



PMI | Africa IRS (AIRS) Project

Indoor Residual Spraying (IRS 2) Task Order Four

2012 BENIN END-OF-SPRAY REPORT

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2012 BENIN END-OF-SPRAY REPORT

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Acronyms

ABE	Benin Environmental Agency (Agence Béninoise pour l'Environnement)
ACT	Artemisinin-based Combination Therapy
AIRS	Africa Indoor Residual Spraying
BMP	Best Management Practices
CENAGREF	National Center of Fauna Resources Management
CFR	Code of Federal Regulations
CHW	Community Health Worker
CMT	Country Master Tracker
CREC	Entomological Research Center of Cotonou (Centre de Recherche Entomologique de Cotonou)
DAGRI	Directorate of Agriculture
DDHU	Regional Directorate for the Environment, Habitat and Urbanism (Direction Départementale de l'Environnement, de l'Habitat et de l'Urbanisme)
DDS	Regional Directorate for Health (Direction Départementale de la Santé)
DHAB	National Directorate of Hygiene (Direction de l'Hygiène et de l'Assainissement de Base)
ECO	Environmental Compliance Officer
EIA	Environmental Impact Assessment
EIR	Entomological Inoculation Rate
GOB	Government of Benin
HBR	Human Biting Rate
ICC	Inventory Control Cards
IEC	Information, Education, and Communication
IGN	National Geographic Institute
IPTp	Intermittent Preventive Treatment for Malaria in Pregnancy
IRS	Indoor Residual Spraying (Pulvérisation Intra Domiciliaire (PID))
LLIN	Long-Lasting Insecticide Net
M&E	Monitoring and Evaluation
MEHU	Ministry of Environment, Habitat, and Urbanization
MAEP	Ministry of Agriculture and Fisheries (Ministère de l'Agriculture, de l'Elevage et de la Pêche)
MOH	Ministry of Health
MOU	Memorandum of Understanding
NMCP	National Malaria Control Program (Programme National de Lutte contre le Paludisme)
OMS	Organisation Mondiale de la Santé
PID	Pulvérisation Intra Domiciliaire (Indoor Residual Spraying)
PMI	President's Malaria Initiative
PPE	Personal Protective Equipment
RBM	Roll Back Malaria
RTI	Research Triangle International
SESP	The Monitoring, Evaluation and Planning Service
SHAB	Community Hygiene and Sanitation Service (Service de l'Hygiène et de l'Assainissement de Base)
SOW	Scope of Work
SPPS	Health Promotion and Protection Service (Service de Promotion et Protection de la Santé)

TOT Training of Trainers
USAID United States Agency for International Development
WHO World Health Organization
ZOC Zone d'Occupation Contrôlée (Inhabited Controlled Zone in Pendjari Biosphere Reserve)

Executive Summary

Under its Task Order Four contract with the United States Agency for International Development, Abt Associates has assumed the role of lead implementing agent for the President's Malaria Initiative's Africa Indoor Residual Spraying (AIRS) project in Benin and 13 other sub-Saharan countries. In December 2011, Abt established its project office in Cotonou and began the implementation of an indoor residual spraying (IRS) program. The key objective of AIRS Benin in 2012 is to reduce malaria-associated morbidity and mortality in all nine communes of Atacora Region by completing IRS of an estimated 200,000 eligible structures, and thereby to protect as many individuals in Atacora as possible.

AIRS Benin implemented the 2012 IRS campaign in close collaboration with several government agencies, most notably, the National Malaria Control Program, the Ministry of Health, the Ministry of Agriculture and Fisheries, the Ministry of Environment, Habitat and Urbanization, the Benin Environmental Agency, the National Directorate of Agriculture, the National Directorate of Hygiene, and the Regional Administrative Authorities in Atacora (particularly the Regional Directorate of Health).

AIRS Benin achieved the following results during the 2012 IRS campaign, which was implemented for 35 days, May 14–June 22:

- Trained 1,758 seasonal staff (83.6 percent men, 16.4 percent women), including 681 spray operators (93 percent men; 7 percent women).
- 210,380 structures were sprayed, which accounted for 94.8 percent spray coverage.
- 652,777 people were protected by the IRS campaign, which includes 17,807 pregnant women and 127,133 children under five (63,674 males and 63,459 females).

Abt subcontracted the Entomologic Research Center of Cotonou (*Centre de Recherche Entomologique de Cotonou* (CREC)) to complete entomological surveillance and help determine the quality of the IRS campaign. Via World Health Organization Cone Bioassays, CREC reported that 24 hours after spraying, mortality rates for mosquitoes were 100 percent. One month after spraying (June), CREC reported that mortality rates for susceptible mosquitoes were greater than 97 percent. The mortality rate of susceptible mosquitoes was above 80 percent in July, two months after spraying. However, by August, three months after spraying, mortality rates had fallen below 80 percent (ranging from 56 percent to 75 percent).

Key lessons learned from the 2012 IRS campaign include the following:

- Geographical reconnaissance and determination of the borders of environmentally sensitive areas, particularly national parks and protected areas, should be undertaken every year.
- Forecasting and international procurement should be completed several months in advance of the IRS campaign.
- Optimizing transport, or ensuring that transport is used more efficiently (regarding costs and the least number of vehicles that can carry the most people and equipment) is important. Transportation (specifically vehicle rental and fuel) is a significant line-item in the budget.
- Door-to-door and direct community mobilization is more effective than Information, Education, and Communication (IEC) programming via radio.

Résumé (en français) :

Sous le contrat Task Order 4 de l'USAID, Abt Associates est le partenaire de l'Initiative du Président Américain de Lutte contre le Paludisme (PMI) pour assurer la Pulvérisation Intra Domiciliaire d'Insecticide (PID) au Bénin et dans 13 autres pays en Afrique Subsaharienne. En décembre 2011, Abt a installé son bureau à Cotonou et commença la mise en œuvre du programme PID sous l'appellation de Pulvérisation Intra Domiciliaire en Afrique (AIRS) de Bénin. En 2012 les principaux objectifs d'AIRS Bénin est de réduire les taux de morbidité et de mortalité liés au paludisme dans les neuf communes de l'Atacora et partant traiter 200 000 structures éligibles pour protéger autant de population que possible.

Abt a mis en œuvre le projet en étroite collaboration avec plusieurs institutions gouvernementales dont notamment le Ministère de la Santé y compris le Programme National de Lutte contre le Paludisme, le Ministère de l'Agriculture, le Ministère de l'Environnement, de l'Habitat et de l'Urbanisme, l'Agence Béninoise de l'Environnement, la Direction de l'Agriculture (DAGRI), les autorités administratives dans l'Atacora plus particulièrement la Direction Départementale de la Santé (DDS) et le Centre de Recherche et de l'Entomologie de Cotonou (CREC) pour les activités de surveillance entomologique.

Durant les 35 jours de la mise en œuvre de la campagne PID du 14 mai au 22 juin, AIRS Bénin a obtenu les résultats suivants :

- 1 758 agents saisonniers (83,6% hommes, 16,4% femmes) ont été formés dont 681 agents operateurs (93% hommes, 7% femmes) ;
- 210 380 structures ont été traitées en 2012 ce qui représente une couverture de 94,8% ;
- 652 777 personnes seront protégées par la dernière campagne PID parmi lesquelles 17 807 femmes enceintes et 127 133 enfants de moins de 5 ans (63 674 garçons, 63 459 filles).

CREC a assuré la surveillance entomologique pour déterminer la qualité de la campagne PID. En utilisant le test en cône (Bio essai) de l'Organisation Mondiale de la Santé (OMS, CREC a rapporté que le taux de mortalité des moustiques exposés au mur 24 heures après la pulvérisation était de 100%. Un mois après l'opération (juin), ce taux était au-dessus de 97%, et avoisinait 80% deux mois après la pulvérisation (juillet). Toutefois, le taux de mortalité était moins de 80% (56% à 75%) trois mois après la pulvérisation en août.

Les principales leçons apprises de la campagne PID 2012 sont :

- La reconnaissance géographique avec détermination des limites des zones sensibles notamment le Parc National et les aires protégées est importante et doit être actualisée au besoin.
- La prévision et l'approvisionnement sur le plan international doivent être faits plusieurs mois avant la campagne PID.
- L'optimisation du transport, ou l'utilisation efficiente des moyens de transport pour diminuer les dépenses liées au carburant et la location des véhicules est d'une importance capitale pour la prochaine campagne.
- Le porte-à-porte et la mobilisation de la communauté par contact direct seront renforcés pour la prochaine campagne.

1. Introduction

Under its Task Order Four contract with the United States Agency for International Development (USAID), Abt Associates has assumed the role of lead implementing partner for the President's Malaria Initiative (PMI) Africa Indoor Residual Spraying (AIRS) project in Benin and 13 other sub-Saharan countries. In December 2011, Abt established its project office in Cotonou and began the implementation of an indoor residual spraying (IRS) program. The key objective of AIRS Benin in 2012 is to reduce malaria-associated morbidity and mortality in all nine communes of Atacora Region by completing IRS of an estimated 200,000 eligible structures, and thereby to protect as many individuals in Atacora as possible.

AIRS Benin implemented the 2012 IRS campaign in close collaboration with several government agencies, most notably, the National Malaria Control Programme (NMCP), the Ministry of Health (MOH), the Ministry of Agriculture and Fisheries (MEAP), the Ministry of Environment, Habitat and Urbanism (MEHU), the Benin Environmental Agency (ABE), the National Directorate of Agriculture (DAGRI), the National Directorate of Hygiene (DHAB), the Regional Administrative Authorities in Atacora (particularly the Regional Directorate of Health (DDS)).

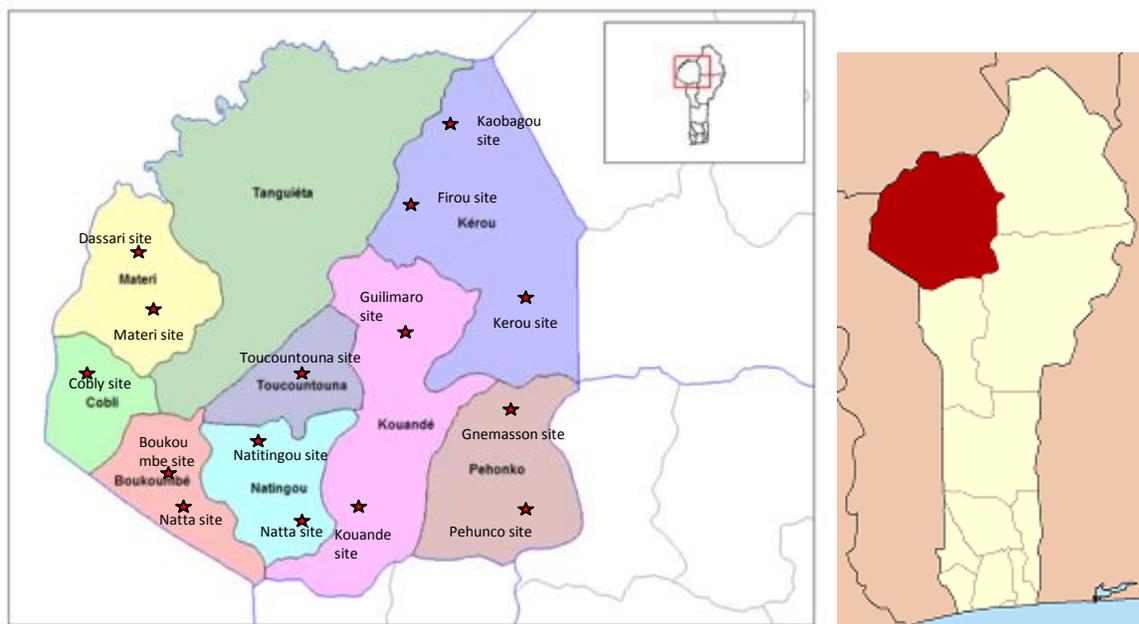
This report provides a description of the planning, implementation, and monitoring of the IRS campaign operations in 2012. The report also provides the results of the key indicators for which AIRS Benin is required to report to PMI-Benin, and the preliminary findings of CREC regarding entomological monitoring.

Please note that the report does not include a cost or financial analysis of the 2012 IRS campaign. AIRS is currently completing a separate financial analysis of IRS campaign expenditures and operations for all of its project countries. The analysis is on-going, and will be completed in early 2013. The results of the analysis will help elucidate the actual cost of IRS operations in Benin, and will help PMI and the NMCP understand the actual costs for IRS programming in Benin.

2. Country Background

2012 marked the second round of PMI-supported IRS in Atacora. Also, with IRS covering Kérou and Péhunco districts, 2012 is the first year in which PMI-supported IRS covered all nine districts that constitute the Atacora Region. Figure 1 shows a map of the region and its location within Benin. Table 1 provides data on the estimated population of the region.

Figure 1: Districts of the Atacora Region of Benin



Source: Rarelibra (online cartographer), for public domain use



Operations bases

Table 1: Atacora Region's Estimated Population and Population Density

District	Population from 1992 Census	Population from 2002 Census*	Estimated 2012 Population based on annual growth rate of 3.25%**	Area (km ²)	Estimated Population per km ² 2012
Boukoubé	58,196	60,617	83,463	1,081	77
Kérou	42,491	61,952	85,301	3,769	23
Cobly	38,382	46,661	64,247	827	78
Kouandé	50,379	82,949	114,212	3,237	35
Matéri	58,516	82,949	114,212	1,719	66
Natitingou	57,153	73,175	100,754	1,348	75
Péhunco	33,833	54,783	75,430	2,008	38
Tanguéta***	40,430	53,950	74,283	5,466	14
Toucountouna	21,233	30,033	41,352	1,068	39
Atacora	400,613	547,069	753,256	20,523	37

*Source: 2002 Census

** The annual growth rate was gained from, the Institut National de la Statistique et de l'Analyse Economique (INSAE)'s "Annuaire Statistique 2005-2007" pg. 4.

*** Only the area within Tanguéta District, which is not part of the Pendjari Biosphere Reserve, was covered by the IRS campaign in 2012.

2.1. Objectives for 2012 IRS Campaign

As stated in the 2012 AIRS Benin work plan, the four objectives of AIRS Benin are to:

- 1) Cover at least 85 percent of eligible structures found in all nine districts of Atacora Region;
- 2) Continue efforts to develop national and local capacity in organizing, planning, implementation, and evaluating IRS campaigns, with a goal of identifying a plan for sustainability;
- 3) Identify cost and operation efficiency, to streamline the IRS campaign, lower the cost of implementation, and limit stock and supply chain error; and
- 4) Improve monitoring and evaluation (M&E) efforts and increase data quality.

Given these objectives, AIRS Benin aimed to cover an estimated 200,000 structures in Atacora during its IRS campaign and protect as many of the estimated 757,464 people in Atacora as possible.

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

- The NMCP, which validated IRS management tools, assisted with the planning of the IRS campaign, trained enumerators and spray operators, performed supervision during the IRS campaign, and helped to validate data collected during the IRS campaign;
- Roll Back Malaria (RBM) partners, which validated IRS management tools and the IRS campaign plan, and provided technical and operations advice for IRS implementation;
- The Entomologic Research Center of Cotonou (*Centre de Recherche Entomologique de Cotonou*, CREC), which completed entomological surveillance activities, most notably vector susceptibility and insecticide resistance monitoring before, during, and after the IRS campaign.

3. Preparation for IRS Campaign

3.1. IRS Campaign Planning

Listed below are the activities that were undertaken to plan and organize the 2012 IRS campaign:

- Development and Completion of 2012 AIRS Benin Work Plan (November 2011-April 2012). The work plan was completed by the newly hired AIRS Benin staff and the AIRS Core team. Guidance on the work plan was provided by PMI/Benin and PMI/Washington, leading to the final approved work plan in April 2012.
- Internal IRS Campaign Planning (February-May): Beginning in February, the AIRS Benin team began the detailed planning for all activities to be completed within the IRS campaign. AIRS Benin staff met regularly between February and May, to review its organization and planning for the IRS campaign, and make changes as needed.
- IRS Task Force Meeting (February): The IRS Task Force, which comprises representatives from the NMCP, PMI/Benin, the MOH, and DDS Atacora, met in February to discuss the IRS campaign for 2012, and the role of each partner at the national and regional levels for completing the IRS campaigns.
- Regional Partner Meetings (March): AIRS Benin met with the DDS Atacora, district medical doctors, and mayors of each district to discuss their roles in the IRS campaign, and to develop a

calendar and schedule for the implementation of the IRS campaign. This meeting led to field visits to meet with local government staff and community leaders to gain their approval for the spray campaign. The field visits by AIRS Benin and the DDS Atacora also led to reviewing operation base locations, and developing transport routes for IRS campaign activities.

- **Microplanning Meetings (first week of May):** AIRS Benin completed microplanning (or discussing the actual planning and implementation of the IRS campaign down to the sprayed structure level) with the district coordinators for the IRS campaign, DDS Atacora, and medical staff from each district to develop the exact schedule for when communities would be sprayed and to ensure that all operation systems were in place to support the IRS campaign. Additionally, the microplanning sessions covered made certain that health centers throughout Atacora were ready to encounter and treat any potential health issues arising from the IRS campaign.

3.2. Pre-Spray Environmental Assessment

3.2.1. Geographic Reconnaissance

Research Triangle International (RTI) completed a geographic reconnaissance in October 2011 that determined the viability of completing IRS in all nine districts of Atacora. In March and April, AIRS completed a second geographic reconnaissance to identify flood zones, and areas that may be impacted by the beginning of the rains in June. This information helped with IRS planning, and allowed AIRS Benin and regional officials to note which communities would be covered first during the IRS campaign, due to roads and river crossings that would become more difficult as the rains increased in May. To strengthen local technical capacity, the National Geographic Institute (IGN) and the Regional Directorate for the Environment and Natural Protection (DDHU) participated in the second geographic reconnaissance and developed maps of flood zones in Atacora for the IRS campaign.

Additionally, the second geographic reconnaissance also worked to define the borders of Pendjari Biosphere Reserve, as the national park is located in the northwest of Atacora (see section 3.2.3).

3.2.2. Pre-Spray Environmental Inspection

From March 19 to March 23, 2012, a pre-spray environmental inspection was performed by the AIRS Benin Environment Compliance Officer (ECO) and Operations Manager, along with staff from the NMCP, MAEP, and MEHU. Details from the pre-spray environmental inspection are found in the Letter Report that AIRS submitted to PMI and USAID-Washington in May. The inspection team used a checklist to complete their review, based on PMI's Best Management Practices (BMP) document.

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

- Inspect and identify any environmental non-compliance issues for the proposed IRS operations bases, and to develop and implement plans for remediating these issues; and
- Prospect new operations bases in the two new spray districts for 2012, Péhunco and Kérou, and develop plans for ensuring the new operations bases are environmentally compliant.

The inspections resulted in refurbishing and rinsing wash areas, soak pits, and showers/toilets at the operations bases, and at the AIRS Benin Central Storage Facility in Natitingou (which also was also used as an operations base in 2012). Additionally, storage facilities at all operations bases were upgraded to include double lock systems, effective ventilation, mounts/supports for storing spray pumps, and repairing fencing around all operation base facilities.

Figures 2 and 3 show the condition of the soak pits/washing areas in Coby District, prior to and after refurbishment. Please note that all fencing around the soak pits had been removed following the 2011 IRS campaign in Figure 2.

Figure 2: Soakpit and Rinsing Area in Coby District, Before Refurbishment



Figure 3: Soakpit and Rinsing Area in Coby District, After Refurbishment



Table 2 notes the location of each operations base (where soak pits, wash areas, and storeroom were located) for the 2012 IRS campaign, and if the operations base received storeroom, soak pit, or fencing refurbishments.

Table 2: Locations of Operation Bases

District	Operation Base Location (District)	Facility Type	Storeroom Refurbished	Soak pit Refurbished	Fencing Refurbished
Natitingou	Natitingou	Central warehouse	Yes (Y)	Y	Y
	Perma	Health center	Y	Y	Y
Toucountouna	Toucountouna	Health center	Y	Y	Y
Boukoubé	Natta	Municipal building, provided by community	Y	Y	Y
	Manta	Health center	Y	Y	Y
Tanguiéta*	Tanguiéta	Health center	Y	Y	Y
Matéri	Matéri	Municipal building, provided by community	Y	Y	Y
	Dassari	Health center	Y	Y	Y
Cobly	Cobly	Health center	Y	Y	Y
Kouandé	Kouandé	Health center	Y	Y	Y
	Guilimaro	Health center	Y	Y	Y
Péhunco	Ouassa	Health center	Y	New construction	New construction
	Gnemasson	Municipal building, provided by community	Y	New construction	New construction
Kérou	Firou	Municipal building, provided by community	Y	New construction	New construction
	Kaoubagou**	Health center	N/A	New construction	New construction
	Kérou	Municipal building, provided by community	Y	New construction	New construction

* The operations base in Tanguiéta was near the Zone d'Occupation Contrôlée (see section 3.2.3.), and was moved to Toucountouna, after reviewing feasibility of spraying areas within the Pendjari Biosphere Reserve.

** Kaoubagou Health Center was only used as a soak pit and washing area. Due to inadequate storage facilities, personal protective equipment and insecticide were stored at the nearby Firou's Operation Base.

The pre-spray environmental inspection teams found that neither information on insecticide intoxication management nor emergency phone contacts in case of fire were found at most operation bases. Therefore, AIRS Benin revisited the operation bases following the pre-spray inspection, and provided posters and booklets at each operation base on what to do in case of intoxication and protocol to follow in case of a fire. The booklets on intoxication were also provided to health workers throughout Atacora, IRS campaign warehouse managers and logistics assistants, and all drivers transporting insecticides for the IRS campaign.

3.2.3. Review of IRS in the ZOC of the Pendjari Biosphere Reserve

Although the Pendjari Biosphere Reserve is strictly protected as an environmental and ecological area, it was noted during the geographic reconnaissance that the boundaries of the park have been urbanized, with an estimated 48,501 people living in communities on the biosphere reserve's border or within the reserve itself. Through further discussions with officials at the biosphere reserve, local officials in Tanguiéta District (primarily the mayor of Tanguiéta), and environmental officials at the regional level, the AIRS Benin team learned that the national park is divided into three zones:

- The ecotourism zone is the core of the biosphere reserve, and has the highest environmental protection. The zone is designated for flora and fauna protection, ecotourism, and game-viewing. This zone is located in the far north of the park, bordering Burkina Faso. This zone is located 120km north of Tanguiéta town.
- "La Zone Tampon No. 1" and "La Zone Tampon No. 2" surround the ecotourism zone. Both zones 1 and 2 are set aside for forestry conservation, eco-tourism, and limited hunting and resource exploitation.
- "La Zone Tampon No. 3" or the Zone d'Occupation Controllee (ZOC) surrounds both Zone Tampon No. 1 and No. 2, and extends for 3-5 kilometers on both sides of the two major roads that diverge from Tanguiéta town (heading northwest towards Porga and the Burkina Faso border, and northeast towards Batia). The ZOC consists of 177,000 hectares (ha), and includes several towns and villages along the main routes passing through the area. The ZOC is designated as a zone for habitation and allows for agriculture, fishing, hunting, bee-keeping, and limited resource development. The government of Benin passed decree Number 94-64 and Law Number 2002-16 to set up the ZOC, acknowledging the increased population around the biosphere reserve.

Although the ZOC was sprayed during the 2011 IRS campaign, AIRS Benin is cognizant of the environmental protection agreements that Benin has signed regarding the biosphere reserve, the environmental regulations concerning the use of insecticides in sensitive areas as described in the Benin Supplemental Environmental Assessment, and that the Pendjari Biosphere Reserve is linked directly with national parks in Burkina Faso and Niger, to allow for wildlife to move freely.

To clarify whether AIRS Benin should spray the ZOC, AIRS Benin presented a memo to PMI and the NMCP regarding the environmental regulations concerning allowable activities within the biosphere reserve, and noted information gained from discussions with biosphere reserve officials, Tanguiéta district authorities, and Atacora regional environmental and health authorities about the possibility of completing IRS within the ZOC. Also, the AIRS Benin explained the views of a memo received from the General Director of the National Center of Fauna Resources Management (CENAGREF), the government agency that manages Benin's national parks, regarding spraying in the ZOC. The CENAGREF memo stated that CENAGREF approved of IRS in the ZOC, but would not be responsible for any adverse effects that might result from spraying within the protected areas of Pendjari Biosphere Reserve. Given the information stated in the AIRS Benin memo, PMI-Benin decided not to complete IRS in the ZOC, but rather to develop alternative malaria programming to protect individuals living within the ZOC.

AIRS Benin acknowledged this decision and noted that 10,430 eligible structures in the ZOC were removed from the total number of eligible structures for the 2012 IRS campaign.

Further, considering the environmental sensitivity of the area around the biosphere reserve, AIRS Benin closed its IRS campaign operation base near Tanguiéta town (located on the border of the biosphere reserve), and used the operation base in Toucountouna to support IRS activities in the communities near Tanguiéta. The AIRS Benin ECO and Technical Director closely supervised all spraying in communities that are near the biosphere reserve's borders and monitored the amount of insecticide used in these areas.

3.3. Insecticide Selection

In 2011, the NMCP, MAEP, DAGRI, and PMI selected carbamates as the insecticide class for the 2012 IRS campaign. It was noted by CREC, during its entomological surveillance reporting for the 2011 IRS campaign, that vector mortality rates on walls treated with carbamate had decreased compared to results from entomological surveillance data for Atacora collected in 2010. CREC noted that the Ace-1 mutation has increased in Atacora, but remains at a very low level. Given this information, the NMCP, PMI, and AIRS Benin have asked CREC to identify a possible alternative insecticide for future IRS campaigns, and will closely review the results of CREC's post IRS campaign entomological surveillance.

3.4. Logistics Planning and Procurement

3.4.1. PPE and Insecticide Inventory and Procurement

In January, AIRS Benin reviewed its inventory of IRS equipment and commodities at the central warehouse in Natitingou. Most of the personal protective equipment (PPE) and spray pumps used during the 2011 IRS campaign remained in good condition, and were available for use in the 2012 IRS campaign. Thereafter, AIRS Benin also noted the quantities of damaged or non-reusable PPE, and developed a list of PPE that AIRS needed to procure locally and internationally.

Overall, procurements were made locally and internationally using an open tender process and collecting bids/quotes on commodities to be purchased. A full list of all PPE that was procured for the 2012 IRS campaign is found in Table 15 in the annex.

Regarding insecticide, the January inventory count confirmed that 31,380 sachets of Bendiocarb remained from the 2011 IRS campaign. To ensure enough stock for the 2012 IRS campaign AIRS procured 30,000 sachets of Bendiocarb, which were sent to Benin in March. The procurement for the Bendiocarb was completed by following a competitive bidding process by manufacturers that produce carbamate-class insecticides, and produce carbamates that meet PMI quality standards.

3.4.2. Establishing Logistical Needs for 2012 IRS Campaign and Development of New Operation Bases

The AIRS Benin team worked with the DDS-Atacora in March to plan the logistics and transportation for implementing the 2012 IRS campaign. Several field visits were conducted with DDS-Atacora staff to meet with local authorities, recognize, and identify transportation routes, and note areas with difficult roads. These field visits led to detailed operational management plans, organizing spray teams with regards to access to operation bases and spray areas, and calculating the exact number of days needed for completing IRS operations.

The field visits with DDS-Atacora also included identifying five new operation base locations in Ouassa, Gnemasson, Firou, Kérou, and Kaoubagou.

Figure 4: New Soakpit and Rinsing Area in Kérou



Following AIRS Benin's refurbishment for all operation bases in April, AIRS Benin organized the distribution of PPE and insecticide to all operation bases in early May. Table 3 notes the distribution of key PPE items in early May among the operation bases.

Table 3: Distribution of Key PPE to Operation Bases

Operation Base Sites	Overalls	Boots	Helmets	Pumps
Natitingou(*)	143	74	58	51
Perma	141	68	53	58
Toucountouna	84	44	43	31
Nata	104	50	50	39
Manta	86	46	42	32
Tanguiéta	159	91	80	58
Matéri	137	75	65	51
Dassari	87	47	41	33
Cobly	127	63	61	48
Kouandé	80	44	30	30
Guilimaro	60	35	23	23
Ouassa	146	73	55	55
Gnemasson	45	22	16	16
Firou(**)	33	17	17	12
Kérou	165	92	72	58
TOTAL	1,597	766	706	707

* The Central Storage Facility in Natitingou also served as an operation base during the campaign for the communities near Natitingou.

**Firou Operation Base also served as the storage facility for IRS operations for Kaobagou (10 km away), due to inadequate storage facilities at the Kaobagou Health Center.

3.5. Human Resources

3.5.1. IRS Campaign Seasonal Staffing

AIRS Benin hired 780 seasonal staff to implement the 2012 IRS campaign. This included 646 men and 134 women. Table 17 in the annex provides a full breakdown of the number of men and women hired for each seasonal staff position.

AIRS Benin placed job advertisements for some of the seasonal staff, including district coordinators, store keepers, logistics assistants, finance assistants, and data clerks, in Beninese newspapers in March and April.

Spray operators, team leaders, pump technicians, and washers were recruited in each spray area by the local medical staff based on criteria developed by the AIRS Benin technical staff. All spray operators were required to be able to read and write, and carry spray pumps for several hours per day, as well as to have a certified note from a district doctor stating that they are in good health (and for women noting that they are not pregnant). Additionally, all spray operators were required to be individuals respected within their communities, and have had experience working on community health activities. AIRS Benin gave priority to spray operators that performed well during the 2011 IRS campaign.

Table 4 provides details on the seasonal staff that were hired for the 2012 IRS campaign.

Table 4: Seasonal Staff Hired for the 2012 IRS Campaign per District

Districts	Spray Operators	Team Leaders	District Coordinators	IEC Assistants	Data Clerks	Store Keepers	Logistics Assistants	Finance Assistants	Washers	Service Technicians
Natitingou	69	14	1			2			11	8
Toucountouna	26	5	1			1			3	3
Boukoubé	59	12	1			2			7	7
Cobly	41	5	1			1			5	5
Matéri	70	14	1			2			8	8
Tanguiéta	49	9	1			1			5	6
Kouandé	62	12	1			2			7	7
Natitingou IRS Campaign Office				1	40		3	4		
Péhunco	59	12	1			2			7	7
Kérou	54	10	1			2			7	8
TOTAL	495	94	9	1	40	15	3	4	60	59

3.5.2. Operations Supervision

AIRS Benin staff provided daily technical supervision for the IRS campaign implementation to ensure that:

- Appropriate quantities of PPE and insecticide were available at the operation bases for the use of spray teams;
- Stock cards and inventory forms were carefully tracked;
- Environmental best practices for the storage, use, and disposal of PPE and insecticide were followed;
- Seasonal spray staff were paid on time;
- Supervision and staff concerns were addressed and resolved; and
- IRS campaign data were of high quality and entered efficiently.

Additionally, 68 Beninese government staff from national, regional, and district health and environment offices provided daily supervision of spray operations in the field, and played a key role in observing the implementation of spray activities. The supervision provided by the government staff kept AIRS Benin informed and ready to provide technical and operations assistance to resolve IRS campaign issues.

Figure 5: NMCP National Level Staff Completing Supervision During Enumeration/Mobilization Activities



Table 5 provides a breakdown of the supervision activities performed by the Beninese government staff during the IRS campaign.

Table 5: Breakdown of Supervision by Beninese Government Agencies

Government Level	Office	Number of People	Supervised Activities
National	NMCP	6	IEC and Enumeration activities, Environmental Compliance (pre-spray, mid-spray and post-spray inspection), Spray Operations, Monitoring & Evaluation and Data Collection, IRS Trainings
	DHAB	1	Environmental Compliance (pre-spray, mid-spray, and post-spray inspection), Spray Operation, IRS Trainings
	DAGRI	1	Environmental Compliance(pre spray, mid spray and post spray inspection),
Regional	NMCP-Atacora	1	IEC and Enumeration, Environmental Compliance(pre-spray, mid-spray, and post-spray inspection), Operation, Monitoring & Evaluation Trainings
	DDHU	2	Environmental Compliance(pre-spray, mid-spray, and post-spray inspection), Spray Operations, IRS Training
	DDS	1	Spray Operations, IEC and Enumeration, IRS Training
	The Monitoring, Evaluation and Planning Service (SESP)	1	IEC and Enumeration, Spray Operations, Monitoring & Evaluation, IRS Trainings
	Health Promotion and Protection Service (SPPS)	1	IEC and Enumeration, Spray Operation, Monitoring & Evaluation, IRS Trainings
	The Community Hygiene and Sanitation Service (SHAB)	1	IEC and Enumeration, Environmental Compliance(pre-spray, mid-spray, and post-spray inspection), Spray Operation, IRS Trainings
District	Health Zone Coordinator	3	IRS Training, Spray Operations
	District Chief Doctors	9	IRS Training, Spray Operations
	Hygiene Agents from District Health Centers	30	Spray Operations, Quality of the Spraying, Environmental Compliance by Spray Operators and Washers, IEC during campaign
	Community Health Workers/ Other Individuals	11	Spray Operations, Quality of the Spraying, Environmental Compliance by Spray Operators and Washers, IEC during campaign

3.6. Trainings

AIRS Benin organized and helped facilitate 11 training sessions for its seasonal staff and the government personnel who supervised IRS campaign activities. The objective of the training was to ensure all seasonal staff were aware of their roles and understood how the IRS campaign would function (particularly with regards to supervision). Additionally the training sessions covered the precautions

that should be undertaken and what to do in case of emergency situations (such as poisoning from insecticide). The trainings also reinforced to all seasonal staff the value of their work in preventing malaria transmission. All training materials were shared with and approved by the NMCP and Health Promotion and Protection Service (SPPS).

Training sessions were led by AIRS Benin staff, government personnel (from the NMCP, DHAB, DDS, and DDHU), CREC, and individuals trained as trainers (selected from spray operators and team leaders who were noted as outstanding personnel in past IRS campaigns). All training took place between mid-April and early May.

Figure 6: Chief Medical Doctor in Cobly District Leading Spray Operator Training



In total, 901 people were trained in spray operation Table 6 provides a breakdown of the personnel who participated in the 2012 IRS campaign trainings.

Table 6: Participants in 2012 IRS Campaign Trainings

Categories of Individual Trained	Training of Trainers		Spraying Operations		Data Capture		Logistics Training		Technical Maintenance		Structure Enumeration/ IEC Training of Trainers		Structure Enumeration/ IEC Training		Medical Treatment of Intoxication Cases		Washer Activities		Fire Security		Transport Security	
	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F
DDS- (AD / OP)	5	1									3				2							
SHAB	1															1						
NMCP National																						
NMCP Regional		1									1	1				1						
DDEPN	1																					

Categories of Individual Trained	Training of Trainers		Spraying Operations		Data Capture		Logistics Training		Technical Maintenance		Structure Enumeration/ IEC Training of Trainers		Structure Enumeration/ 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
	DAGRI																					
CREC	1																					
Districts Coordinators	5	4									5	4										
Health Zone Coordinator	2														1							
District Chief Doctors/ Other Doctors	7										8				10							
Chiefs of Health Post/ Midwife											26	28			33	21						
Hygiene Agents`	32	15																				
Spray Operators			633	48																		
Data Clerks					18	22																
Storekeepers							13	2	13	2										15		
Logistics Assistants							3		3											3		2
Service Technicians									66	5												
IEC agents													424	64								
Washers																	62					
Drivers																				65		65
Guards																				4		
TOTAL M/F	54	21	633	28	18	22	16	2	82	7	43	33	424	64	46	23		62	87		65	
TOTAL/ training	75		681		40		18		87		76		488		69		62		87		65	

Brief Description of Training Activities

Training of Trainers: Hygiene agents were trained on spray methods, completing data collection forms, and providing IEC to notify IRS beneficiaries on how to prepare their structures before the IRS campaign and protocol to follow after the IRS campaign. The hygiene agents, in turn, trained spray operators at the nine primary operation bases the week before the IRS campaign.

Spray Operators Training: All spray operators traveled to the primary operation base where their spray team would be based. The spray operator trainings were provided over four days: two days for classroom training on spray techniques and protocol for completing spray operations, and two days for practicing spray technique in controlled areas. At all spray operator training sessions, a pre-test and post-test were administered. Spray operators who scored the highest on the post-test, were selected to become the team leaders for each spray team.

Figure 7: Spray Operators Practicing Spray Technique in Natitingou District



Data Capture Training: Data clerks gained familiarity with the IRS campaign data entry forms and the database used for uploading all IRS campaign data. Data clerks also practiced entering data.

Logistics Training: The logistics assistants and store keepers were trained on inventory management, the value of completing and updating stock cards, and the correct protocol for storing PPE and insecticide.

Technical Maintenance Training: Service technicians and store keepers learned to identify the different components of spray equipment, and to maintain and repair equipment in case of default.

Washer Training: Washers learned techniques to wash PPE correctly.

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

Transport Security Training: Drivers and seasonal logistics staff learned correct methods to secure and safely handle insecticides. Participants also learned how to manage an insecticide spill.

Medical Treatment of Intoxication Cases training: Medical and health staff from all nine spray districts was trained on medical treatment and intoxication management for potential poisonings from contact with Bendiocarb. The training was led by a toxicology lecturer from the University of Abomey-Calavi.

Descriptions of the IEC training are found below in section 4 under “IEC Activities.”

4. IEC Activities

Before and during the IRS campaign, AIRS Benin organized advocacy events, worked with mass media channels, produced and distributed various promotional materials, and directly reached out to individuals through door-to-door mobilization, to inform the population of Atacora about IRS.

All communication activities and key messaging were discussed and planned with the NMCP, and were reviewed and approved by the SPPS.

IEC activities completed in 2012 included:

Community Mobilization: In May, the National Coordinator of the NMCP and staff from the DDS and AIRS Benin met with district administrators to go over the IRS campaign schedule and reinforce the benefits of IRS. In turn, district administrators and AIRS Benin staff spoke with community leaders to ensure beneficiaries were informed and ready for the IRS campaign. Additionally, several advocacy meetings were held with community leaders, particularly the village chiefs and public criers, to answer their questions about the IRS campaign and provide information to promote the IRS campaign. Information was also provided on the schedule of the IRS campaign, the activities the beneficiaries should complete to make structures ready for IRS, and the protocol to follow once their structures were sprayed. In total, 450 community leaders participated in IRS advocacy activities.

Door-to-Door Mobilization: 488 IEC agents were hired for the 2012 IRS campaign. All received a two-day training to go over messaging, and learn effective communication techniques, structure identification, and how to complete the enumeration data collection cards. The IEC agents then traveled throughout Atacora from mid-March through early April, going door to door and notifying beneficiaries about the upcoming IRS campaign. IEC agents explained the benefits of IRS for malaria prevention, answered questions about the IRS campaign, informed beneficiaries about how to prepare their structures for spraying and what to do after the spray occurs, and provided leaflets about the IRS campaign for the beneficiaries' reference.

Figure 8: IEC Agent Completing Door to Door Mobilization



Nearly all structures (97.9%) visited by the IEC mobilizers agreed to have their structures sprayed during the IRS campaign. The most common reason for rejecting sensitization (as noted in Boukombé, Cobly, Kouandé, Matéri, Natitingou, and Kérou districts) was due to household occupants not being at home (usually the household occupants were working in their fields far from their household).

In Péhunco and Tanguiéta districts, the IEC mobilizers found 513 structures (199 structures in Péhunco district or 0.8% of eligible structures, and 314 structures in Tanguiéta district or 1.2% eligible structures) where sensitization was rejected. This was mostly due to personal or cultural issues in the districts, where non-family members are not allowed to enter a household. Since Péhunco is a new district, AIRS Benin believes that acceptance of sensitization will increase in the future, as the district population becomes more familiar with IRS and its benefits. For Tanguiéta district (which was also sprayed in 2011), AIRS Benin will consider providing more community meetings, and asking village chiefs and community leaders to participate in future door-to-door mobilization to further ensure that beneficiaries accept the mobilizers into their households. Table 7 provides the results of the door-to-door mobilization.

Table 7: Overview of Community Mobilization Results

Districts	Structures Found	Men Sensitized	Women Sensitized	Total population Sensitized	Leaflets Distributed	Number of Structures Not Sensitized	Main Reason for Not Sensitizing
Boukombé	27,807	24,744	28,671	53,415	15,449	1,864	Beneficiaries not at home
Cobly	21,620	15,571	19,820	35,391	9,999	256	Beneficiaries not at home
Kérou	24,354	27,033	32,012	59,045	12,235	377	Beneficiaries not at home
Kouandé	32,300	37,905	39,084	76,989	16,357	1,305	Beneficiaries not at home

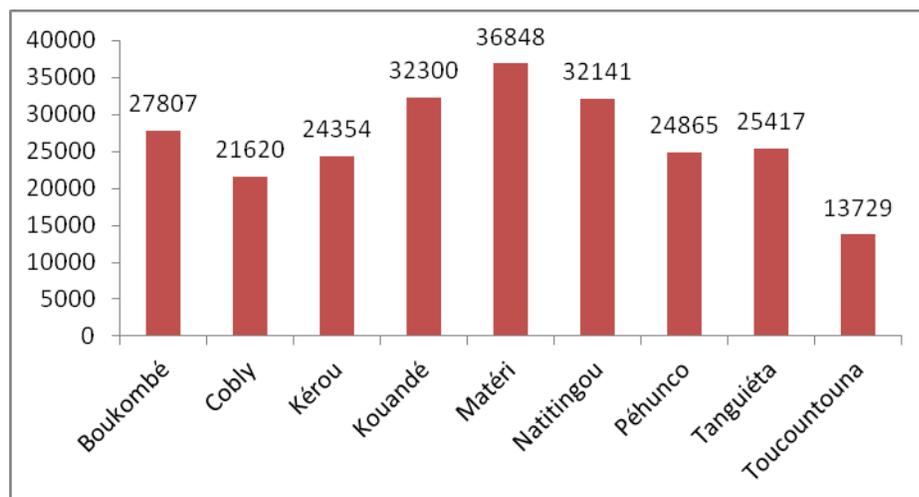
Districts	Structures Found	Men Sensitized	Women Sensitized	Total population Sensitized	Leaflets Distributed	Number of Structures Not Sensitized	Main Reason for Not Sensitizing
Matéri	36,848	22,903	29,136	52,039	19,459	336	Beneficiaries not at home
Natitingou	32,141	31,799	34,952	66,751	20,360	104	Beneficiaries not at home
Péhunco	24,865	32,081	36,043	68,124	9,324	199	Did not accept IEC agent into their house
Tanguiéta	25,417	19,798	22,299	42,097	12,088	314	Did not accept IEC agent into their house
Toucountouna	13,729	14,257	14,905	29,162	5,909	404	Beneficiaries not at home
Atacora	239,081	226,091	256,922	483,013	121,180	5,159	

Enumeration: Concurrent with the door-to-door mobilization, IEC agents identified eligible structures for the IRS campaign, and noted the number of people who lived in/used each eligible structure. This was recorded on IEC mobilization cards, which were entered into the AIRS Benin database. The enumeration data were important for the following reasons:

- The IEC agents gained details about the location of each eligible structure, and key information on the number of individuals that sleep in the structure;
- The IEC agents applied a code to each structure visited. This code allowed AIRS team to note the exact location of the structure, in case IRS campaign staff needed to follow-up on the structure for quality control checks, or in case of an emergency;
- The enumeration data provided a “check” or point of comparison for the number of structures found by spray operators during the spray campaign. Thus, if spray operators were over-reporting the number of structures sprayed, the AIRS team would have data as a point of comparison, to determine if this was true.

Overall 239,081 eligible structures were identified during enumeration. Figure 8 provides the details of the number of structures enumerated per district.

Figure 9: Structures Enumerated Per District



Radio Broadcasts: Six radio stations in Atacora were used for broadcasting IEC messages. All radio messaging was aired in French and local languages. Additionally, AIRS Benin staff and district and regional officials participated in call-in shows, and on-air presentations regarding IRS. Table 8 provides details on the types of radio programs that were aired and the frequency of the radio programs.

Table 8: IEC Activities Conducted by Radio Stations

Activities	N° of Broadcasts
Short radio spots (French and national languages)	2,132
IRS schedule announcements/invitations for local leaders to attend IRS planning meetings(French and national languages)	153
Debates and discussion shows	25
Covered in local news stories	88
Interviews with opinions leaders and public	91
News magazine describing malaria	14

Additionally local radio station covered the IRS campaign launch and closing ceremonies.

Table 9 summarizes the number of IEC-related activities that occurred and IEC materials that were distributed.

Table 9: Number of IEC Activities Completed and IEC materials Distributed in 2012

Activities	N° of Activities
Community meetings	43
Radio broadcasts	2,503
T-shirts distributed	993
Caps distributed	42
Leaflets distributed	114,110
IRS launch ceremony	1
IRS closing ceremony	1
Newspaper articles	8

5. Implementation of IRS Activities

5.1. Spray Campaign Launch Ceremony

An official IRS campaign launch ceremony was held on May 14, the first day of the 2012 IRS campaign. The prefect for Atacora-Donga officially launched the spray campaign, and spoke about the benefits of IRS. Staff from the NMCP and PMI-Benin attended the launch ceremony, along with representatives from all nine spray districts, including mayors, and staff from health, environment, and agriculture agencies. All spray operators, team leaders, and district coordinators were in attendance. After the launch ceremony concluded, all spray operators, team leaders, and district coordinators left for their designated operation bases to receive their PPE, insecticide, schedules, and data collection sheets. Several communities near Natitingou began spraying on May 14.

5.2. Spray Operations

The 2012 IRS campaign was implemented from May 14 through June 22, 2012.

Spray teams were deployed Monday through Saturday each week. Sunday was designated as a day off for rest, fixing spray equipment, and catching up on data entry. The spray operators were divided into 99 spray teams of five to six spray operators. Each team was supervised by a team leader. The team leader was responsible for his/her team's performance and organization. The number of spray teams per district was determined by the number of targeted eligible structures found in the district (as noted by the enumeration data). A breakdown of the distribution of spray teams is found in Table 10.

Table 10: Distribution of Spray Teams By District

District	No. of Spray Teams	No. of Eligible Structures
Matéri	14	36,848
Natitingou	14	32,141
Kouandé	12	32,300
Boukoubé	12	27,807
Péhunco	12	24,865
Kérou	12	24,354
Tanguiéta	10	25,417
Cobly	8	21,620
Toucountouna	5	13,729
TOTAL	99	239,081

Spray activities were closely supervised by staff from a variety of health and environmental agencies. Please see Table 5 for more details on the division of supervision and the supervision activities completed.

Additionally, the AIRS Project Director, Brad Lucas, was in Benin for the beginning of the spray campaign and helped the AIRS Benin team identify areas that needed further strengthening during the IRS campaign. This included:

- Improving record keeping on IRS commodity transactions (documenting when commodities were delivered and left the operation bases);
- Working with the AIRS Benin team to develop a daily microplan for spray operations, and use this as a base for following the IRS campaign's progress;
- Reinforcing the need for close supervision by local authorities and strategies for further involving local authorities in the IRS campaign;
- Working with the AIRS Benin team to improve communication between operation bases and the central store in Natitingou; and
- Collecting data to help determine the start date for future IRS campaigns, to avoid delays due to the start of the rainy season.

Overall, the 2012 IRS campaign did not experience any insecticide poisonings or spills, and no injuries were reported. AIRS Benin found communities were very receptive to having their structures sprayed.

The spray operators did experience a few minor issues, most notably that an estimated 4,578 eligible structures originally found during the enumeration were used to store grain following recent harvests. These structures were not sprayed, and were removed from the total eligible structures for the spray campaign.

The AIRS Benin team remained attuned to activities in the field, via the district coordinators and several spray team leaders sending daily SMS to the AIRS Benin Operations Manager regarding the number of structures sprayed each day (based off their review of the spray cards turned in daily), and any issues that were experienced in the field. This reporting allowed the AIRS Benin team to note its progress as compared to the IRS program's schedule, and to help problem-solve any issues quickly.

The AIRS Benin staff, most notably the Chief of Party, Operations Manager, Technical Manager, ECO, Logistician, and M&E Manager spent considerable time in the field providing spray campaign supervision, and working directly with spray teams to improve all IRS activities.

5.3. Mid-Spray Environmental Inspection

During the spray campaign the AIRS Benin ECO worked with the NMCP, DDS, Community Hygiene and Sanitation Service (SHAB), DDHU, and MAEP to form an inspection team to complete a mid-spray environmental inspection of all operation bases, and spraying activities. The inspection team used a checklist for their inspection that was based on PMI's BMP manual. The inspection reported the following during their mid-spray inspection:

- All storage sites at the operation bases were equipped with a double lock system, and were clean and well-maintained. Additionally, storage facilities were well-ventilated, and were

registering temperatures via the storage facility daily logs. Insecticide stocks and contaminated solid wastes were stored in separate pallets not higher than two meters.

- Stock cards at all storage facilities were accurate and up to date. The inspection team completed spot checks regarding insecticide inventory and the number of empty insecticide sachets found at each operation base. Overall, they found stock cards to accurately account for the insecticide in-stock, and empty sachets found within the storage facility.
- The wash areas and the soak pits were all fenced and secured. The inspection team found that most soak pits were also well-maintained; however weeds were found in the rinsing area of the central warehouse in Natitingou. The weeds were promptly removed soon thereafter. Also the inspection team noted that some wastes (non-hazardous wastes, chiefly papers and grass clippings) were being disposed near the actual warehouse in Natitingou. After learning of this finding, the warehouse manager and logistics assistants quickly moved the wastes to another area in the warehouse compound, far away from the warehouse, soak pit, and wash areas.
- During visits to Toucountouna, Kouandé, and Kérou, the inspection team noted that store keepers did not wear their boots, as the boots received at these operation sites were too small for the store keepers. The inspection team made sure the store keepers understood the necessity of wearing boots, and AIRS Benin provided larger boots for the store keepers.
- Pregnancy tests were available at all operation sites, and were regularly used by women washers, store keepers, and spray operators.
 - At Perma, a washer's pregnancy test results were missing during the inspection team's visit. The washer had a medical examination at the local health facility where it was noted that she was not pregnant. Fortunately, the original pregnancy test results were also found, which also noted that she was not pregnant and could work.
- The inspection team noted the spray teams correctly mixed insecticide within their spray pumps, and the actual spraying was performed well, with the right amount of insecticide applied to each wall. The inspection team noted that most spray operators wore and used their PPE correctly.
 - However, the inspection team found that some of the spray operators removed their masks immediately after spraying. The team provided immediate refresher training to these spray operators, and explained the protocol for wearing the face masks, and the risks of not wearing PPE properly.
- Rinsing of spray pumps and the washing of PPE were performed correctly, with all washers correctly using gloves, aprons, and other PPE.
 - The inspection team did note that several washers, who had removed PPE after completing their work, entered the wash areas and soak pits to monitor the drying of the PPE. The inspection team provided refresher training to the washers and noted the need to wear PPE at all times in the wash areas, to prevent insecticide contamination.
- The inspection team found that transport vehicles were not overloaded. Most of the vehicles had capacity for 18 persons, and were found to transport 14 spray operators.
 - The inspection team did find that small amounts of already mixed insecticide on the floor of two transport vehicles, as spray operators had not depressurized their spray tanks before entering the vehicles, and their pumps had leaked insecticide. AIRS Benin sent a project-wide communication to all spray operators that reminded them to depressurize their spray pumps at the end of spraying and to raise their nozzles before getting into vehicles. Additionally, AIRS Benin staff visited the spray teams that had leaked their spray pumps in the vehicles, and followed up to make sure that they were depressurizing their spray pumps before they entered any vehicle. AIRS Benin staff also

worked with the drivers of the two vehicles where the leaked insecticide was found, and followed the BMP to clean the vehicles accordingly.

5.4. Stock Management during the IRS Campaign

AIRS Benin used inventory control cards (ICC) for recording each item in the central warehouse and operation sites. Storekeepers updated the ICC daily regarding the movement of stock in or out of the storeroom. Store keepers were also required to conduct routine physical stock counts daily to ensure that the actual stock in storerooms matched the ICC record.

At the operational sites, insecticide sachets were only issued to team leaders, who filled and signed issue forms. The store keeper would immediately enter the amount provided to the team leaders on the ICC to ensure accurate stock balances.

At the end of each spray day, spray operators turned in their used and unused sachets to the team leader, who collated and submitted them to a store keeper. The store keeper recorded the full sachets on the stock card as a positive adjustment, and updated the stock balance. The used sachets were registered on a daily utilization record form that helped AIRS Benin calculate insecticide utilization trends. To validate the insecticide inventory, the store keepers worked with AIRS Benin logistics staff to compare the stock cards for the unused insecticide sachets with the daily utilization records. This comparison also allowed for the AIRS Benin team to note if spray operators were using too little or too much insecticide during their spraying, and if various operation sites needed more insecticide.

Figure 10: Store keeper in Gnemasson Counting Insecticide Sachets after Distribution



Regarding PPE, one week before the IRS campaign, all PPE was organized at the central warehouse in Natitingou by the Logistician, store keepers, and logistician assistants and sent to all operation bases.

Every morning during the spray campaign, the team leaders with the store keepers would organize, distribute, and sign-out all PPE to be used for the spray operations. The warehouse managers also

organized and distributed all PPE to the washers and other IRS staff as needed. At the end of each day, all PPE was turned over to the washers for cleaning. After the PPE was washed, the washers turned the PPE over to the store keepers and team leaders, who completed another inventory count to ensure that all inventory was returned.

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

5.5. Results of Logistics and Supply Chain Analysis by RTT Group, Limited

As noted in the 2012 AIRS Benin work plan, AIRS subcontracted RTT Group, Limited (RTT) to complete an analysis of the project's logistics and supply chain systems during the IRS campaign, and provide recommendations. Overall RTT found that the AIRS Benin team was knowledgeable of the logistics and supply chain needs of the IRS campaign, and that the operation sites were secure, accurately used stock cards, stored PPE and insecticides properly, and were well organized. Further, the quantity of PPE and insecticide procured and used for the IRS campaign are sufficient, and hazardous materials, such as insecticides, were handled properly by all IRS campaign personnel.

The key areas for supply chain and logistics improvements that RTT suggested include:

- AIRS Benin should consider new planning to hire the least number of vehicles possible for the transport of IRS commodities and spray campaign personal. The rental of vehicles and the purchase of fuel is a large cost to the project. Thus, AIRS Benin may consider improving transit routes and devising other methods for spray operators to travel from their home villages to the operation bases (a significant transport cost is picking up and returning spray operators to their villages each day).
- Currently IRS campaign inventory can only be checked by either physically visiting an operation base and checking stock cards, or calling warehouse managers to get the inventory data. If possible, developing an electronic inventory management system would improve efficiency and accounting for IRS commodities.
- For future IRS campaigns, AIRS should consider a variety of sizes for some of the PPE (particularly gloves and gumboots). It was also noted that some of the spray equipment, particularly valves, were breaking from frequent wear and tear.
- Forecasting is undertaken only once per year, and is not adjusted or changed after it is completed. AIRS should utilize historical data on stock levels and stock usage from previous IRS campaigns to help develop their forecasts. Overall, forecasts should be completed as well in advance of the spray campaign as possible, and adjusted as needed based on the availability of locally procured PPE and decisions on insecticide for future IRS campaigns.

RTT recommended the following ideas for improving logistics and supply chain management:

- Purchasing a pallet mover or pallet jacket for the central warehouse in Natitingou, as this will allow the AIRS Benin team to move materials more quickly for distribution to other operation bases, and ensure all commodities are stored securely.
- An electronic inventory management system should be developed. At the very least this should be kept at the central warehouse, and the Logistician can use SMS and mobile calls to contact warehouse managers to find out daily inventory at all operation bases.
- Since many IRS commodities have multiple parameters for determining the right amount to procure, an Excel sheet should be established noting these parameters and allowing for

calculations for forecasting of commodities that is inclusive of these parameters. Additionally, forecasting should consider historical data from forecasting and procuring IRS commodities from past IRS campaigns.

- A significant cost in transporting spray operators is picking up and dropping off spray operators in their home villages. The IRS program should consider ideas for ensuring spray teams' members travel and report directly to the operation bases on their own, as this will cut back on the amount of time transport vehicles are needed and the distances the vehicles will need to travel each day.
- AIRS Benin should consider the costs of hiring more spray operators, and project if this could reduce the amount of time to implement the IRS campaign and potentially the amount of rent for storage spaces, vehicles, and the number of days to pay seasonal staff costs.
- AIRS Benin should provide more supply chain management and logistics training to seasonal staff and the AIRS Benin team during the quiet periods after the spray campaign.
- Since other malaria programs operate in northern Benin, and distribute long-lasting insecticide net (LLIN), Intermittent Preventive Treatment for Malaria in Pregnancy (IPTp), and other malaria programming commodities, AIRS Benin should consider working with other malaria programs to organize joint transportation of commodities to northern Benin. This would allow for the sharing of logistics costs, and lower marginal costs for all malaria programs.

6. Monitoring and Evaluation of 2012 IRS Campaign

M&E for the 2012 IRS campaign closely followed the processes outlined in the 2012 AIRS Benin work plan and the M&E Concept Paper developed by the AIRS Core team. M&E activities were led by the AIRS Benin M&E Manager and the Database Manager.

The key objectives of AIRS Benin's M&E activities are:

- To emphasize accuracy of both the data collection and data entry process through comprehensive training and supervision at all levels;
- To streamline and standardize data information flow, and minimize error and facilitate timely reporting; and
- To ensure IRS data security and storage for future reference through the establishment and enforcement of proper protocols.

6.1. Data Management

IRS campaign data were entered each time a structure was visited by a spray operator. This includes noting if a structure was not sprayed and the reason why the structure was not sprayed on to a spray operator card.

Data quality assurance protocols were followed to check the accuracy of all spray operator data collected. Team leaders and thereafter district coordinators were required to check and validate all spray operator cards before they were sent to Natitingou for the data clerks to process and enter into the AIRS Benin database. Additionally, the M&E Manager and Database Manager regularly checked the accuracy of data entered by data clerks, by randomly selecting 10 percent of the spray operator forms collected during a week and checking for accuracy of the data noted on the spray operator card and the data entered into the AIRS Benin database. Finally, beneficiaries were randomly selected out of the

database, and thereafter AIRS Benin staff traveled to the field and interviewed beneficiaries, to compare data entered into the database and the actual structures located within a beneficiary's household. Also, the AIRS Benin database was developed via Microsoft Access, and includes logic and controls to validate data entries and minimize data entry error.

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

6.2. Number of Structures Covered by the 2012 IRS Campaign

The 2012 IRS campaign sprayed 210,380 structures. Spray coverage was well over the 85 percent minimum threshold, as spray coverage was 94.8 percent for the total number of structures found by spray operators (221,937). Table 11 describes the overall spray coverage rate.

Table 11: Summary of IRS Coverage

Total number of structures found	221,937
Total number of structures sprayed	210,380
Spray coverage	94.8%

6.3. Population Protected

A total of 652,777 people, including 327,664 men and 325,113 women, were protected by the IRS campaign. Regarding vulnerable populations, 127,133 children under-five years were protected, including 63,674 males and 63,459 females; the IRS campaign protected 17,807 pregnant women. Table 12 provides a breakdown of the total number of people protected by IRS per district.

Table 12: People Protected by the IRS Campaign per District

District	Total Population Protected			Children <5 Years Protected			Pregnant Women Protected
	Men	Women	Total	Male	Female	Total	
Boukombé	33,718	34,259	67,977	6,184	6,104	12,288	1,432
Cobly	26,815	27,400	54,215	4,557	4,931	9,488	1,192
Kérou	44,523	43,916	88,439	8,993	9,071	18,064	3,755
Kouandé	49,290	47,194	96,484	10,418	10,305	20,723	2,603
Matéri	41,267	43,001	84,268	7,594	7,333	14,927	1,898
Natitingou	50,480	48,888	99,368	7,713	7,501	15,214	2,141
Péhunco	44,129	41,770	85,899	10,304	10,113	20,417	3,203
Tanguiéta	21,089	21,176	42,265	4,510	4,605	9,115	891
Toucountouna	16,353	17,509	33,862	3,401	3,496	6,897	692
Totals for Atacora	327,664	325,113	652,777	63,674	63,459	127,133	17,807

Overall, 11,557 structures that were identified as eligible were not sprayed during the IRS campaign, leading to an estimated 14,479 people who were unprotected by the IRS campaign. Since the leading reason for not spraying a structure was related to beneficiaries not being at home, the spray operators were unable to gain precise data on the number of individuals who lived in the unsprayed structure.

6.4. LLIN Use

As required by the NMCP, spray operators collected data on the number of people in Atacora (particularly children under 5 years and pregnant women) sleeping under LLIN. Spray operators asked for this data at each structure that was sprayed, with the data recorded on the spray operator card, and entered into the AIRS Benin database.

Among the 652,777 people protected by IRS, it was noted that 589,861 (or 90.33% of people protected) slept under LLINs. LLINs were distributed in 2011 by the NMCP and its partners. Previously, LLINs were distributed free to pregnant women in Atacora. Table 13 provides a breakdown of LLIN use in the communes covered by the 2012 IRS campaign.

Table 13: LLIN Use in Structures Covered by the IRS Campaign, Per District

District	Total Number of People Sleeping under LLINs	Total of Children under 5 Years Old Sleeping under LLINs	Total of Pregnant Women Sleeping under LLINs
Boukombé	65,979	11,677	1,261
Cobly	53,170	9,243	1,136
Kérou	83,922	17,235	3,517
Kouandé	80,011	18,408	2,218
Matéri	80,033	13,632	1,561
Natitingou	81,302	12,757	1,593
Péhunco	78,000	18,664	2,903
Tanguiéta	37,219	7,963	697
Toucountouna	30,225	6,184	574
Total	589,861	115,763	15,460

6.5. Insecticide Usage and Spray Operator Performance

A total of 50,842 insecticide sachets were used to spray the 210,380 eligible structures in the nine districts of Atacora. Thereby, spray operators averaged spraying 13 structures per day, and 4.1 structures were treated per insecticide sachet.

Table 14 provides a breakdown of the average number of structures covered by one sachet, per district.

Table 14: Insecticide Used per District

District	Number of Sachets Used	Number of Structures Sprayed	Number of Structures Covered (Sprayed) per Sachet of Bendiocarb
Boukoubé	5,777	23,928	4.14
Cobly	3,588	18,412	5.13
Matéri	6,899	29,165	4.23
Toucountouna	2,729	10,418	3.82
Tanguiéta	3,785	14,209	3.85
Natitingou	13,300	30,296	2.38*
Kouandé	5,132	30,865	6.01
Péhunco	5,594	26,222	4.79
Kérou	4,038	26,865	6.75
Total	50,842	210,380	4.14

*In Natitingou district there is a significant urban population, and on average most houses in Natitingou town (the largest city in the region) usually contained more rooms per structure, and larger rooms per structure. This led to spray operators needing to spray more insecticide to fully cover an average structure in Natitingou.

7. Entomology

As described above, CREC was subcontracted by AIRS Benin to complete entomological surveillance for the 2012 IRS campaign. Since most entomological surveillance results for the 2012 IRS campaign will be reported in the final entomological report (to be completed in October), this section provides a brief explanation of entomological surveillance that was completed before and during the IRS campaign.

7.1. Entomological Surveillance Baseline

In April, baseline data were collected by CREC. The baseline data included specie capture and identification, which found that *Anopheles gambiae* was the most prevalent species (60.34 percent) in Atacora. *Culex quinquefasciatus* accounted for 34.4 percent of species found.

Since the baseline was completed during the dry season, human biting rates for *An. gambiae* were low (11.16 bites per person per month) but the infectivity of these mosquitoes was high (positivity of *An. gambiae* for *P. falciparum* circum-sporozoitic antigen was recorded at 10 percent) with a high parous rate (physiological age grading at 97.67 percent) and a high endophilic behavior¹ (92.15 percent).

7.2. Initial Bioassay Testing

At the beginning of the IRS campaign, a quality control study was carried out to check the efficacy and homogeneity of insecticide treatment. A susceptible colony of *An. gambiae* was used to assess the quality of spraying and insecticide persistence after spraying as per the World Health Organization

¹ Endophilic refers to the preference of mosquitoes to rest indoors (inside a structure).

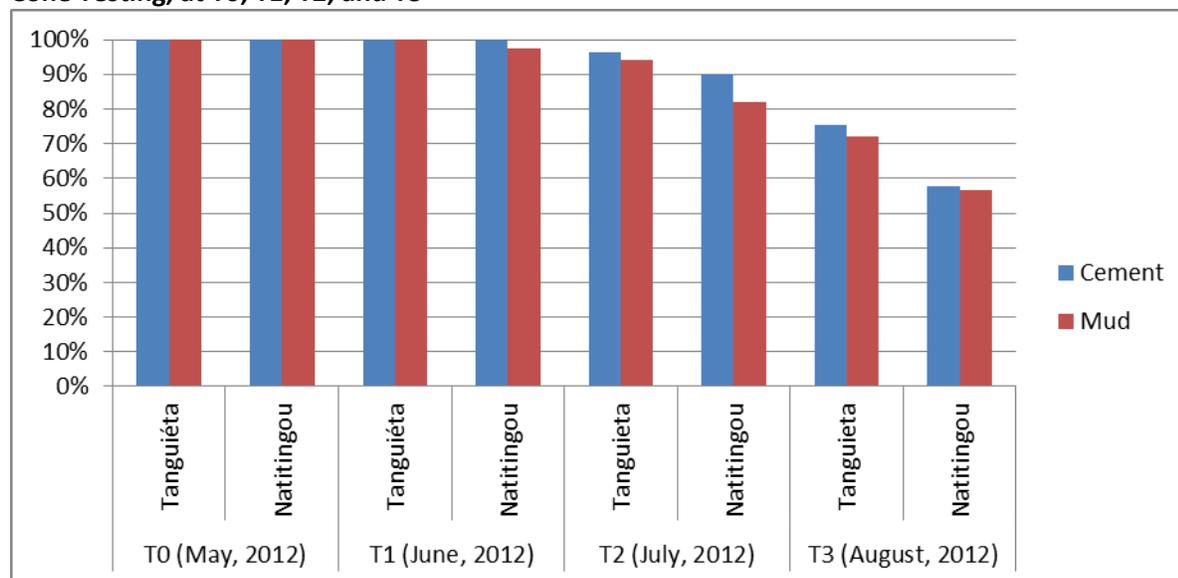
(WHO) recommendation. Thereby, bioassays were performed 24 hours after IRS activities according to the WHO procedures, with a susceptible strain. During the bioassay tests, the knock-down rate for mosquitoes after 30 minutes and 60 minutes was found to be 100 percent in all surveillance sites.

One month after the IRS campaign (T1; June 2012), bendiocarb remained effective with a test mortality rate of 100 percent on cement walls and greater than 97.5 percent on the mud walls. Two months (T2; July 2012) after spraying test mortality rates were greater than 90 percent for cement walls and ranged between 82 percent to 94 percent on the mud walls. However, the efficacy of the insecticide on all sprayed walls declined to less than 80 percent for both cement and mud walls three months (T3; August 2012) after spraying. In T3, efficacy ranged between 57 percent and 75 percent for cement walls, and 56 percent and 72 percent for mud walls.

AIRS will provide more details following the submission of future entomological monitoring reports by CREC.

Figure 11 notes the percent mortality of susceptible strains to Bendiocarb at T0 (24 hours after spraying in May), through T3 (August 2012).

Figure 11: Percent Mortality of Susceptible Strain after 30-minute Exposure to Bendiocarb via WHO Cone Testing, at T0, T1, T2, and T3



7.3. Other Preliminary Entomological Surveillance Findings

Other preliminary results of entomological surveillance include:

- A reduction of 67.8 percent of the *An. gambiae* mosquito population was found in the five entomological surveillance sites in Atacora (Matéri, Tanguieta, Kouandé, Natitingou, and Péhunco) right after the IRS campaign was completed in June.
- In June, an average of 16.2 *An. gambiae* mosquitoes was collected in Atacora. This is significantly less than the 70 *An. gambiae* mosquitoes that were collected on average in a nearby control district (Copargo district in Donga Region) that was not covered by the IRS campaign.

- The Human Biting Rate in June was 0.25 bites per person per night in the districts covered by IRS. In the control areas, 6.25 bites per person per night were recorded in June.
- The entomological inoculation rate (EIR) in June, at the end of the IRS campaign was noted as being five times lower at surveillance sites in Atacora as compared to surveillance sites in the control district.
 - June EIR, Atacora surveillance sites: 0.074 infective bites per man per night, or 2.22 infective bites per month
 - June EIR, control district surveillance sites: 0.38 infective bites per man per night, or 11.4 infective bites per month.

8. Post-Spray Activities

8.1. Closing Ceremony

On June 22, the final day of the 2012 IRS campaign, a closing ceremony was held in Natitingou. The ceremony was hosted by the DDS, with representatives from the nine spray districts and health staff from all spray areas in attendance. The ceremony provided an opportunity for AIRS Benin to thank all seasonal spray staff, PMI, and the national, regional, and district government staff involved in the planning, supervising, and implementation of all IRS campaign activities.

8.2 Post-Spray Meeting/Review

A three-day (August 7-9) post-spray conference was held in Grand Popo. The first day of the conference was set aside for AIRS Benin to complete an internal evaluation of the IRS campaign, and develop a SWOT analysis to determine the successes and challenges of the IRS campaign and note best practices to help with the planning of the 2013 IRS campaign.

On August 8-9, representatives of the MOH, NMCP, DDS-Atacora, PMI-Benin, and CREC participated in the discussion of the results of the IRS campaign, best practices and lessons learned, and recommendations for the 2013 IRS campaign, and in the development of plans for organizing the 2013 IRS campaign.

8.3. Post-Spray Environmental Assessment

The post-spray environmental inspection was performed from July 16 to July 20, by an inspection team led by the AIRS Benin ECO, Operations Manager, and Field Logistician and representatives of the NMCP, DDS Atacora, DDHU, and MAEP. The inspection's main objective was to make sure all operation bases were properly closed and note any environmental issues that need to be resolved before the 2013 IRS campaign. The findings of the post-spray environmental inspection include:

- All of the IRS campaign items have been transported back to the central warehouse in Natitingou for storage until the 2013 IRS campaign.
- Most rinsing/washing areas and soak pits at operation bases remain in good condition and enclosures around these areas are also in good condition and locked.
 - The enclosures around the rinsing areas and soak pit in Cobly (Cobly District), Matéri (Matéri District), and Nata and Manta (Boukoubé District) were damaged. AIRS Benin is currently working with the AIRS Core team to develop and construct covers for the soak pits

made of cement, or locked down heavy plastic. Unfortunately, it is likely that the fencing around the soak pits were stolen, as the straw material often used for fencing is highly prized (please see Figure 4, which shows the typical straw fencing around soak pits and washing areas; and please see Figures 2 and 3, noting soak pits from previous years where the straw fencing was removed). AIRS Benin intends to construct the soak pit covers in the next few weeks.

- In Firou, the municipality moved a civil servant into the building that was used for the IRS campaign's storage facility. AIRS Benin has confirmed that the building was cleaned and decontaminated after the IRS campaign; however, AIRS remains concerned that this person is living in this building. AIRS Benin is currently in discussion with the Chief of the Sub-District in Firou, the DDS, and the NMCP to move this person to another building. Due to this issue, AIRS Benin intends to include in their memorandum of understanding (MOU) with the DDS for 2013 the exact buildings that will be used for storage, and to highlight that these structures are not to be inhabited before, during, or after the IRS campaign. It is likely that AIRS Benin will either look for another structure for the storage area in Firou, or use another community nearby as an operation base in 2013.
- The inspection team found that all of the boots at the central warehouse were organized but many had not been washed. Since this finding, AIRS Benin has gone ahead and washed all of the boots, and will re-check again during an upcoming inventory trip to Natitingou.
- The central warehouse in Natitingou remained well organized and clean after receiving and storing all remaining PPE and insecticide from the operation bases. All PPE items were found on pallets that were clearly identified, and inventory matched quantities stated on the central warehouse stock cards.
 - Remaining sachets of Bendiocarb were well separated from whole boxes found in the central warehouse.
 - Solid waste items, such as empty sachets and used dust masks, had already been removed and transferred to St. Jean de Dieu Hospital for incineration.

8.4. Incineration of Solid Waste

With the Minister of Health present, AIRS Benin began the incineration of solid wastes from the 2012 IRS campaign in early July. For a second year, the Benin IRS program used the incinerator at St. Jean de Dieu Hospital. The incinerator had already been reviewed by the AIRS ECO for its capacity, its ability to reach high enough temperatures for incineration of IRS solid wastes, and its low level of emissions. All loading of solid waste and the actual incineration were closely supervised by the AIRS Benin ECO and Logistics Manager and staff from the DAEP. The incineration process lasted for eight hours. The incinerated wastes included:

- 50,842 empty sachets of insecticide
- 22,260 used respiratory masks
- 2,450 used gloves
- 644 used operator bags
- 560 used head-lamps(*)
- 125 used plastic tarps

* Since the head lamps were contaminated by insecticide (as they were constantly exposed to insecticide spraying inside the sprayed structures), AIRS Benin went forward with their incineration.

Although the incineration of the head lamps was completed without incident, all parties agreed that in future years, the contaminated head lamps will be washed thoroughly and evaluated for possible re-use (just like the gumboots) or recycling, or as a last option burying the head lamps (after consultation with national and regional environmental authorities) after thorough cleaning. Overall, AIRS Benin found that the exhaust and smoke from incinerating the hard plastics found in the head lamps was too much of an environmental risk.

8.5. Post-Spray Inventory

Starting in late June, as PPE and insecticide were returned to the central warehouse, the AIRS Logistician and Warehouse Manager completed an inventory of all remaining commodities from the 2012 IRS campaign. The results of the inventory are found in Table 16 in the annex.

8.6. Post-Spray Campaign Radio Programs

During the two weeks after the IRS campaign's completion, radio stations throughout Atacora continued IRS messaging, chiefly broadcasting information on the benefits of using structures covered by the IRS campaign, malaria prevention, and protocol for not applying paint, plaster, or other materials to treated walls.

9. Lessons Learned and Recommendations

9.1. Challenges and Lessons Learned

Administration and Logistics

- For future IRS campaigns, all PPE procured internationally should be sent to Benin earlier in the year, around January/February.
- Although advertisements for hiring seasonal staff and tenders for hiring vehicles for the IRS campaign were placed in newspapers distributed throughout Benin, local authorities and partners in Atacora did not see these newspapers. Therefore, in future years AIRS Benin will send letters and emails to local authorities and partners in Atacora with copies of the newspaper advertisement. Additionally, AIRS may look into placing posters advertising for seasonal staff and vehicle rental throughout health centers, post offices, and other buildings (pending permission) in Atacora.
- Due to the limited number of AIRS Benin vehicles and the cost and time of traveling between AIRS Benin's office in Cotonou and the spray campaign sites in Atacora, it is recommended that some staff should travel by bus between Cotonou and Natitingou when appropriate.

M&E/Enumeration

- AIRS hired 40 data clerks to complete data entry and ensure timely reporting of spray campaign data. AIRS Benin found this to be the right number of data clerks. Hiring fewer data clerks would increase the workload and lead to delays in reporting.
- Some IRS cards developed by the contracted printing company had duplicate serial numbers. This caused some confusion at the beginning of the IRS campaign and initial rejections for data entry by the database. Due to this issue, the M&E team had to reconfirm some of the spray cards with district coordinators, and there were some initial delays with

data entry for the first two weeks of the spray campaign. Fortunately the issue was resolved quickly.

- Due to the costs of renting laptops, and the poor quality of some of the rented laptops, AIRS Benin purchased 16 new laptops for data entry. After analyzing the work plan budget, it was noted that purchasing a laptop (which can be used for the IRS campaigns in 2013 and 2014) was cheaper than renting 16 laptops for the duration of the 2012 IRS campaign.
- Some of the IEC agents used chalk to mark all structures found during enumeration. However, due to weather, the chalk marks often wore off, leaving the structures unmarked. AIRS Benin is considering using markers in 2013 to mark all structures found during enumeration.
- The daily activities report, which district coordinators sent by SMS to the Operations Manager, was important to chart IRS campaign progress and note key issues regarding IRS programming.
- As noted above, 4,578 eligible structures found during enumeration were converted into granaries following early harvests. Because they were granaries, AIRS Benin did not spray these structures. Fortunately, due to the spray cards that were completed by the spray operators, it was easy to identify that these structure had become ineligible and the reason why they were not sprayed. This also allowed the AIRS Benin team to quickly calculate how these 4,578 structures impacted the total number of eligible structures for the 2012 IRS campaign.

IEC

- Most people in Atacora do not have, or prefer not to listen to, radios. AIRS Benin performed an informal survey during the IRS campaign, and found that more people learned about the IRS campaign through the “crieurs de village.” For future IRS campaigns, AIRS Benin will consider spending less on radio broadcasts and will provide more funding towards local communication activities (community mobilization, crieurs de village, door-to-door mobilization). This was also a lesson learned from past IRS campaigns in Ouémé-Plateau.
- AIRS Benin may consider completing the IEC door-to-door mobilization in 2013 just a few weeks before the IRS campaign. Some communities had forgotten the key messages provided by the IEC agents, as the door-to-door mobilization occurred 1.5 to 2 months before the IRS campaign.
- Drivers often had significant down-time, while spray operators were in the field spraying. AIRS Benin may look into training drivers to provide some mobilization and sensitization activities while sprayers are completing their work.
- Some community leaders did not participate in the general IRS information meeting in March. This led to difficulties: the community leaders did not announce the dates of the IRS campaign to their communities, which in turn led to some minimal delays for the spray operators in working with beneficiaries to prepare their structures for spraying. In the future, AIRS Benin may hold information meetings in several locations to ensure that as many community leaders as possible attend these meetings.

Logistics

- For future IRS campaigns, AIRS Benin will work to procure larger gumboots for spray operators.
- Fuel shortages were experienced in Atacora; fortunately they did not impact the IRS campaign.

Environmental Compliance

- There is a need to formally establish an environmental inspection group, to make sure staff from government environmental agencies participate in IRS environmental inspections and approve the quality of refurbishments to operation bases. In 2012, AIRS was able to establish inspection groups featuring regional and national environmental officials. For future years, AIRS will seek to establish an expectation of having the environmental inspection group in place for pre-, mid-, and post-spray environmental evaluations. AIRS may seek the support of NMCP and MOH, in developing these inspection groups under a MOU with the MOH.
- Protocols should also be established and provided to each health center to ensure they note the condition of operation bases during the non-spray months, and report any issues to AIRS Benin.
- Since the straw used for currently fencing soak pit enclosures is highly prized and often stolen, AIRS Benin may complete a cost-benefit analysis of constructing enclosures for soak pits out of clay (banco). For enclosures where theft has occurred, AIRS Benin will work with the AIRS Core team to apply concrete or heavy plastic (that can be locked) to cover the soak pits.
- Openness and transparency with PMI were key in identifying the risks of spraying inside the ZOC, and ensuring PMI could make a well-informed decision about whether to spray structures in the ZOC.

Operations/Trainings

- AIRS Benin did note that the 2012 spray campaign coincided with the start of the rainy season in northern Benin. Overall the rains caused minor delays that did not impact the timeline of the IRS campaign. The rains did lead to some delays, mainly that the rains caused slow transport of spray operators and IRS commodities in some areas due to more difficult roads. Additionally, in some areas individuals were unwilling to remove their possessions from targeted structures while it rained. This often led to spray operators waiting until it stopped raining, and then helping to remove possessions in eligible structure to start spraying the structure. Finally, in some areas the rains caused more individuals to head to their fields for farming, as rainy season usually means the start of the planting and agricultural season. However, these individuals frequently returned to their structures when they found-out spray operators were in their community and were scheduled to spray their structure. AIRS Benin did contact the Benin government to gain meteorological data regarding spraying in April, May, and June. Completing the IRS campaign from mid-April through the end of May, would limit delays, as rain is less frequent in April and May. However, spraying one month earlier would require that the insecticide selected for the 2013 IRS campaign would need to have a residual life of at least five months, as the peak of malaria transmission occurs in June, July, and August.
- Good collaboration between AIRS Benin and the DDS, DDHU, and mayors of the spray districts led to government staff becoming more interested and involved in the planning of the IRS campaign, and participating in IRS campaign supervision.
- Technical experts from CREC, the University of Benin, and the NMCP were readily available for trainings and helped improve the training content and materials.
- AIRS Benin will need to consider how to improve the hygiene agents' (provided to AIRS Benin from DDS-Atacora) supervision activities. Many of the hygiene agents did inadequate supervision, and were not as readily available as needed.

- Developing a supervision monitoring system would be very useful for identifying inadequate supervisors and providing refresher training to improve supervision.

Entomology

- CREC has continued to complete high-quality entomological surveillance for the IRS campaign, and was very active in the field to measure and ensure the quality of the IRS campaign.
- AIRS Benin has started to involve NMCP staff in entomological surveillance, and is working with CREC to ensure that NMCP staff clearly understand entomological surveillance findings and can make good malaria control decisions based on the entomological data

9.2. Recommendations

The recommendations listed below are suggested activities and actions that the AIRS Benin team can follow to improve the efficiency and effectiveness of IRS programming in Atacora. Additionally, several of the recommendations provide suggestions on how to further establish capacity at the NMCP, DDS, and other Beninese health and environmental agencies.

1. Immediately after the completion of the 2013 work plan in October, AIRS Benin should begin working on detailed plans for how all activities for the 2013 IRS campaign will be completed. This document should be revised as the team develops new ideas throughout the months leading up to the IRS campaign.
2. During enumeration, IEC agents should mark all eligible structures with marker or a pen. This will allow the spray operators to note eligible structures during the spray campaign, and ensure as many eligible structures as possible are sprayed.
3. AIRS Benin should look into developing an environmental technical committee comprising the ECO, Operations Manager, and representatives from the DDS and DDHU. The committee would travel to Atacora throughout the year to inspect operations bases and ensure that all sites are refurbished properly. This committee can also identify ways to improve cost-effectiveness in environmental compliance, such as building enclosures for soak pits out of clay instead of straw fencing, and develop better terms of reference for community leaders and local authorities to be more involved in environmental compliance activities.
4. Although the NMCP and DDS was involved in all steps of the IRS campaign from planning and training (especially the training of trainers) to supervision and coordinating IRS logistics, AIRS Benin would like to further involve the NMCP and DDS in managing the overall implementation and management of the IRS campaign. Thereby, AIRS Benin would like for the NMCP and DDS to take over the management of one aspect of the IRS campaign in future years, such as ensuring all logistics and supply chain processes, or providing overall management of spray operators, etc. This will further develop the capacity of the NMCP and DDS, and instill more ownership for the NMCP and DDS in IRS programming. Given this idea, AIRS Benin may develop an IRS operations management training for the NMCP and DDS, to further develop the NMCP and DDS understanding of IRS campaign operations and staff's management skill-sets.

5. AIRS Benin should further involve IEC agents during the IRS campaign, to ensure that villages are aware of the IRS campaign dates and that beneficiaries prepare their structures for the IRS activities before the spray operators arrive.
6. Given the inadequacy of the supervision provided by Hygiene Agents, AIRS Benin will develop a formal scope of work (SOW) document that will be reviewed and presented to the DDS and NMCP for their review and guidance. The SOW will provide clear performance-based indicators to note if the Hygiene Agents are contributing to supervision. This SOW will be presented to the Hygiene Agents during their training in Atacora, and will need to be signed before hygiene agents can receive per diem or transport reimbursements. If a Hygiene Agent fails to meet the supervision standards set in the SOW, they will be reported to the NMCP and provincial level supervisors. A hygiene agent, who continues to fail to supervise appropriately, may be removed from the IRS campaign. AIRS should also consider developing a system for strong hygiene agents to mentor hygiene agents who are struggling with supervision activities.
7. AIRS Benin should examine the costs for radio broadcasts and community mobilization activities, and consider providing more funds to traditional and inter-personal methods of community mobilization in 2013, due to their greater effectiveness.
8. AIRS Benin will look into developing MOUs with the DDS and mayors to ensure the use of local health and community facilities for operations bases in the following spray cycles. The MOU will also provide the environmental considerations that need to be followed for the use of local facilities, most notably to ensure that no one inhabits the store areas at any time.
9. Develop better formulas and methods for completing quantification and forecasting of PPE and insecticides for future IRS campaigns. The forecasting should be completed well ahead of time to allow for any changes in various commodities that need to be procured.
 - a. Further, AIRS Benin should consider PPE sizes (of gloves, boots, coveralls, etc.), to ensure that store keepers and spray operators have access to the best-fitting PPE in future IRS campaigns.
 - b. AIRS Benin may consider asking all seasonal staff to provide their sizes/measurements with their applications.
10. Facilitate dialogue with other AIRS country offices, to foster a robust exchange about lessons learned and recommendations for improving IRS campaign efficiency.
11. Consider various ideas for lowering transportation costs, such as asking spray operators to use bicycles to the main operations bases where they can be picked up by the IRS campaign transport vehicles.
12. Given the difference in mosquito mortality regarding Bendiocarb applied to mud walls, versus other types of walls, an issue that has been noted in Ethiopia and Mali, AIRS Benin will look into more susceptibility testing for Bendiocarb. This may be an issue to highlight to manufacturers.
13. As noted by the NMCP, it may be best to move the IRS campaign earlier in the year, to ensure that the IRS campaign is not as impacted by the rainy season that begins in June.

10. Annex

10.1. Additional Figures and Tables

Table 15: IRS Commodities and Inventory

Item	Initial Stock Before IRS Campaign	Number of Item Procured	Stock Before Campaign	Used/ Unusable Stock after IRS Campaign	Usable Stock Remaining for 2013	Notes
Insecticide (FICAM)	31,740	30,480	62,220	50,858	11,362	Procured internationally
Spray Pumps	562	150	712	5	707	5 pumps were determined to be damaged after the IRS campaign, and cannot be used in 2013.
Overalls	1,683		1,683	1	1,682	1 overall was lost in Péhunco
Helmet	506	200	706	6	700	6 helmets were found to be damaged after the IRS campaign and cannot be used in 2013
Gumboots	641	200	841	1	840	1 pair of gumboots was found to be damaged after the IRS campaign and cannot be used in 2013
Gloves for Spray Operator	2,282	1,500	3,782	2,558	1,224	
Gloves for Washer	0	100	100	1	99	
Respirator Mask	2,687	27,120	29,807	22,607	7,200	Procured internationally
Operator Flashlight (Head Lamp)	46	610	656	560	96	45 flashlights were not returned by spray operator. In 2013, these flashlights will be washed and returned to the central warehouse
Stock Keeper Flashlight	10	10	20	9	11	
Tee-shirt (Used for Mobilization)		1,500	1,500	993	507	Will order fewer in 2013
Caps (Used for Mobilization)		502	502	42	460	Will order fewer in 2013

Item	Initial Stock Before IRS Campaign	Number of Item Procured	Stock Before Campaign	Used/ Unusable Stock after IRS Campaign	Usable Stock Remaining for 2013	Notes
Paracetamol		6,000	6,000	4,570	1,430	
First Aid Kits	24	100	124	43	81	35 of the First Aid Kits that were returned were missing items (bandages, etc.) and will need to be restocked
Adjustable Spanner	32	30	62		62	
Pliers	30	30	60		60	
Screwdriver	30	30	60		60	
Thermometers	20		20		20	
Fire Extinguishers	16	4	20		20	
O Ring for Spray Tube	479		479		479	
Spray Pump Spare Part Kits	34		34		34	
Filters	485		485		485	
White Washers(spare part for pumps)	344		344	118	226	
Nozzles 8002		1,000	1,000	701	299	
Nozzles 8001	190		190		190	
Grease for Spray Pumps	348		348	115	233	
Face Shield for Helmets	12	500	512	289	223	Due to wear and tear, will need to purchase more face shields for 2013
Helmet Cap	12	504	516	296	220	
IRS Cards		140,000	140,000	140,000	0	
Leaflets	35,200	183,500	218,700	110,710	107,990	
IEC Form		50,400	50,400	48,000	2,400	
IRS Spray Operator Forms		60,000	60,000	42,800	17,200	
Spray Regulator		150	150	0	150	
Pregnancy Kits		400	400	220	180	
Chronometers	57		57	37	20	
Polyethylene	720	450	1,170	585	585	

Item	Initial Stock Before IRS Campaign	Number of Item Procured	Stock Before Campaign	Used/ Unusable Stock after IRS Campaign	Usable Stock Remaining for 2013	Notes
Sheets						
Generators	1	0	1	0	1	

Figure 12: Spray Coverage Based on Structures Found by Spray Operators per District

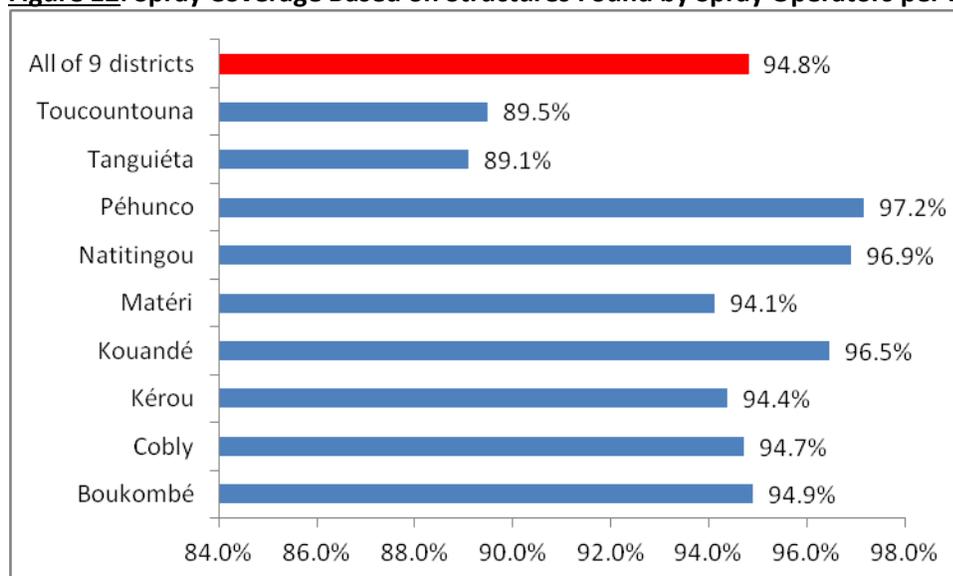


Table 16: Breakdown of Seasonal Staff Hired, by Sex

Districts	Spray Operators		Team Leaders		District Coordinators		IEC Assistants		Data Clerks		Storekeepers		Logistics Assistants		Finance Assistants		Washers		Service Technicians	
	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F
Natitingou	69		12	2		1					2							11	6	2
Toucountouna	20	6	5			1					1							3	3	
Boukombé	56	3	10	2	1						2							7	7	
Cobly	41		4	1	1						1							5	5	
Matéri	70		10	4	1						2							8	8	
Tanguiéta	46	3	9	1		1					1							5	6	
Kouandé	61	1	11	1	1						2							7	6	1
Natitingou IRS Campaign Office							1		18	22			3		3	1				
Péhunco	53	6	9	3	1						2							7	6	1
Kérou	54	6	9	1		1					2							7	7	1
TOTAL M/F	470	25	79	15	5	4	1	0	18	22	13	2	3	3	1			60	54	5
TOTAL	495		94		9		1		40		15		3		4			60		59

Table 17: Summary of Mid-Spray Environmental Inspections- Storage Facility and Soak Pits*

Operation Site	Are the store keepers, SOs and wash persons wearing appropriate PPE?	Do spray teams have clean PPE at the start of each work day?	Are overalls washed daily, and dried over the soak pit?	During transport, are all spray operator comfortably seated with pumps well placed between their legs in the transport vehicle?	Are spray operators fed before start of spray? (before wearing of PPE)	Is the store well arranged? (height of arranged items, allowing for free movement, proper stacking of items, allowing for ventilation)	Are warning signs correctly displayed? (danger sign, insecticide safety notice)	Is there firefighting equipment (not expired)?	Is there a thermometer to measure daily temperature in the store?	Is there a well-stocked First Aid Kit in the store? (eye wash, vitamin E cream)	Is the floor impermeable?	Is the roof leak-proof?	Is lighting and ventilation adequate? (Can you see your way through the store at day and night? Are there "Operable" windows and ventilators (fans, AC) to allow air circulation)	Are the surroundings of the store and soak pit clear of IRS solid wastes (empty sachets, masks, gloves)?	Are contents of drums 1, 3, 5 and 7 emptied into spray pumps before spray operators depart for field?
Toucountouna	Yes	Yes	Yes	N/A	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Natitingou	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Manta	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Natta	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Matéri	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Cobly	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Perma	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Guilimaro	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Kouandé	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firou	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Gnemasson	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Kérou	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Dassari	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Kaoubagou**	Yes	Yes	Yes	Spray Operators Walked to communities that were sprayed	Yes	Storeroom in Firou	Storeroom in Firou	Storeroom in Firou	Storeroom in Firou	Yes	Storeroom in Firou	Storeroom in Firou	Storeroom in Firou	Yes	Yes
Ouassa	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

*Since the operation site was closed in Tanguiéta (see page 10), as the operation site is located within the Pendjari Biosphere Reserve, AIRS Benin did not complete a mid-spray environmental inspection at the Tanguiéta Operation Site

** Kaoubagou Health Center was only used as a soak pit and washing area. Due to inadequate storage facilities, personal protective equipment and insecticide were stored at the nearby Firou's Operation Base.

Table 18: Summary of Mid-Spray Environmental Inspections- Household Preparation Before IRS*

Operation Site	Have all personal belongings, animals, and sick persons been removed from the house?	Have all immovable items been moved to center of the house and properly covered with polythene sheet?	Are the residents instructed on what to do during and after spraying?
Toucountouna	Yes	Yes	Yes
Natitingou	Yes	Yes	Yes

Operation Site	Have all personal belongings, animals, and sick persons been removed from the house?	Have all immovable items been moved to center of the house and properly covered with polythene sheet?	Are the residents instructed on what to do during and after spraying?
Manta	Yes	Yes	Yes
Natta	Yes	Yes	Yes
Matéri	Yes	Yes	Yes
Cobly	Yes	Yes	Yes
Perma	Yes	Yes	Yes
Guilimaro	Yes	Yes	Yes
Kouandé	Yes	Yes	Yes
Firou	Yes	Yes	Yes
Gnemasson	Yes	Yes	Yes
Kérou	Yes	Yes	Yes
Dassari	Yes	Yes	Yes
Kaoubagou	Yes	Yes	Yes
Ouassa	Yes	Yes	Yes

*Since the operation site was closed in Tanguiéta (see page 10), as the operation site is located within the Pendjari Biosphere Reserve, AIRS Benin did not complete a mid-spray environmental inspection at the Tanguiéta Operation Site

Table 19: Summary of Mid-Spray Environmental Inspections- Observation of Spray Operators in the Field (Where Applicable)*

Operation Site	Are SOs in full PPE? (helmet, overalls, boots, gloves, mask)	Is mixing of the insecticide witnessed by any household resident?	Are SOs spraying only the recommended surfaces?	Do SOs correctly record household details?	Is any SOs observed eating/drinking/smoking while at work?	Do SOs correctly follow the spraying techniques (standing 45cm from the wall, using vertical swaths, 5cm swath overlap, frequently shaking the can and constant observation of the pressure gauge)
Touncountouna	N/A	N/A	N/A	N/A	N/A	N/A
Natitingou	Yes	Yes	Yes	Yes	No	Yes
Manta	Yes	Yes	Yes	N/A	No	Yes
Natta	Yes	Yes	Yes	Yes	No	Yes
Matéri	Yes	Yes	Yes	Yes	No	Yes
Cobly	Yes	Yes	Yes	Yes	No	Yes
Perma	Yes	Yes	Yes	N/A	No	Yes
Guilimaro	Yes	Yes	Yes	N/A	No	Yes

Operation Site	Are SOs in full PPE? (helmet, overalls, boots, gloves, mask)	Is mixing of the insecticide witnessed by any household resident?	Are SOs spraying only the recommended surfaces?	Do SOs correctly record household details?	Is any SOs observed eating/drinking/smoking while at work?	Do SOs correctly follow the spraying techniques (standing 45cm from the wall, using vertical swaths, 5cm swath overlap, frequently shaking the can and constant observation of the pressure gauge)
Kouandé	Yes	Yes	Yes	Yes	No	Yes
Firou	Yes	Yes	Yes	Yes	No	Yes
Gnesmasson	Yes	Yes	Yes	Yes	No	Yes
Kérou	Yes	Yes	Yes	N/A	No	Yes
Dassari	Yes	Yes	Yes	Yes	No	Yes
Kaoubagou	Yes	Yes	Yes	Yes	No	Yes
Ouassa	Yes	Yes	Yes	Yes	No	Yes

*Since the operation site was closed in Tanguiéta (see page 10), as the operation site is located within the Pendjari Biosphere Reserve, AIRS Benin did not complete a mid-spray environmental inspection at the Tanguiéta Operation Site

Table 20: Summary of Mid-Spray Environmental Inspections- Observations of Spray Operators at Operation Sites After Completing Spraying (Where Applicable)*

Operation Site	At the end of the shift, are both full and empty sachets returned, counted and recorded in inventory?	Empty sachets and used masks are stored in separate designated and labeled containers in the store room?	Are 7 barrels placed and arranged on an impermeable ground or polythene sheet (for permeable grounds) along the wash bay?	Do barrels #2, 4, and 6 contain enough water for triple rinsing?	Do SOs correctly conduct triple rinsing while wearing PPE?	Are all IRS PPE and haversacks handed over to the store keeper at the end of the day's work?	Are washed pumps orderly arranged in the store?	Are SOs provided with soap to wash and bathe?	Do spray teams bathe after the day's work?	Is the insecticide usage rate and average no. of houses sprayed per SO within acceptable limits?(At least 2.5 – 3 and 10 houses/SO/day)
Touncountou na	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Natitingou	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Manta	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Operation Site	At the end of the shift, are both full and empty sachets returned, counted and recorded in inventory?	Empty sachets and used masks are stored in separate designated and labeled containers in the store room?	Are 7 barrels placed and arranged on an impermeable ground or polythene sheet (for permeable grounds) along the wash bay?	Do barrels #2, 4, and 6 contain enough water for triple rinsing?	Do SOs correctly conduct triple rinsing while wearing PPE?	Are all IRS PPE and haversacks handed over to the store keeper at the end of the day's work?	Are washed pumps orderly arranged in the store?	Are SOs provided with soap to wash and bathe?	Do spray teams bathe after the day's work?	Is the insecticide usage rate and average no. of houses sprayed per SO within acceptable limits?(At least 2.5 – 3 and 10 houses/SO/day)
Natta	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	N/A
Matéri	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	N/A
Cobly	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Perma	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Guilimaro	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Kouandé	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firou	Yes	Yes	Yes	Yes	Yes	N/A	Yes	Yes	Yes	Yes
Gnemasson	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Kérou	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Dassari	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Kaoubagou	Storeroom in Firou	Storeroom in Firou	Yes	Yes	Yes	Storeroom in Firou	Storeroom in Firou	Yes	Yes	Yes
Ouassa	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	N/A

*Since the operation site was closed in Tanguiéta (see page 10), as the operation site is located within the Pendjari Biosphere Reserve, AIRS Benin did not complete a mid-spray environmental inspection at the Tanguiéta Operation Site

Table 21: Summary of Post-Spray Environmental Inspections*

Operation Site	Have all of the IRS items, insecticides and wastes been taken back to the central store?	When adding the used insecticides and unused insecticides, does this equal the beginning inventory?	Was the store cleaned before being handed over to the owners?	Is the soak pit covered and the gate closed and locked?	Were the soak pit and its surroundings left clean?	Was the working relationship between the IRS team and owners of the store good?	Additional Comments
Touncountouna	Yes	Yes	Yes	Yes	Yes	Yes	
Natitingou	No, since this	Yes	Yes	Yes	Yes	Yes	

Operation Site	Have all of the IRS items, insecticides and wastes been taken back to the central store?	When adding the used insecticides and unused insecticides, does this equal the beginning inventory?	Was the store cleaned before being handed over to the owners?	Is the soak pit covered and the gate closed and locked?	Were the soak pit and its surroundings left clean?	Was the working relationship between the IRS team and owners of the store good?	Additional Comments
	operation site also serves as the central store						
Dassari	Yes	Yes	Yes	Yes	Yes	Yes	
Natta	Yes	Yes	Yes	Yes	Yes	Yes	
Matéri	Yes	Yes	Yes	Yes	Yes	Yes	
Cobly	Yes	Yes	Yes	Yes	Yes	Yes	
Perma	Yes	Yes	Yes	Yes	Yes	Yes	
Guilimaro	Yes	Yes	Yes	Yes	Yes	Yes	
Kouandé	Yes	Yes	Yes	Yes	Yes	Yes	
Firou	Yes	Yes	Yes	Yes	Yes	Yes	The municipal government staff allowed one of their staff members to move into the storeroom after the IRS campaign
Gnemasson	Yes	Yes	Yes	Yes	Yes	Yes	
Kérou	Yes	Yes	Yes	Yes	Yes	Yes	
Ouassa	Yes	Yes	Yes	Yes	Yes	Yes	Municipal government staff pushed for a quick turn-over of the storeroom, for other storing needs. Future MOUs should be developed to allow enough time for AIRS to thoroughly

Operation Site	Have all of the IRS items, insecticides and wastes been taken back to the central store?	When adding the used insecticides and unused insecticides, does this equal the beginning inventory?	Was the store cleaned before being handed over to the owners?	Is the soak pit covered and the gate closed and locked?	Were the soak pit and its surroundings left clean?	Was the working relationship between the IRS team and owners of the store good?	Additional Comments
							complete all close-out activities at each operation site.
Dassari	Yes	Yes	Yes	Yes	Yes	Yes	
Kaobagou	Yes	Yes	Yes	Yes	Yes	Yes	

*Since the operation site was closed in Tanguiéta (see page 10), as the operation site is located within the Pendjari Biosphere Reserve, AIRS Benin did not complete a post-spray environmental inspection at the Tanguiéta Operation Site

10.2. Post-Spray Conference Report

IRS Campaign Review Meeting and Workshop Grand Popo, Benin August 8 and 9, 2012

The workshop was organized by AIRS Benin (with support from PMI-Benin) to review the 2012 IRS campaign that was completed in all nine districts of the Atacora region. Workshop participants included the AIRS Benin staff, and participants from the NMCP, USAID and PMI-Benin, DDS-Atacora/Donga, CREC, DHAB, and seasonal IRS campaign spray staff including district coordinators and hygiene agents. Please see the list of participants at the end of this report for more information.

Overall, the main objective of the workshop was for the participants to discuss the successes and difficulties of the IRS campaign, and the recommendations for improving IRS implementation.

The opening of the workshop featured remarks from the AIRS Benin Chief of Party, who presented the objectives of the workshop, and recommended for the participants to complete SWOT analyses during break-out sessions, to help analyze the 2012 IRS campaign. The SWOT analysis idea was accepted by the workshop participants.

Opening remarks were also provided by the participants from PMI-Benin, DDS Atacora, and the Deputy Coordinator of the NMCP, who asked for everyone to participate as fully as possible.

All workshop participants also agreed to name a secretariat for the workshop, which was composed of:

- **Workshop President:** Dr Jacob NAMBONI (DDS /Atacora Donga)
- **Rapporteur:** Filémon TOKPONNON (NMCP/MOH)
- **Secrétaire:** Joel SODJINOUE (AIRS Benin Database Manager)

Following the opening of the workshop, various workshop participants completed presentations regarding different aspects of the 2012 IRS campaign. Brief summaries of these presentations are found in the table below:

Table 22: Summary of Post-Spray Conference Presentations

Presentation	Presenter	Key Presentation Points	Points Raised during Presentation Discussions
Pre-IRS Campaign Activities, Coupling Enumeration with Mobilization and Sensitization	Bertille ONAMBELE (AIRS Benin, Monitoring and Evaluation Manager)	<ul style="list-style-type: none"> Enumeration and mobilization/sensitization were coupled together in 2012, to save costs, as the both activities cover and visit the same communities. The activity focused on training the IEC Agents/Mobilizers to identify eligible structures, and thereby note eligible structures on their mobilization cards These cards were entered into the AIRS Benin database. Data collected from the activity included: <ul style="list-style-type: none"> Number of eligible structures identified: 239,081 Number of eligible structures sensitized: 233,922 Percentage of people accepting sensitization: over 95% Number of IRS campaign pamphlets distributed: 121, 180 	<ul style="list-style-type: none"> Training IEC Agents at three training sites throughout Atacora was useful, and prevented long travel for trainers and IEC Agents The number of eligible structures identified, exceeded expectations Additionally the identification of eligible structures earlier than usual, allowed for more time to plan the IRS campaign Good quality leaflets were distributed For future IRS campaigns it would be great to further involve district and municipal staff during the enumeration/sensitization activities In some areas, there was a lack of supervision, and lack of collaboration between IEC supervisors and the IEC agents. To improve this situation AIRS Benin should better define each role within the enumeration/sensitization activity.
IRS Campaign Environmental Compliance	Damien CODJO (AIRS Benin Environmental Compliance Officer)	<ul style="list-style-type: none"> Identifying flood zones with GIS mapping helped ensure IRS planning took into account which areas are flooded or hard to access when the rain start in Atacora Fences made of straw at most operation sites were in poor shape, and there is a need to devise a solution to end replacing fences each year 	<ul style="list-style-type: none"> Further discussion on methods to prevent malaria within structures found in Pendjari National Park Ideas for better utilizing the flood map for future IRS campaign planning Need to provide data on pregnancy

Presentation	Presenter	Key Presentation Points	Points Raised during Presentation Discussions
		<ul style="list-style-type: none"> The mid-spray environmental inspection showed strong results, and noted the high-level of environmental compliance at most operation sites, and adherence to environmental policies by spray teams Reviewed the process undertaken by AIRS Benin and PMI Benin to identify eligible structures in Pendjari National Park, and the solution devised by PMI-Benin to cover these structures since it was determined that they could not be sprayed Post IRS campaign environmental inspection showed good results, although there is a need to develop a MOU with district and municipal government staff concerning the use of store rooms after the IRS campaign. 	<p>tests as soon as they are completed to AIRS Benin staff and other IRS campaign supervisors, to assure pregnant women are not placed near insecticides</p> <ul style="list-style-type: none"> Need to better define which PPE items can be incinerated
Preliminary Results Regarding Insecticide Surveillance during the IRS Campaign	Evelyne ALYKO (AIRS Benin, Technical Manager)	<ul style="list-style-type: none"> Situation and use of insecticides during the 2012 IRS Campaign Preliminary vector resistance data gained from CREC Results of insecticide class resistance studies completed by CREC Initial discussions on insecticide class to use during the 2013 IRS campaign 	<ul style="list-style-type: none"> Choice of insecticide for 2013 IRS campaign Possibility of rotating insecticides Choice of Copargo as the control district for entomological surveillance The necessity of making a decision of which insecticide class to use for 2013, as soon as possible
Financial Management of the IRS Campaign	Josephine TOSSA (AIRS Benin, Finance and Administration Manager)	<ul style="list-style-type: none"> Mechanism for contracting IRS campaign seasonal staff Payment of seasonal staff in the field via Ecobank Fuel shortages and the need for back-up fuel during future IRS campaigns 	<ul style="list-style-type: none"> Would like to have seen a table summarizing IRS campaign costs NMCP wanted to see a table of the main expenses of the IRS campaign, to better understand which costs drive IRS programming Should review the seasonal staff payment process, and make sure this can work in 2013

Presentation	Presenter	Key Presentation Points	Points Raised during Presentation Discussions
			<ul style="list-style-type: none"> Brainstorm about plans to prevent or quickly react to any future fuel shortages Identify ways to assure better fuel efficiency and consumption by transport vehicles during the IRS campaign
Operations Management of the 2012 IRS Campaign	Eugene KITI (AIRS Benin Operations Manager)	<ul style="list-style-type: none"> Overview of IRS campaign planning process, and the importance of participatory planning from NMCP, DDS, and other Atacora officials Implementation of the “communale brigade,” or developing a spray operator representative group to voice spray operator concerns about the IRS campaign Problems with operation sites, particularly theft of fencing, gates, and other items around operation sites Possibility of decentralizing operations management in future IRS campaigns, will help reduce costs and further involve provincial and district staff Ability to use local expertise during IRS campaign trainings was very useful Need to further clarify roles within the IRS campaign seasonal staff Need to ensure better maintenance of operation sites between IRS campaigns Important to start developing a sustainability plan for IRS in Atacora 	<ul style="list-style-type: none"> Need to further define the role of the mayors and municipal staff during the IRS campaigns Need to further develop capacity at the district and municipal levels, to ensure better supervision and possible management of IRS activities Need to complete more dialogues with local officials to protect operation sites between IRS campaigns Should work to improve recruitment and the quality of seasonal staff hired Need to determine better method to communicate between IRS campaign management and IRS staff in remote rural areas
IRS Campaign Logistics	Ricardo MISSIHOUN (AIRS Benin, Logistics and Procurement Coordinator)	<ul style="list-style-type: none"> Overview of IRS campaign supply chain system Availability of stock and inventory data at each operation site Fuel shortages made transportation difficult Operation site store rooms needed a lot of refurbishment before the IRS campaign 	<ul style="list-style-type: none"> Streamlining and improving management of PPE procurement Process for recycling and re-using PPE from 2012 IRS campaign

Presentation	Presenter	Key Presentation Points	Points Raised during Presentation Discussions
		<ul style="list-style-type: none"> • Need to improve PPE forecasting, taking into account all parameters (such as availability of items locally, and shipping dates) • Need to Improve communication between central and secondary warehouses, to ensure appropriate levels of PPE and insecticide • Develop more defined MOU for contracting secondary warehouses from DDS • Possibility of contracting with a petrol company to improve access to fuel during IRS campaign 	
Supervision of IRS Campaign Staff	Eugene KITI	<ul style="list-style-type: none"> • Organization of IRS campaign supervision • Review of responsibilities of supervisors at all levels • Noted that collaboration/supervision completed by district coordinators and hygiene agents varied considerably from very strong to non-existent • There is a need to assure supervisors are closer to spray implementation • Methods to improve the performance of supervisors during the IRS campaign, and quality of supervision 	<ul style="list-style-type: none"> • Possibility of decentralizing supervision during future IRS campaigns, to ensure supervisors are closer to spray operations • Need to review process of hiring supervisors, especially hygiene agents • Should work with village chiefs to make sure supervisors are respected in communities • AIRS Benin should stress the successes of the IRS campaign during the workshop • Hygiene agents as civil servants, felt uncomfortable being supervised by District Coordinators (who are seasonal staff for the IRS campaign)

During the second day of the workshop, participants were divided into three groups. During a break-out session, each group met and completed a SWOT analysis, and provided recommendations regarding the following issues:

- IEC and sensitization
- Data collection
- Supervision of IRS campaign/Planning for 2013 IRS campaign/Sustainability plan for IRS

Groups presented on their break-out session discussions and offered the following suggestions and recommendations for improving IRS programming in Benin.

IEC

- Complete more IEC activities at the community-level to reinforce IEC messaging
- Translate more IEC materials and messaging into local languages
- Complete more IEC activities during the IRS campaign
- Improve supervision and tracking of IEC messaging
- Train teachers, religious leaders, and agricultural extension agents in IEC messaging
- Recruit a consultant to help manage IEC during the enumeration/mobilization activities
- Complete more radio programming the week before the IRS campaign, and two weeks after the IRS campaign, to reinforce messaging
- Further involve the DDS in IEC programming for future IRS campaigns, and ensure all DDS staff are trained in IEC messaging
- Send a message of thanks to the provincial, district, and municipal staffs, religious and community leaders after the IRS campaign

Data Collection

- Should complete a performance evaluation for all IEC Agents and their ability to collect data during the enumeration process, and of the spray operators and their ability to collect data during the IRS campaign
- Develop a standardized recruitment process for hiring IEC Agents, to ensure they can adequately identify eligible structures and record data
- Further involve local officials in data collection supervision and quality control
- Should develop channels for the public to provide complaints, recommendations, and various observations about the IRS campaign
- Need to include village chiefs in efforts to assure data quality, specifically to assure that all of the structures reported to be sprayed in their communities, were actually sprayed

Sustainability Plan of IRS

- A draft sustainability plan should be developed, and its finalization should be completed by the NMCP and DDS

IRS Campaign Supervision

- All levels of supervision within the IRS campaign should validate all supervision plans and methods before the start of the IRS campaign
- NMCP staff should be spread out between all spray areas, to assure their supervision of all IRS campaign activities

Planning for future IRS Campaigns

- This topic was not covered extensively during the break-out session. However, the group pushed for establishing a start-date for the IRS campaign as soon as possible.

The workshop concluded with the NMCP's deputy coordinator stating all objectives for the workshop were met, and the recommendations and discussions of the workshop will help improve future IRS programming.

Table23: List of Post-Spray Conference Participants

Participant	Organization
Beno AHANDESSI	AIRS Benin
Rock AIKPON	CREC
Evelyne AKAKPO	NMCP/MOH
Evelyne ALYKO	AIRS Benin
Emile BONGO	USAID/PMI
Aymard DENKAPO	AIRS Benin
Yves Eric DENON	NMCP/MOH
Pierre GANDONOU	NMCP/MOH
Alphonse B. GNAYATI	Cobly District Coordinator
Eugene KITI	AIRS Benin
Damien KODJO	AIRS Benin
Marcel KOUNNOU	SESP
Ricardo MISSIHOUN	AIRS Benin
Jacob NAMBONI	DDS
N'Koue NEKOUA M'PO	SPPS
Bertille ONAMBELE	AIRS Benin
Noe RAKOTONDRAJONA	AIRS Benin
Joel SODJINO	AIRS Benin
Mama SOUROKOU	District Coordinator Péhunco
Odette TCHEREKOU	SHAB
Filémon TOKPONNON	NMCP/MOH
Josephine TOSSA	AIRS Benin
Alliance TOSSOU	AIRS Benin
Mahamoud ZONGO Mahamoud	NMCP