



INDOOR RESIDUAL SPRAYING FOR MALARIA CONTROL

Mali Spraying Performance Report

Indoor Residual Spraying (IRS 2) Task Order One

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Abbreviations

ASACO	<i>Association de Santé Communautaire/Community Health Association</i>
BCC	behavior change communication
CA-USA	Crown Agents USA, Inc.
CCM	Country Coordinating Mechanism
CCN	Cooperating Country National
CDC	U.S. Centers for Disease Control and Prevention
CFM	Contract Finance Manager
CFR	Code of Federal Regulations
CLD	Local Development Committee
COP	Chief of Party
CNIECS	MOH National Center for Information, Education, and Communication (<i>Centre National d'Information d'Education et de Communication pour la Santé</i>)
COTR	Contracting Officer's Technical Representative
CPM	Chiefs of Medical Posts
CS	Capsule Suspension
CSCOM	<i>Centre de Santé Communautaire/Community Health Center (Mali)</i>
CSREF	<i>Centre de Santé de Référence/Referral Health Center (Mali)</i>
DCMO	District Chief Medical Officer
DDS	<i>Direction Régionale de la Santé</i>
DDT	Dichloro-Diphenyl-Trichloroethane
DHPS	<i>Division d'Hygiène et Salubrité Publique (Division of Public Hygiene and Safety)</i>
DHO	District Health Office
DHT	District Health Team
DRACPN	<i>Direction Régionale de l'Assainissement et du Contrôle des Pollution et des Nuisances/Regional Sanitation and Environmental Pollution Control Department</i>
EPA	Environmental Protection Agency (U.S.)
EU	European Union
FAO	Food and Agriculture Organization of the United Nations
FM	Finance Manager
FY	Fiscal Year
GF	Global Fund
GFATM	Global Fund to Fight AIDS, Tuberculosis, and Malaria
GPS	Global Positioning System
GR	Geographical Reconnaissance
HCC	Health Communication Center
IEC	Information, Education and Communication
IPTp	Intermittent Preventive Treatment for Pregnant Women
IQC	Indefinite Quantity Contract
IRS-2	Indoor Residual Spraying
ITN	Insecticide-treated Net
IVM	Integrated Vector Management
km	Kilometer

km ²	Square Kilometers
L	Liter
LLIN	long-lasting insecticide-treated net
M	meter
M&E	monitoring and evaluation
MEO	USAID Mission Environmental Officer
MEWS	Malaria Early Warning System
ml	milliliter
MOE	Ministry of Environment
MOH	Ministry of Health
MOP	Malaria Operational Plan
MOU	Memorandum of Understanding
MRL	Minimal Residual Level
MRTC	Malaria Research Training Center
MSF	<i>Médecins Sans Frontières</i>
NGO	nongovernmental organization
NMCP	National Malaria Control Program
PASP	<i>Programme Africain relatif aux Stocks de Pesticides obsoletes</i> /African Program on Pesticide Stocks
PDA	Personal Digital Assistant
PERSUAP	Pesticide Evaluation Report and Safer Use Action Plan
PID	<i>Pulverisation Intra-Domiciliaire</i>
PMI	United States President's Malaria Initiative
PPE	personal protective equipment
PSI	Population Services International
psi	pounds per square inch
PVC	Polyvinyl Chloride
QC	Quality Control
RBM	Roll Back Malaria
SDSES	<i>Service de Développement Social et de l'Economie Solidaire</i>
SEA	supplemental environmental assessment
SIS	Sachets in Stock
SOP	standard operating procedures
STTA	short-term technical assistance
TDY	Temporary Duty
TO	Task Order
TOT	training of trainers
TPM	technical program manager
USA	United States of America
UNICEF	United Nations Children's Fund
USAID	United States Agency for International Development
WG	wettable granules
WHO	World Health Organization
WHOPES	WHO Pesticide Evaluation Scheme
WP	wettable powder

1. Executive Summary

In July 2005, the United States Government announced a five-year \$1.2 billion malaria initiative to rapidly scale-up malaria prevention and treatment interventions in 15 high-burden countries in sub-Saharan Africa. The United States President's Malaria Initiative (PMI) began with \$30 million in bilateral funding in Fiscal Year (FY) 2006, increased to \$135 million in FY 2007 and \$300 million in FY 2008 and FY 2009, and is intended to reach \$500 million in FY 2010.

The goal of PMI is to achieve 85% coverage of artemisinin-based combination therapies (ACTs), possession and use of insecticide-treated nets (ITNs), intermittent preventive treatment for pregnant women (IPTp), and indoor residual spraying (IRS), to reduce malaria-related mortality by 50%. Now in its fourth year of funding, PMI is fully implementing activities in 15 countries.

PMI, in partnership with National Malaria Control Programs (NMCP) and in support of country-level strategic plans, is providing technical, managerial, and commodity support for IRS campaigns in all 15 PMI countries. In the second year of PMI (2007), more than 17.5 million people were protected by IRS.

PMI is committed to continuing its support of NMCPs in achieving high coverage levels of IRS, to ensure that malaria transmission levels are “knocked down and kept down,” while simultaneously expanding their capacity to plan, execute, and monitor IRS programs.

In September 2009, RTI International was awarded the indoor residual spraying (IRS) Task Order 1 for the continued implementation of IRS through sub-Saharan Africa from 2006 to 2011. The purpose of this task order is to support United States President's Malaria Initiative (PMI)—as well as United States Agency for International Development (USAID) Missions and Bureaus with malaria programs outside PMI countries—in planning and implementing IRS programs. The overall goal is to reduce the burden of malaria by at least 50% in PMI target sites in Africa. This Task Order will enhance USAID's ability to implement IRS programs on the ground through cost-effective commodities procurement and logistics systems, and through increasing access to technical expertise, in countries affected by malaria.

Under the above contract with USAID, RTI is the prime contractor for the implementation of IRS 2 Task Order 1. RTI is working with its subcontractors and partners, including Crown Agents USA (CA-USA) for procurement and logistics services; Meridian Group International (Meridian Group) for information, education and communication materials; and the Medical Research Council of South Africa (MRC) for technical support, capacity building, entomological assessment, and surveillance. In addition, RTI is working with local technical institutions, or Centers of Excellence, with a view to enhancing their capacities to become the local go-to organizations for technical and quality control references. Mali's Malaria Research Training Center (MRTC) has been identified as one such center of excellence.

This IRS 2 Spraying Performance Report covers the period January 1, 2010–July 31, 2010, in Mali. The IRS campaign was conducted May 16 through June 30, 2010, and covered Bla and Koulikoro districts. While this IRS 2 Spraying Performance Report covers FY 2010, we have planned commodities to take into account the third district that will be covered in addition to the other two districts in FY 2011.

The pyrethroid class was the insecticide selected for the 2010 IRS operations. Deltamethrin was specifically selected through an open competitive procurement.¹

The table below shows some results for the 2010 Mali IRS campaign.

Indicators	Total
Structures found	13,0842
Structures treated	12,7273
Number of persons in the structures found	450,442
Number of persons in the structures treated	440,815
Number of children under 5 years in the structures found	94,308
Number of children under 5 years in the structures treated	92,361
Number of pregnant women in the structures found	13,163
Number of pregnant women in the structures treated	12,876
Number of persons trained	1,461
Sachets used	44,685

The following are a few challenges and lessons learned during this spray round:

- The establishment of a new monitoring and evaluation (M&E) system: a good M&E system helps to anticipate, correct, and ensure the collection of very high quality data.
- The support received from DSES officials supervising and monitoring the information, education, and communication (IEC) mobilizers has played a key role in the success of the 2010 IRS campaign.
- A good and systematic counting of the structures and a good coding of the concessions (unique identifier) and the Actors are important to ensure efficient monitoring of a successful campaign.

¹ The NMCP has decided to keep using pyrethroids for the time being; deltamethrin was selected after open competition.

2. Country Background

In Mali, malaria accounts for an estimated 13% of mortality in children under five years of age, 463 of maternal mortality for 1,000 live births.² As a result, Mali became one of 15 countries to receive support from the United States President's Malaria Initiative (PMI) in 2008. Geographic coverage for the total population who have access to public health service is estimated at 50% within 3.11-mile (5-km) and 75% within 9.32-mile (15-km) radius from health facilities.

Before the introduction of PMI in Mali, no systematic IRS program was operational, and the country did not have experience conducting large-scale IRS programs.

The overall objective of the IRS Project in Mali is to help the Ministry of Health (MOH) and the National Malaria Control Program (Programme National de Lutte contre le Paludisme [PNLP]) provide IRS and other malaria control interventions to 85% of the targeted population, thereby achieving a 50% reduction in malaria-related mortality by the end of the pilot program in 2010. RTI works under the direction of and in full collaboration with the NMCP to implement IRS campaigns as an integral part of the government's malaria control program.

The projects main activities are to

- Provide the support, management, and the operations to implement the objectives of the MOH (through the PNL) to reduce mortality due to the malaria in the targeted zones
- Strengthen the capacity on all the levels to promote greater sustainability of the national IRS program
- Encourage the appropriation and the cash-in-hand of the program by the country, including community participation.

During this 2010 IRS campaign, the IRS team worked alongside the MOH/PNL and other partners (e.g., Ministry of Environment, MRT) to build their capacity to plan, conduct, monitor, and assess IRS at all levels. This capacity building included training, ground operations, IEC, supervision, monitoring, and data collection.

Specifically, RTI worked with the PNL and the following partners:

- Public Hygiene and Health Division (Division d'Hygiène Publique et Salubrité), was involved in supervision at the national level.
- MOH's National Center for Information, Education, and Communication (Centre National d'Information d'Education et de Communication pour la Santé [CNIECS]) on IEC to inform beneficiaries, raise public awareness, and promote behavior change, including environmental management and sanitation
- Ministry of Environment (MOE) in Bamako and its counterparts in the two targeted districts (cercles) of Koulikoro and Bla and the African Program on Pesticide Stocks (Programme Africain relatif Aux Stocks de Pesticides Obsolètes [PASP]) were involved in pesticide supervision at the national level.

² PMI Fact Sheet, April 2009

- Regional Health Services (*Direction Régionale de la Santé [DRS]*), was involved in supervision at the regional level.
- Referral Health Centers (*Centre de Santé de Référence*) was involved in supervision at the regional level.
- Social Development and Cooperatives Service (*Service de Développement Social et de l'Économie Solidaire [SDSES]*), was involved in supervision at the district level.
- Community Health Centers (*Centre de Santé Communautaire [CSCOM]*) and Community Health Associations (*Association de Santé Communautaire [ASACO]*), was involved in supervision at the local or community levels.

2.1 Malaria Transmission and Burden

Malaria is one of the primary causes of morbidity and mortality in Mali. In fact, it represented the first cause of morbidity and mortality in the national health information system (Système Local d'Information Sanitaire [SLIS]), in 2004 (45%), followed by acute respiratory infections (27.4%) and diarrhea (8%).

The most common pathogens are (Dumbo et al., 1991, 1992):

- *Plasmodium falciparum*, contributing 85–90% of the parasite formula, and accounts for the lethal, serious, and complicated forms of malaria in Mali
- *Plasmodium malariae*, contributing 10–14% of the parasite formula
- *Plasmodium ovale*, contributing 1% of the parasite formula.

The main vectors of malaria in Mali are (Touré et al, 1986, 1998):

- Complex *Anopheles gambiae sl* with its chromosomic forms (*Anopheles gambiae ss* chromosomic form Mopti, Bamako, Savana) and *Anopheles arabiensis*
- *Anopheles funestus*

Background of Malaria Control

From 1960 to 1980, malaria control was mainly based on mosquito eradication through intra- and extra-home spraying and medical treatment of malaria cases. These well-organized campaigns, conducted by the vertical services with financial support from international partners, did not reduce incidence or prevalence of malaria in Mali.

2.2 National Malaria Strategy

The malaria control strategies applied by the PNLP are based on the National Malaria Control Policy Paper, revised in March 2005 and mainly influenced by global malaria control strategies, namely:

2.2.1 Major Strategies

- Management of malaria cases
- Prevention of malaria during pregnancy

- Vector control. National guidelines for the control of malaria vectors are aimed at developing the integrated vector control (IVC), using the following simultaneous actions:
 - Promotion of insecticide-treated nets, especially in pregnant women and children targeted for vaccination
 - Targeted treatment of larva breeding grounds
 - Intra- and extra-home spraying in the targeted areas
 - Promotion of hygiene and sanitation
- Prediction, forecasting, prevention, and management of malaria epidemics

2.2.2 Support Strategies

- Communication and social mobilization
 - Advocacy among political leaders and partners
 - Social mobilization of all actors involved in the MCP
 - Behavior change communication (BCC) at different levels
- Operational research
- M&E

2.3 District Selection

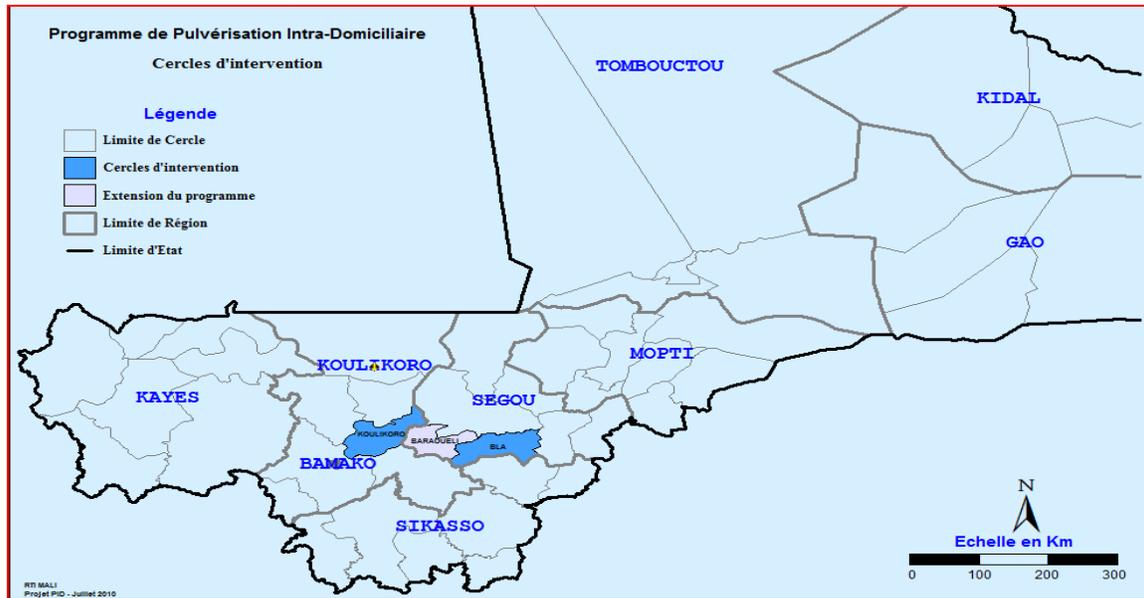
The two pilot districts (Figure 1) selected in 2007 for the pilot phase of IRS are Bla (with 259,000 inhabitants) and Koulikoro (172,000 inhabitants), making a total population of about 431,000 inhabitants.

Criteria for district selection included high seasonal malaria transmission (assumed from high infant mortality in DHS), seasons of less than 6 months, relatively high population density, and poor coverage with other interventions. Selection of the district was done in consultation with the MOH and scientists from MRTC and CDC. Baseline entomology assessment was conducted during the 2007 rainy season.

The third district of Baraouéli (Figure 2) was identified by PNL in collaboration with MRTC during the preparation of the proposal to be submitted to the ninth round of the Global Fund. This identification was based on:

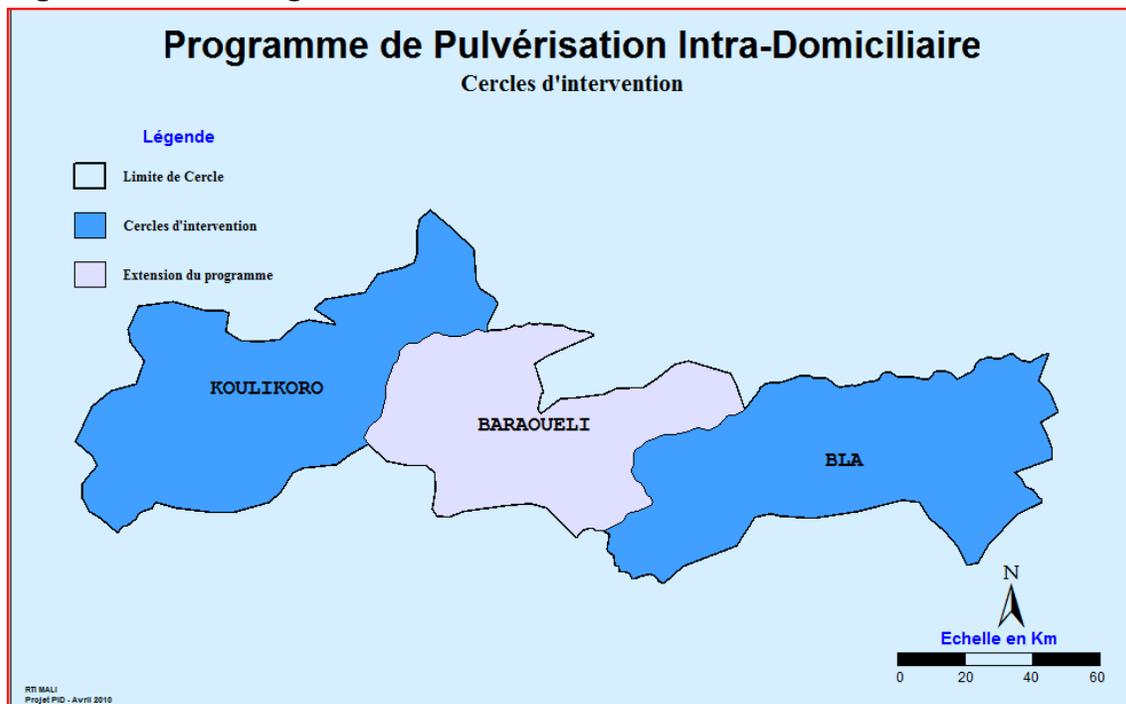
- Levels of malaria transmission
- Longevity of malaria transmission season to include medium to longest seasons.
- Annual increase of IRS operational districts was planned to expand *concentrically* around the two districts currently under IRS (Bla and Koulikoro). This means that we must not have any remaining “pockets” not covered by IRS during the expansion.

Figure 1. IRS-targeted Districts



IRS districts of Bla and Koulikoro for 2007–2010 spray campaigns.

Figure 2: IRS-targeted Districts for 2011



IRS Bla and Koulikoro (shaded in blue). Baraouéli will be covered in 2011.

3. Preparation for the IRS

The preparation of the 2010 Spraying campaign benefitted a lot from the lessons learnt during the 2008 and 2009 campaigns. This enabled us to anticipate and plan the preparatory activities and execute them earlier:

- Geographical reconnaissance: January 2010
- Analysis of logistical needs: March 2010
- Evaluation of the pre-campaign environmental compliance: April 2010
- Identification and recruitment of staff: April 15, 2010
- Training of trainers: April 3–8, 2010
- Start of the Campaign: May 16, 2010

3.1 Geographic Reconnaissance

During the 2008 and 2009 PID campaigns, we used as denominators of the estimation of figures from the demographic and health survey of Mali. This sometimes led us to achievements exceeding hundred percent. This explains why for the 2010 campaign, we started geographic reconnaissance by organizing systematic census of all structures existing in all the villages of our intervention zone. This geographic reconnaissance was conducted in the month of January 2010.

It was the census Agents who were charged with administering the census forms to the different Concession Chiefs. At the end of the census, each concession was given an identification number. The Agents were recruited from the community workers by the Heads of medical posts in collaboration with officials of Community Health Associations of each health area.

Given their leadership role in the Community Health system, the Heads of Medical Posts (CPM) coordinated the operations of identifying the structures of each health area. They were responsible for collecting, each in his/her Health Area, the census forms and transmitting them to the Chief Medical Officer who in turn sent them to the RTI office for processing.

At the end of this process, we prepared the first list of concessions by health area which we sent to each CPM. We requested them to verify whether all the concessions had been registered. We repeated this exercise three times so as to be as exhaustive as possible. Despite all these precautions when spraying began, we quickly realized that all the compounds had not been identified. We even brushed the breakdown of the insecticide because the planned amount corresponded to the number identified only fair.

But we can ensure that this identification enabled us to obtain a more accurate denominator which made it possible for us to make appropriate assessment of the coverage of the PID campaign in each intervention circle.

The other advantages of the identification of structures are described in this report in the chapter on Monitoring and Evaluation.

The identification enabled us to obtain the following results:

- Number of structures: 128,614
- Number of pregnant women: 12,876
- Number of children under 5 years: 92,361

- Population: 440,815

3.2 Environmental Assessment

In May 2008, a Supplemental Environmental Assessment (SEA) was approved by USAID and in July an Environmental Impact Assessment (EIA) was approved by MOE. Since, for the 2010 campaign we were operating in the same two districts, using the same class of Insecticide, we did not have to conduct another environmental assessment.

For 2011, we plan to move to the third district, and then we will need an SEA which will cover that new district (Barouéli). But since there is a possibility of extension in future, the SEA will cover the two regions, instead of limiting itself to the only district concerned.

Prior to the implementation of the actual indoor spraying operations, certain prerequisites/environmental criteria in force, and required by WHO, must be met. The main objective here is to ensure correct indoor spraying with less environmental risk using Deltamethrin, a residual insecticide.

The prerequisites include the following (the list is not exhaustive):

- Conduct an inspection of the environmental conformity before the campaign and ensure that two other inspections (one pre- and other post-campaign are planned)
- Ensure that an environmental monitoring plan is available during the PID
- Ensure that all arrangements for environmental professional safety of all the actors involved in the PID are taken
- Ensure that the environmental and social impacts during and after the PID campaign are minimized.

It should therefore be noted that the use of insecticide during the PID generates waste, which must be managed in such a manner that they do not cause harm to the environment. The Bamako Convention, on toxic wastes and their movement, ratified by Mali in 1991, stipulates that generators of toxic waste must assume full legal responsibility for the future of their wastes.

In March 2010, an environmental compliance pre-campaign inspection mission was organized as part of the preparation of the 2010 PID campaign. This mission team comprised representatives from RTI, PNL, and the DNACPN.

The objective of this first mission was to

- Ensure the environmental compliance of the central warehouses.
- Ensure the availability of storage infrastructure at the health areas (secondary warehouses).
- Adopt measures relating to the environmental conformity of these secondary warehouses.
- Adopt measures relating to the environmental conformity of the washing areas (Management of liquid wastes).

- Look for appropriate incinerators for the management of solid wastes.

The implementation of the recommendations (Figures 3–5) of the pre-campaign environmental compliance made it possible to

- Correct certain irregularities at the Koulikoro central warehouse
- Rehabilitate all the washing areas.

Figure 3: Tombougou secondary store in construction



Figure 4: Wash area of Koutienso



Figure 5: Wash area of Touna



3.3 Logistics Needs Assessment

A logistics assessment and inventory was conducted after the 2009 IRS campaign, based on the total population to be protected (approximately 483,208 people), and the quantity of PPE and insecticide that remained at the end of the 2009 spray operations.

Poor road infrastructure makes it difficult to access some of the villages in the two districts, hindering efficient data collection and monitoring. Thus, the RTI team has used the same transport methods for spray operators, team leaders, and supervisors for quick and efficient data collection and close supervision by the monitors.

Additionally, use of motorcycles enabled pump service engineers to reach remote villages in a more timely fashion to repair failed pumps and thus improve the efficiency of spraying. With the use of motorcycles, it was possible to assign two pump technicians per district.

Table 1. Spray Operations Material Input

Nos.	Items	Total # of Units
1	Pumps	274
2	Insecticides	39,447 sachets
3	Pregnancy test	257
4	Helmet	276
5	Gloves	3,030
6	PVC Gum Boots	303 (120 in size 9 & 183 in size 11)
7	Support Visor	286
8	Visors	820
9	Respirator mask	29,990
10	Overall	595 (357 in size 42 & 238 in size 50)

Nos.	Items	Total # of Units
13	First aid kit	67
15	Filters	684
16	Nozzles("buses")	842

The IRS team arranged for the procurement, shipping, delivery, storage and security of all commodities via CA-USA through competitive procurement and the safe transport and delivery of IRS commodities. All pesticides and related supplies were stored in warehouses located close to the spray sites. A schedule was developed for dispatching supplies by truck, according to the proximity of the warehouses to spraying sites. Warehouse staff maintained entry and exit records. Other facilities also kept entry records verified by the IRS logistics officer or the district logistician.

3.4 Human Resource Requirements

During this spray round, the IRS project worked with permanent and contract temporary staff at the national, district and community levels.

- At the national level, full-time RTI staff:
 - Chief of Party (COP)
 - Finance & Administration Manager
 - Technical Coordinator
 - Logistics Officer
 - Office Manager.
- At the national level, Consultants (hired on a temporary basis)
 - Environmentalist Specialist.
 - Monitoring & Evaluation Specialist.
- Seasonal district level staff (hired on temporary basis):
 - 2 District Coordinators,
 - 2 District Logisticians,
 - 6 Data Clerks,
 - 6 Monitors,
 - 4 Services Engineers.
- Seasonal Community level staff (hired on temporary basis):
 - 352 Operators
 - 70 Team Leaders
 - 42 Supervisors,
 - 772 Mobilizers,
 - 48 Washers,

- 42 Storekeepers,
- 36 Security Guards,
- Supervision teams:
 - Supervision from the National level: MOH, MOE.
 - Supervision from the Regional level,
 - Supervision from the District level.
- One hygiene agent each from Koulikoro and Bla, two chief medical officers, 42 chief nurses, two hygiene agents from DRS, and two representatives from local MOE were involved too in the 2010 IRS operations.

Tables 2 and 3 summarize temporary district staff and temporary spray operation and auxiliary staff employed during this spray round.

Table 2. Temporary Operational Field Staff

Title	Total Staff
Operations Managers	0
District Coordinators	2
Logistics Assistants	2
Central Warehouse keeper	2
Pumps technicians	4
Monitors	6
Data Clerks	6
Drivers	6
Finance Assistants	0
M&E Assistants	0
Other (insert here)	0
Total	28

Table 3. Temporary Spray Operational and Auxiliary Staff

Title	Total Staff
Spray Staff	352
Team Leaders	70
Supervisors	42
Storekeepers	42

Title	Total Staff
Washers	48
Mobilizers	772
Security Guards	36
Drivers	44
Total	1406

3.5 Training

Instead of conducting recruitment, IRS used the health system already in place in Mali. The MOH already has in place a system of health workers working with partner organizations and trained in health programs. This system of workers includes the Service d'Hygiene (Hygiene Service) staff from Health Centers and District Health Offices, medical doctors, nurses, and community workers. As in the 2008 and 2009 IRS campaigns, IRS, in close collaboration with the district officials, set up and oriented a District Operation Management Team composed of a coordinator, a logistician, a central warehouse keeper, the pump technicians and data clerks.

Before the start of the spray campaign in May, training for all personnel involved in IRS was conducted in close collaboration with PNL. The training of seasonal staff took advantage of certain aspects developed and lessons learned during the 2008 and 2009 previous campaigns:

- The Training manual: Prior to training of spray operators, returning participants were given refresher training, while new spray operators received the complete training course.
- Prior Training of Trainers: most of the trainers required only basic refresher training.
- Spray operators were recruited within the targeted districts by district authorities, heads of community medical centers, mayors, and village leaders based on agreed criteria.

Considering the importance of supervision in IRS, teams on the ground would be kept as small as possible. Spray operators were organized into teams of 5 spray operators and one team leader to ensure strict supervision during the implementation phase. One supervisor managed and monitored a total of 4 spray teams. This means that each supervisor was in charge of a team of 24 people (in the new district, the ratio was reduced for one team leader per 2–4 teams, and a supervisor was in charge of 25 people).

IRS district teams, in close partnership with the MOH and other agencies, provided oversight to achieve RTI's goal of providing day-to-day operational management and support for IRS implementation, including all aspects of monitoring and quality assurance.

The aim of IRS training is to build the capacity of the host government at the national and district levels to implement a well-organized IRS program. IRS engaged the PNLP and district authorities through planning, capacity building (such as training of trainers), and supervision to encourage ownership of the program and oversight of spray operations in the targeted districts. Capacity building was directed not just at training capacities, but also concerned “learning by doing” during implementation of the spray round. The fact of planning together, conducting different training sessions together, supervising together -- at all MOH levels, has already resulted in relative success in skills transfer. Nevertheless, during the FY10 spray round, we focused on the monitoring and evaluation skills of staff of the district health information system. We are confident that we have moved as promised towards realizing our sustainability plan.

3.5.1 Training of Trainers (TOT)

TOT sessions (5 days) were conducted by the PNLP along with the MOE, MRTC, DNHP, and the IRS Mali team, under the leadership of an IRS training specialist. The TOT participants were tested and the best were certified to participate as trainers in the forthcoming training of spray operators.

3.5.2 Spray Operator Training

The chief physician at the CSREF recruits the spray operators. The IRS team works with the CSCOMs, CSREFs/SDESES, and ASACOs to (re)train spray operators, who are natives of the villages, and who must be able to read and write. The number of operators and teams vary, based on the number of villages, population to be protected, and structures to be sprayed within the time frame of the operation. Training of operators was organized at a CDMHC level for eight (8) days.

The RTI team did not participate in or influence the process of selecting potential personnel to be deployed in each IRS round. This task was handled by the relevant local authorities, using the agreed-upon eligibility criteria jointly developed by IRS and MOH/PNLP for selection of spray operators. All spray operators and IEC mobilizers were recruited from within the targeted districts.

Before going through spray operator training, a qualified government medical officer conducted physical examinations to eliminate those candidates with obvious medical conditions that would preclude them from participating in IRS. Prior to spray operator training, no task is assigned to anyone until he/she has completed the basic IRS spray operator training (refer to the IRS manual). From the post-IRS training test and on the basis of performance during training, trainees, including the following, are assigned to tasks on the ground:

- Spray operators
- Supervisors
- Team Leaders
- Washers
- Storekeepers

- IEC mobilizers

3.5.3 Other Training

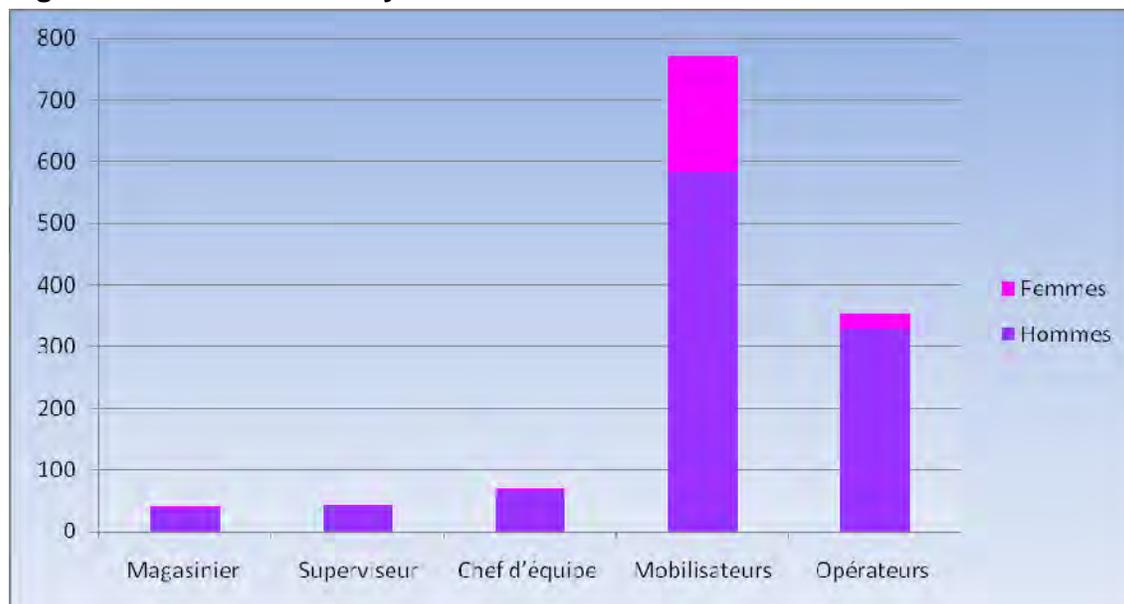
Personnel then received additional specialized training upon successful completion of IRS training.

The women within each of the above categories subjected to a pregnancy test carried out by a qualified public medical practitioner, and women who tested positive were reassigned as IEC mobilizers or data clerks.

Table 4. IRS Training

Type of Training	No. of Males	No. of Females	Total
Spray operators	330	22	352
Supervisors	41	1	42
Team Leaders	67	3	70
IEC Mobilizers	584	188	772
Washers	0	48	48
Pump Technicians	4	0	4
Drivers	52	0	52
Security Guards	36	0	36
Health Workers (CPM)	32	10	42
Trainers of Trainers	39	4	43
Total	1,185	276	1,461

Figure 6: Distribution by sex of trained seasonal staff



4. IEC Activities and Community Mobilization

The IRS IEC campaign focuses on providing two elements to the IRS campaign. The first is to work with the government and other counterparts and stakeholders from national to local and community leadership to advocate for IRS with all decision-makers and opinion leaders. The second is a focus on community mobilization in support of IRS. The purpose of this mobilization is to provide immediate information about malaria prevention and IRS to its primary audiences and to strive to create long-term sustainability through its secondary and tertiary audiences.

4.1 IEC Training

A critical component of any IRS program is IEC, which informs the population about the benefits and necessary precautions associated with this malaria control intervention. In Mali, and more specifically in Koulikoro and Bla, IRS has utilized a system of *community workers*. Both regional and circle health officers have requested that RTI train and engage the services of the *community workers*. With the involvement of the SDSSES, IRS has proposed to provide a system of “training in cascade” that has allowed all *community workers* to be involved. The SDSSES, which is in charge of the management of community health mobilization at the cercle level, is an ideal partner to ensure the sustainability of this activity.

The CPM (IEC supervisors) and mobilizers established initial contact with and briefed village chiefs, religious leaders and other organizations and associations (especially Women’s Associations), including NGOs operating in the area. In addition, they organized village gatherings and conducted door-to-door visits. They used these encounters to explain to the population the purpose, benefits, and precautions required for the conduct of the intervention, answered questions and

distributed simple pamphlets to households. One day before the launch of spraying, homeowners were notified by mobilizers that the spray team would be spraying their home the following day.

IEC training of Mali's public health staff, team leaders and supervisors took place at the CSREF/SDSES where representatives from the latter and from every CSCOM have been trained. In turn, these individuals trained mobilizers at the CSCOM level (from the villages within the CSCOM) and monitored their work in the villages. The CSREF/SDSES-level training and CSCOM-level training were conducted in two days.

4.1.1 Training of Trainers of IEC Mobilizers

The IEC TOT training was held in Koulikoro and Bla for five (5) days each. Representatives from each of the 17 CSCOMs in Koulikoro and 25 CSCOMs in Bla were trained, and in turn trained the IEC mobilizers (community workers).

In the FY09 spray round, approximately 1,948 IEC mobilizers were used during spray operations. There were a number of complaints by the community that the IEC mobilizers were overworked and unpaid during IRS operations. IRS worked with the current health system, in which community workers are not compensated.

During the 2010 campaign, we reduced considerably the number of community workers, from 1948 in 2009 to 772. We then calculated an average number of days worked and paid them a little compensation.

4.1.2 Training of IEC Mobilizers

Training of IEC mobilizers followed that of training of spray operators. IEC mobilizers were selected from the group that underwent all medical tests and successfully completed the spray operator training. The IEC team members comprised mostly those who had the higher aptitude in the mobilization questions that were included in the pre- and post-spray operator training course.

The training of IEC mobilizers was conducted in close collaboration with the PNL. The IRS team worked with all local partners and village leaders to identify IEC mobilizers and leverage existing community communication channels. In addition, the IRS team received technical support from the IEC specialist and mobilized her services as needed.

A five-day TOT seminar was conducted by the IRS team in conjunction with personnel from the Communication Department in the government system. The training of mobilizers was supervised by the SDSES and the IEC coordinator from the government.

4.2 IEC Campaign Implementation

The IRS project staff developed an IEC campaign implementation plan based on the information gathered by the RTI team during the 2008 and 2009 spraying operations. Developed in collaboration with the PNL, the plan included existing IEC tools adapted from the 2008 and 2009 experience to conduct community mobilization

campaigns. The most efficient mobilization methods used in the 2008 and 2009 campaign was replicated, including village gatherings and door-to-door visits to explain the purpose, benefits, and precautions associated with IRS and to answer any questions.

During the implementation of IEC, village chiefs, religious leaders, and other organizations and associations operating in the area were invited to be part of the mobilization process throughout the IRS campaign. These leaders were fully engaged to intensify community mobilization, as they are best placed to convince the population to accept IRS.

During the IEC implementation, IRS launch activities were organized at each targeted district. During these launch activities, people from all levels (national, regional, district, and community) were invited. It offered a good opportunity to advocate for the IRS campaign.

4.3 IEC Material Design and Production

During the 2010 PID campaign, the PNL and the local RTI team prepared the IEC materials with the support of the Regional Communication Coordinator of RTI, and in collaboration with the CНИЕCS. They helped to convey the IEC messages on the PID. As in 2008 and 2009, community radio stations were solicited to carry the messages further still.

In 2010, to strengthen the capacity of the mobilizers and to ensure sustainability, IRS worked closely with the SDSSES. The latter, located at the district level, is in charge of issues related to community capacity building. We did not sufficiently involve SDSSES during the two previous campaigns. We worked closely with the 2010 campaign because we are confident that this is what should be done in order to ensure sustainability. In 2010, the SDSSES has been involved in the selection, training and supervision of the mobilizers. Our collaboration with the CНИЕCS in 2010 has also continued in order to ensure high quality messages and IEC tools.

Table 5. IEC Materials

Item	No. Printed	No. Distributed
Brochure	100,000	87,000
IRS Card	134,000	126,850
Tee shirts	1,250	1,250
Caps	1,250	1,250
Audio cassettes	21	21
Others (Insert here)		
Totals	236,521	216,371

4.4 End of Spray IEC Activities

At the end of the campaign, the mobilizers requested the inhabitants:

- to continue using the insecticide-treated nets even if their room have been sprayed;
- to carefully keep the IRS cards until the next campaign.

Some lessons learnt:

- The close collaboration with the Social Development and Integrated Economy Services, the involvement of the CPM and motivation of the mobilizers contributed to
- the success of the IEC and, consequently, conduct of the IRS.
- The effective presence of the local authorities during the mobilization days organized
- in the health areas testified to their support for the program me.
- The management of a limited number of mobilizers per village and according to the local duration of the spraying helped to maintain the costs at reasonable levels.
- The low level of education of the mobilizers created difficulties in the collection of data despite the translation of the aids into Bamanan language.

As recommendations, it would be useful to:

- Envisage a review of the aids intended for the mobilizers in order to further simplify and also start the IEC activities early;
- Start the IEC campaign 2 weeks before the start of the IRS operations;
- Hold the mobilization days just before the start of the IRS operations.

5. Implementation of IRS Activities

5.1 Planning, Monitoring, and Supervision

The experiences gained from the first two spray rounds in Mali enabled RTI and partners to better plan for the FY10 and FY11 spray rounds. The RTI team initiated preliminary discussions with PMI Mali and the PNLP to discuss planning for the next IRS campaign. The joint micro-planning of IRS operations was carried out in close collaboration with district and departmental health authorities. Before the micro-planning, the RTI logistician conducted geographic reconnaissance in the target IRS sites to determine the logistical needs of the forthcoming IRS round. In addition, the logistician and COP conducted field visits to prepare the implementation plan and advocate for IRS with local leadership. RTI then initiated detailed planning, involving district health staff and other stakeholders, to generate an IRS micro-plan for IRS operations in the targeted districts.

Lessons learned from the first spray round were used in planning the 2010 and subsequent IRS spray rounds. Before the placement of orders for replenishing

commodities, the IRS team inspected the other existing inventory to determine its state and available quantities. Procurement of pesticides and equipment were only conducted to replace the equipment that was damaged and to procure additional personal protective equipment (PPE). A number of small consumable items were procured locally. The logistics officer made an inventory, which enabled the IRS team to assess the needs in materials and equipments for the FY 2010–FY 2011 IRS campaign.

The 2010 IRS campaign was implemented from 16 May to 30 June 2010. This period was chosen in order to:

- Avoid spraying during the rainy season
- Avoid spraying in the hot period of March and April when temperatures can reach over 45⁰ C (113 F)
- Allow good coverage during the malaria transmission season.

Planning was conducted in close collaboration with the districts and communities. The IRS logistics officer and M&E specialist developed a geographical reconnaissance map. This map enabled the mobilizers to know each day exactly where spray operators were and thus notify homeowners of spray operations at least one or two days before IRS.

5.2 Logistics

IRS has acquired vehicles to transport the spray teams. Though priority was given to the transport source used in the 2008 and 2009 IRS campaign, it is important to note that selection is always done on a competitive basis, with the best price and other criteria used as decisive factors. Team vehicles were based at the CSCOM level for the purpose of transporting spray teams to the various villages within the radius of the CSCOM. IRS also made provision for transporting supervisors and CSREF personnel involved in program monitoring.

Initial commodities were delivered by Crown Agents to Bamako and released to IRS Mali staff. The COP and the logistics officer made arrangements for an inventory and delivery of the items to each district. District personnel made an inventory and distributed the equipment and supplies to the various CSCOMs for use in the field.

All materials and equipment were subject to strict control procedures, with particular emphasis on the chain-of-custody of insecticides.

5.3 Environmental Compliance

The Supplemental Environmental Assessment (SEA) for IRS, using pyrethroids in Mali was signed in May 2008. The SEA contained a Safer Use Action Plan guiding the safe use of Insecticides, based on international best practices. The current SEA has guided the 2010 spray operations.

As in the 2009 spray operations, RTI worked closely with the regional and district offices of the Ministry of Environment (MOE) and the Ministry of Agriculture (MOA), who identified and proposed qualified staff to monitor Environmental Safety

and Compliance with respect to the environmental guidelines maintained by their respective agencies, as well as those required by USAID and international bodies. Monitors were entrusted with the task of monitoring the safe handling of insecticides, proper use of protective gear, and proper construction and marking of areas designated for washing equipment and disposal of rinse water. They assisted in the more efficient collection and delivery of data and worked in close collaboration with the IRS environmental team, who took on the lead role of quality control/quality assurance (QC/QA).

To minimize and/or mitigate adverse impacts, RTI:

- Anticipated adverse impacts on human health and livestock to better avoid, minimize, mitigate, compensate, and adopt corrective measures before cumulative effects are experienced.
- Provided World Health Organization (WHO)-standard personal protective equipment (PPE) to all spray teams for IRS activities.
- Trained all spray teams and drivers on good spraying techniques and how to respond to emergencies.
- Created awareness and sensitized targeted populations to the “do’s and don’ts” before and after spraying, in order to reduce exposure incidents.
- Procured pregnancy tests for all female spray candidates. The chief medical officer at the CSCOM level performed the testing and conducted general physical testing for all spray teams.

The RTI team conducted training for all surrounding health care facility personnel on emergency response to acute pesticide poisoning, and all surrounding health facilities worked with PNLN to stock the recommended antidotes for pesticide poisoning in the health centers. RTI has in place storage facilities in environmentally sound sites. The team ensured the sound disposal of pesticide residue and saw to it that all empty pesticide sachets and unused pesticides were locked securely until an appropriate disposal mechanism was identified. IRS is working with the African Program on Pesticide Stocks (*Programme Africain relatif Aux Stocks de Pesticides* [PASP]) and the MOE to dispose of waste from the initial spray operations.

Compliance with the measures described in Safer Use Action Plan was monitored on a regular basis by PNLN and the National Department of Sanitation and Environmental Pollution Control (*Direction Nationale de l'Assainissement et du Contrôle des Pollutions et des Nuisances* [DNACPN]). IRS also conducted an internal compliance inspection and submitted a compliance report to major program stakeholders. The pre-spray inspection, scheduled to coincide with the training of trainers, was conducted by RTI’s in-country Environmental Officer. The mid-spray inspection was conducted jointly by the Environmental Officer and a Nairobi-based Environmental Officer to facilitate capacity building.

Finally, USAID health and environment staff (local or from Washington) visited the program site periodically to assess the progress of the IRS campaign as well as compliance with the SEA. Compliance with measures described in the EIA was also monitored on a regular basis by the MOE and relevant Koulikoro and Bla officials.

Table 6. Environmental Compliance Actions Table

Period	Key Issues	Recommendations	Actions Taken	Comments
Pre-Spray	1. Soak pits	Reinforcement with cement	All 41 soak pits reinforced	Well done
		New soak pit in Kamani	Soak pit realized	Well done
	2. Wash areas	Reinforcement with cement	All 41 soak pits reinforced	Well done
	3. Storage facilities	New storage in some health areas, and rehabilitation in others	Doumba, Diedala, and Tombougou have new storage.	Acceptable
Rehabilitation of Tienabougou & Sirakorobougou's storage			Acceptable	
Mid-Spray	1. Use of PPE	Recommended to all actors and operators	Strengthen supervision	Almost effective
	2. Monitoring and tracking of insecticides	Coding & Applied tracking of Insecticide sachets	Strengthen supervision & Use sachets monitoring forms	Very efficient
	3. Storage areas	Covering up insecticides and all items in Koula and Sirakorobougou because of leaking of storages roof	More plastic sheet taken to health areas their use supervised	Well done
		Replacement of Touna's storage facility	New storage given by the commune mayor	Good
1. Use of PPE	Recommended to all actors and operators	Strengthen supervision	Almost effective	
Post-Spray	1. Waste disposal	Good management	All waste in PVC barrels are kept in containers	Very seriously watched
	2. Remaining amount of insecticides	134 Sachets of Deltamethrin	Stored in Bla's Warehouse	Well done
	3. Fire extinguishers	Fire extinguishers maintenance	Negotiations in process	In process

Using insecticides involves a number of issues related to safety, both for manipulators, applicators, populations and the environment. In General, all formulations of insecticide approved by WHO are safe if they are used with the recommended protection measures. Risks related to the application of insecticides as well as ways to prevent them, must be clearly assessed.

Environmental compliance inspections are precious step recommended by USAID before, during and after an Indoor Residual Spraying Campaign. These different inspections are always advantageous since they enable us to correct irregularities and improve measures that are already taken in order to pretend to better spray operation.

Thus, 2010 IRS environmental compliance inspection Pre campaign recommended that certain local storages were supposed to be completely changed and other rehabilitated; that was the reason why improvements have been made in Tienabougou,

Diedala in Bla's district. In the district of Koulikoro, community has built new storage facilities in Doumba and Tombougou; it was supported by RTI for finishing the work. Always in Koulikoro, Sirakorobougou has received support for the rehabilitation of the already existing secondary storage.

During the mid-spray environmental inspection, the use of personal protective equipment was recommended for all IRS actors and operators. Strengthened supervision led us to an almost effective use of PPE this spray round.

Sachets coding allowed us an applied tracking of the insecticide. The monitoring and tracking of insecticide has been efficient because of strengthen supervision and the use sachets monitoring forms.

While Insecticide and other items were covered up with plastic sheet to prevent them to get wet because of leaking roof in Koula and Sirakorobougou in Koulikoro's district; in Bla, Touna's local storage had to be changed, because very small.

At the end of this spray round, RTI IRS/Mali has only 134 insecticides sachets left. This small amount is actually located in Bla's central storage.

Currently all solid wastes are located in barrels made of PVC. These barrels are all well sealed and well stowed in containers located near the warehouses in Koulikoro and Bla.

Regarding fire extinguishers maintenance that has been recommended, exchanges and talk are still in process. This will be done very soon.

5.4 Closing of IRS Operations

Two main activities characterize the closure of the PID campaign, namely: disorganization and management of solid wastes.

Disorganization

It consists in the execution of the following post-campaign activities:

- All the operators hand over their Individual Protection Equipment to the secondary Storekeepers,
- The latter ensure that all the equipment and insecticides have been rendered.
- The mini-buses that were in charge of transport the Sprayers returned these equipment and materials (+ insecticides, where necessary) to the central Warehouse.
- The equipment and materials are well washed, dried and carefully arranged in the central Warehouse pending the subsequent campaign.

Management of solid wastes

The management of solid wastes was subdivided into two groups: insecticide bags and the other solid wastes (gloves, dust masks, irretrievable valves from the X-Pert Pumps, sheets and towels used during the campaign).

These “other solid wastes” were destroyed in a Dragon-type incinerator, which can reach temperatures of between 800°C and 900°C. For the Koulikoro Cercle, this destruction took place at Sinzani and for the Bla Cercle, at Koutienso.

The destruction of empty insecticide bags has different requirements, such as a temperature of more than 1200°C. In Mali, we do not have an incinerator with such high power. Until a solution is found, we decided to carefully stock the empty insecticide bags in hermetically closed barrels. These barrels are then placed in containers which are also tightly closed.

It should be noted that RTI has just received from the Ministry of Environment of Mali and PMI/USAID the authorization to purchase a mobile Incinerator that can reach 1300° C. The acquisition of this incinerator will enable us to destroy the insecticide bags locally. This is an important point, which shows the capacity of Mali to manage in a sustainable manner the wastes produced by its Indoor Spray Program.

Inspection of the post-campaign environmental compliance.

This mission was conducted by the local Environment Consultant in July 2010. It made it possible to:

- Avoid pushing grass on the site of the washing area,
- Rehabilitate stores and defective drains before the next campaign,
- Perform pregnancy tests Operators and actresses in all health areas of Koulikoro.
- Organize a general maintenance of all fire extinguishers in the very near future to predict fire

Validation workshops.

The validation workshops are planned in September 2010 after the period of Ramadan. We intend to organize 3: in Koulikoro, Bla and Bamako. These workshops help to share the results of the campaign with populations of the Cercles concerned. They also help to get feedback and suggestions from beneficiaries who can contribute to the improvement of future IRS campaigns.

6. IRS Results (Monitoring and Evaluation)

6.1 Introduction

Monitoring-Evaluation is one of the main components that contribute to the efficient conduct of an indoor spray campaign. Indeed, it is the component on which rests the huge responsibility of collecting, processing and disseminating the data of the campaign.

This chapter presents the activities of the monitoring-evaluation during three major periods of the campaign:

- Activities preceding the campaign.
- Activities during the campaign.
- Activities after the campaign.

6.2 Activities Preceding the Campaign

The activities carried out during this period consisted mainly in the preparation of the campaign. To that end, we first of all had to familiarize ourselves with the existing information system in order to propose improvements.

6.2.1 Coding of the Data

The originality of this year's campaign was instituting a coding system to cater not only for all the people participating in the campaign but also the information required to ensure the success of the campaign. To that end, the following codings were added to those already existing:

- Coding of the villages
- Coding of the concessions with the allocation of a unique identifier to each concession
- Coding of actors of the IRS

The purpose was to put in place a coding of the actors involved in the spray operation during the campaign, especially:

- Central Storekeepers
- Secondary Storekeepers
- Supervisors
- Team Leaders
- Washers
- Security Guards
- Data Clerks
- Coding of the indoor spray operators

The purpose was to put in place a coding for operators who are effectively involved in the spraying activities in the field, particularly:

- IEC Mobilizers
- Spray Operators.

All these codings helped to put in place a computerized application for the collection, processing and validation of the data of the campaign.

6.2.2 Design of Data Entry Forms

A computer application was introduced for processing the data. This application was conceived with the Access database software. It operates with the Access 2003 and

2007 version. In this regard, data entry forms were designed for the collection of data, namely:

- Data entry form for the identification of concessions
- Data entry form for the spray operators (Team Leader form)
- Data entry form for the IEC mobilizers (Team Leader form)
- Data entry form for the distribution of insecticides.

Throughout the entire period preceding the campaign, the monitoring-evaluation component also participated in the update of some data collection tools.

6.3 Training of Data Clerks

The introduction of data entry forms facilitated the training of the data clerks on the use of the forms during the campaign. It should, however, be noted that the entry forms for concessions were to be used during this period for planning the campaign.

Hence, six (6) data clerks were recruited and trained on the use of the computer application, especially its component on the use of data entry forms.

6.4 Installation of Data Clerks

The start of the campaign coincided with the installation of the data clerks in the two spraying zones. Two teams, each comprising three (3) data clerks were installed in each of the spraying zones. All necessary arrangements were made to facilitate the work of the two teams put in place.

6.5 Activities during the Campaign

During the campaign, the role of monitoring-evaluation was mainly focused on the following activities:

- Input of data,
- Supervision of data input,
- Recuperation and centralization of the data and
- Processing of data and dissemination of results.

6.5.1 Input of Data

The two data input teams worked during the entire period of the campaign. One team was based at Bla and the other at Koulikoro. The period of the campaign was mainly devoted to the input of the following forms:

- Support 2: Daily recapitulation - Team Leader
- Support 5: Summary of the daily report on mobilization activities
- Support 12: Insecticide distribution and monitoring form.

These forms are, indeed, those containing the necessary information for the main indicators for monitoring the campaign.

6.5.2 Supervision of Data Input

The supervision of data input consisted in taking into account all the demands of the input clerks to ensure smooth conduct of this operation. As some controls could not be introduced in the computer application, the exploitation in the field revealed the following weaknesses, which were quickly corrected:

- Equality between structures found and the addition between treated structures and untreated structures;
- Equality between the bags received and the expression “Bags returned + empty bags – used bags”.

The same applies to the insecticide distribution form where the equality between bags received and the addition of full bags returned should be respected.

The supervision tour also facilitated the recuperation of the data and the restart of the data with a view to reducing its size to make it easy to send through internet.

6.5.3 Recuperation and Centralization of Data

The data captured in the regional level (Bla and Koulikoro) were recuperated in two ways:

- Every three days, the data input teams were to send the zipped database of each data clerk by internet to the monitoring-evaluation officer of RTI/IRS Bamako
- The monitoring-evaluation officer was charged with recuperating the databases of each data clerk during the supervision tours.

The databases recuperated from each data clerk were then incorporated into the central database of the monitoring-evaluation component for centralization.

6.5.4 Processing of Data and Dissemination of Results

The computer application put in place made it possible, through requests, to come up with the tables required for constituting the trend curve. The drawing of the curve was done in two stages:

- Execution of the request in Access
- Copy of the result on the Master Tracker.

6.5.5 Results

The data captured during the campaign showed that out of a total of 128,614 structures planned at the beginning of the campaign, 130,842 were found and 127,273 were treated, representing a coverage rate of 98% in relation to the structures found and 99% in relation to the structures planned. Table 1 presents the main different indicators of the 2010 campaign.

Table 7. Summary of IRS Results

District	No. Structures Sprayed	No. Structures Targeted for Spraying that Were Sprayed	No. People Residing in Structures Sprayed (Population Protected)	No. Pregnant Women Residing in Structures Sprayed	No. Children <5 Yrs. Residing in Structures Sprayed
Koulikoro	48,225	55,468	174,692	5,470	33,315
Bla	79,048	73,146	266,123	7,406	59,046
Total	127,273	128,614	440,815	12,876	92,361

Figure 7 Distribution of Population Protected – pregnant, under 5, others

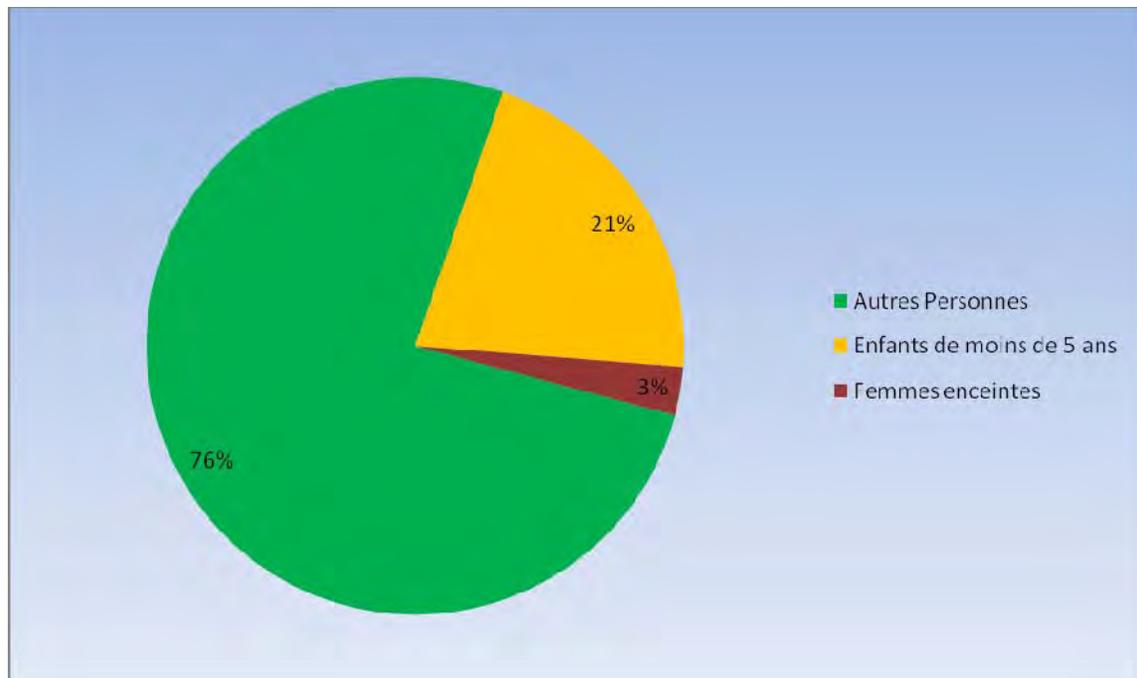


Figure 8: Structures planned, funded and sprayed

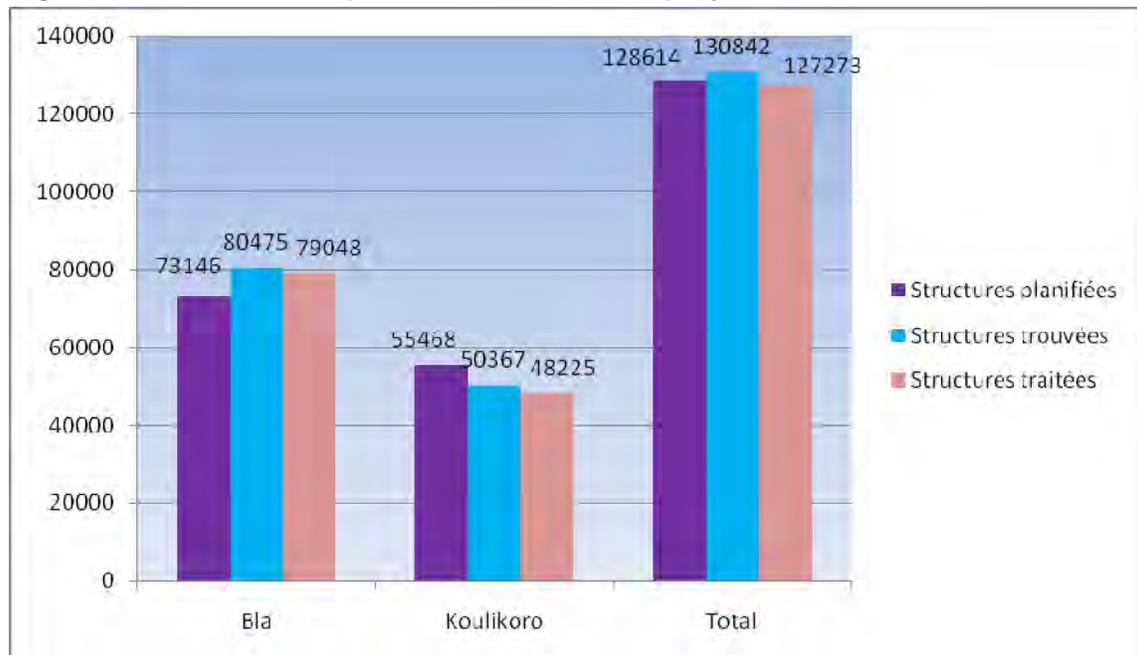


Table 8: Distribution by sex of the Temporary Staff Type

Temporary Staff Type	Bla			Koulikoro			Total		
	M	F	T	M	F	T	M	F	T
Central storekeeper	1		1	1		1	2		2
Secondary storekeeper	22	3	25	16	1	17	38	4	42
Supervisor	24	1	25	17		17	41	1	42
Spray team leader	39	3	42	28		28	67	3	70
Guard	25		25	11		11	36		36
Washers		30	30		18	18		48	48
Data clerks		3	3		3	3		6	6
Mobilizers	300	119	419	283	70	353	583	189	772
Spray operators	198	11	209	132	11	143	330	22	352

Figure 9 Coverage by the planned structures

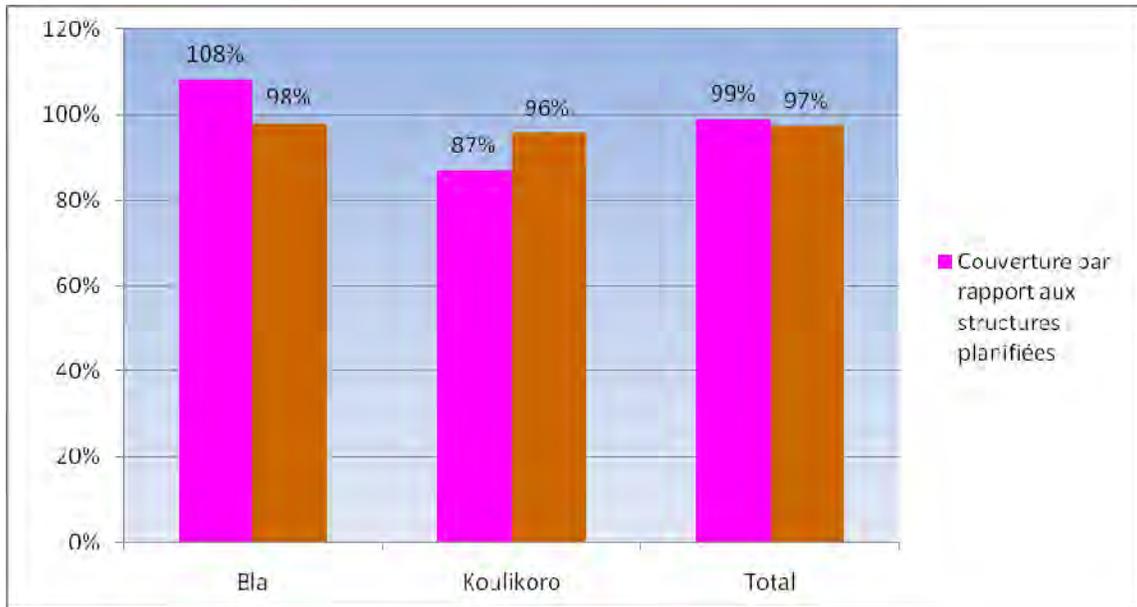
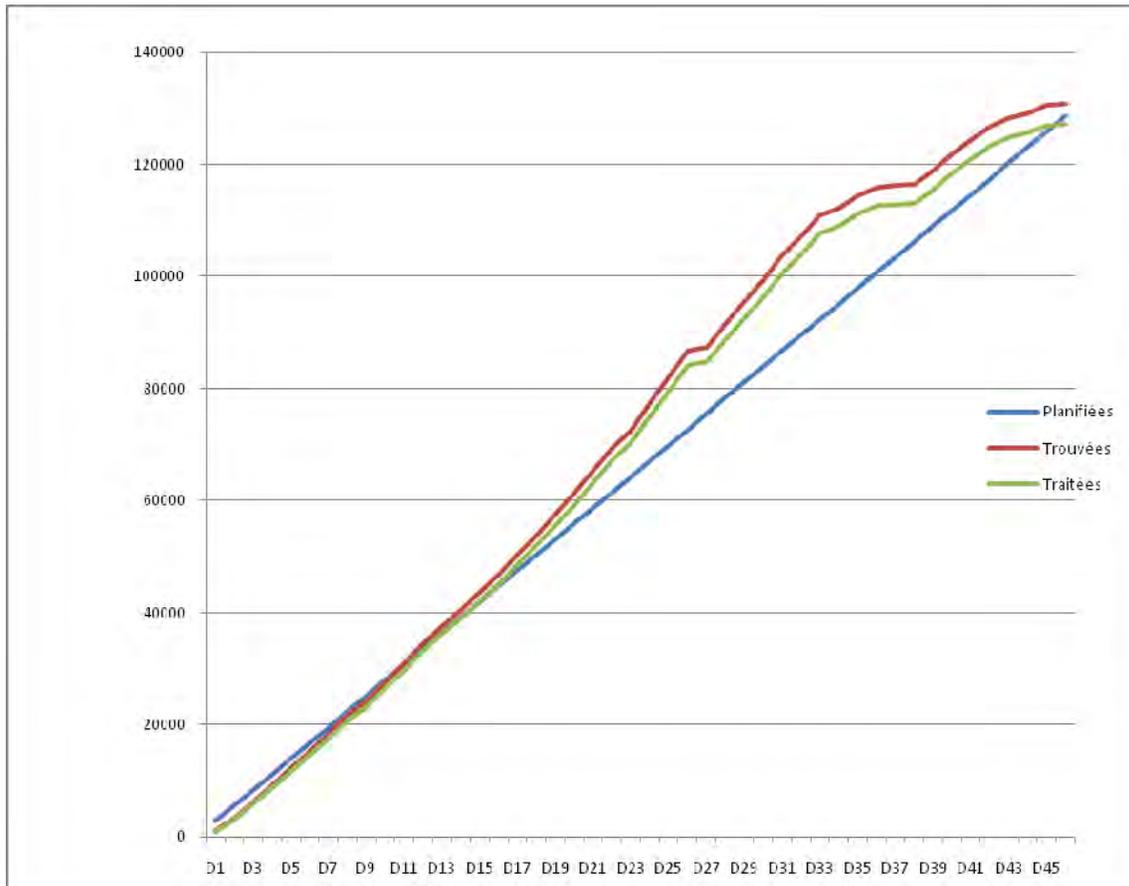


Figure 10: Master Tracker of the 2010 Campaign



The graph presents the situation of the spraying operations per day. The planned target was attained and even exceeded in terms of structures found from the 11th day while it was attained and exceeded from the 15th day of the campaign in terms of structures treated. This trend was maintained until the 40th day to reach the planned target.

6.6 Activities after the Campaign

The post-campaign activities consisted of pursuing data input and reconciling the data contained in the database and the data brought from the field. The pursuit of data input is currently focused on medium 3 (List of daily control of IRS operations) and medium 6 (Control list of supervisors of mobilizers). These two media will help to assess the work of the mobilizers and spray operators in the field.

6.7 Conclusion to the M&E

The introduction of a new information system for the Monitoring-Evaluation component during the 2010 campaign facilitated the collection of the essential data of a spray campaign. These data enabled management to know, in the course of the campaign, the places where bottlenecks could be found and to quickly correct crisis situations. The system also helped to know who does what, at what place and on what date in terms of spray operations.

It is, however, useful to recall that the wrong completion of the data collection forms by the operators and team leaders at the beginning of the campaign posed some problems in the input of data. This problem was quickly resolved through a formative supervision.

7. Challenges

- Establishment of a new Monitoring-Evaluation system: a good monitoring-evaluation system helps to anticipate, correct and ensure the collection of very high quality data.
 - During the first two years of the IRS program, we put in place a virtually blind monitoring-evaluation system. If this system could indicate to us the number of structures sprayed in the village, it could not tell us in the case of “mopping-up,” for example, the concessions concerned, nor the responsible agents.
 - To address these weaknesses of the first M&E system, the project decided to put in place a coding that would take charge not only of all those participating in the campaign, but also of all useful information for the success of a campaign. To that end, the following codings were added to those existing already:
 - Coding of villages
 - ***Coding of concessions with establishment of a unique identifier for each concession***

- Coding of IRS agents
- The mobilizers and IEC agents occupy an important place in the success of an indoor spray campaign.
 - During the 2009 Campaign, we witnessed the loss of motivation on the part of the ‘Community Workers’, which paralyzed the activities of the campaign.
 - In 2010, two factors made it possible to correct this gap: 1- the full involvement of the Social Development and Integrated Economy Division, used to managing aspects associated with community mobilization. 2- the reduction of their number and payment by the job helped to make their sponsorship affordable.
- Have a secondary warehouse at each site.
 - Sometimes, it is difficult to find a secondary warehouse in some sites, especially since RTI does not build warehouses.
 - Where the problem arose, we proposed a little contribution towards the renewal of the secondary warehouse.
- Ensure the systematic counting of the structures in the entire intervention zone.
 - The counting must be done before the campaign under the supervision and with the involvement of the Heads of Post.

8. Lessons Learned

- Accurate counting of structures and accurate coding of the concessions (unique identifier) and the actors are important to ensure efficient monitoring of a successful campaign.
- Close collaboration with the Social Development and Integrated Economy Division, the involvement of the CPM and motivation of the mobilizers contributed to the success of IEC activities and, consequently, facilitated IRS operations.
- Effective involvement of the CPM is a guarantor of the success of the campaign.

9. Recommendations

To PNLP:

- Develop an IRS Strategic Plan for Mali, in which the extension to other Circles is envisaged.
- Ensure that in each new zone, the counting of structures is done and that each concession has a unique identifier.

- Involve the Monitoring-Evaluation Official of the PNL in the implementation of the campaign and, thus, in the documentation of the IRS process.
- Determine an official solution to the issue of the remuneration of the IEC Mobilizers at the national level.

To CSREF and SDES

- The *CSREF* is in charge of the general supervision of the campaign in the field and must ensure that the Heads of Medical Posts are effectively involved in the implementation of the campaign.
- Ensure that the SDES effectively plays its role in community mobilization and in the management of issues associated with catering for the Community Workers
- Ensure that the focal point is available and becomes the key person at the operational level.

To RTI

- Continue to ensure participatory planning at all levels and involvement of all stakeholders.
- Ensure that at the beginning of each campaign all the concessions have a unique identifier.
- Create within the RTI national team a permanent position of Data Manager. This is a strategic position for the successful implementation of an IRS campaign from beginning to end.
- Continue to strength capacity of partners at all level in order to guaranty the sustainability of this program.
- Continue to work in partnership with ECOBANK for the payment of our temporary staff during the IRS campaign.

10. IRS in Action

The loss of five sachets of insecticide in Monzombala

Since 2008, with funding from PMI/USAID, RTI is supporting the PNL through a Pilot Project of IRS. We just finished the third round of IRS and the story we share here happens in Monzombala, one of 17 health areas that make up the Health District of Koulikoro.

My name is Ibrahim Traore, the Head of the Monzombala Community Health Center.

“On Saturday June, 5th 2010, after his daily physical stock control of insecticide, the local storekeeper discovered that there was a difference of 5 sachets between the remaining quantity and the quantity registered on the form. Knowing that the loss of insecticide was not tolerated, he decided to call me and to report the loss of five sachets of insecticide in a batch 50.

Since Monday May, 30th 2010, I had been, with all the Heads of Community Health Centers of the District, in a training session on Malaria at the District Health Center of Koulikoro.

I asked the head of the community health center to check with the Central Warehouse Keeper about the numbers of sachets that RTI gave us. I asked him to check the numbers that he gave to the spray operators in the morning. After all this investigations were done the same morning in the utmost discretion, we concluded that the five sachets were stolen directly from our secondary store. The same day in the afternoon, I described that situation to the Medical Chief of the District, Dr Mamadou Désiré Keita.

But on Sunday, June 6th, the local storage keeper called me to tell me that a man called and told that he had “removed five sachets from the storage a few days before, had wanted to sell them, but could not find a client. If the keeper wants to find the sachets, [he] threw them in one of the school latrines.” I asked the keeper if he had noticed signs of robbery at the storage level. He told me that indeed the window showed such signs, and that he was afraid to mention this because the night guard is the President of the ASACOS, and he was afraid and chose to keep quiet. Then I informed the chief physician and RTI Coordinator about the story.

The Medical Chief of the District instructed me to go to Monzombala with RTI team to see and assess the facts. We found that the storage keeper and the night guard had recovered the five sachets which were in a black plastic bag. We had to see the latrine, observe the window and learn more about the anonymous call.

RTI National Coordinator and the Medical Chief of Koulikoro, after being informed of our findings, decided to dismiss the keeper and instructed us to seek someone to replace him. They asked us to inform the Prefect, the village leader and the Mayor. We asked the head of the village to make a team available to guard the storage for the rest of the campaign.

Lessons learned through this story:

- Good data management system has enabled us to quickly detect errors or weaknesses and correct them immediately.
- Good awareness has meant that the population refused to buy even 5 sachets of stolen insecticide.
- Recruitment of a President or other member of the ASACO’s Management Committee in the IRS activities is to be avoided.
- Must take good care of secondary stores and more secure them.

Appendix A: IRS Generic Sustainability Chart

Partners' Proportional Responsibility Matrix

Activity	Proportional Responsibility (%)							
	Round One		Round Two		Round Three		Round Four	
	MOH	RTI	MOH	RTI	MOH	RTI	MOH	RTI
Partnership development								
Establish IRS oversight committees	50	50	80	20	90	10	90	10
Environmental compliance								
Prepare Environment Assessment	20	80	20	80	50	50	80	20
Environmental monitoring Plan	0	100	20	80	40	60	50	50
Environmental compliance inspection	0	100	10	90	20	80	20	80
Entomological surveillance								
Identify and train entomological technicians	50	50	60	40	80	20	90	10
Baseline survey	10	90	50	50	80	20	90	10
Periodic surveys	10	90	60	40	80	20	90	10
IEC Program								
Formative research	10	90	90	10	90	10	90	10
Training of IEC mobilizers	0	100	50	50	70	30	90	10
Production of materials	0	100	10	90	90	80	40	60
Pre-IRS IEC mobilization	10	90	50	50	70	30	90	10
IEC coordination with IRS	0	100	50	50	70	30	90	10
Post spray IEC survey	10	90	40	60	50	50	50	50
Logistics procurement and management								
Field visit for logistics needs assessment	50	50	50	50	60	40	60	40
Issue requisitions	0	100	10	90	50	50	50	50
Logistics delivery	0	100	10	90	50	50	50	50
Micro-planning	50	50	50	50	50	50	50	50
Logistics chain of custody	0	100	10	90	30	70	30	70
IRS operations								
Geographical reconnaissance	10	90	20	80	40	60	40	60
Training of supers and SOPs	0	100	20	80	20	80	20	80
Spraying operations	10	90	20	80	20	80	20	80
Post spraying Activities	50	50	50	50	80	20	80	20

Assumptions

1. The concept of learning by doing applies
2. Availability of MOH counterparts to partner RTI
3. Variability of countries is taken into account
4. RTI has contractual obligations to fulfill to the client
5. This is not a scientific measure, it is rather subjective
6. The matrix is completed at the end of each IRS cycle by RTI COP

Appendix B: Mitigation Measures

The potential negative health impacts of the intervention include transitory, acute health impacts on the local population, targeted beneficiaries and spray operators including the entire spray team as a result of unintentional pesticide exposure. The acute health impacts could arise from ingestion, inhalation, dermal or eye exposure. Exposure leading to adverse human and environmental impacts could occur during the transportation, storage, loading and unloading, spraying and after spray operations. This is what is commonly referred to as a pathway of exposure. Adverse impacts on the physical environment is anticipated and could occur due to accidental spills on water bodies, soil and vegetation, unintentional or intentional spraying of the physical environment, poor siting of pesticide storage facilities that could expose sensitive environment to contamination .

Potential adverse environmental impacts are expected to be minimal in most of the targeted spray areas, and the following mitigation measures will be pursued to minimize these potential adverse effects.

Mitigation Measures

Anticipated adverse impacts through pesticide exposure to the bio physical environment or human health including livestock will be avoided, minimized, mitigated, or compensated and corrected if possible before cumulative effects are experienced. Mechanisms to mitigate adverse impacts include; Provision of Personal Protective Equipment (PPE) of standards recommended by WHO for IRS activities to all the spray teams; Training of all the spray teams and drivers on good spraying techniques and how to respond in cases of emergency exposure to pesticides; Awareness creating and sensitization of all the targeted residents in the cercles on the do's and don'ts before the spraying and after the spraying to reduce exposure incidents; this will include instructions on not to enter the houses until 4 hours after the spraying; removal or covering of all furniture, curtains, food items etc from the houses; sweeping away into pit latrines or burning of any dead insects; tying up all livestock during the spray process; Undertaking pregnancy testing for all the female spray candidates and general physical testing for all the spray teams; Training of all the surrounding health care facility personnel on emergency response due to acute pesticide poisoning; Equipping all the health facilities with the recommended anti-dotes for pesticide poisoning; locating the storage facilities in environmentally sound sites including away from markets centers, hospitals, school, close to water sources etc.; Ensuring that the storage facilities are secured and double padlocked with security guards to avoid incidences of pilferage; Ensuring sound disposal of after spray pesticide residue through triple rinsing and then disposing the residue into soak pits; and ensuring that all the empty pesticide sachets and un-used pesticides are locked securely as recommended by WHO until such a time that an appropriate disposal mechanism will be arrived at and this could include shipping the sachets back to the manufacturer.

Significant adverse impact could occur in the fishing village of N'Togosso located in the cercle of Bla where the houses are located very close to the river which has a dam erected across it. Accidental spills when crossing the bridge or through unintentional or deliberate exposure while spraying to the external environment could end up contaminating this water body and on the fish, aquatic invertebrates, and the livelihoods of the largely dominant fisher folk.

For this reason, the SEA recommends that this particular village situated next to the dam be EXCLUDED from the IRS program and instead an alternative intervention including but not limited to the use of ITN be pursued. This is because the potential risk for contamination is too HIGH to mitigate effectively.

Compliance with measures described in the PERSUAP will be monitored on a regular basis by PNLP and DNACPN Mali. RTI International will also conduct an internal compliance inspection and submit a compliance report to major program stakeholders. Finally, USAID health and environment staff will visit the program site periodically to determine the progress of the IRS campaign as well as to assess compliance with this SEA.

A Safer Use Action Plan (SUAP) or Environmental Management Plan (EMP) has been prepared as part of this SEA and details the mitigation requirements for the pilot program to minimize these risks to human health and the bio-physical environment. Mitigation measures include substantial training for all individuals involved in implementation, community education, utilization of personal protective equipment, and best practices for re-use/disposal of contaminated water from operations.

Compliance with measures described in the EMP will be monitored on a regular basis by the Malian Environmental Ministry and relevant Koulikoro and Bla Officials. RTI International will also conduct an internal compliance inspection and submit a compliance report to major program stakeholders. Finally, USAID health and environment staff will visit the program site periodically to determine the progress of the IRS campaign as well as to assess compliance with this SEA.

The SUAP or EMP can be found at the end of the report and summarizes the required mitigation actions according to the time that the actions should be taken. Bolded indicators are those that are considered “minimum requirements” for all IRS programs, and are used to compare IRS programs funded through PMI through time; these indicators are also listed in the environmental compliance monitoring checklist in Appendix 1. USAID and *the Comite technique d'analyse environnementale* will discuss the compulsory nature of EMP implementation with the Ministry of Health; the Ministry of Health must be committed to the implementation of the EMP. Key institutions and collaborators who will assist in the implementation of the project include:

- Mali National Malaria Control Program (PNLP)
- Malaria Research and Training Center (MRTC)
- USAID Health Team
- RTI International

- Pharmaceutical Products Registration Committee (CNGP)
- Comite technique d'analyse environnementale (equivalent of a Malian Environmental Agency)
- Direction Regionale de la Sante (Regional Health Center) of Segou (Bla) and Koulikoro
- Departmental Direction of Agriculture, Phytosanitary Studies and Protection of Vegetables of Bla and Koulikoro
- African Program for the Elimination of Obsolete Pesticides (PASP-Mali)

These institutions will be brought together in an IRS coordination committee to resolve program issues periodically and systematically. . This will be coordinated by the in country COP and or the country task manager to assign appropriate responsibilities. Roles played by each of these collaborating institutions are identified in the EMP table under “Implementation Responsibility.”

This assessment is based on field visit and desk top research conducted in Mali from February 1st to February 22nd April, 2008, including consultations with several IRS program stakeholders. Additionally, government documents concerning pesticide use, the environment, and malaria control were reviewed and incorporated into this EA.

Appendix C: Indicators for the 2010 IRS Campaign

Zone Indicators	Bla	Koulikoro	Total
Structures planned	73,146	55,468	128,614
Structures found	80,475	50,367	130,842
Structures treated	79,048	48,225	127,273
Percentage in relation to the planning	108.1%	86.9%	98.9%
Coverage	98.2%	95.7%	97.2%
Number of people in the structures found	269,833	180,609	450,442
Number of people in the structures treated	266,123	174,692	440,815
Percentage	98.6%	96.7%	97.8%
Number of children under 5 years in the structures found	59,845	34,463	94,308
Number of children under 5 years in the structures treated	59,046	33,315	92,361
Percentage	98.6%	96.6%	97.9%
Number of pregnant women in the structures found	7,503	5,660	13,163
Number of pregnant women in the structures treated	7,406	5,470	12,876
Percentage	98.7%	96.6%	97.8%
Bags used	28,933	15,752	44,685