,937
	Kandi	179,290	234,000	3,591
	Ségbana	89,081	106,171	4,359
Total		**977,347**	**1,260,499**	**24,152**

**INSAE, 2015- RGPH4: Que retenir des effectifs de population en 2013, Ministère du développement, de l'analyse économique et de la prospective, Benin /What to Retain about Population in 2013, Ministry of Development, Economic Analysis and Prospective, Benin.*

***Rapport du recensement des ménages et de leurs structures eligibles pour la pulvérisation intra domiciliaire d'insecticide, janvier 2017 (Internal report, AIRS2-Benin) /Census Report of Households and Their Eligible structures for Indoor Residual Spraying of Insecticide, January 2017 (Internal report, AIRS2-Benin)*

2.1 Objectives for 2017 Spray Campaign

As stated in the 2017 AIRS Benin work plan, the three objectives of AIRS Benin for 2017 were to:

1. Cover at least 85% of eligible structures found in all eight communes of Atacora, Donga and Alibori Departments.
2. Increase national and local capacity in planning, implementing and supervising IRS, including: conducting morning mobilizations, supervision of teams in the field, verification of IRS form completion, organizing daily debriefings, organizing logistics, supervising data entry, and preparing the IRS report. This also included reinforcing familiarity with the use of smartphone technology during spraying and environmental compliance supervision with a goal of planning for sustainability.
3. Implement cost efficient activities through strong oversight and accurate management to save funds.

Given these objectives, AIRS Benin aimed to cover an estimated 443,044 structures in the eight targeted communes of Atacora, Donga, and Alibori departments, and to protect as many of the estimated 1,260,499 people living there as possible.

To achieve these objectives, AIRS worked with several partners including:

- NMCP, whose activities included: 1) validation of IRS management tools, including IEC tools, Data collection & verification forms, report forms, checklists, etc.; 2) support with planning the IRS campaign; 3) training of information, education, and communication (IEC) mobilizers and SOPs; 4) supervision during the IRS campaign; and 5) support with validating data collected.

- The Beninese Association of Social Marketing (ABMS), who supported IEC activities designed to increase the population's comprehension of IRS and compliance.

3. PREPARATION FOR THE 2017 IRS CAMPAIGN

3.1 IRS CAMPAIGN PLANNING

Table 3 summarizes the activities that were undertaken to plan for and organize the 2017 IRS campaign.

TABLE 3: IRS ACTIVITIES PLANNING

Dates	Activities	Participants or Stakeholders	Comments
December 2016-January 2017	Finalize development of 2017 AIRS Benin work plan	AIRS Benin and AIRS Home Office	Meetings were held with NMCP on specific aspects of the 2017 IRS campaign, especially in the context of withdrawal of the AIRS Project from Atacora, socio-cultural realities of the new target areas, and lessons learned from 2016. Guidance was provided by PMI/Benin and PMI/Washington, leading to a final approved work plan on January 2017.
February-May, 2017	IRS Campaign Planning and Assistance to NMCP for the development of a contingency plan for withdrawing IRS in Atacora	AIRS Benin, NMCP, DDS Atacora, Donga and Alibori, Technical working group (vector control), 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. Several meetings were held with NMCP, PMI and other stakeholders to review the draft contingency plan.
March 13-17, 2017	Mini boot-camp training/orientation for AIRS-Benin staff	14 AIRS-Benin staff, two representatives from NMCP, and one from each new IRS department of Alibori and Donga	The PMI AIRS Operations Director conducted a five-day training on planning, supervision, and monitoring of the 2017 spray campaign.
March 21-24, 2017	Information and advocacy mission to the political, administrative and health authorities on IRS	NMCP, CREC and AIRS Benin	Political, administrative and health authorities of Atacora and two new target departments (Donga and Alibori) were informed about the rationale for withdrawing IRS from Atacora. Their support and commitment to the project's success in their respective departments were also requested.
March 30-April 1, 2017	IRS micro plan development – presentation of the 2017 IRS campaign in new IRS areas, including milestones and	NMCP, DDS Atacora, Donga, Alibori, USAID/PMI, ABMS/PSI and AIRS2 Benin	During a workshop held in Bohicon, stakeholders updated micro-plans based on last year's plans and shared responsibilities for implementation of the 2017 IRS. IRS leadership in two municipalities / Communes (Copargo and Gogounou) was assigned to the NMCP to strengthen their capacity.

	expected outcomes		
April 22, 2017	Advocacy and awareness raising for local authorities on IRS implementation	DDS Atacora, Donga and Alibori staff, commune medical doctors, health zone coordinators, three prefects or their representative, eight mayors, district chiefs, religious leaders, and other halth system partners	The objectives of the meetings were to: • Discuss stakeholder roles in the IRS campaign; • Reinforce participants' knowledge about and communication capacity for IRS; • Draw up an action plan for authorities to support social mobilization; • Gain endorsment by the eight commune mayors, DDS, commune medical doctors, and health zone coordinators to conduct IRS; and • Share the overall campaign plan and methodology with local authorities.

The NMCP provided leadership in the two communes of Copargo (Department of Donga) and Gogounou (Department of Alibori). This leadership involved recruiting seasonal staff, overseeing IRS implementation, collecting, monitoring and evaluating data under the mentorship of project's technical staff and in compliance with IRS guidelines.

3.2 Improvements and Initiatives for Efficient IRS Operations and Monitoring

Master training

With a view to strengthen local capacity in the training of seasonal staff, a master training was initiated and aimed in particular at forming a pool of trainers on the different aspects of the implementation of the spray. These trainees should be able to train in turn other trainers. This approach also makes it possible to decentralize training activities over time.

Supporting staff

To face the challenge of the small number of project technical staff in relation to the scope of work in the new intervention areas, the project added assistants to some key jobs functions. A total of 27 assistants supported the implementation of the 2017 IRS, specifically: 4 Environmental Assistants, 4 M&E Assistants, 5 Financial Assistants, 3 Logistic Assistants and 11 IEC Assistants.

IRS duration

Taking into account the experience of the past years, the duration of the intervention was increased from 20 to 22 days. This time was more adequate to cover the entire intervention areas and perform the mop up of unsprayed households during the initial passage of operators.

Launching of IRS campaign on two different dates

In 2016, the spray campaign was launched the same day in all communes of the Atacora department. However, with the addition of 2 new departments to Atacora in 2017, the campaign was launched on two different dates in order to manage all logistical aspects effectively in all 3 departments in 2017; thus, the intervention area was divided into two zones with the following respective municipalities: Zone 1 (Pehunco, Kerou, Djougou, Ouaké and Copargo) andZone 2 (Kandi, Gogounou and Segbana). Spraying began in Zone 1 on May 3, 2017 and ended on May 27, 2017; and in zone 2 on May 15, 2017 and ended on June 8, 2017. In both zones, the campaign had a duration of 22 days as planned.

Use of mobile soak pit in remote villages

Considering the difficulty in reaching some remote villages by road and the fact that habitats were scattered in the commune of Gogounou (Alibori department), AIRS Benin introduced the use of mobile soak pit during the 2017IRS campaign to allow the spray teams to perform the end of day cleanup close to the areas they sprayed.

3.3 Insecticide Selection

In 2016, CREC conducted resistance testing in the communes targeted for the 2017 IRS campaign. As a result, organophosphate was selected again as susceptibility remained above 98%. CREC noted that pirimiphos-methyl CS formulation was effective on both susceptible and wild strains of *An. gambiae* s.s (the main malaria vector), as well as on cement and mud walls. NMCP therefore complied with CREC's recommendation to use pirimiphos-methyl CS during the 2017 IRS campaign.

3.4 Logistics Planning and Procurement

3.4.1 Personal Protective Equipment and Insecticide Procurement for the 2017 IRS Campaign

In February 2017, AIRS Benin reviewed the inventory list of its IRS equipment that was being stored at the central warehouse in Natitingou. Most of the personal protective equipment (PPE) and spray pumps used during the 2016 IRS campaign were in an acceptable condition and available for use in 2017. AIRS Benin identified damaged or non-reusable PPE and developed a list of equipment to procure locally and internationally. A full list of PPE procured for the 2017 IRS campaign is included in Table 20 (Annex A).

The inventory count revealed that 7,424 bottles of pirimiphos-methyl CS were in stock at the end of the 2016 spray campaign. This quantity was deducted from the 2017 spray campaign insecticide usage forecast of 88,609 bottles. The project procured a total of 79,968 bottles of pirimiphos-methyl CS. The organophosphate shipment arrived in Benin on April 7, 2017.

AIRS Benin also received quality control test results via SYNGENTA laboratories (see Annex B) for the batches of organophosphates shipped to Benin. The results showed that all batches were of good quality and ready for use during this campaign.

3.4.2 Planning Logistics and Transportation for the 2017 IRS Campaign

A needs assessment workshop for the 2017 IRS campaign was organized in October 2016 with the Integrated Vector Control Consortium (IVCC) / New Generation IRS (NGenIRS) project, NMCP and PMI/Benin. Several field visits were conducted between December 2016 and February 2017 with AIRS, NMCP and interested DDS staff. During these visits, meetings were held with local authorities for geographical reconnaissance.

In order to achieve greater than 85% spray coverage in the 22 days planned for the 2017 IRS campaign, the intervention areas were subdivided into fixed operational sites that take into account the administrative subdivision (villages, arrondissements and communes), the number of structures to be treated, the number of days planned for the campaign, spray operators per site and the existence of a building that can be used to store insecticides and other IRS equipment. The site should also meet environmental safety standards outlined in the USAID BMP manual for IRS updated in July 2010 (insecticide warehouse located more than 30 meters of crops, animal pens, hives bees, dwellings or public buildings such as schools, and away from groundwater or surface water areas).

An operational site is serviced by the establishment of the following infrastructures: a soak pit with filter layers to collect and treat effluents from the washing of the equipment used during the IRS operations, a rinsing area, toilets, showers and locker rooms for men and women, water storage tanks, danger signs and orientation posters. Ideally, an operational site serves about 10 teams, with each team comprising of 5 SOPs and 1 leader per team.

For a need of 31 operational sites according to the standards described above, the project was able to install only 17 fixed operational sites due to an insufficiency of infrastructures meeting standards described above in the new IRS zone; which resulted in a plethora of SOPs in most of the operational sites with a number of SOPs ranging from 31 to 134 depending on the location. To mitigate the potential risks of this congestion on the environment and on the safety of SOPs, rinsing areas, soak pits and toilets were duplicated on sites serving over 70 SOPs. On each site, a number of SOP transport vehicles were allocated at a rate of one vehicle per 10 SOPs, i.e. two teams, for their transport from the operational site to the workplace and their repatriation to the site for the end of day clean up.

3.4.3 Distribution of PPE to Operations Sites

AIRS Benin started distributing PPE and insecticide to all17 operations sites two weeks before the IRS campaign began. In Zone 1(Atacora and Donga), this activity was conducted from April 18-29, 2017 and in Zone 2 (Alibori), from May 5-11, 2017.

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

TABLE 4: DISTRIBUTION OF KEY PPE TO OPERATIONS SITES

Operation Sites	Overalls	Pairs of Boots	Helmets	Pumps	
				X- Pert	Goizper
Donga department					
Djougou commune					
Djougou III	360	180	180		147
Barei	406	203	203		166
Partago	350	175	175		143
Kolokonde	360	180	180		147
Copargo Commune					
Copargo	286	143	143		117
Ouaké Commune					
Semere	334	167	167		137
Atacora Department					
Pehunco commune					
Ouassa Pehunco	314	157	157	129	
Gnemasson	94	47	47	42	
Kérou commune					
Firou	154	77	77	66	
Kérou	326	163	163	134	

Alibori department					
Kandi Commune					
Kassakou	254	127	127		104
Angaradebou	240	120	120	60	40
Sonsoro	310	155	155	127	
Gogounou commune					
Sori	338	169	169		140
Borodarou	208	104	104		87
Segbana Commune					
Piami	256	128	128		106
Libante	144	72	72		61
Total	**4,734**	**2,367**	**2,367**	**558**	**1,395**

3.5 HUMAN RESOURCES

3.5.1 RECRUITMENT OF IRS CAMPAIGN SEASONAL STAFF

The implementation of the IRS operations requires a variety of staff, Including Support and Administrative.

The number of spray operators was estimated by dividing the number of structures to be sprayed by the average estimated structures per day per spray operator by the proposed period of spraying. Their recruitment was conducted under the health system jurisdiction at the peripheral level on the basis of criteria developed by AIRS project in collaboration with the NMCP. Selection of spray operators took into account the following criteria:

- Age- legal age for employment in Benin (at least 18 years old)
- Level of education - completion of the primary level of education or higher
- Literacy / numeracy- Ability to read, write, and count
- Able to communicate with residents
- Pregnancy status for females SOPs- To not be pregnant or breastfeeding (pregnancy tests were conducted during medical checkup)
- Physical fitness to operate the spray pump
- Allergy- Not allergic to insecticides and no chronic health conditions (i.e. respiratory problems)
- Level of motivation- Strong interest in IRS and capable of working under minimal supervision

The duties of spray operators were consistent with the WHO and USAID guidelines on IRS operations and consisted of:

Morning preparation

- Go to the assembly point at 05:00 am at the latest ;
- Take meals provided by the project with peers (Meal-taking is prohibited in the field)
- Wear personal protection equipment and take the required material (pump, insecticide, forms, etc.) and assume complete care and responsibility for all the equipment taken

- Knowing the village to be sprayed and the daily objective to be reached
- Board the vehicle assigned to his/her team and depart for the field

During the working time

- Ensure that dwellings are prepared according to instructions received
- Obtain authorization from the head of the household or his representative before entering the dwellings;
- Be courteous and respectful to the household members and their property
- Explain the purpose of spraying and the precautions being taken as well as answering any questions asked by household residents;
- Prepare the product mix in the pump: 1liter of product + 6.5 liters of water
- Assist the household members, if necessary, to move furniture and other belongings
- Spray all eligible structures following the program's procedures, protocols and guidelines, and be accountable for all insecticide sachets received;
- Fill out the data collection form, including information on considered locality, date of spraying, product used, name of head of household, structures ID, number of protected persons disaggregated by sex, age category (less than five years and more than five years) and by status of women in relation to pregnancy status; number of sleeping units, number of people sleeping under mosquito nets with a specification of children under five years old and pregnant women.
- Remind residents of precautions to be taken after spraying
- Thank household residents for their cooperation and address any concerns upon completing the spraying
- Report any problem to his/her team leader as soon as they arise;
- Depressurize the pumps before boarding the vehicle to return back to the site
- Protect him / herself and the environment from insecticide contamination

Back to the site

- Proceed with progressive rinsing of spray pump
- Rinse helmet, boot and gloves
- Keep clean and in good working order spray pump, personal protection equipment and other tools received;
- Return the completed forms and remaining products (insecticide) to the team leader at the end of the day
- Take a full shower with soap before going home

The number of other seasonal staff categories such as team leaders, supervisors, and site coordinators were estimated on the basis of the size of the spray teams, number of teams in an operational site, and number of operational sites in the commune. A spray team consisted of five operators with one team leader. A supervisor supported 2 spray teams and worked from one operational site.

Duties of team leaders and supervisors included:

- Assist in the training of spray operators and guide them in the proper completion of their duties.
- Keep all spray personnel up-to-date and informed as to their progress and that of the campaign;

- Continuously and routinely check their team members to make sure their equipment is kept clean and in working condition;
- Carry out or supervise minor field repairs to spray pumps and personal protection equipment;
- Supervise his/her spray team members during spraying operations and ensure their work is carried out according to instructions and following established protocols and procedures;
- Conduct sporadic checks on application equipment and nozzles so that appropriate discharge and application rates are maintained;
- Ensure that team members have adequate supplies of insecticide, record cards, replacement PPE, etc;
- Ensure that zone maps are always available (or produced) and are updated as team members progress from village to village;
- Ensure homeowners and residents are notified of spray operations at least a day in advance;
- Contact the village leaders as soon as his/her spray squad enters the village;
- Make appropriate corrections on method or technique not executed correctly by any of his/her team members;
- Verify that spraying has been conducted according to the established plan upon completion of the spray day;
- Ensure all data recorded by team members is correct and accurate and rectify any deficiencies noted;
- Prepare daily progress reports accurately at the completion of daily spraying;
- Supervise the cleaning of application equipment at the end of the spray day;
- Report to the supervisor the progress of the squad and include remarks on the work of each spray operator;
- Carry out any other instructions given by his/her superior or any other senior program officer;
- Ensure each team member in his/her team maintains a professional image and conducts him / herself with cultural sensitivity.

The project selected and hired site coordinators in consultation with the NMCP. Site coordinators plan IRS activities jointly with their respective government counterparts and local leaders at the sub-commune level (Arrondissement) in compliance with the intervention planning.

During recruitment, gender balance was considered and a great effort was made to recruit as many women as possible. Priority was given to Community Health workers.

In addition to the seasonal staff listed above, AIRS Benin hired additional seasonal support staff to assist with the following: logistics, M&E, IEC, environmental compliance, and finance. This recruitment was prompted by the increased geographical reach of the new area of intervention in 2017.

3.5.2 Number of Seasonal Staff Hired

AIRS Benin hired 3,789 seasonal staff to implement the 2017 campaign, which included 3,056 men (80.7%) and 733 women (19.3%). Table 6 provides a breakdown of the number of seasonal staff hired per category.

TABLE 5: SEASONAL STAFF HIRED FOR THE 2017 IRS CAMPAIGN PER CATEGORY

Seasonal staff	Total Seasonal Staff Hired	Male	Female	Proportion of Women
Temporary project supporting staff				
Environmental Compliance Officer assistants	4	1	3	75.0%
M&E assistants	4	4	0	0.0%
IEC assistants	10	7	3	30.0%
Finance assistants	5	5	0	0.0%
Logistics Assistant	4	4	0	0.0%
Data clerks	53	37	16	30.2%
Security guards	38	38	0	0.0%
Subtotal 1	***118***	***96***	***22***	*18.6 %*
Supervisory staff				
Site Coordinators	15	14	1	6.7%
Team Leaders	315	254	61	19.4%
Supervisors (Community Agents)	154	127	27	17.5%
Subtotal 2	***484***	***395***	***89***	*18.4 %*
Technical staff				
Pump technicians	155	131	24	15.5%
Washers	155	0	155	100.0%
Storekeepers	31	24	7	22.6%
SOPs	1,572	1,415	157	10.0%
Subtotal 3	***1,913***	***1,570***	***343***	*17.9 %*
IEC staff				
IEC Mobilizers	1,195	942	253	21.2%
IEC Mobilizer Team Leaders	79	53	26	32.9%
Subtotal 4	**1,274**	**995**	**279**	21,9%
Total number of seasonal staff hired for the 2017 IRS campaign	**3,789**	**3,056**	**733**	**19.3%**

AIRS Benin continued to maintain the overall participation of women in the IRS campaign. In 2017, 733 women were hired (19.3%) compared to 543 hired in 2016 (19.2%). The status quo was maintained after a lengthy process of advocacy and persuasion in close collaboration with men to break social stereotypes about women's abilities to contribute to IRS and to create a more welcoming work environment for women.

3.6 TRAINING

The training was undertaken in three phases. Detailed training activities are described below. In brief, the first phase, master training, was conducted from April 11-15, 2017 in Djougou (Donga). It involved training the cadres of personnel (Site Coordinators and Assistants) for all three departments (Atacora, Alibori and Donga) on the critical aspects of IRS operations planning, implementation and management, particularly the use of M&E tools.

Phase two consisted of a Training of Trainers (ToT) for operations and mobilization activities at the departmental level and was attended by IEC and Operations supervisors. This was organized for Zone 1 in Djougou (Donga department) between April 17-21, 2017 and Zone 2 in Kandi (Alibori department) between May 1-5, 2017. During this phase, appointed physicians and nurses from the intervention areas were also trained in the management of insecticide side effects.

Phase three consisted of cascade trainings for SOPs, Team Leaders and other support staff (pump technicians, washer agents, security guards, drivers and store keepers). These trainings were conducted closer to the campaign start date of May 3, 2017 in Zone 1 and May 15, 2017 in Zone 2 so that training concepts and skills remained fresh at the start of the campaign.

A total of 45 training sessions in 3 departments: 1 global (Master training, 3 Training of Trainers (TOT), 41other IRS staff trainings) were organized for all seasonal staff to ensure that everyone was aware of their roles during the IRS campaign. Additionally, the training sessions covered the precautionary measures to be taken when working with insecticides and provided guidance in case of an inadvertent accident or inappropriate use of insecticide. All trainings emphasized the contribution of the staff's work in preventing malaria transmission, and recalled the harassment prohibition policy.

Training sessions were conducted by AIRS Benin staff and government counterparts, including staff from NMCP, DDS, Community Hygiene and Sanitation Service (SHAB), and Departmental Directorate of Living Environment and Sustainable Development (DDCVDD). Staff from CREC and local firefighter units also helped in leading some specific training sessions.

A total of 4, 4,143 people – of whom 3,350 (80.9%) were men and 793 were women (19.1%) – attended the trainings. Only SOPs and Team Leaders who received a high score on the post-training test were hired. Table 6 shows the number of people trained by institution and category.

TABLE 6: NUMBER OF PEOPLE TRAINED BY INSTITUTION AND CATEGORY

Categories of Institutions/ Individuals Trained	Number of People Trained for the 2017 IRS Campaign	
	M	F
Temporary project supporting staff		
Logistics assistants	3	0
Finance Assistants	5	0
IEC assistants	8	3
Environmental Compliance Officer assistants	1	3
M&E assistants	4	0
Data clerks	43	14

Subtotal	***64***	***20***
Staff from Central & Local Government		
CREC	1	0
DDS	3	0
SHAB Regional	2	0
NMCP regional	2	0
Commune chief doctors/other doctors	8	3
Hygiene agents /others supervisors	144	35
Chiefs of health post / midwife (have served as IEC Mobilizer Team Leaders)	51	28
Subtotal	***211***	***66***
Supervisory staff		
Site Coordinators, total Government Site Coordinators Non-Governmental Site Coordinators	 2 12	 0 1
Subtotal	***14***	***1***
Technical staff		
SOPs	1,457	170
Team leaders	254	63
Storekeepers	25	6
Pump technicians	139	26
Washers	0	155
Drivers	246	0
Guards	32	0
Subtotal	***2,153***	***420***
IEC staff		
IEC mobilizers	908	286
Subtotal	***908***	***286***
TOTAL Male / Female	**3,350**	**793**
GRAND TOTAL / trainings		**4,143**

3.6.1 Training Activities

Master Training

This training was the first of its kind, with a goal to have a pool of trainers able to organize ToTs. Targeted participants were: Site Coordinators, M&E assistants, Environmental Compliance Officer (ECO) assistants, and representatives from AIRS Benin's partners and government. During the five-day training, 26 participants were trained on malaria vector control options, including IRS, its planning, implementation and leadership in IRS management. They also acquired knowledge in the use of spray pumps (Goizper® and Hudson® brands) and spray techniques. This training was completed three weeks before the campaign.

Training of Trainers

During this training, 179 hygiene and sanitation officers, commune chief doctors, and other seasonal staff selected by local government leaders were trained on: spray techniques, filling out data collection forms, environmental compliance, and providing IEC messages through an interpersonal communication approach. The participants were also trained on gender integration and sexual harassment awareness. Only participants who successfully completed the post-test (at least 80%) were selected to train SOPs in the 17 operational sites the week before the IRS campaign.

IEC training

1,194 people were trained as community mobilizers by the chiefs of health facilities / midwife (IEC Team Leaders) previously trained during TOTs sessions together with IEC assistants. These trainings that took place in almost all health centers of the 8 IRS targeted communes provided knowledge and skills to participants on how to raise awareness on IRS, facilitate community mobilization, ensure acceptance of IRS, and encourage participation in IRS operations at household level. The following aspects were specifically addressed: interpersonal communication techniques, house preparation before IRS, structures marking, IRS cards filling and distribution, and data collection. Public criers were not trained as such but received orientation sessions with local political and health officials on IEC messages to be provided prior to the passage of SOPs in villages.

SOP Training

This training was much more focused on the practice of IRS and the safety of SOPs, beneficiaries, and the environment during spraying. SOPs also received training on their dealings with community members and households. They were requested to demonstrate respect for the property and people in whose homes they were allowed to enter, since inappropriate behavior could negatively affect the success of field operations. Special emphasis was placed on the project's gender approach and prevention of sexual harassment to enable participants to better understand these concepts and shed light on perceptions about women equality issues, inclusion and empowerment in participating in IRS-related roles. The trainings included a day and a half classroom session on spray techniques, gaining familiarity with PPE, filling data forms, and protocols for conducting spray operations. The training also included three and a half days for practicing the spray technique using water on the walls in training sites and the use of control flow valves.

In addition, the training focused on the new quality assurance approaches in Benin: mHealth system, spray quality verification, and daily health checklist. For all SOP training sessions, a pre-test and post-test was administered. SOPs who scored the highest on the post-test were selected to become Team Leaders for each spray team. SOPs also learned procedures for mixing the insecticide and cleaning their bottles, as well as precautions for spraying with organophosphate insecticide. Theoretical and practical training on the maintenance of spray pumps, in particular the end-of-day cleaning, was an important aspect of the training. SOPs were also trained to read short message service (SMS) reminders and react accordingly.

Team Leader Training

The training of Team Leaders emphasized their responsibilities in the quality of operations and spraying data. For this purpose, the training focused on improving their skills and abilities in supervision, control of the quality of spraying and verification of primary data. Some leadership fundamentals were discussed during this training. The AIRS Team Leader training curriculum was used. New Team Leader tools (e.g. DOS form and daily health checks) were reviewed and practical exercises undertaken.

FIGURE 2: TRAINING ON SPRAY TECHNIQUES, APRIL 2017

Data Capture Training

Like 2016, data clerks participated in one-day training in both zones on IRS data entry forms and the database used for uploading all IRS campaign data. Data clerks also practiced entering data at the AIRS Benin data entry centers in Djougou and Kandi.

Logistics Training

This training was conducted in two sessions. The first session took place from April 13-15, 2017 for the logistics assistants and warehouse managers of Zone 1, and the second from May 1-3, 2017 for the warehouse managers in Zone 2. Trainings focused on commodities management, the value of completing and updating stock cards, the appropriate protocol for storing PPE and insecticide, and filling out the performance tracking sheet, which tracks daily IRS team performance relative to the average number of structures sprayed by SOP and the average coverage of structures per bottle of insecticide.

Additional training for warehouse managers covered how to store the full and empty insecticide bottles. They were also trained on how to send daily IRS data (Number of SOPs that worked during the day, number of structures found, number of structures treated and number of bottles of insecticides used) to the CommCare platform. This training focused on the SMS network system and the four key IRS variables to be captured.

Spray Pump Maintenance Training

This training was conducted in two sessions, one in Djougou for Zone 1 (April 24-27, 2017), and the other in Kandi for Zone 2 (May 8-11, 2017). Pump technicians learned to maintain and repair the different components of spray equipment. The training also covered progressive rinsing and calibration of the spray pumps to be able to assist SOPs at the end of each day.

Washer Training

The washers were trained in two one-day training sessions. These sessions took place on May 2, 2017 in Djougou and May 14, 2017 in Kandi. Led by the ECO and his assistants, these sessions focused on best practices to be observed during the cleaning of PPE to ensure the safety of the environment and users.

Fire Security Training

The Djougou and Kandi fire brigade trained IRS campaign drivers, storekeepers, and guards on fire risks and first aid on May 2 and May 14, 2017. Three hundred and two seasonal workers who attended this

training learned to distinguish between different types of fire extinguishers, how to effectively use them, and how to move injured persons from vehicles in case of fire or traffic accident.

FIGURE 3: DJOUGOU FIRE BRIGADE LEADS TRAINING ON FIRST RESPONSE TECHNIQUES IN CASE OF ACCIDENT

Transport Security Training

All drivers involved in the transport of IRS staff benefited from training on first aid in case of fire or accident. Emphasis was also placed on the management of pesticide transportation. Drivers and seasonal logistics staff learned appropriate methods to secure and safely handle insecticide. Participants also learned how to manage an insecticide spill and to prevent traffic accidents.

Training on Management of Side Effects caused from Exposure to Insecticide

87 Medical and health personnel (medical doctors and chief nurses of health facilities) from the eight communes were trained on how to manage potential side effects from contact with insecticides, particularly those pertaining to organophosphates. The course focused on the mechanism of inhibition of acetyl cholinesterase, physiological implications of this inhibition, clinical diagnosis of side effects, and case management of poisoning, including symptoms and antidotal treatment. The training was conducted by the head of departmental service of public health of the DDS / Atacora. He took the opportunity to discuss with health workers other public health diseases including viral hemorrhagic fever (Ebola and Lassa) for prevention and management in case of occurrence in the context of IRS where the spread of these diseases can reach many people.

4. ADVOCACY / IEC ACTIVITIES

IEC is a critical component of the IRS program and aims to inform beneficiaries about IRS activities, what they should expect, how it is beneficial to them and their family's health, and what precautions they need to take. IEC activities focused on positive benefits of IRS in preventing and controlling malaria.

Different stakeholders at the community level were involved in IEC activities, namely local leaders, town criers, community health workers, and religious and women association leaders. Many other channels of mass communication were used: local radios, flyers, and door-to-door communication.

Local radio stations aired various malaria prevention messages. All communication activities and key messages were discussed and planned with the NMCP IEC focal point, and were reviewed and approved by the public health department directorate.

In March 2017, AIRS Benin reviewed IEC materials from the previous year's campaigns and adjusted IRS training manuals. The IEC materials included leaflets distributed to inhabitants living in targeted structures. Messages from local radio shows and town criers included information about IRS and the insecticide used in this campaign.

Three training sessions were held before launching the IEC activities, including:

- Guidance to local radio managers
- ToTs
- Training of IEC professionals

4.1 DESCRIPTION OF ADVOCACY / IEC ACTIVITIES

Advocacy Activities and Community Mobilization

Ten days before the IRS campaign, staff from the DDS and AIRS Benin held a workshop in Djougou with local leaders, religious authorities, AIRS health zone coordinator, mayors of the eight communes, their respective heads of boroughs, and IRS staff. The workshop was led by the Mayor of Djougou who chaired the launch together with the three departmental health directors. Workshop participants reviewed the IRS campaign schedule and reinforced the benefits of IRS for malaria prevention. In turn, commune administrators and AIRS Benin staff ensured that beneficiaries were informed and ready for the IRS campaign. Additionally, several meetings were held with community leaders, particularly the heads of villages and public criers, to provide details about organization of the IRS campaign and the benefits in malaria prevention. These meetings were conducted by the local authorities who had taken part in the information and awareness session organized jointly by AIRS, MoH, NMCP and CREC before the start of the campaign.

Before the workshop, two other workshops were held in Djougou and Kandi at the end of March 2017. In this workshop, the AIRS Benin Chief of Party and the NMCP staff officially explained the upcoming IRS intervention to administrative, health, and religious authorities. They requested their support in assuring the compliance of target populations.

Mobilization

Door-to-door mobilization and IRS card distribution were carried out the week before the IRS campaign. Mass mobilization was led by ABMS/PSI under the supervision of IEC assistants in each

commune. The IEC assistant, in collaboration with the Site Coordinator, met with village leaders and town criers one or two days before the arrival of SOPs in their localities. Village leaders who accepted to take part directly in the implementation of IRS activities were hired as mobilizers. Town criers reminded beneficiaries of best practices, especially house preparation during IRS operations.

In total, 1,195 IEC mobilizers participated in the IRS campaign. All participated in a one-day training in April 2017 that focused on messaging and effective communication techniques, structure marking, and filling in mobilization data collection cards and the IRS card. Eighty-one trainers participated in the IEC ToT. IEC mobilizers mobilized all the villages in Atacora, Donga and Alibori five days prior to the start of the spray campaign. This year, household awareness was not done during the campaign but five days beforehand; this proved to be a better strategy. Household members who were home when IEC agents came to their house were provided with leaflets about the IRS campaign. The leaflets informed them of what to do before, during and after the spraying, and the need to keep properly an IRS card and have it filled out after spraying to facilitate later monitoring. They were also sensitized on malaria preventive measures.

A mobilized structure was marked on the door. For supervision purposes, this marking aimed to specify the date of mobilization and the identification code of the structure as it appears on IRS card. It has seven digits (1digit for the department, 1 digit for the IRS round number and 5 digits for the continuous numbering of the structures in the department).

Town Criers

Each village used one or two town criers depending on its size. When the village was not completed in one day for any reason, including weather, the scattering of households in the village, etc., the town crier, in collaboration with the leader and mobilizer of the village, the IEC assistant and Site Coordinator updated household owners. Town criers and heads of villages reminded households of safety instructions before and after the spray.

Radio Broadcasts

Eight community radio stations, two in Atacora, three in Donga, and three in Alibori, were contracted to cover the IRS campaign. Activities included the broadcast of messages in French and in local languages covering the following:

- Dissemination of IRS operations schedules in each location.
- Talk shows, roundtables and radio plays.
- Regular spots on malaria preventive measures.
- Best practices during IRS operations, etc.

Additionally, AIRS Benin staff, commune and department officials participated in call-in shows and on-air presentations. Local radio stations also covered the campaign launch and closing ceremonies.

The radio station contracts covered the period from April 17 to July 17, 2017. Six weeks after the IRS campaign, radios continued to broadcast educational information to communities on malaria prevention aspects.

4.2 Results of IEC Activities

Nearly all household owners (99.86%) that received educational information from IEC mobilizers accepted IRS this year. Difficulties faced by IEC mobilizers included the absence of household owners during IEC visits, and conflicts with scheduled cultural ceremonies. See Table 7 for the results of mobilization efforts and Table 8 for radio station activities.

TABLE 7: OVERVIEW OF MOBILIZATION RESULTS[2]

Commune	Total Households found	Total Households Mobilized	Proportion of Households Mobilized	Population Sensitized			Total Households Accepting IRS	Proportion of Households Accepting IRS	Number of Leaflets Distributed
				Men Sensitized	Women Sensitized	Total Population Sensitized			
Atacora department									
Kérou	8,090	8,084	99.93%	17,935	20,719	38,654	8,084	100.00%	8,085
Péhunco	7,780	7,776	99.95%	15,068	17,769	32,837	7,772	99.95%	7,833
Total Atacora	15,870	15,860	99.94%	33,003	38,488	71,491	15,856	99.98%	15918
Donga Department									
Copargo	6,879	6,877	99.97%	20,547	21,245	41,792	6,876	99.99%	6,651
Djougou	37,953	37,853	99.74%	108,090	114,375	222,465	37,750	99.73%	35,154
Ouaké	6,673	6,668	99.93%	21,867	23,331	45,198	6,660	99.88%	6,616
Total Donga	51,505	51,398	99.79%	150,504	158,951	309,455	51,286	99.78%	48,421
Alibori Department									
Gogounou	16,071	16,061	99.94%	43,667	49,418	93,085	16,042	99.88%	16,006
Kandi	27,388	27,372	99.94%	62,383	71,248	133,631	27,344	99.90%	28,809
Segbana	10,943	10,929	99.87%	31,072	32,897	63,969	10,920	99.92%	10,911
Total Alibori	54,402	54,362	99.93%	137,122	153,563	290,685	54,306	99.90%	55,726
Grand Total	**121,777**	**121,620**	**99.87%**	**320,629**	**351,002**	**671,631**	**121,448**	**99.86%**	**120,065**

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

TABLE 8: IEC ACTIVITIES CONDUCTED BY RADIO STATIONS (APRIL 17 TO JULY 17, 2017)

Activities	Number of Broadcasts
Disseminating short radio spots and messages (French and national languages)	5,940
IRS schedule announcements/invitations for local leaders to attend IRS planning meetings (French and national languages)	1,962
Debates and discussion shows (interactive emissions/magazines)	152
Animation radio games	37
Interviews and testimonials of beneficiaries	162
Reports	8

4.2.1 Rapid Assessments of IEC Activities

There were some challenges faced with IEC activities, including low literacy levels, particularly in Djougou commune. Indeed, some IEC mobilizers have had difficulties to conduct effectively IEC campaigns, to correctly complete mobilization records and properly mark mobilized structures due to their low education level. This explained partially a significant number of refusal cases in this commune. To overcome this, the chief of party (COP) and other AIRS cadres resorted to political authorities, religious and opinion leaders to reinforce IEC campaigns through different channels, including media and meetings with the population.

5. IMPLEMENTATION OF IRS CAMPAIGN ACTIVITIES

5.1 SPRAY CAMPAIGN LAUNCH CEREMONY

The 2017 IRS launch ceremony took place in Djougou on May 5, 2017 and was marked by a parade of AIRS officials, SOPs and a cultural group of horseback riders from the northern region of Benin. Various speeches were given to recall the burden of malaria in the country and ongoing control strategies, including IRS. The different speeches were delivered by the MOH Chief of Staff, Mayor of Djougou, the Prefect of Alibori, the Director of Donga's Health Department, and the PMI / Benin Malaria focal point, Dr. Fortune Dagnon who highlighted the continued partnership between the US Government and the Government of Benin (GOB) for malaria control.

Other attendees of the launch ceremony included staff from the NMCP, officials from the different communes and departments, DDS staff, staff from health centers, beneficiaries and religious leaders.

The official launch of the spray campaign was conducted in a selected house in Djougou. The head of the household accepted the operation and prepared his structure to be sprayed. An SOP sprayed all rooms within the structure in the presence of invited officials.

FIGURE 4: WELCOMING THE GUESTS BY AIRS-BENIN COP AND THE ORGANIZING COMMITTEE

FIGURE 5: RIDERS AND SOPS CELEBRATING THE LAUNCH CEREMONY


FIGURE 6: LAUNCH SPEECH BY PMI / USAID MALARIA SPECIALIST (LEFT) AND MINISTRY OF HEALTH CHIEF OF STAFF (RIGHT)


5.2 SHORT-TERM TECHNICAL ASSISTANCE

Four short-term technical assistance (STTA) assignments planned in the 2017 work plan were achieved to support the campaign. The first was undertaken by the AIRS Director of Operations from Abt's home office (Bethesda, MD - USA); the second, by the Operations Manager of AIRS Madagascar; the third, by the Technical Program Manager from the home office (Bethesda, MD - USA); and the forth, by the M&E Specialist from the home office (Bethesda, MD - USA).

The mission carried out by the Operations Director took place from March 12-18, 2017 and enabled the AIRS-Benin team to better prepare for the 2017 IRS campaign.

The South to South Support STTA conducted by the Operations Manager from AIRS Madagascar took place from April 16-May 13, 2017, and aimed to assist the team during the planning and implementation phase of the spray campaign.

The PMI AIRS Technical Program Manager took place from May 6-19, 2017 and aimed to support the PMI AIRS Project in Benin during the spray operations with daily field supervision and support.

The STTA from AIRS M&E Manager, Ms. Emily MacDonald, took place from April 30 to May 13, 2017, where she provided M&E and supervision related support.

These STTA assignments provided valuable support for the smooth operation of the IRS campaign. Recommendations provided during the debriefing sessions allowed the AIRS Benin team to improve the quality of the IRS campaign and address some challenges in time.

5.3 SPRAY OPERATIONS

Given the extent of the area to be covered and to ensure a better quality of 2017 IRS intervention, AIRS Benin divided the intervention area into two zones with the following respective municipalities (Communes): Zone I (2 communes of Atacora department; Pehunco & Kerou, and 3 Communes of Donga: Djougou, Ouaké and Copargo); Zone II (3 Communes of Alibori department: Kandi, Gogounou and Segbana) (see Figure 1). Spraying began in Zone I on May 3, 2017 and end on May 27, 2017; and in zone 2 on May 15, 2017 and ending on June 8, 2017. In both zones, the campaign had duration of 22 days as planned.

Implementation Logistics

The distribution of IRS materials and supplies from regional warehouses to the IRS operation stores was conducted in a timely manner. Adherence to this strategy enabled all IRS communes to start IRS operations on the scheduled date. All pumps were fitted with control flow valves (CFVs) to ensure the quality of spraying.

Household Preparation

This phase of IRS operations consisted of assigning spray areas to SOPs about the actions to be taken before, during and after the house spraying as previously explained by IEC mobilizers, including:

- Move out household items furniture, cooking implements and all foodstuffs prior to spraying
- Move all furniture that cannot be moved from the home to the center of the room and cover it with a tarpaulin.
- Advise occupants to stay outside the home during spraying and for at least two hours after spraying.
- If people are unable to be removed from the house, postpone the spraying of this structure for the mop-up period if possible
- Keep children and domestic animals far from structure
- Enter in structures after 2hours 30 minutes after structure being sprayed

Supervisors ensured that houses preparation was performed efficiently and to the desired standards.

Directly Observed Spraying (DOS)

AIRS Benin continued to use the DOS approach for supervision. The DOS form, which represents a tool used by team leaders to evaluate the insecticide mixing and spraying techniques performed by SOPS based on standard procedures, is used during the spray campaign by Team Leaders to ensure that their SOP teams mixed well the insecticide and used high quality spraying techniques. Each spray day, Team Leaders observed the mixing of insecticide and spraying technique of each SOP under his/her supervision inside at least one structure and recorded their findings, related to insecticide mixing, triple rinsing of the bottle, wearing of PPE, presence of a CFV on the pump, house preparation, spraying techniques, pump integrity, etc.). This allowed for in-situ corrective action of practices when necessary.

Daily Health Team Leader Checklist

The daily health team leader checklist was used to track SOPs' health status at the beginning of each spray day. This tool was filled out by Team Leaders at the beginning of the day and allowed to check the health status of SOPs to perform spraying, including having taken the breakfast, presence of certain symptoms like fatigue and dizziness, weak performance of the spray operator the previous day, proper wearing of PPE .

Daily Performance Tracking

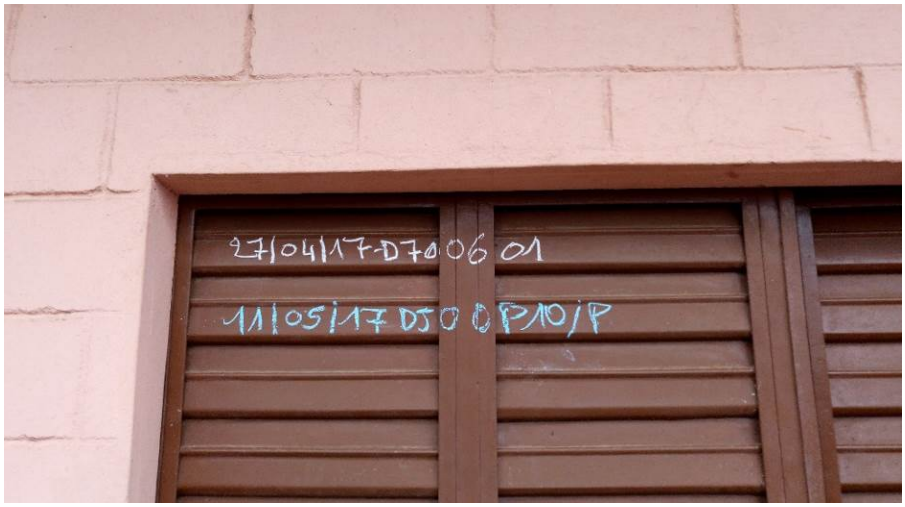
The AIRS-Benin team explained the importance of the daily performance tracking tool to site supervisors, SOPs, and Team Leaders during the training of trainers (ToT) and training of SOPs. At the end of each day, Team Leaders completed the sheet with nine indicators to gauge overall performance. The indicators recorded included: number of SOPs who worked, number of structures found, number

of structures sprayed, number of insecticide bottles used, insecticide stock balance, average number of structures sprayed per bottle of insecticide, average number of structures sprayed per SOP, number of SOP supervisions completed, and number of red flags /issues recorded. This performance tracking tool enabled the AIRS and NMCP supervision teams to strengthen the capacity of Team Leaders.

Structure Marking

Structure marking during the spray operations aims to mention information related to the spray date, the commune code (3 digits), the code of the spray operator who sprayed the structure and the spraying status of the structure (P: sprayed, NP: not sprayed or X: awaiting spraying during mop up). This marking was done by SOPs and supervision allowed to check whether it was properly done (Figure 7).

FIGURE 7: STRUCTURE MARKING



As during the previous campaign, marking structures with chalk was extremely helpful for mop-up operations as it was easy to erase the previous marking according to the new spraying status of the house.

Operation Site Coordination

Fifteen Site Coordinators were hired to manage spray operations in the eight targeted communes. The number of coordinators per commune depended on its size. For large sites requiring a strong leadership, some Site Coordinators were assisted by one or two Supervisors who were assigned similar tasks as the site coordinator for a smaller geographical area.

TABLE 9: NUMBER OF OPERATION SITE COORDINATORS PER COMMUNE

Department	Communes	Number of Site Coordinators
Alibori	Gogounou	2
	Kandi	3
	Ségbana	2
Atacora	Kérou	1
	Péhunco	1
Donga	Copargo	1
	Djougou	4
	Ouaké	1
Total		**15**

mHealth Use

AIRS Benin used the mHealth system throughout all eight communes to improve spray operations. The system enabled AIRS Benin staff and supervisors to conduct standard supportive supervision, access daily spray data quickly, conduct data verification at the household level, and remind temporary staff about regulations and operational procedures. The system minimized paperwork, enabled real time sharing of data, and increased both the use of mobile technology and results-based decision making.

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

The mHealth reporting tools for data collection and verification, which AIRS-Benin used throughout the IRS campaign, included:

- *Performance monitoring tracker:*

After a day's spray activities, team leaders summarized spray results of their respective teams on team leader forms. Performance reports were generated based on the team leader forms. Storekeepers aggregated performance monitoring tracker daily reports on four operational indicators and sent them to the gateway phone linked to the Telerivet system. The indicators were: total number of spray operators who worked on that day; total number of structures found by spray operators; total number of structures sprayed; and the total number of insecticide bottles used at the operational site. The gateway phone then sent the data to the Dimagi LLC server for processing and storage. The performance monitoring tracker information was shared daily during the debriefing meeting with supervisory staff from NMCP, DDS and AIRS-Benin. Performance monitoring tracker data provided a spray progress overview and timely information for decision making purposes through a dashboard developed for this purpose.

- *Supervisory Application:*

Supervisors filled out the CommCare application forms on morning mobilization and transportation, household preparation and spray operator's performance, storekeeper's performance, and end of day clean-up. These forms were filled out and submitted to the CommCare system and provided information on field activities, spray performance and red flags during the campaign. Some of the red flags raised were incomplete wearing of PPE, leakage of pumps, triple rinsing poorly done, weak household's preparation, etc.

- *Data Collection Verification (DCV):*

AIRS Benin collected information through DCV forms at the household level on household spray status. Households were randomly selected to provide a sample population. The Project then verified this information with households' information as entered into the AIRS database by tracking IRS card numbers. After filtering households' data from the database, Monitoring and Evaluation assistants compared them with DCV form findings to match head of household, structures and rooms found, and spray status. DCVs were of great help in appreciating the accuracy of data reported by SOPs and to target the mopping-up. Anomalies found were compiled during the evening meetings and used to relay feedback messages and corrective actions by spray teams The DCV was housed in the same CommCare platform as the supervisory forms.

- *Job Aid Messages:*

AIRS Benin sent out daily SMS messages to supervisors, spray operators, team leaders, and storekeepers to remind them about topics such as compulsory taking of breakfast, wearing personal protective

equipment, gender awareness, the daily number of targeted structures, and avoiding consuming food while on duty.

Management of spray teams

During the campaign period, spray teams were deployed from Monday to Saturday while Sundays were reserved for a weekly review meeting with Site Coordinators and to repair spray equipment. The 1,572 SOPs recruited were divided into 315 spray teams. Each team was composed of five to six SOPs supervised by a Team Leader. The number of spray teams per commune was determined by the estimated number of targeted eligible structures found in each commune using 2016 IRS campaign data in Atacora, and 2016 enumeration data in Donga and Alibori. See Table 10 for more detail.

TABLE 10: DISTRIBUTION OF SPRAY TEAMS BY COMMUNE

Communes	No. of spray teams	No. of eligible structures found by SOPs in 2017
Alibori Department		
Kandi	54	72,464
Gogounou	37	51,346
Segbana	26	36,228
Subtotal 1	*117*	***160,038 (38,12%)***
Atacora Department		
Pehunco	27	37,796
Kerou	32	48,757
Subtotal 2	*59*	***86,553 (20,62%)***
Donga Department		
Djougou	98	122,866
Copargo	19	23,711
Ouake	22	26,617
Subtotal 3	*139*	***173,194 (41,26%)***
Grand Total	**315**	**419,785***

*The number of structures found in 2017 represents an increase of 41.62% compared to the structures found in 2016 (419,785 versus 296,409).

5.4 IRS Spray Campaign Supervision

5.4.1 IRS Campaign Supervision by AIRS Benin Staff

AIRS Benin staff, including the COP, Operations Manager, ECO, Logistics Coordinator, Health Zone Coordinator and M&E Manager moved to Djougou and Kandi with the seasonal assistants during the IRS campaign. Following the supervision plan, AIRS Benin technical staff and counterparts from NMCP, DDS and USAID/PMI Benin traveled every day to the field to provide supportive supervision to seasonal staff using smartphones with CommCare applications (a platform that manages data sent by SMS through the Telerivet system). This was to ensure that IRS campaign activities were performed appropriately. Supervision activities, implemented through Smartphones with CommCare applications, included but were not limited to:

- Observing SOP performance: house preparation, spraying practices by direct observation in eligible structures, house marking, filling forms and compliance to other instructions;

- Evaluating the support provided to SOPs by team leaders and proximity supervisors, and the proper filling of forms and checklists;
- Evaluating the performance of storekeepers in the management of commodities, equipment and products;
- Assessing compliance to instructions regarding the handling of insecticide and other contaminated equipment, including PPE;
- Addressing concerns raised by beneficiaries, seasonal staff, and other individuals involved in IRS operations;
- Checking the performance of each SOP team using the daily performance tracking sheet;
- Ensuring that IRS operations in sites managed by the NMCP, namely Copargo (Donga department) and Gogounou (Alibori), were performed appropriately;
- Ensuring the quality of beneficiary mobilization and solving possible problems of refusal by sensitization and advocacy.

The AIRS Benin team, NMCP, DDS staff and PMI staff followed field activities and daily spray progress closely using daily updates that the commune and operation Site Coordinators sent via SMS. These messages noted the number of structures sprayed each day (based on the Site 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 progress against the IRS schedule, and to identify any campaign issues that needed quick action from the team.

In addition to the daily SMS report generated by the CommCare platform, 17 storekeepers sent indicators from the Performance Tracking Sheet by SMS to the platform located in Djougou or Kandi depending on the zone where the site was installed. The indicators were: total number of spray operators who worked on that day; total number of structures found by spray operators; total number of structures sprayed; and the total number of insecticide bottles used at the operational site. Every two days at around 5 p.m. a debriefing and coordination meeting was organized by the AIRS Benin staff and IRS campaign supervisors from the national, departmental NMCP and DDS staff in Djougou and Kandi. The meetings provided a forum for AIRS Benin and government counterparts to update each other on IRS campaign progress, discuss various issues/adjustments that needed to be addressed and resolved the following days, and determine what new daily reminders would be sent out in the eight communes. See Figure 8.

FIGURE 8: SUPERVISORS PARTICIPATING IN A DEBRIEFING AND COORDINATION MEETING

5.4.2 IRS Campaign Supervision by Beninese Government Staff

About 87 government officials contributed to the supervision of the campaign. This year, NMCP led the spray campaign in two communes - Copargo (Donga department) and Gogounou (Alibori department). NMCP leadership in these communes included operations, IEC, logistic management, and M&E activities. The AIRS team built NMCP's capacity through the transfer of technical and managerial skills at the national and departmental level to conduct IRS campaigns with more autonomy and according to the required standards. Also, the daily debriefing meetings were often chaired by the Donga DDS in Zone 1 and Alibori DDS in Zone 2. Table 11 provides a breakdown of the supervision activities performed by GOB staff during the 2017 IRS campaign.

TABLE 11: BREAKDOWN OF SUPERVISION BY BENINESE GOVERNMENT AGENCIES

Government Level	Office	Number of People	Supervised Activities
National	NMCP	8	IEC and mobilization activities, environmental compliance (pre-spray, and post-spray inspection), spray operations, M&E and data collection, IRS trainings
	DHAB	2	Spray operations, IEC activities.
	DAGRI	2	Environmental compliance (pre-spray and inspection)
Departmental	NMCP-Atacora NMCP-Donga NMCP-Alibori	1 1 1	IEC and mobilization, environmental compliance, spray operations, M&E, trainings
	DDEGCC-AD	4	Environmental compliance (pre-spray, mid-spray, and post-spray inspection), spray operations
	DDS	3	Spray operations, IEC mass mobilization, M&E, IRS trainings
	Public Health Service	1	IEC and mobilization, spray operation, M&E, IRS trainings
	SHAB	3	IEC and mobilization, environmental compliance (pre-spray, mid-spray, and post-spray inspection), spray operation, IRS trainings
Commune	Site Coordinator	3	IRS training, mass mobilization, spray operations, M&E
	Commune Chief Doctors	8	IRS training ,mass mobilization, environmental compliance, spray operations, M&E
	Hygiene staff from Commune Health Centers	50	Spray operations, quality of the spraying, environmental compliance by SOPs and washers, IEC during campaign, data control.

5.5 Stock Management During the IRS Campaign

The AIRS Benin warehouse manager used Inventory Control Cards (ICC) and the stock registers to double track each item in the central warehouse and operation sites. Storekeepers updated the ICC and the register daily on the movement of stock from each store room. They were also required to conduct

daily physical stock counts to ensure that the actual stock in the store rooms matched the ICC and the register.

At the beginning of each 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 and register to ensure accurate stock balances. At the end of each IRS campaign day, SOPs turned in their stock of bottles (used and unused) to the Team Leader, who collated these and submitted them to a storekeeper. The latter recorded the full bottles on the ICC, registered 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 insecticide use. 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 SOPs were using too little or too much insecticide during their spraying and if various operation sites needed more insecticide.

With respect to PPE, Team Leaders and storekeepers every morning would organize, distribute and sign out all PPE to be used for spray operations. 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. The Logistics Manager 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.

6. ENTOMOLOGY

6.1 CONE BIOASSAY TESTS TO ASSESS THE QUALITY AND DECAY RATES OF PIRIMIPHOS METHYL (ACTELIC 300CS) ON TREATED WALL SURFACES

The Entomological Research Center of Cotonou (CREC) conducted Bio-assays using WHO cones to evaluate the quality of spraying. This was done by exposing a susceptible strain of *An. gambiae* (Kisumu strain) one week (7 days) after spraying (T0) and then one month (T1) after the IRS campaign in the communes of Copargo and Djougou. Different types of treated walls (cement and mud) were tested using WHO standard procedures. Two to five day old female mosquitoes were introduced into transparent cones fixed at different heights on the treated support (0.5m, 1m, 1.5m and 2m). These mosquitoes remained in contact with the wall for 30 minutes and were then cautiously removed from the cones and transferred to clean paper cups covered by a net. Mortality was recorded after a 24 hr holding period.

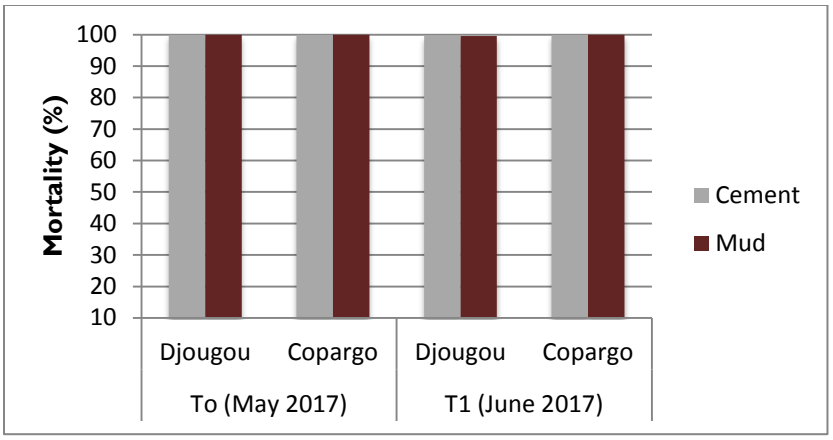
6.2 FUMIGANT EFFECT OF PIRIMIPHOS METHYL

The fumigant effect of pirimiphos methyl was evaluated using the susceptible strain of *An. gambiae* (Kisumu strain) in treated structures in Djougou. Two cages that contained about 150 female *An. gambiae* (Kisumu strain) fed on 10% sugar solution were placed in the middle of the house from 6pm to 7am, one in a sprayed and the other in an unsprayed room for this test at T0 and T1.

6.3 RESULT OF BIO-ASSAYS

The mortality rate of the *anophelines* of the susceptible reference Kisumu strain exposed to the treated walls was 100% on both mud and cement surfaces one week (7 days) after spraying (T0) and one month (T1) after spraying. The mortality rates were 100% regardless of the position of the cones on the treated walls. This demonstrates the homogeneity of the treatment and the good quality of the treatment (see Figure 9).

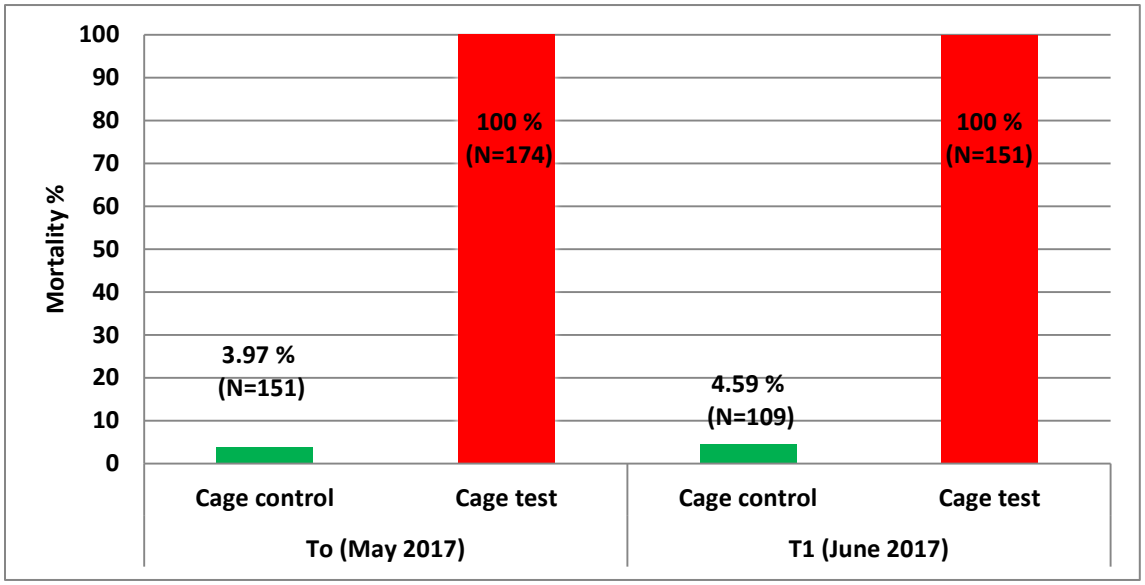
FIGURE 9: MORTALITY RATE OF ANOPHELES GAMBIAE KISUMU (SUSCEPTIBLE STRAIN) 24 HOURS AFTER A 30-MINUTE EXPOSURE TO WALLS TREATED WITH PIRIMIPHOS METHYL



6.4 RESULT OF THE FUMIGANT EFFECT OF PYRIMIPHOS METHYL

One week after spraying and then one month after 2017 IRS campaign, the fumigant effect of pirimiphos methyl induced a 100% mortality rate in the susceptible strain of *An. gambiae* (Kisumu strain) twenty-four hours post exposure. See Figure 10.

FIGURE 10: MORTALITY RATE INDUCED BY THE FUMIGANT EFFECT OF PIRIMIPHOS METHYL ON ANOPHELES GAMBIAE (KISUMU STRAIN) 24 HOURS THEN 1 MONTH AFTER TREATMENT OF THE WALLS



7. ENVIRONMENTAL COMPLIANCE

7.1 PRE-SPRAY ENVIRONMENTAL ACTIVITIES

7.1.1 DOCUMENTATION ON ENVIRONMENTAL CHANGES

AIRS Benin operates under a Supplemental Environmental Assessment (SEA) approved by USAID in 2016. The SEA covers the nationwide use of all WHO-recommended insecticides for IRS (with the exception of DDT), including pyrethroids, organophosphates, carbamates, and chlorfenapyr (once recommended by World Health Organization Pesticide Evaluation Scheme) for the period 2016-2020. The Environmental Compliance Certificate delivered in 2008 by the ABE remains valid.

7.1.2 DIGITIZATION OF INFORMATION

Since 2013, AIRS Benin has used smartphones to conduct environmental compliance supervision and monitoring. Environmental compliance checklists include: Morning Mobilization and Transport, Home Owner, Preparation and SOP Performance Checklist, End-of-Day Clean-Up, Storekeeper Performance. Checklists were uploaded to smartphones, equipped with a Global Positioning System (GPS) and a photo camera.

The ECO performed the initial pre-season environmental compliance assessment (PSECA) using smartphones to assess the condition of all 17 operational sites and ensure that the campaign was compliant with the USAID's 22 CFR 216 Code. The information collected was uploaded and made available on the PMI AIRS Project's environmental compliance database. This enabled PMI AIRS staff to view the results of the inspections and note which refurbishments or installations were needed to maintain the safety of personnel and protection of the environment.

During the initial PSECA, the ECO ensured that both the NMCP and the Departmental Directorate of Living Environment and Sustainable Development (DDCVDD) were able to use the smartphone to collect environmental information. After completing rehabilitation activities, the same electronic device was used by the inspection team to verify readiness for operations. The campaign start date decision was confirmed after the final PSECA indicated all renovation tasks had been completed in line with Best Management Practices (BMP) and the secondary storage site had been supplied as required.

Smartphones were also used by the ECO and the inspection team to carry out the midterm inspection and routine supervision and post-inspection.

7.1.3 PRE-SPRAY ENVIRONMENTAL INSPECTION

The IRS intervention area was divided into two zones: Zone 1 (Péhunco, Kérou, Djougou, Copargo, and Ouaké) and Zone 2 (Kandi, Gogounou, and Ségbana). The initial and final PSECA for Zone 1 was conducted January 24-February 4 and March 6-8, 2017, respectively. The initial and final PSECAs for Zone 2 were conducted March 9-11and May 10-11 respectively.

The pre-spray environmental inspections were conducted by the AIRS-Benin ECO, NMCP representative, MAEP, DDS, and DDCVDD representatives. The inspections aimed to ensure the availability of storage and sanitation infrastructures and help to consolidate the partnership between the AIRS Benin Project and concerned organizations.

To meet these goals, the following activities were performed:

- Identify the possible causes of environmental and safety non-compliance at each operational site and

make repairs or upgrades as needed to assure compliance for the 2017 IRS campaign

- Make appropriate recommendations as needed
- Reinforce all partners' skills, especially the NMCP representative, in using smartphones to collect environmental compliance data
- Negotiate with competent authorities (health, administrative, or community) on the provision of new buildings to the AIRS Benin Project

As a result, the inspection allowed AIRS Benin to determine the types and quantities of safety equipment to be procured and the different types of repairs to be carried out on both warehouses and sanitation facilities. In addition, it was possible to settle on the number of soak pits to be installed at each operational site and to assure that all operation sites have access to guidelines on the management of insecticide exposure.

Special attention was given to the transfer of experience to government counterparts, especially those from NMCP, in conducting environmental inspections using smartphones.

Table 12 indicates the location of each operational site for the 2017 IRS campaign and whether the operational sites received storeroom, rinsing area and/or soak pit, or barbed fencing refurbishments or were equipped with dressing rooms, as the pre-spray environmental inspection recommended.

TABLE 12: LOCATIONS OF OPERATION SITES

Communes	Operation Site Location (sub-commune)	Facility Type	Storeroom Refurbished	Rinse Area/ Soak Pit Refurbished*	Barbed Fencing Refurished	Cloakroom Installed
Natitingou	Natitingou	Central warehouse	Yes (Y)	Y	No	No
Péhunco	Péhunco	Health Center	Y	Y/New Installation (NI)	No/NI	Y
	Gnemasson	Health Center	Y	Y	No	Y
Kérou	Kérou	MAEP building	Y	Y/NI	No/NI	Y
	Firou	Community bulding	Y	Y	Y	Y
Djougou	Djougou 3	Health Center	Y	NI (2)	NI (2)	Y
	Partago	Community building	Y	NI (2)	NI (2)	Y
	Kolokondé	Health Center	Y	NI (2)	NI (2)	Y
	Barei	Municipal Center	Y	NI (2)	NI (2)	Y
Copargo	Copargo	Health Center	Y	NI	NI	Y
Ouaké	Sèmèrè 1 (Daka)	Private (Rent)	Y	NI (2)	NI (2)	Y
Kandi	Kandi (Kassakou)	Health Center	Y	NI	NI	Y
	Angaradebou	Health Center	Y	NI	NI	Y
	Sonsoro	Health center	Y	NI (2)	NI (2)	Y
Gogounou	Borodarou	Community building	Y	NI	NI	Y
	Sori	Municipal Center	Y	NI (2)	NI (2)	Y
Ségbana	Ségbana (Piami)	Community bulding	Y	NI	NI	Y
	Libantè	Municipal bulding	Y	NI	NI	Y

Legend: *NI: One new installation; NI (2): Two new installations*

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

7.1.4 Medical Check up

A medical check-up for all seasonal staff was conducted a few days before the IRS campaign during the period of April 27-29, 2017, for the Zone 1 (Djougou-Ouaké-Copargo) and from May 9-11, 2017, for Zone 2 (Kandi-Gogounou-Ségbana). The medical check-up included physical examinations and an assessment and testing of pre-existing conditions such as respiratory diseases (asthma, tuberculosis, etc.) and pregnancy that are incompatible with the participation in IRS operations. Only individuals deemed medically capable were selected among the seasonal staff. Five women who tested positive for pregnancy worked as mobilizers instead of SOPs.

7.2 Mid-Spray Environmental Activities

7.2.1 Mid-Spray Environmental Inspections

Two mid-spray environmental inspections were organized from May 18-20, 2017, in Zone 1 and from May 24-26 in Zone 2. The AIRS Benin ECO, along with NMCP, DDCVDD, and Department Coordination for Hygiene and basic sanitation (CDC-HAB) of both zones carried out this activity for all operating sites and spraying activities.

Smartphones were used to check BMP requirements regarding precautions to take for ensuring safety during the IRS operation::

1. SOP morning mobilization:
2. Homeowner preparation and SOP performance:
3. Storekeeper performance
4. End-of-day cleanup

FIGURE 11: SOP MORNING MOBILIZATION

As a result of the inspections, the following findings were noted:

- In the villages where communities were informed on time about spraying activities, they completed proper house preparation for a successful implementation of spray operations.
- Most of house owners removed their personal belongings without the assistance of SOPs. Food from the houses and the heavy items were properly covered with a plastic sheet.
- In some households, cases of resistance were noted due to false rumors and the lack of accurate information.
- Structures containing food or sick people were not sprayed.
- Homeowner adhered to safety measures to be taken before, during, and after spray.
- The complete and appropriate wearing of PPE was noted in 98% of cases
- SOPs performed the mixing of the insecticide in the presence of homeowners and practiced progressive rinsing of the bottles during pesticide make-up day. They also respected the required pressure (55 psi for Hudson) before starting the spraying.
- Pumps were triple-rinsed at the end of the day.
- Team leaders ensured that all steps were followed throughout the spray. Any lapses were corrected immediately.

FIGURE 12: SOP CHECKING ROOM PRIOR TO SPRAY (LEFT) AND SUPERVISOR OVERSEEING MIXING OF INSECTICIDE (RIGHT)

- The inspection team did not observe any SOPs eating, drinking, or smoking during the spray operation.
- Four incidents were reported during the 2017 IRS campaign and took place in Donga: one rental vehicle that completely burned while parked due to an electrical failure; one female SOP who was hit by a motorcycle but who returned to work after medical care; one SOP who suffered skin irritation after touching an insecticide-contaminated sheet without gloves on but was able to return back to work after appropriate treatment; one SOP who was apprehended while trying to steal insecticide was taken to the local police station, where he admitted to trying to sell the insecticide to local farmers; he was released after spending few days at the police station. All storekeepers respected and enforced good practices with all users of the operational sites. They all wore appropriate PPE.
- Every storage facility was provided with a spill kit, fire extinguisher, pesticide Material Safety Data Sheet, and a thermometer to monitor temperature inside the store room.
- No expired insecticide was found in any of the storerooms.

FIGURE 13: CENTRAL WAREHOUSE IN NATITINGOU – INSECTICIDE PLACED ON WOODEN PALLETS (LEFT) AND SECONDARY WAREHOUSE IN KASSAKOU

The inspection team also supervised the end-of-day clean-up and corrected any noted irregularity as appropriate.

- In some sites, the number of SOPs reached 100 per site; therefore, the team had to create two different lines within the soak pit to allow two SOP teams to enter the soak pit at once. In addition, to speed up the cleaning process, the spray pump technicians were in charge of cleaning pumps after the SOPs triple rinsed them
- All vehicle drivers had their cell phones, wore PPE while driving the spray teams to villages, and cleaned their vehicles.
- All vehicles were provided with first aid kits.
- Finally, the experience of using 2 mobile soak pits in Alibori department was a success in remote villages

FIGURE 14: SOPS LINE UP FOR END OF DAY CLEAN-UP

7.3 Post-Spray Environmental Assessment/Activities

The post-spray environmental inspection was performed from May 29-June 1, 2017, for Zone 1 and from June10-15, 2017, for Zone 2 by a team led jointly by representatives from NMCP and the AIRS Benin ECO. The inspection team also included staff from the CDC-HAB and DDCVDD of Atacora, Donga, and Alibori Departments. The main goal was to check if all operational areas were properly closed and to note any environmental issues that needed to be solved before the 2018 IRS campaign. Key findings of the post-spray environmental inspection are as follows:

- All of the IRS campaign commodities (including PPE and leftover insecticide) were transported back to the central warehouse in Natitingou for storage until the next campaign.
- All secondary storage sites were decontaminated thoroughly with water and soap by seasonal staff, preferably washers and / or SOPs under the supervision of storekeepers who were trained on this activity by the AIRS Environmental compliance officer. During the post spray environmental assessment, the inspection team checks whether this activity has been carried out properly by simple observation or by asking questions
- All rinsing areas and soak pits at operational sites remained in good condition. Soak pits were completely covered by a metal lid and thoroughly secured with padlocks.

7.4 Solid Waste Disposal

During the 2017 IRS campaign, various types of solid waste were generated as follows:

- 44,879 used respiratory masks
- 1,883 unusable back sacks
- 58,759 empty bottles of pirimiphos-methyl

- 2,765 pairs of used plastic gloves
- 4,897 empty cardboards boxes

7.4.1 Disposal Methods

Three different methods will be used to dispose of the solid waste. These methods include incineration, grinding followed by recycling (for solid waste with high-density of polyethylene, particularly the insecticide bottles), and burying of used low-density polyethylene such as gloves. Cardboard will be disposed of by recycling it into prefabricated plates for use in the construction of beach bungalows and ceilings.

7.4.2 Incineration of Solid Waste

AIRS Benin completed the incineration of solid waste during the period of August 5-12, 2017, using the "St Jean de Dieu" Hospital Incinerator of Tanguieta. Originally incineration was planned July18-22, 2017, but an unforeseen technical breakdown of the incinerator caused a delay of this activity. In the new IRS zone, there is no local alternative to the incinerator in Tanguieta, which meets BMP requirements. All loading of solid waste and the incineration process was closely supervised by the AIRS Benin ECO in collaboration with DDS and DDCVDD representatives.

7.4.3 Recycling of Empty Bottles

The empty and decontaminated bottles will be disposed of by the environmental NGO named Community Development and Environmental Sanitation (Développement Communautaire et Assainissement du Milieu (DCAM))/ Bethesda. DCAM/Bethesda is a non-profit NGO located in Cotonou that has recycled empty insecticide bottles generated during previous IRS campaigns. After triple rinsing all of these bottles in the field and decontaminating them with soap and water at the central warehouse in Natitingou, AIRS Benin delivered them to the DCAM Bethesda's recycling plant in Pahou (Ouidah Commune), where the recycling process started on July13, 2017.

The bottles will be cut into relatively small pieces and then ground up prior to recycling into pavement blocks. In total, 58,759 empty bottles were sent to DCAM/Bethesda.

7.4.4 Burying Wastes at a Landfill

Rubber gloves used from the 2017 IRS campaign contain low density polyethylene, which releases toxic or harmful gaseous by-products when incinerated. Burial remains as the only acceptable disposal mode for gloves. The burying is done in collaboration with the Municipality of Cotonou at their landfill located in Ouèssè (Ouidah Commune). The process is compliant with the provisions of the Law n° 98-030 related to the framework law on the environment in the Republic of Benin.

After their decontamination with water and soap at the central warehouse in Natitingou, the used rubber gloves were buried jointly with SOPs' plastic sheets by the technician team of Cotonou Municipality under the supervision of a team composed of NMCP representatives and the AIRS Benin ECO.

Please see Environmental Mitigation and Monitoring Report table in Annex D.

8. MONITORING AND EVALUATION

8.1 DATA MANAGEMENT AND PROCESSING

8.1.1 DATA COLLECTION

As in previous years, AIRS Benin followed closely M&E processes outlined in the 2017 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 specialist and database manager. The full monitoring and evaluation plan can be found in Annex F. In the 2017 IRS campaign, efforts were made to record IRS data as quickly and accurately as possible and enter the data in the database to have real-time insight into the status of the spray campaign. Before the beginning of each mobilization and spray operation, those involved in data collection and supervision were trained in the data collection process and in filling in the forms. Data collection forms went through several checks before being entered into the database.

8.1.2 DATA ENTRY

The IRS database was developed in Microsoft Access format in 2012 and has been improved over the years to facilitate easy and rapid data checking during the entry process. The AIRS Benin database manager used several logic checks and controls to validate data entries and minimize data entry error. In 2017 IRS campaign, two data entry and processing centers were used: one in Djougou for data entry from Zone 1 (Atacora and Donga departments) and the other one in Kandi for data entry from Zone 2 (Alibori Department). The M&E assistant, database manager and M&E manager checked the accuracy of data entered by data clerks daily by randomly selecting 10% of the SOP forms collected during a week and comparing the information on the cards with the data entered into the AIRS Benin database. Out of 6727 records checked, 59 contained errors, i.e. an error rate of 0.88% (a little less than 1%).

8.2 DATA QUALITY ASSURANCE

Data quality assurance tools, the Error Eliminator (EE) and Data Collection Verification (DCV), DOS Form, Data Entry Verification Form helped improve supervision and ultimately the quality of data collection and data entry during the 2017 spray campaigns. M & E assistants recruited also contributed to the improvement of supervision. Out of 31,236 forms filled out by SOPs, approximately 200 forms (0.64%) had some missing data and were returned to field to be completed.

Error Eliminator (EE)

The EE is a paper checklist formatted form used by Team Leaders to check the completeness and correctness of Spray Operator data before leaving the field or before the forms are submitted for data entry at the end of each IRS campaign day. The EE is printed on the backside of the daily SOP form to facilitate use.

DCV Form

This form is used during randomized household visits to check the accuracy of data collected in the field, to ensure that the data written on the Daily SOP forms matches the information households reported

and/or the data recorded on the IRS Cards disseminated to households. In total, AIRS technical staff, national supervisors, Site Coordinators, and the PMI Benin technical team completed 1,247 DCVs using smartphones. Operation site supervisors completed 2,972 DCVs using paper forms in 155 villages on a total of 585 villages.

Corrective measures on observed anomalies, like inadequate marking of structures, undercounting of number of structures sprayed, over counting of eligible structures by counting food stores etc., were provided either on the field or through SMS to prevent repetitive errors. Moreover, the audit information made the mop-up operations easier.

DOS Form

Developed by AIRS, this form was used by team leaders to oversee and improve SOPs' performance and spray quality. Team leaders conducted supervisory visits throughout the spray campaign to observe SOPs' performance. For each observation, team leaders recorded whether or not the SOPs correctly mixed the insecticide and complied with spraying techniques. Any errors made during the observed visit were recorded and created a red flag in the database. Daily alerts were sent to supervisors containing a summary of all red flags from the previous day, which enabled supervisors to monitor closely the quality of SOPs' performance and take corrective action to address any errors and ensure better quality of spray operations. Altogether, 4,121 red flags were recorded in Zone 1 out of 13,469 observations made: 1,067 in the first week, 1,020 in the second week, 1,008 in the third week and 1,026 in the last week. In Zone 2 a total of 1,103 red flags were recorded out of 11,996 observations made: 304 the first week, 281 the second week, 372 the third week and 146 last week. Out of 5,224 red flags recorded in the two zones, 2,674 were related to leaks in the pumps, particularly the Hudson x-pert pumps; 1696 red flags to spraying techniques, including distance between the walls and the nozzle (385), non-respect of the overlap band (357), non-use of CFV (298) and 656 for the non-observance of correct speed of spray; Triple rinse (391), insecticide mixing (355); incomplete wearing of PPE (107). Pump technicians and team leaders addressed efficiently these issues.

Data Entry Verification

Spray operators collected spray data using standardized data collection forms designed to capture all core PMI indicators. Data collected were verified by Team leaders and Supervisors before being transported to the data entry Center. Data clerks performed a final verification of data collection form (data and arithmetic) before entering the data into the database. At the end of each day, the M&E team (AIRS M&E, M&E Assistants and database managers) used the Data Entry Verification form to verify that the data entered into the database matched the data on the Daily SOP Forms. Of 6,759 records, 91 (0.88%) had errors, including wrong choice of the pre-defined village, mistyping of dates and household codes, mistyped totals, bottles gaps, etc. In addition to the Data Entry Verification Form, the database design enforced several logic rules to ensure the quality of data entries (e.g., the number of pregnant women in the structure cannot exceed the number of women in the structure). AIRS Benin also provided each data clerk with a data cleaning tool, which enabled data entry clerks (DECs) to run error reports and correct data entry mistakes each day before leaving the office.

Data was entered within 48 hours for timely generation of weekly client spray progress reports. Data entry clerks filed and archived Daily Spray Operator Forms at each of the data centers. Meeting the 48-hour data entry turnaround was sometimes a challenge for remote operational sites, including Kerou and Péhunco. At the end of each day, data entry clerks backed up all databases electronically in three different ways: first, into a backup folder on each data entry server; second, into a cloud backup; and third, onto an external hard disk. All servers, memory cards, and external hard disk are secured in the AIRS office in Cotonou.

8.3 mHEALTH RESULTS

- SMS Reminder: A total of 135,696 SMS reminders (three reminders per day sent to the 2,056 seasonal staff during 22 days) were sent during the 2017 IRS campaign. The SMS reminders focused on environmental compliance (e.g., proper wearing of PPE) and SOPs' performance (e.g., reminders of the number of structures to be sprayed every day to reach the goal).
- Mobile based supervisory tools:
    - DCV: 1,247 forms were completed
- Mobile Performance Tracker: Supervisors submitted daily reports on some key targets (e.g., number of structures found / sprayed) via SMS. A total of 384,544 sprayed structures were tracked via SMS against 384,761sprayed structures captured with IRS data collection forms in the three project intervention Departments. Data gathered through SMS informed daily decision-making, but the data collected through data collection forms remained the project's official data source, given that these forms collected more comprehensive information and underwent a thorough data entry verification and cleaning process.

TABLE 13: COMPARISON OF SMS STRUCTURES TO CONFIRMED STRUCTURES

	Data Collection Form	SMS	Difference
Number of structures found	419,785	420,938	1,153
Number of structures sprayed	384,761	384,544	217
Coverage rate	91.7%	91.4%	0.3%

8.4 NUMBER OF STRUCTURES COVERED BY THE 2017 IRS CAMPAIGN

The 2017 IRS campaign sprayed 384,761 structures out of the 419,785 eligible structures found by SOPs. Spray coverage exceeded the 85 percent minimum, with a 91.7 percent spray coverage rate of the total eligible structures found by SOPs. However, the total number of structures found by operators (419,785) is lower than the number of structures found at an enumeration (443, 044) carried out in 2016. This difference is greater in the Donga Department than the Alibori. This is due to several factors, in particular the change of status of certain structures converted into kitchens, shops, and storage places for crops that are ineligible structures. Table 14 describes the overall spray coverage rate.

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

Department	Commune	Eligible Structures Found by SOPs	Eligible Structures Sprayed 2017	Coverage Rate 2017
Donga	Copargo	23,711	21,825	92.0%
	Djougou	122,866	107,744	87.7%
	Ouaké	26,617	22,830	85.8%
Atacora	Kérou	48,757	46,812	96.0%
	Péhunco	37,796	35,464	93.8%

Alibori	Gogounou	51,346	48,420	94.3%
	Kandi	72,464	67,855	93.6%
	Ségbana	36,228	33,811	93.3%
Total		**419,785***	**384,761**	**91.7%**

*296, 409 structures were found in 2016 against 419,785 structures in 2017, an increase of 41.62%

All communes reached or exceeded the minimum required coverage rate of 85 percent. The lowest coverage rates were recorded in Ouaké and Djougou communes with 85.5% and 87.7%, respectively. Closed structures (4.15% in Djougou; 4.97% in Ouake), structures transformed into granaries (2.26% in Djougou; 2.54% in Ouake) during the IRS campaign, and refusals cases (4.22% in Djougou; 4.27% in Ouake) were the main reasons for the lower coverage rates in these communes.

Overall, 35,024 eligible structures (8.3% vs 9.2% in 2016) and 74,429 people (5.7% vs 7.3% in 2016) found by SOPs did not benefit from spraying during the 2017campaign. The main reasons for non-sprayed structures included: absence of households' owners (structures locked - 35.4% vs 26.1% in 2016), home owners refused treatment (28.5% vs 26.0% in 2016), and the transformation of eligible structures into granaries during the time of spray (22.5% vs 39% in 2016).

8.5 POPULATION PROTECTED

IRS provided protection to 1,227,536 people, including 632,866 men (51. 6%) and 594,670 women (48.4%), in the 2017 IRS campaign. Those protected included vulnerable populations: 234,984 children under five years old (19.1%), and 46,169 pregnant women (3.8%). Table 15 provides a breakdown of the population protected during the 2017 IRS campaign per commune.

TABLE 15: POPULATION PROTECTED DURING 2017 IRS CAMPAIGN PER COMMUNE

Communes	Total Population			Children <5 years			Pregnant Women
	Men	Women	Total	Male	Female	Total	
Copargo	30,457	28,370	**58,827**	4,828	4,927	**9,755**	**1,548**
Djougou	161,580	151,214	**312,794**	28,360	28,124	**56,484**	**10,741**
Ouaké	30,316	28,663	**58,979**	4,829	4,635	**9,464**	**1,506**
Kérou	85,441	76,010	**161,451**	18,672	17,119	**35,791**	**9,768**
Péhunco	59,523	54,821	**114,344**	13,852	13,297	**27,149**	**5,944**
Gogounou	85,798	83,556	**169,354**	15,400	15,218	**30,618**	**5,184**
Kandi	121,625	116,891	**238,516**	21,554	20,978	**42,532**	**7,564**
Ségbana	58,126	55,145	**113,271**	11,693	11,498	**23,191**	**3,914**
All 8 Districts	**632,866**	**594,670**	**1,227,536**	**119,188**	**115,796**	**234,984**	**46,169**

8.6 USE OF LLINS

As requested by the NMCP, SOPs collected data on the number of people in the intervention area (particularly children under five years and pregnant women) sleeping under LLINs the night before, including in households that were not sprayed. Among the 1,227,536 people protected by IRS, SOPs found that 767,861(62.6%) slept under LLINs the night before. Of the 234,984 children under five who

were protected by IRS, 162,980 (69.4%) slept under LLINs the night before. Lastly, of the 46,169 pregnant women protected by IRS, 30,197 (65.4%) slept under LLINs the previous night. Table 16 below provides the breakdown of the LLIN data collected by SOPs.

TABLE 16: BREAKDOWN OF LLIN DATA COLLECTECTED BY SOPS

Communes	Total number of people (in sprayed structures) who slept under a mosquito net the night before the spraying		Total number of children under 5 years of age (in sprayed structures) who slept under a mosquito net the night before the spraying		Total number of pregnant women (in sprayed structures) who slept under a mosquito net the night before the spraying	
	Number	**(%)**	**Number**	**(%)**	**Number**	**(%)**
Donga Department						
Copargo	30,978	52.7	5,872	60.2	793	51.2
Djougou	190,676	61.0	38,561	68.3	6,560	61.1
Ouaké	42,136	71.4	7,163	75.7	1,049	69.7
Subtotal 1	*263,790*		*51,596*		*8,402*	
Atacora Department						
Kérou	97,559	60.4	24,281	67.8	6,825	69.9
Péhunco	85,094	74.4	21,004	77.4	4,606	77.5
Subtotal 2	*182,653*		*45,285*		*11,431*	
Alibori Department						
Gogounou	110,867	65.5	22,381	73.1	3,411	65.8
Kandi	139,649	58.5	28,137	66.2	4,457	58.9
Ségbana	70,902	62.6	15,581	67.2	2496	63.8
Subtotal 3	*321,418*		*66,099*		*10,364*	
Grand total	767,861		162,980		30,197	

8.7 INSECTICIDE USE AND SOP PERFORMANCE

A total of 58,765 bottles of pirimiphos-methyl CS formulation were used to treat 384,761 eligible structures during the 2017 IRS campaign. On average, SOPs sprayed 11.1 structures per day and 6.5 structures were treated per bottle[1] of Pirimiphos-methyl CS.

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

[1] One bottle of organophosphate is formulated to cover an average of 250m^2.

TABLE 17: INSECTICIDE USED PER COMMUNE

Communes	Number of Organophosphate Bottles Used	Number of Structures Sprayed	Number of Structures Sprayed per Bottle
Donga Department			
Copargo	3,310	21,825	6.6
Djougou	16,831	107,744	6.4
Ouaké	4,119	22,830	5.5
Subtotal 1	*24,260*	*152,399*	*6.3*
Atacora Department			
Kérou	7,379	46,812	6.3
Péhunco	6,098	35,464	5.8
Subtotal 2	*13,477*	*82,276*	*6.1*
Alibori Department			
Gogounou	5,487	48,420	8.8
Kandi	11,351	67,855	6.0
Ségbana	4,190	33,811	8.1
Subtotal 3	*21,028*	*150,086*	*7.1*
All 8 Communes	**58,765**	**384,761**	**6.5**

At the end of the campaign, there was a total of 28,615 full bottles of insecticide left: 108 bottles of insecticide with an expiration date of December 2018 and 28,507 bottles of insecticide with an expiration date of January 2019. The leftover insecticide will be used for future spray campaign in Benin.

9. POST-SPRAY ACTIVITIES

9.1 POST-SPRAY INVENTORY

Unused PPE and insecticide were returned to the central warehouse in Natitingou. An inventory of all remaining commodities from the 2017 IRS campaign was completed (See provisional detail in Annex A).

9.2 POST-SPRAY CAMPAIGN RADIO PROGRAMS

The post-spray campaign radio programs include the following activities:

- Raise awareness of the benefits of sleeping in sprayed structures and the need to preserve the effectiveness of the insecticide (not applying paint, plaster, or other materials to walls).
- Broadcast information on other malaria prevention measures in addition to the correct and daily use of the LLINs, especially during the rainy season: sanitation and clearing water collection areas, which mosquitoes around houses can use as breeding sites.
- The benefits of being properly tested and treated as soon as one feels malaria symptoms, including fever.

10. GENDER

AIRS Benin has always prioritized gender equality and female empowerment across spray operations. Approaches envisaged for achieving an impact include:

- Explicit inclusion of gender issues in all training modules, from TOT through cascade training
- Working directly with local hiring authorities and women's groups to increase the percentage of women hired by the Project. Staff shared information on the importance of hiring female SOPs and presented data that show that women are as effective as their male counterparts in terms of structures sprayed per day. The project emphasized placing qualified women into supervisory roles and into highly gender-segregated roles, such as pump technicians, drivers, and security guards.
- Continuing promotion of a respectful working environment through the Project's sexual harassment policy for all employees, including seasonal workers. The Project's Gender Awareness guidelines were posted at all operational sites. New anti-harassment posters, adapted from the successful pilot in Ghana, were printed and posted at all sites
- Revising training and mobilization documents to include more pictures and information about women in a range of IRS roles
- Ensuring that recruitment, mobilization, and training include women and respect women's time constraints (when possible)
- Ensuring that women who are pregnant and recruited during the campaign are assigned to roles without exposure to insecticide
- Ensuring women have accommodations in operational sites where they feel safe and comfortable, including separate bathrooms and showers equipped with sanitary bins and PPE in appropriate sizes
- Creating a buddy system so that at least two women are together on each spray team
- Providing sex-disaggregated data for all indicators, as appropriate

The AIRS Benin gender focal point coordinated and met with the USAID/Benin gender advisor to promote synergy between the Project's work on gender and other USAID-supported initiatives around gender equality and female empowerment in Benin.

FIGURE 15: POSTER ON SEXUAL HARASSMENT IN DJOUGOU 3 SITE WAREHOUSE

FIGURE 16: FEMALE STOKEEPERS IN KASSAKOU (KANDI) SITE WITH THE GENDER FOCAL POINT (RIGHT) AND THE AIRS TECHNICAL PROGRAM MANAGER (SECOND FROM RIGHT SIDE)

SOP Performance by Sex

To expect 100% of coverage given the size of structures in new IRS target areas, the daily performance for an SOP was set at 13 structures a day, which is lower than the performance set in 2016. The Two new departments that were added in 2017 had not received spray before; therefore, this made it a bit challenging to implement IRS as the level of refusals was a bit high despite all the mobilization efforts and support from local authorities. The actual average achieved was 11.1 structures a day in 2017 vs. 13.9 structures in 2016. Table 18 below shows the SOPs' performances achieved by commune and by sex in 2017. Based on figures in this table, it appears that female SOPs performed better than men in Copargo, Ouake, Pehunco, and Kandi. Considering the overall performance, men and women are equal with 11.1 structures a day. During supervision, female SOPs were more compliant than their male counterparts. This encourages AIRS-Benin to continue to ensure gender equality in its activities.

TABLE 18: FEMALE SOP PERFORMANCE (2017 IRS CAMPAIGN)

Commune	Number of Structures Sprayed by sex		Number of SOPs by Sex		Structures Sprayed per Day by Sex	
	Female	Male	Female	Male	Female	Male
Donga Department						
Copargo	1,748	20,077	6	85	13.2	10.7
Djougou	9,498	98,246	45	439	9.6	10.2
Ouaké	2,084	20,746	9	102	10.5	9.2
Subtotal 1	*13,330*	*139,069*	*60*	*626*	*10.1*	*10.1*
Atacora Department						
Kérou	3,675	43,137	17	141	9.8	13.9
Péhunco	5,762	29,702	16	118	16.4	11.4
Subtotal 2	*9,437*	*72,839*	*33*	*259*	*13.0*	*12.8*
Alibori Department						
Gogounou	3,748	44,672	16	174	10.6	11.7
Kandi	9,134	58,721	35	240	11.9	11.1
Ségbana	2,821	30,990	13	116	9.9	12.1
Subtotal 3	*15,703*	*134,383*	*64*	*530*	*11.2*	*11.5*
Total	**38,470**	**346,291**	**157**	**1,415**	**11.1**	**11.1**
	384,761		**1,572**		**11.1**	

In 2017 IRS campaign, 19.3% of seasonal workers were female versus 19.2 in 2016.

11. CAPACITY BUILDING

Capacity building is one of the objectives of the IRS program in the collaborating country with the intention that in the long run, the government and private sector actors can carry out IRS with minimal donor-led support. Unlike in 2016, where NMCP provided more of an additional operational support to the AIRS team and did not have a specific commune fully assigned to them, in 2017 it was fully assigned a specific spray area.

The activities below describe NMCP involvement in the 2017 IRS campaign and AIRS Benin's support:

- Capacity building on IRS implementation process: the NMCP took full responsibility (under AIRS Benin's mentorship) of IRS management in the commune of Copargo (Donga department) and in the commune of Gogougou (Alibori department)
- Participation in pre-, mid-, and post-spray EC inspections
- Assignment of two database managers who worked with the AIRS database manager team during the data entering process in the IRS campaign
- The IEC/Behavior Change Communication focal point from the DDS fully carried out his tasks with the AIRS Benin counterpart

To run the IRS operations in Gogounou, MOH/NMCP assigned one nurse from the health center of Gogounou as Site Coordinator. He participated in the IRS campaign action plan development in Bohicon in March 2017. After attending the TOT on IRS technical aspects, the commune coordinator led the SOP and mobilization training in his commune. It was the same case for the coordinator of the commune of Copargo, who is an environmental health technician in this commune.

With AIRS Benin's support, commune coordinators established the IRS operation micro-plan for their communes and managed IRS activities such as supervising the secondary warehouse with the store keeper, preparing the SOP teams for field work, supervising their work, validating the recorded IRS data, and sending data to the main data center every day. In addition, the commune coordinators coordinated all IRS components in their geographic area. The health zone officer (from the government) supported commune coordinators on supervisory activities and daily monitoring of IRS operation progress.

In general, the IRS coverage in Copargo and Gogounou are all above the objective set by the National Malaria Strategic Plan. Nevertheless, some key interventions can be improved, such as:

- Strengthen leadership and management at the national, departmental, and commune level in spray operations, planning, and implementation
- Conduct close supervision of spray teams and mobilizers and reinforce field activity coordination to improve results
- Identify the best roles for NMCP (national, departmental, and commune) staff that maximize their strengths within their human resource constraints
- Increase NMCP leadership in determining long- and short-term strategies envisioned for IRS in Benin
- Train the M&E staff (focal points) on database management
- Reinforce NMCP competencies in site preparation and soak pit/wash area building

12. Lessons Learned and Challenges

Administration and Logistics

- The first-time pilot mobile payment experience was a success, particularly in reducing beneficiaries' wait time for their payment, quick return of supporting documents, etc.
- Some operators signed the contract without having read the content. That created the problem of explaining certain provisions of the contract while the campaign was in progress, in particular the provisions on payment terms.
- The area of intervention extends over three departments with different political, administrative, and health levels and partners, which made it difficult to bring all seasonal staff together in the same place for the launching activities of the campaign. It is also difficult to combine training, especially for SOPs, in the same place as long as this training is to be brought closer to the campaign period to keep the information fresh. Having two intervention zones (Zone 1 and Zone 2) with separate launching dates has made it possible to cope with this challenge.
- The involvement of influential figures such as political, religious and opinion leaders, within the communities, in addition to the local media made it possible to address cases of refusal and increase the coverage of IRS intervention.
- We experienced difficulties in managing operational sites with more than 100 operators mainly due to lack of buildings in the new IRS area to serve as a secondary storage site. In areas where crops consume large quantities of pesticides, the tendency to steal insecticide is higher since operators are exposed to many solicitations from farmers.

M&E

- The data collection tools are generally well designed. However, seasonal staff with low levels of education (often recruited by government authorities) often have difficulty filling in the forms. The SOP training on data collection should be strengthened to address this issue.
- DECs are paid on the basis of their performance in terms of the number of lines entered per day. This approach optimizes the performance of data clerks, but the results of data entry verification checks, which confirm the quality of entered data, should also be a factor in DEC payment.

IEC

- In case of refusal due to misconceptions or rumors, the involvement of the political, religious, and opinion leaders is very important to overcome this difficulty.

Logistics

- The transition to a new IRS area poses enormous challenges in estimating needs since there are many unanticipated contingencies. As an illustration, many bottles of insecticide remained after the 2017 IRS campaign due mainly to the fact that the average number of structures sprayed per bottle of insecticide during the spray campaign was higher than the estimated number of structures per insecticide bottle in the work plan. For instance, the average number of structures sprayed during the spray campaign exceeds 6, while the workplan had an estimated number of 5 structures per bottle.

Environmental Compliance

- In remote villages, such as the Alibori department, the mobile soak pit was of great help.
- The lack of adequate structures to serve as storage sites during the campaign in the Alibori Department led to the project using additional financial resources to develop secondary storage sites.
- The very hot climatic conditions in northern Benin, especially in the new IRS area, is a barrier to the correct use of PPE as operators get hot and tend to not fully cover up. Frequent reminders were sent to the SOPs via SMS reminders to comply with the correct use of PPEs to ensure that the body is appropriately covered during the spray.
- IRS intervention uses large quantities of water for the mixing of insecticide and for the end-of-day clean up. In the new IRS area, water is a rare commodity in some localities. This increases the project's cost for the provision of water to operational sites for IRS purposes, in particular the end-of-day clean up and the laundry of the PPE.

13. RECOMMENDATIONS

To improve future IRS campaigns in Benin, the project recommends:

1. Increase the number of operational sites to ensure better use of IRS support infrastructures (store, rinsing area, toilet, etc.)
2. Ensure strong involvement of political, religious, and opinion leaders in IEC activities and increase the number of days for mobilization
3. Handle carefully plastic pumps for which parts are mostly irreparable
4. Ensure proper maintenance of spray pumps to prevent leaks or malfunctions and gradually replace the old pumps
5. Promote a collaboration with other USAID implementers on critical components of IRS, including IEC
6. Ensure close monitoring of the use of insecticide in areas where theft attempts have been observed
7. Improve structures enumeration strategies and needs assessment in future new IRS areas

ANNEX A: IRS COMMODITIES AND INVENTORY

TABLE 19: IRS COMMODITIES AND INVENTORY

Item	Initial Stock before IRS Campaign	Number of Items Procured	Stock before Campaign	Defective Items after IRS Campaign + Consumables (Single use)	Usable Stock Remaining for 2017
Insecticide (Pirimiphos - methyl-CS)	7,424	79,968	87,392	58,777	28,615*
Spray Pumps X-PERT (Hudson)	639	0	639	349	290
Spray Pumps IK12 VC (Goizper)	400	0	400	0	400
Spray Pumps IK Super VC (Goizper)	0	996	996	1	995
Overalls	2,968	1,899	4,867	31	4,836
Vest	389	593	982	241	741
Helmet	1,391	1,056	2,447	52	2,395
Gumboots	1,497	943	2,440	54	2,386
Gloves for SOP	156	3,744	3,900	2,781	1,119
Gloves for Washer	88	96	184	122	62
Respirator Mask	9,480	39,800	49,280	46,080	3,200
Operator Flashlight (head lamp)	53	2,155	2,208	1,950	258
Guard Flashlight	0	20	20	5	15
Caps (used for mobilization)	59	1,010	1,069	382	687
First Aid Kits	56	138	194	102	92
Thermometers	33	0	33	6	27
Fire Extinguishers	35	0	35	0	35
O Ring for Supply Tube Hudson	477	0	477	77	400
Filters x PER	642	0	642	330	312
Filter Goizper Pump	600	0	600	0	600
White Washers (spare part for pumps)	414	1,010	1,424	510	914
Elbow with Nozzles Goizper	150	0	150	66	84
Nozzle Blues	50	50	100	0	100
Face Shield for Helmets	154	2,359	2,504	2,404	100

Filter Assembly, for Pressure Gauge Hudson	360	0	360	227	133
Cup Retainer Hudson	152	75	227	0	227
Plunger Adaptor	259	0	259	54	205
Complete Chamber Goizper	109	245	354	286	68
Sieve Pump IK Super	0	10	10	5	5
Two-Component Hose New Pumps/Goizper	5	0	5	0	5
Two-Component Hose Old Pumps/Goizper	18	0	18	12	6
Valve Goizper	11	58	69	0	69
Safety Valves Goizper	81	60	141	90	51
Collar Seal/Goizper	34	0	34	2	32
Lance Filter New Pumps/Goizper	150	0	150	142	8
Lance Filter Old Pumps/Goizper	13	196	209	0	209
Lance Tube Old Pumps/Goizper	48	0	48	30	18
Lance Tube New Pumps/ Goizper	61	0	61	35	26
Pressure Regulator/Goizper	147	762	909	80	829
Pressure Regulator/Hudson	675	0	675	35	640
Spare Parts Kit Pumps Goizper/	20	0	20	0	20
Spare Part Kit Hudson	35	0	35	2	33
Complete Handle/Goizper	49	103	152	121	31
Pressure Gauge Xp Hudson	557	0	557	226	331
Leaflets	21,450	156,500	177,950	150,450	27,500
Pregnancy Test Kits	0	503	503	503	0
Generators	3	0	3	0	3
Buckets for SOPs	1,754	271	2,025	180	1,845
Plastic Buckets for Dustbin (100L)	147	63	210	9	201
Barrel (100l)	3	0	3	0	3
Ficam Barrel (150L)	84	0	84	0	84
Rinsing Barrel (200L)	84	228	312	0	312
Fuel Tank (200L)	15	10	25	0	25
Water Tank	14	4	18	1	17
Motorcyles	8	0	8	0	8

**At the end of the campaign, there was a total of 28,615 bottles of insecticide left: 108 bottles of insecticide with an expiration date of December 2018 and 28,507 bottles of insecticide with an expiration date of January 2019.*

ANNEX B: CERTIFICATE OF ANALYSIS

syngenta

Contact:
RAHIA KHAN

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P.O. Box
CH-4002 Basel
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DATE: 23.01.2017

Sold to
Arysta LifeScience (Mauritius) Ltd.
Block 8 suite 8E, Clarens Field
Med. Bus. Park Riviere Noire Rd.
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Broekman Logistics Europoort BV
Merwedeweg 4
3198 LH ROTTERDAM-EUROPOORT
NETHERLANDS

CERTIFICATE OF ANALYSIS

ACTELLIC 300CS 12x833 ML

Material No.	0048588
Agro No.	A15293BA
Delivery No.	285128082
Order No	11600829 - 151116/30

Batch No.	**Quantity**
BSN6L1280	8.636,544 L
Production Date	**Expiry Date**
12/12/2016	12/12/2018

Batch No.	**Quantity**
BSN6L1482	9.596,160 L
Production Date	**Expiry Date**
14/12/2016	14/12/2018

Nominal A.I.Content : 30.000 % W/V PP511 PIRIMIPHOS-METHYL

It is herewith certified that the above batches have been tested and are in line with the specifications.

This certificate was generated electronically and is valid without signature. 1 /

ANNEX C: NUMBER OF PEOPLE TRAINED

TABLE 20: NUMBER OF PEOPLE TRAINED BY TYPE OF TRAINING

Categories of Individual Trained	Training on IRS Delivery								Other Trainings															
	Master training		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	M	F
DDS			3																					
SHAB Regional			2																					
NMCP Regional			2																					
DDEHU																								
CREC	1																							
Site Coordinators	14	1																						
District Chief Doctors/ Other Doctors*			8	3									5	3			5	3						
Chiefs of Health Post/ Midwife													51	28			51	28						
Hygiene Agents/Others Supervisors			144	35																				
SOPs					1457	170																		
Data Clerks							43	14																
Storekeepers	1								20	4											21	7		
Logistics Assistants	1								3															
Pump Technicians											139	26												
IEC mobilizers															908	286								
Washers																			155					
Drivers																					246			
Guards																					32			
IEC Assistants			3										8	3										
Environmental Compliance Officer assistants	1	3																						
M&E Assistants	4																							
TOTAL M/F	**22**	**4**	**162**	**38**	**1457**	**170**	**43**	**14**	**23**	**4**	**139**	**26**	**64**	**34**	**908**	**286**	**56**	**31**	**0**	**155**	**299**	**7**	**0**	**0**
TOTAL/ training	**26**		**200**		**1,627**		**57**		**27**		**165**		**98**		**1,194**		**87**		**155**		**306**		**0**	

Note: Some doctors , head of Health facilities and midwives followed more than one training.

ANNEX D: ENVIRONMENTAL MITIGATION AND MONITORING REPORT

TABLE 21: ENVIRONMENTAL MITIGATION AND MONITORING REPORT

Mitigation Measure	Status of Mitigation Measures	Outstanding Issues Relating to Required Conditions	Remarks
1a. Pre-contract inspection and certification of vehicles used for pesticide or spray team transport	All transport vehicles were provided with an inspection certificate on-board	None	
1b. Driver training	It took place in two steps, on May 2 in Zone 1 and May 14 in Zone 2, 2017 and involved all of transport vehicles drivers	None	
1c. Cell phone, personal protective equipment (PPE) and spill kits on board during pesticide transportation.	100% of transport vehicle drivers had their cell phone and PPE on board; every transport vehicle was provided with a spill kit	None	Every driver came with his cell phone; every transport vehicle was equipped with PPE and spill kit
1d. Initial and 30-day pregnancy testing for female candidates for jobs with potential pesticide contact	All female candidates for jobs with potential pesticide contact were submitted to the initial pregnancy testing (IRS campaign lasted 22 days)		Five females with positive pregnancy tests at launch of campaign were declared unfit by the physicians to perform as spray operators
1e. Health fitness testing for all operators	All SOPs received health fitness testing	None	
1f. Procurement of, distribution to, and training on the use of PPE for all workers with potential pesticide contact	SOPs and other workers wore complete PPE during spraying and clean-up	None	SOPs, storekeepers, or washers not wearing complete PPE were recalled and sensitized for immediate use
1g. Training on mixing pesticides and the proper use and maintenance of spray pumps	SOPs were trained on proper mixing of pesticide; they also used and most of them correctly maintained spray pumps	Frequent leakages observed only on old spray pumps	New spray pumps helped notably to limit leakage issues

Mitigation Measure	Status of Mitigation Measures	Outstanding Issues Relating to Required Conditions	Remarks
1h. Provision of adequate facilities and supplies for end-of-day cleanup	Compliant rinsing areas, soak pits, and drums with sufficient water for end-of-day cleanup were available	Two rinsing areas showed water stagnation due to construction defects	Intructions were given to construction companies for repairs
1i. Enforce spray and clean-up procedures	Spray and clean-up procedures were taught during training and applied at all operation sites over the IRS campaign	No issue	Mid-inspection and daily supervisions were performed as scheduled, with immediate implementation of corrective actions
2a. IEC campaigns to inform homeowners of responsibilities and precautions	Pre-spray IEC campaigns were executed; homeowners knew their responsibilities and precautions	Some beneficiaries declared not to be informed	SOPs and supervisors provided them with due information
2b. Prohibition of spraying houses that are not properly prepared	Almost all the sprayed houses had previously been well prepared	Some SOPs attempted to spray houses with stored grain inside	Prohibition was strongly highlighted and the SOPs were given frequently educational sessions during morning meetings, which helped properly prepare houses before spraying
2c. Two-hour exclusion from house after spraying	Beneficiaries observed two-hour (and sometimes more) exclusion	None	
2d. Instruct homeowners to wash itchy skin and go to health clinic if symptoms do not subside	Instructions were given; no incident related to skin issue was noted or reported	None	
3a. Indoor spraying only	No SOP was observed spraying outside the house; in Benin, even eaves are not sprayed	None	SOPs respected recommended surfaces
3b. Training on proper spray technique	SOPs were trained on proper spray technique and most of them used it correctly	Improper use of spray technique by some SOPs	These operators were trained again for better results
3c. Maintenance of pumps	Pumps were maintained by SOPs and maintenance technicians; leaks were noted mainly with old pumps	None: there were spare parts enough	Plastic pumps were more vulnerable
4a. Choose sites for disposal of liquid wastes, including mobile soak pit sites, according to PMI BMPs	All operation sites are compliant with PMI BMPs, except Semere site	Shallow soil induced a slight overflow that was quickly resolved by reducing water consumed	Change Semere site as soon as possible

Mitigation Measure	Status of Mitigation Measures	Outstanding Issues Relating to Required Conditions	Remarks
4b. Construct fixed and mobile soak pits with charcoal to absorb pesticide from rinse water	AIRS Benin fixed and mobile soak pits perfectly complied with the BMP guidelines	None	
4c. Maintain soak pits as necessary during season	All soak pits (26 permanents and 2 Mobile soak pits) have been well maintained over the spray season	No major issue	
4d. Inspection and certification of solid waste disposal sites before spray campaign	The usual disposal site of Tanguieta was confirmed only during the spray campain because the Order of Malta Hospital of Djougou declined at the last moment its commitment to treat our waste, since the new center could not be made operational. -The landfill site of Ouessè and the DCAM's Recycling Center of Pahou are in line with the national Law (No 98-030) on environment and confirmed before IRS campaign	Momentary breakdown of Incinerator	Incineration planned from August 5-12, 2017
4e. Monitoring waste storage and management during campaign	During IRS campaign, solid waste was stored and managed in compliance with the PMI BMPs	No major issue	The rare non-compliance cases (storage height, storage of insecticide, and new masks on the same pallet) detected were immediately corrected
4f. Monitoring disposal procedures post-campaign	Solid waste disposal procedures are ongoing, and disposal certificates will be delivered as required	None	Incineration will take place from August 5-12, 2017; empty bottles were decontaminated and transported back at DCAM storage facilities in Pahou, waiting for grinding process
5a. Maintain records of all pesticide receipts, issuance, and return of empty sachets/bottles	All pesticide, masks, and empty bottle movements were properly recorded over campaign in stock cards and the ledger	None	Monitoring completed during supervision and mid-spray inspections
5b. Reconciliation of number of houses sprayed vs. number of sachets/bottles used	These numbers were reconciled thanks to the tracking sheet monitoring completed during the campaign	Suspected cases were checked in the field	Monitoring completed during routine supervision and mid-spray inspection

Mitigation Measure	Status of Mitigation Measures	Outstanding Issues Relating to Required Conditions	Remarks
5c. Visual examination of houses sprayed to confirm pesticide application.	Most of examined houses were effectively sprayed with insecticide	Poor application cases detected were corrected	Monitoring carried out over mid-spray inspection
5d. Perform physical inventory counts during the spray season	Physical inventories of insecticide and empty bottles performed during campaign matched with the quantities recorded	None	Inventories completed during IRS supervision

ANNEX E: IRS DAILY COVERAGE RATE PER ZONE

FIGURE 17A : PERCENTAGE OF DAILY SPRAYED STRUCTURES VS. STRUCTURES FOUND IN ZONE I (DCO-KP)

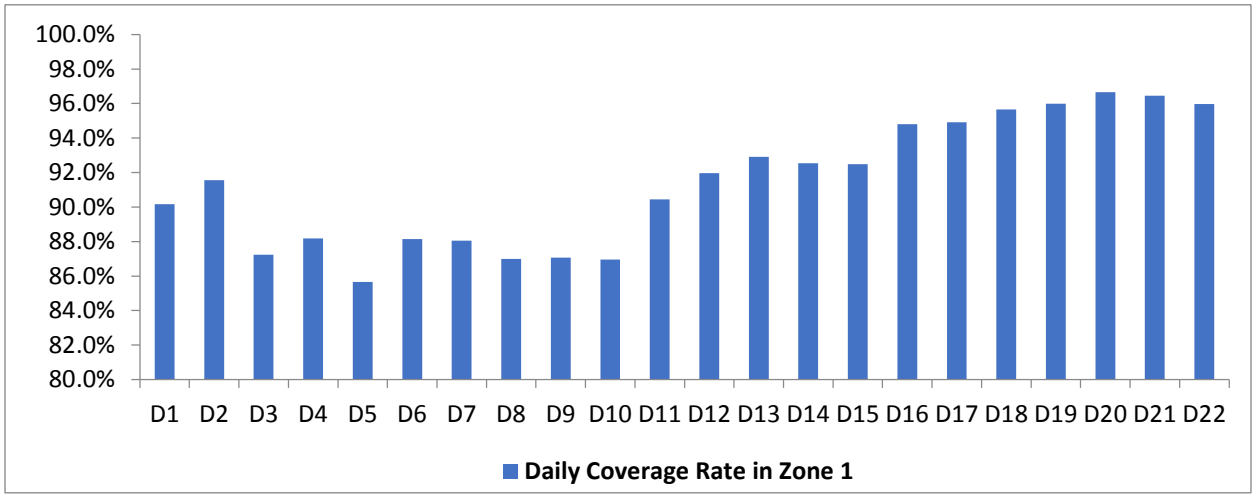
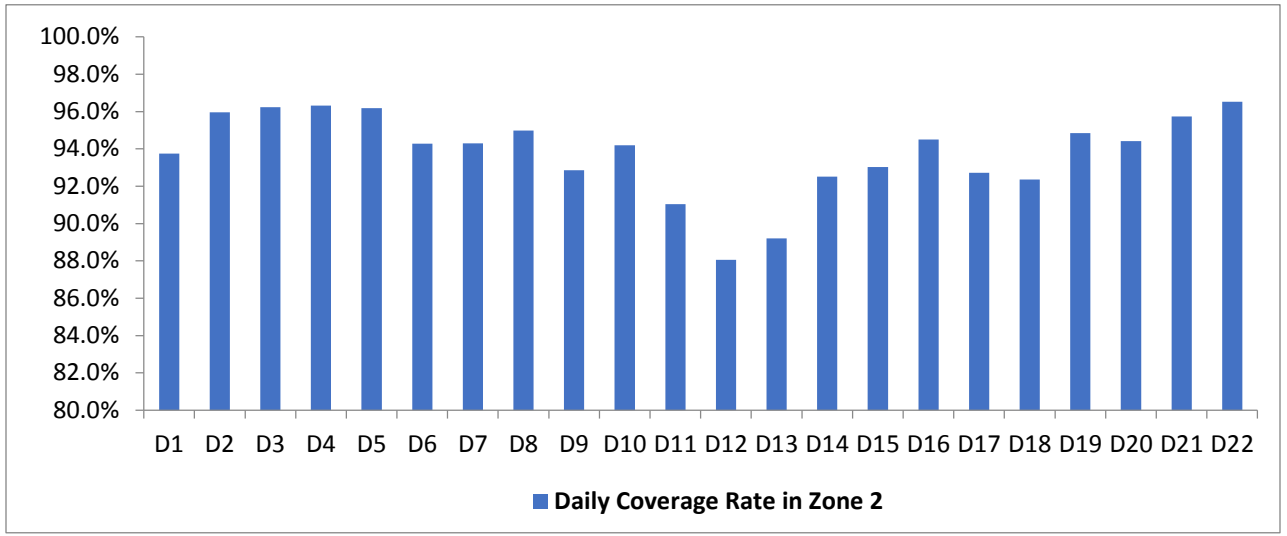


FIGURE 17B : PERCENTAGE OF DAILY SPRAYED STRUCTURES VS. STRUCTURES FOUND IN ZONE 2 (KGS)



Figures 19a and 19b above show the progress of daily coverage rate. The coverage rate (# eligible sprayed structures versus # eligible structures found) evolved from 90.2% (Day 1) to 96% (Day 22) in the Zone 1 (figure 19a.), while in zone 2 (figure 19b.), this rate increased from 93.7% (Day 1) to 96.5% (Day 22). The coverage rate increased significantly the last eight days of the campaign, from 92.5% (Day 15) to 96.6% (Day 22) in Zone 1 due to the mop-up performed in the last days of the campaign to capture eligible structures that weren't sprayed in the middle and beginning of the campaign. Most eligible structures visited during the last five days of the campaign were sprayed.

ANNEX F: MONITORING AND EVALUATION PLAN

TABLE 22: BENIN MONITORING AND EVALUATION PLAN INDICATOR MATRIX

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

Performance Indicator	Data Source(s) and Reporting Frequency	Disaggregate	Annual Targets and Results					
			Year 1*		Year 2**		Year 3***	
			Target	Results	Target	Results	Target	Results
start of spray operations	Each spray campaign							
1.1.4 Number and percentage of local procurements for PPE delivered 14 days before the start of spray operations	*Data source:* Project records *Reporting frequency*: Each spray campaign	By Spray Campaign	1; 100%	1;100%	1; 100%	1;100%	1; 100%	1; 100%
1.1.5 Successfully completed spray operations without an insecticide stock-out	*Data source:* Project records *Reporting frequency*: Each spray campaign	By Spray Campaign	Completed	Completed	Completed	Completed	Completed	Completed
1.2 In-Country Exemption and Custom Clearance Process								
1.2.1 Complete exemption and clearance process within the minimum two weeks	*Data source:* Project records *Reporting frequency:* Each spray campaign	By Spray Campaign	Completed	Completed	Completed	Completed	Completed	Completed
1.3 In-Country Logistics, Warehousing, and Training								
1.3.1 Number and percentage of logistics and warehouse managers trained in IRS supply chain management	*Data source*: Training records *Reporting frequency*: Each spray campaign	By Spray Campaign By Gender	18; 100%	17; 94%	19; 100%	19; 100%	23; 100%	27; 100%
1.3.2 Number and percentage of base stores where physical inventories are verified by up-to-date stock records	*Data source:* Project records *Reporting frequency*: Each spray campaign	By Spray Campaign	16 (including central warehouse); 100%	16; 100%	18; 100%	18; 100%	17; 100%	19; 100%

Performance Indicator	Data Source(s) and Reporting Frequency	Disaggregate	Annual Targets and Results					
			Year 1*		Year 2**		Year 3***	
			Target	Results	Target	Results	Target	Results
1.3.3 Submit up-to-date inventory records 30 days after the end of each spray campaign	*Data source:* Project records *Reporting frequency*: Each spray campaign	By Spray Campaign	Completed	Completed	Completed	Completed	Completed	In the process of completing
Component 2: Implement safe and high-quality IRS programs and provide operational management support								
2.1 Planning and Design of IRS Programs								
2.1.1 Annual PMI AIRS country work plan developed and submitted on time	*Data source:* Project records *Reporting frequency*: Annually	By Spray Campaign	Completed	Completed	Completed	Completed	Completed	Completed
2.1.2 Percentage reduction in project operational expenses per structure from the previous year, excluding insecticide costs	*Data source:* Project financial records *Reporting frequency*: Annually	By Spray Campaign	5%	1.65%	5%	(-2.56)%	5%	TBD
2.2 Support of Safety and Health Best Practices and Compliance with USAID and Host Country Environmental Regulations								
2.2.1 SEA/letter reports submitted on time based on schedule agreed upon with the-PMI COR team	*Data source*: Project records – submitted SEAs/ letter reports Reporting frequency: Each spray campaign	By Spray Campaign	Completed	Completed	Completed	Completed	Completed	Completed

Performance Indicator	Data Source(s) and Reporting Frequency	Disaggregate	Annual Targets and Results					
			Year 1*		Year 2**		Year 3***	
			Target	Results	Target	Results	Target	Results
2.2.2 Number of spray personnel trained in environmental compliance and personal safety standards in IRS implementation	*Data source:* Project records – Training reports *Reporting frequency:* Each spray season	By Spray Campaign By Gender	1584[2]	1577	1,3313	1,310 M: 1,072 F: 238	1,736	2,379 M: 1,980 F: 399
2.2.3 Number of health workers receiving insecticide poisoning case management training	*Data source:* Project records – Training reports *Reporting frequency*: Each spray season	By Spray Campaign By Gender	75	80	75	78 M: 49 F: 29	72	90 M: 59 F: 31
2.2.4 Number of adverse reactions to pesticide exposure documented	*Data source:* Incident report forms *Reporting frequency*: Each spray campaign	By Spray Campaign By Residential/ occupational exposure	0	1 Residential	0	1 Occupational	0	1 Occupational
2.2.5 Number and percentage of soak pits and storehouses inspected and approved prior to spraying	*Data source:* Project records – Reports submitted by commune environmental officers *Reporting frequency:* Each spray season	By Spray Campaign By Soak Pit (permanent) By Mobile Soak Pits By Storehouse	33; 100% 16 17	33; 100% 16 17	33; 100% 16 17	33; 100% 16 17	30; 100% 14 16	43; 143% 26 2 17

[2] This number includes: SOPs, team leaders, storekeepers, logistic assistants, service technicians, and washers

Performance Indicator	Data Source(s) and Reporting Frequency	Disaggregate	Annual Targets and Results					
			Year 1		Year 2		Year 3	
			Target	Results	Target	Results	Target	Results
2.3 Conduct Communications Activities and Community Mobilization								
2.3.1 Number of radio spots and talk shows aired	*Data source:* Project records *Reporting frequency:* Per spray campaign	By Spray Campaign	7,796	7,796	7,796	5,494	5,288	8,217
2.3.2 Number of IRS print materials disseminated	*Data source:* Project records *Reporting frequency:* Semi-annually	By Spray Campaign By Type of printed material and message(s)	165,500	165,500 Leaflets: 74,500 IRS cards: 91,000	200,000	200,000 Leaflets: 100,000 IRS cards: 100,000	310,464	325,094 Leaflets: 151,398 IRS cards: 173,696
2.3.3. Number of people reached with IRS messages via door-to-door mobilization	*Data source:* Mobilization Data Collection Forms *Reporting frequency:* Daily per mobilization conducted	By Spray Campaign By Gender	383,889	437,714 M: 210,606 F: 227,108	437,714	434,038 M: 206,052 F: 227,986	434,038	671,631 M: 320,629 F: 351,002
2.4 Spray Targeted Structures According to Technical Specifications								
2.4.1 Number of structures targeted for spraying	*Data source:* Previous spray campaign data, enumeration data (targets); Daily SOP Forms (results) *Reporting frequency:* Daily per spray campaign	By Spray Campaign	265,907	270,141	270,141	296,409	443,044	419,785

Performance Indicator	Data Source(s) and Reporting Frequency	Disaggregate	Annual Targets and Results					
			Year 1*		Year 2**		Year 3***	
			Target	Results	Target	Results	Target	Results
2.4.2 Number of structures sprayed with IRS	*Data source:* Daily SOP Forms *Reporting frequency:* Daily per spray campaign	By Spray Campaign	226,020	252,706	229,620	269,179	376,587	384,761
2.4.3 Percentage of total structures targeted for spraying that were sprayed with a residual insecticide (spray coverage)	*Data source:* Daily SOP Forms *Reporting frequency:* Daily per spray campaign	By Spray Campaign	85%	93.55%	85%	90.8%	85%	91.7%
2.4.4 Number of people residing in structures sprayed (number of people protected by IRS)	*Data source:* Daily SOP Forms *Reporting frequency*: Daily per spray campaign	By Spray Campaign By Gender By pregnant women By children <5 years old	790,000	802,597 M: 406,862 F: 395735 30,454 156,863	802,597	858,113 M: 438,918 F: 419,195 36,088 167,041	1,096,772	1,227,536 M: 632,866 F: 594,670 46,169 234,984
Component 3: Ongoing Monitoring and Evaluation and Quality Control Measures								
3.1 Submit PMI-approved M&E plan to PMI-Benin for approval	*Data source:* Project records *Reporting frequency*: Semi-annual	By Spray Campaign	Completed	Completed	Completed	Completed	Completed	Completed

Performance Indicator	Data Source(s) and Reporting Frequency	Disaggregate	Annual Targets and Results					
			Year 1*		Year 2**		Year 3***	
			Target	Results	Target	Results	Target	Results
3.2 Conduct a post-spray data quality audit within 60 days of completion of spray operations	*Data source*: Spray operations reports *Reporting frequency*: Per spray campaign	By Spray Campaign	N.A	N.A	Completed	Completed	N.A	N.A
Component 4: Contribute to Global and Country-Level IRS Policy Setting and Develop and Disseminate Experiences and Best Practices								
4.1 Number of guidelines/checklists/tools related to IRS operations developed or refined with project support	*Data source:* Project records – Activity reports *Reporting frequency*: Semi-annually	By Spray Campaign By Guideline/checklist/tool	19 7 Environnment Checklist 4 M&E supervision tools 1 Environnment tool 3 AIRS operation guidline 3 operation checklist 1 mHealth checklist	9	12 3 Environnment Checklists 4 M&E supervision/ control tools 1 mHealth checklist 4 operation/ Environnment checklist	12 3 Environnment Checklists 4 M&E supervision/control tools 1 mHealth checklist 4 operation/Environnment checklist	12 3 Environnment Checklists 4 M&E supervision/control tools 1 mHealth checklist 4 operation/Environnment checklist	12 3 Environnment Checklists 4 M&E supervision/control tools 1 mHealth checklist 4 operation/Environnment checklist
4.2 Number of articles/best practice documents published	*Data source:* Project records – Activity reports *Reporting frequency:* Semi-annually	By Spray Campaign By IRS Technical Area	1 Epidemiology	1 Epidemiology	1 Operations	1 Operations	1	In progress

Performance Indicator	Data Source(s) and Reporting Frequency	Disaggregate	Annual Targets and Results					
			Year 1*		Year 2**		Year 3***	
			Target	Results	Target	Results	Target	Results
4.3 Number of best practice presentations given at national/ regional/international workshops and conferences	*Data source:* Project records – Activity reports *Reporting frequency:* Semi-annually	By Spray Campaign By IRS Technical Area	3 1 epidemiology 1 environnment 1 Operation	2	3 1 epidemiology 1 environnment 1 Operation	2 1 epidemiology 1 Operation	3	-
4.4 Number of enterprises engaged through public-private partnerships	*Data source:* Project records – Activity reports *Reporting frequency:* Semi-annually	By Spray Campaign	0	0	1	0	1	1
Component 5: Contribute to the collection and analysis of Routine entomological and epidemiological data								
5.1 Support entomological monitoring activities and insecticide resistance strategies[4]								
5.1.1 Number of entomological sentinel sites supported by the PMI AIRS Project established to monitor vector bionomics and behavior (vector species, distribution, seasonality, feeding time, and location)	*Data source:* Entomological reports *Reporting frequency:* Annually	By Spray Campaign	5	N/A	N/A		8	8

[4] The entomological monitoring is ensured by the Entomology Research Center of Cotonou (CREC)

Performance Indicator	Data Source(s) and Reporting Frequency	Disaggregate	Annual Targets and Results					
			Year 1*		Year 2**		Year 3***	
			Target	Results	Target	Results	Target	Results
5.1.2 Number and percentage of entomological monitoring sentinel sites measuring all the five primary PMI entomological monitoring indicators	*Data source:* Entomological reports *Reporting frequency*: Annually	By Spray Campaign	5; 100%	N/A	N/A		8	8
5.1.3 Number and percentage of entomological monitoring sites measuring at least one secondary PMI indicator	*Data source:* Entomological reports *Reporting frequency*: Annually	By Spray Campaign	5; 100%	N/A	N/A		8	8
5.1.4 Number and percentage of insecticide resistance testing sites that tested at least one insecticide from each of the four classes of insecticides recommended for malaria vector control	*Data source:* Entomological reports *Reporting frequency*: Annually	By Spray Campaign	4; 100%	N/A	N/A		2	8
5.1.5 Number of wall bioassays conducted within 2 weeks of spraying to evaluate the quality of IRS	*Data source:* Entomological reports *Reporting frequency*: Per spray campaign	By Spray Campaign	18 tests total 1 test on 16 treatment structures and 2 control structure	N/A	N/A		N/A	2
5.1.6 Number of wall bioassays conducted after the completion of spraying at monthly intervals to evaluate insecticide decay	*Data source:* Entomological reports *Reporting frequency*: Per spray campaign	By Spray Campaign	108	N/A	N/A		32	2

Performance Indicator	Data Source(s) and Reporting Frequency	Disaggregate	Annual Targets and Results					
			Year 1*		Year 2**		Year 3***	
			Target	Results	Target	Results	Target	Results
5.1.7 Number of vector susceptibility tests for different insecticides conducted in selected sentinel sites*	*Data source:* Entomological reports *Reporting frequency:* Per spray campaign	By Spray Campaign By Type of Insecticide	1 test for pyrethroid class 1 test for carbamate 1 test for organophosphate 1 test for organochlorine	N/A	N/A		8	1
5.2 Support Epidemiological Malaria Data Collection and Analysis								
5.2.1 Collect routine epidemiological data	*Data source:* Project Reports *Reporting Frequency:* Annually	By Spray Campaign	1 per trimester	1	1 per trimester	1	1 per trimester	1
5.2.2 Number of targeted health facilities with routine epidemiological malaria data collection supported by the PMI AIRS Project	*Data source:* Epidemiological reports *Reporting frequency:* Annually	By Spray Campaign	30 Atacora 16 Banicoara 14	33 Atacora 17 Banicoara 16	33 Atacora 17 Banicoara 16	33 Atacora 17 Banicoara 16	45 Donga 14 Alibori 12 Atacora 4 Borgou 15	45 Donga 14 Alibori 12 Atacora 4 Borgou 15

Performance Indicator	Data Source(s) and Reporting Frequency	Disaggregate	Annual Targets and Results					
			Year 1*		Year 2**		Year 3***	
			Target	Results	Target	Results	Target	Results
Component 6 (Cross-cutting): Capacity Building, Knowledge Transfer, Gender Inclusion								
6.1 Increasing the Role of Women and Addressing Gender Barriers								
6.1.1 Number of people trained to deliver IRS in target communes	*Data source:* Project records – Training reports *Reporting frequency*: Semi-annually	By Spray Campaign By Gender Percentage of Women Trained	1,495	1,500 M:1,285 F: 215 14.3%	1,301	1,372 M:1,151 F: 221 16.1%	1,968	1944 M:1,697 F: 243 12.5%
6.1.2 Total number of people trained to support IRS in target communes	*Data source:* Project records – Training reports *Reporting frequency*: Semi-annually	By Spray Campaign By Spray Campaign By Gender Percentage of women trained	3,627	3,333 M: 2,663 F: 559 16.8%	3,218	3,104 M: 2,423 F: 576 18.6%	3,250	3,814 M: 3,086 F: 728 19.09%

Performance Indicator	Data Source(s) and Reporting Frequency	Disaggregate	Annual Targets and Results					
			Year 1*		Year 2**		Year 3***	
			Target	Results	Target	Results	Target	Results
6.1.3 Number of women recruited for IRS employment	*Data source:* Project records – Recruitment reports reports *Reporting frequency*: Semi-annually	By Country By Percentage of women recruited	907 19.0%	559 16.8%	691 25%	576 18.6%	813 25%	733 19.3%
6.1.4 Number of people trained as IRS Training of Trainers	*Data source:* Project records – Training reports *Reporting frequency*: Semi-annually	By Spray Campaign By Gender Percentage of women trained	128	134 M: 106 F: 28 20.8%	125	141 M: 112 F: 29 20.6%	157	200 M: 162 F: 38 19.0%
6.1.5 Total number of people hired to support IRS in target communes	*Data source:* Project records – Contracts signed *Reporting frequency*: *Semi-annually*	By Spray Campaign Gender Percentage of women hired	3,061 19.0%	2,984 M : 2,525 F: 459 15.4%	2,764 M: 2073 F 691 25%	2,835 M: 2,292 F: 543 19.2%	3,666	3,789 M: 3,051 F: 733 19.3%

Performance Indicator	Data Source(s) and Reporting Frequency	Disaggregate	Annual Targets and Results					
			Year 1*		Year 2**		Year 3***	
			Target	Results	Target	Results	Target	Results
6.1.6 Number of women hired in supervisory roles in target communes (this number includes site supervisors, team leaders, M&E assistants, and others who supervise seasonal staff)	*Data source:* Project records – Contracts signed *Reporting frequency*: *Semi-annually*	By Spray Campaign Percentage of women hired	64[5] 21,2%	54 Team Leaders:35 Commune Coordinators: 3 Supervisors: 16 18.7% of supervisory roles were held by women	64	51 Team Leaders: 28 Commune Coordinators: 2 Supervisors: 21 19.8% of supervisory roles were held by women	30% of supervisory position	121 Team Leaders: 61 Site? Coordinators : 1 Supervisors: 27 IEC Mobilizers TL : 26 Environmental Assistant : 3 IEC Assistant : 3 20.9% of supervisory roles were held by women
6.1.7 Number of staff (permanent and seasonal) who have completed gender awareness training	*Data source:* Project records – Training reports *Reporting frequency:*	By Spray Campaign	1	1,431 Seasonal: 1,428 Permanent: 3	1,314	1,301 Seasonal: 1,298 Permanent: 3	1,426	2,131 Seasonal: 2130 Permanent: 1

[5] This number includes team leaders, district coordinator, site coordinator, supervisors

Performance Indicator	Data Source(s) and Reporting Frequency	Disaggregate	Annual Targets and Results					
			Year 1*		Year 2**		Year 3***	
			Target	Results	Target	Results	Target	Results
	Annually	Gender Percentage of women hired		M: 1,236 F: 195 14%		M: 1,106 F: 192 15%		M: 1,858 F: 273 13%

Performance Indicator	Data Source(s) and Reporting Frequency	Disaggregate	Annual Targets and Results					
			Year 1*		Year 2**		Year 3***	
			Target	Results	Target	Results	Target	Results
6.2 Capacity Building								
6.2.1 Number of government officials trained in IRS oversight	*Data source:* Project records – Training reports *Reporting frequency*: annually	By Spray Campaign By Gender Percentage of Women Trained	219	111 M: 79 F: 32 28.8%	111	105 M: 70 F: 35 33.3%	111	157 M: 116 F: 41 26.11%
6.2. Implement all activities outlined in the yearly Capacity Building Action Plan	*Data source:* Project records – Capacity assessment reports *Reporting frequency*: Semi-annually	By Spray Campaign	Completed	Completed	Completed	Completed	Completed	Completed
6.2.3 Benin government implements at least one aspect of the IRS program independently	*Data source:* Project records – MOUs *Reporting frequency*: Semi-annually	By Spray Campaign	Completed	Completed	Completed	Completed	Completed	Completed

***Year 1: 2014-2015; ** Year 2: 2015-2016; ***Year 3: 2016-2017**