

Logistical Needs Assessment for Indoor Residual Spraying in Kabale District, Republic of Uganda

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ACRONYMS

CBO	Community Based Organization
CS	Capsule Suspension
DDHS	District Director of Health Services
DVCO	District Vector Control Officer
GIS	Geographical Information System
GPS	Global Positioning System
GR	Geographical Reconnaissance
HC	Health Center
HIMAL	Highland Malaria
HPED	Health Promotion and Education Division
HSD	Health Sub District
IDP	Internally Displace People
IEC	Information, Education and Communication
IP	In-patient
IPT	Intermittent Presumptive Treatment
IRS	Indoor Residual Spraying
ITNs	Insecticide Treated Nets
IVM	Integrated Vector Management
Kg	Kilogram
MOH	Ministry of Health
NGO	Non Governmental Organization
NMCP	National Malaria Control Program
OPD	Out-Patient's Department
PDCs	Perish Development Councils
PERSUAP	Pesticide Evaluation Report and Safe Use Action Plan
PMI	President's Malaria Initiative
PPE	Personal Protection Equipment
PSC	Pyrethrum Spray Catch
RTI	Research Triangle Institute
TOT	Training of Trainers
UG Sh	Uganda Shillings
US D	United States Dollars
USAID	United States Agency for International Development
USEPA	United States Environment Protection Agency
VCD	Vector Control Division
VHTs	Village Health Teams
WHO	World Health Organization
WP	Wettable Powder

BACKGROUND

The U.S. Agency for International Development (USAID) intends to offer technical and financial support to Uganda's National Malaria Control Program (NMCP) under the President's Malaria Initiative (PMI). The Ministry of Health (MOH)/NMCP would like to make greater use of indoor residual spraying (IRS) as a principal intervention for malaria prevention and control in epidemic-prone areas. In recent discussions, USAID and the NMCP have agreed to use IRS in one epidemic-prone district in 2006 as a demonstration and initial "jump-start" activity under the PMI. USAID and the NMCP agreed to carry out the proposed IRS program in Kabale district, which is an epidemic-prone highland district situated in the extreme south-west corner of Uganda.

Research Triangle Institute (RTI) was assigned to prepare a Pesticide Evaluation Report and Safe Use Action Plan (PERSUAP) and Logistical Needs Assessment for IRS to determine the material, logistical, human resources as well as financial support required for an IRS program to be conducted in mid 2006 in Kabale district.

A team consisting of three consultants specialized in the fields of vector control, epidemiology, medical entomology and environmental science carried out this assessment. The team met officials in the Ministry of Health's National Malaria Control Program and Vector Control Division. The team also met with USAID officials, including Global Health Bureau delegates visiting from Washington D.C.. The team traveled to Kabale district in which IRS operations to be anticipated in 2006 to meet with District Health Office officials and gather detailed information on the at-risk population, field conditions at the proposed spraying sites, infrastructure (such as available storage sites, security conditions, potential insecticide disposal sites, availability of incinerators for waste, etc.), and human and other resources. At the district level, the team had discussions with District Health Office officials responsible for malaria control, health education, maternal and child health, and environmental health. In addition, the team made a reconnaissance visit to the district hospital, one sub-country health center, one sub-county office, and one sub-county village to investigate the ground situation in the IRS target areas (e.g. average household size, proportion of houses with various construction types, etc.). The team had an opportunity to meet the district chief administrator, as well. The team visited World Vision, Malaria Consortium and the WHO country office, gathering their inputs for the proposed plan of action and discussing their possible contributions to the IRS program.

This assessment includes a situation analysis for IRS in Kabale district, detailed logistical and financial requirements for all IRS-related activities including micro-planning, training, logistical arrangements (including storage facilities, health education and community mobilization), as well as supervision, monitoring and evaluation.

1: INTRODUCTION

1:1 Location

Kabale district is located in the South-West corner of the Republic of Uganda, which lies between 29° 45' and 30° 15' East longitude and 1° 00' and 1° 29' South latitude. It borders with the district of Kisoro to the West, Rukungiri to the North, Ntungamo to the East and the Republic of Rwanda to the South.



Figure 01: Map of Uganda showing administrative boundaries and Kabale District

1:2 Administrative Divisions

The district consists of Kabale Municipality as the urban county and Ndorwa, Rukungiri and Rubanda as the three (3) rural counties. The rural counties are divided into 17 sub-counties and 108 parishes which consist of 1322 villages/cells. Kabale municipality has 3 divisions with 12 wards and 75 villages. Altogether this makes three rural counties, one municipality, 120 parishes and 1397 villages. For the purpose of health administration, the above mentioned four sub counties are divided into 7 health sub-counties, namely, Kabale Municipality, Ndorwa East, Ndorwa West, Rubanda West, Rubanda East, Rukungiri South and Rukungiri North (Table:01)

1:3 Population

Based on a 2002 provisional census, the district has projected population of 491,340 for 2006. The provisional census indicates that the sex ratio is 1 male to 1.14 females. During the 2002 census, only 44,106 (9%) lived in the municipality and the remaining

91% lived in the rural areas. The district has 98,268 households (estimated) with an average household size of 5 persons. The district covers a total area of 1,827 square kilometers, the population density is 281 persons per square Km, and it is the third most densely populated district in the country.

Table 01: Health Sub Counties in Kabale District and Population Estimates 2006.

COUNTY	HEALTH SUB DISTRICTS	SUB COUNTY	POPULATION (2006 EST:)
1. KABALE MUNICIPALITY	1. KABALE MUNICIPALITY	1. CENTRAL	15,952
		2. NORTHERN	11,792
		3. SOUTHERN	16,362
2. NDORWA	2. NDORWA EAST	4. BUHARA	26,124
		5. KAHARO	19,512
		6. KYANAMIRA	20,781
		7. MAZIBA	17,718
	3. NDORWA WEST	8. AMUGANGUZI	25,900
		9. KITUMBA	18,801
		10. RUBAYA	27,438
3. RUBANDA	4. RUBANDA WEST	11. BUTANDA	15,369
		12. BUFUNDI	24,829
		13. IKUMBA	34,862
	5. RUBANDA EAST	14. MUKO	41,385
		15. BUBARE	46,132
4. RUKIGA	6. RUKIGA SOUTH	16. HAMURWA	28,725
		17. BUKINDA	20,921
	7. RUKIGA NORTH	18. KAMWEZI	27,207
		19. KASHAMBYA	25,515
		20. RWAMUCUCU	26,015
	DISTRICT TOTAL		491,340

1:4 Topography

The relief of Kabale ranges between the minimum altitude of 1,200 meters and maximum of 3,000 meters above sea level, and has a landscape that generally consists of mountains, highlands, undulating plains, valleys, water lakes, rivers, and marshlands. The three distinguished valleys across the district from South-East to North-West are very important for vector breeding and malaria occurrence.

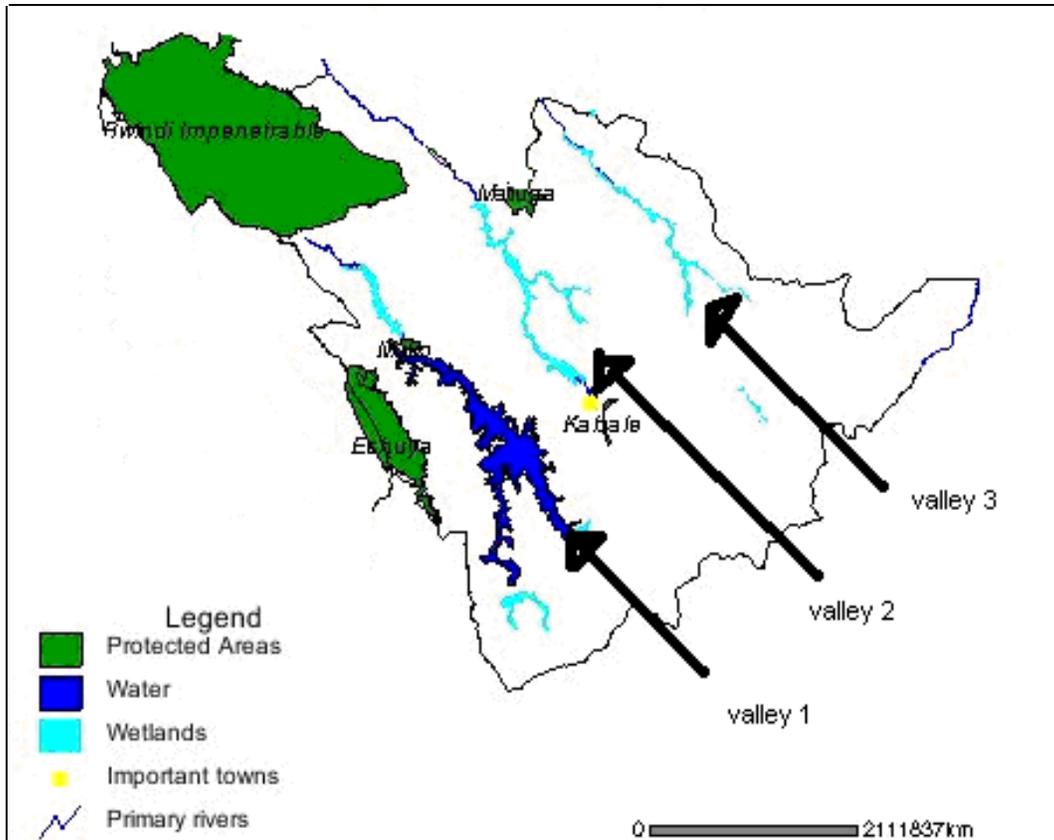


Figure 02: Map showing 3 valleys in Kabale District (Source: PRIME-West; USAID)

1:5 Climate

Kabale experiences a tropical climate all year round with temperatures that rarely go below 15 degrees centigrade or above 30 degrees centigrade. It has two main rainy seasons: March to May is the heavy rain and September to November is the light rain with intervals of some dry spells. The main dry season occurs from June to August, and December to February is the other dry period with mild, scattered rains.

The mean annual rainfall in the district is 1,092 mm and annual maximum temperature is 24.10°C and annual minimum is 11.60°C. The relative humidity in the district ranges between 90% and 100% in the morning and decreases to between 42% and 75% in the afternoon throughout the year (Meteorological Department, Kabale, 2005).

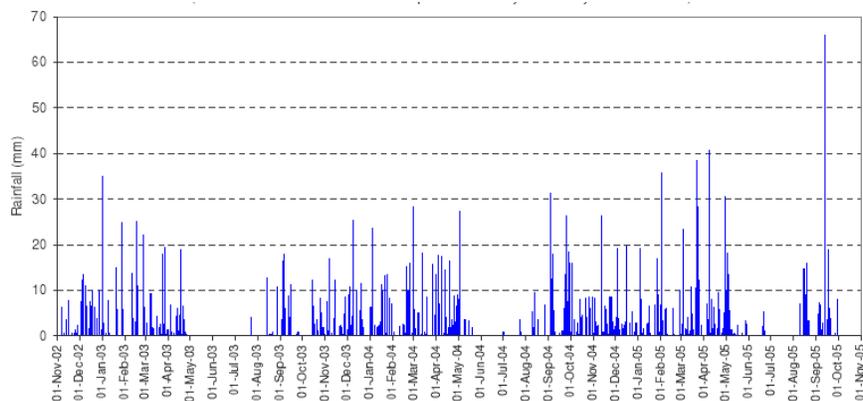


Figure 03: Daily rainfall at Bufundi Health Center III, Kabale District, Uganda

2 MALARIA IN KABALE

2:1 Epidemiology

Malaria is the most prevalent disease in Kabale district, ranking as the number one reported disease, with high morbidity and high economic and social impact to the communities which are mainly dependent on an agricultural livelihood. It is estimated that a single case of malaria in Uganda costs a sum equivalent to 10 working days. The disease is unstable and has great potential for epidemics, mainly in the valleys which were mentioned previously. Although all four species of the parasite exist in Kabale, *plasmodium falciparum* is responsible for over 95 percent of cases. This parasite has shown increasing resistance to both Chloroquine and Sulfadoxine Pyremethamine when used separately as single therapy and more recently as a combination.

It is estimated that 93 percent of the total population in the district are at risk from malaria. The disease is highly prevalent in all valley areas and also has great potential of epidemics due to swamp cultivation of Irish potatoes, flooding and practice of large-scale brick making. Water collected in above mentioned locations, especially burrow pits, furrows in potato plots and cattle hoof prints provide ideal breeding grounds for the vector mosquitoes *Anopheles gambiae s.l.* and *An. funestus*. The valley areas contain reddish clay loamy soil, which retains water for long intervals and is difficult to drain. Such conditions favor vector survival. Table 02 below provides details of potential vector breeding habitats in the most vulnerable sub-counties and parishes in Kabale district.

Detection of clinical malaria cases is usually done by passive case detection. Annually, 250- 300 thousand clinical cases of malaria are reported in Kabale. 90% of these cases are from sub-counties Kamwezi, Bukinda, Kashabya, and Rwamucucu in Rukiga county, sub-counties Hamurwa, Bubaare, and Muko in Rubanda county, sub-counties Maziba Kaharo Kainamira Buhara Kamuganguzi in Ndorwa county and Southern ward of Kabale municipality, where malaria accounts for 30% to 50 % of Kabale Regional Hospital admissions.

COUNTY	SUB COUNTY	PARISH	EPIDEMIC PRE-DISPOSING FACTORS
Rukiga	Kamwezi	Kigara	Swamp cultivation e.g. beans, maize, etc. Area prone to flooding
		Kashekye	Low-lying and prone to flooding – collects all water from surrounding hills
		Rwenyangye	Swamp cultivation e.g. Irish potatoes and other crops
		Kibanda	Many cattle watering wells. Has biggest number of cattle in district. Area is swampy with many hoof prints
	Bukinda	Nyakasiru	Extensive brick making, Swamp cultivation e.g. Irish potatoes
		Nyabirirema	Swamp cultivation e.g. Irish potatoes an also neighbors Nyaksiru Parish with a lot of brick making
	Kashabya	Rutegye	Swamp cultivation e.g. Irish potatoes. Area prone to flooding
		Kitanga	Valley prone to flooding. Some swamp cultivation and fish farming
		Nyakashebeya	Swamp cultivation especially Irish potatoes. Valley prone to flooding
	Rwamucucu	Mparo	Swamp cultivation especially Irish potatoes. Valley prone to flooding
		Noozi	Swamp cultivation especially Irish potatoes and other crops
Kitojo		Swamp cultivation especially Irish potatoes and vegetables.	
Rubanda	Hamurwa	Hamurwa	Swamp cultivation e.g. Irish potatoes.
		Shebeya	Swamp cultivation especially Irish potatoes
	Bubaare	Bubaare	Swamp cultivation especially Irish potatoes. Valley prone to flooding
	Muko	Nyarurambi	Swamp cultivation especially Irish potatoes. Valley prone to flooding
Ndorwa	Maziba	Birambo	Swamp cultivation
	Kaharo	Kaharo	Valley with a stream which is prone to flooding every time it rains
	Kainamira	Nyakagyera	Extensive brick making. Some swamp cultivation e.g. Irish potatoes
	Buhara	Kafunjo	Swamp cultivation especially Irish and sweet potatoes. Valley prone to flooding
		Katanga	Swamp cultivation especially Irish and sweet potatoes. Valley prone to flooding
	Kamugaguzi	Mayengo	Valley prone to flooding. Swamp cultivation especially Irish potatoes and vegetables
		Kisasa	Valley prone to flooding
Kyasano		Swamp cultivation especially Irish potatoes and vegetables	
Kabale Municipality	Southern Ward	Bushoro	Leading parish in brick making in the district and is prone to flooding

Table 02: Malaria Epidemic Prone Areas in Kabale District and Risk Factors

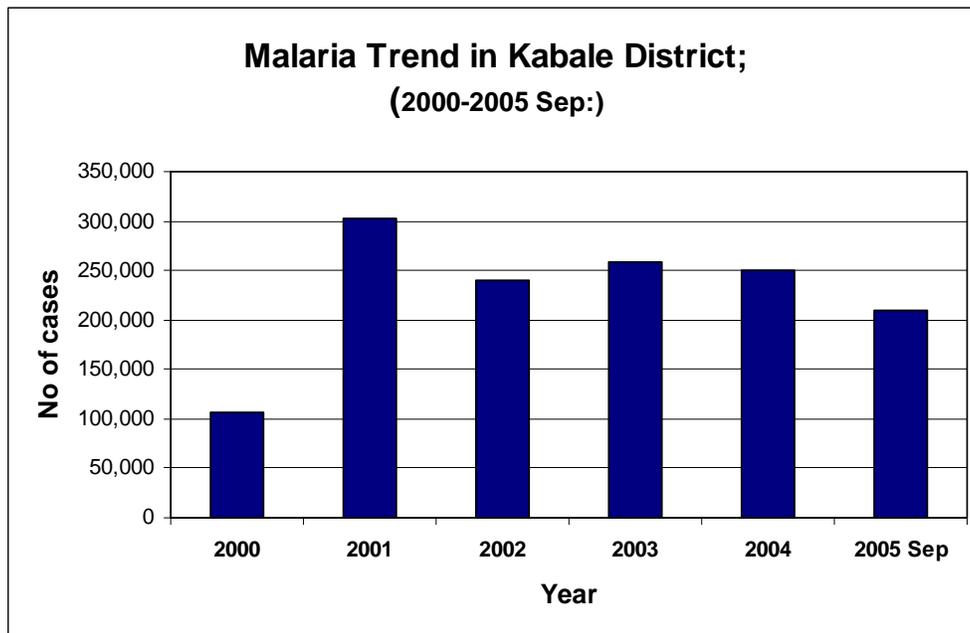


Figure 04: Clinical Malaria Trends in Kabale District from 2000 to 2005 September

Based on weekly clinical malaria data collected by the HIMAL project, it was found that significant epidemics have occurred in February 2002, November 2003 and June-July 2005.

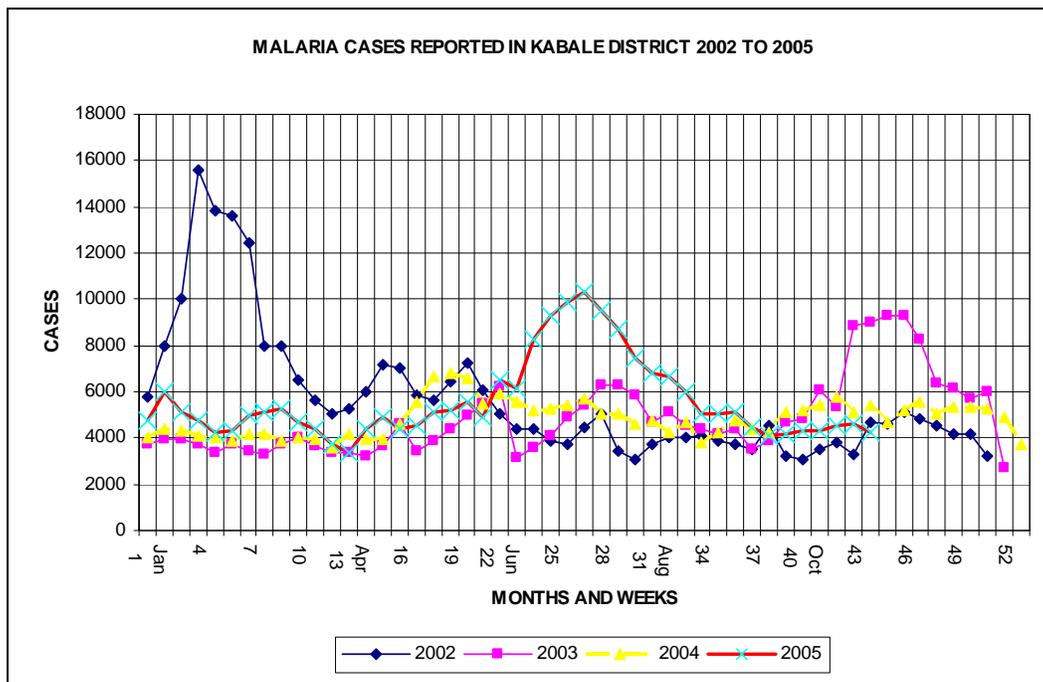
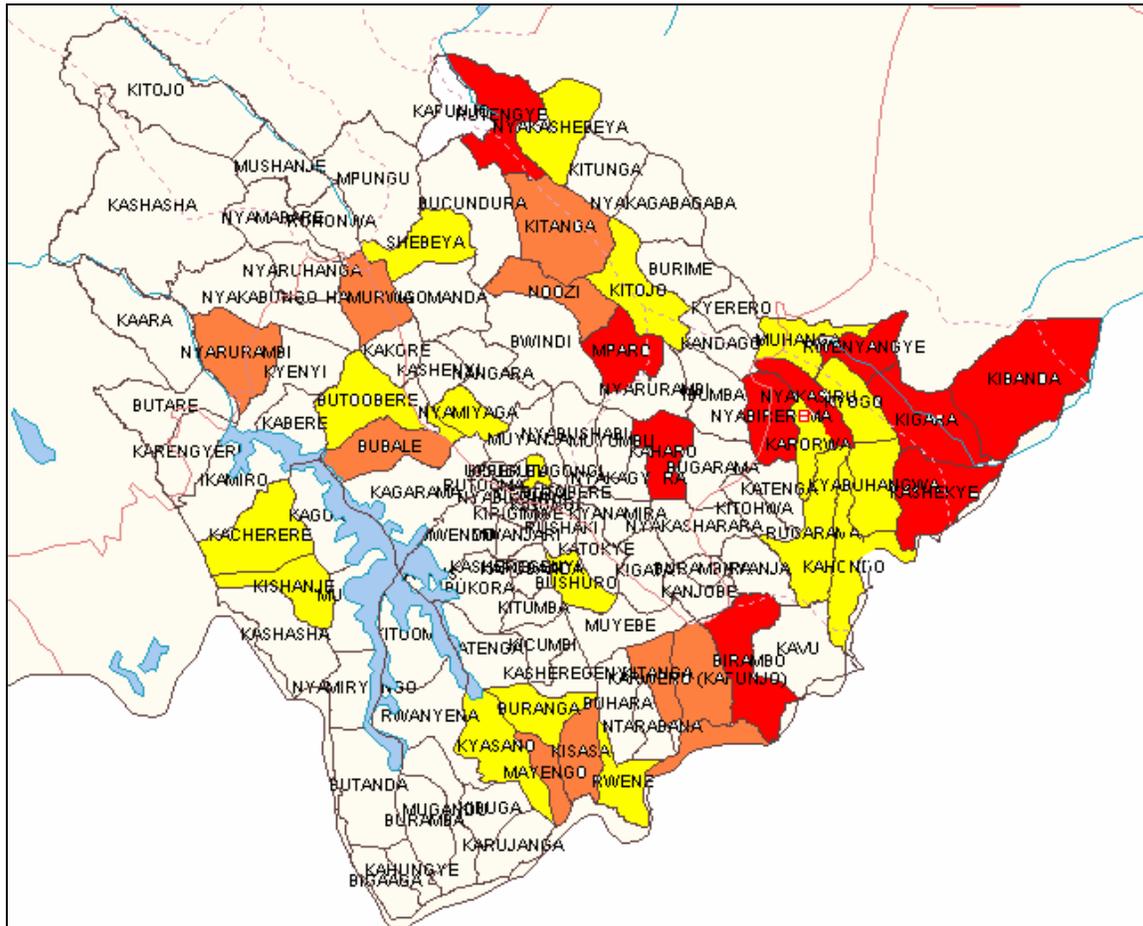


Figure 05; Monthly Malaria Trends, Kabale District, 2000-2005 September

The spatial risk map produced by the District Health Office using available malaria clinical data (2005 up to October) shows very clearly that 3 prominent valleys in the district are highly malarious (Figure 02 and Figure 06). However, District Health Office officials felt that the clinical data is biased as a result of the case detection mechanism, and otherwise whole district has great potential of malaria epidemics.



Red = High risk, Orange= Moderate risk, Yellow= slightly low risk and White = low risk

Figure 06; Malaria Risk Map, 2005 - Kabale District (Data only up to 2005 October)

2.2 Malaria Control Program

2.2.1 Objective and Strategies

Malaria control in Uganda is fully decentralized to districts and carried out as part of primary health care activities. Under the decentralized health system, the district health program functions under the administration of District Director of Health Services. In some areas, given the importance of malaria as a public health problem, malaria control operations may serve to stimulate the development of effective local health systems.

The ultimate goal of malaria control in Kabale is to prevent mortality and reduce morbidity (and consequently social and economic losses) through progressive improvement and strengthening of local and national capabilities. Malaria control is an urgent priority in the district and presently more emphasis is given to case management, IPT for pregnant woman, ITNs and also limited IRS in epidemic risk areas during epidemics.

Moreover, vector control through indoor residual spraying with insecticides has been proven to be highly effective for reducing malaria transmission in Uganda. It therefore is an important component for the district malaria control program in Kabale. The Ministry of Health/NMCP Uganda would also like to implement IRS for malaria control as a component that supplements distribution, scale-up and use of ITNs,

2.2.2 Organization Structure

According to the available organization structure for IRS in Uganda, the District Director of Health Services (DDHS) is the chief administrator to the district health program and the malaria control program is headed by a District Vector Control Officer (DVCO), who is a diploma holder in vector control and specialized in medical parasitology and entomology.

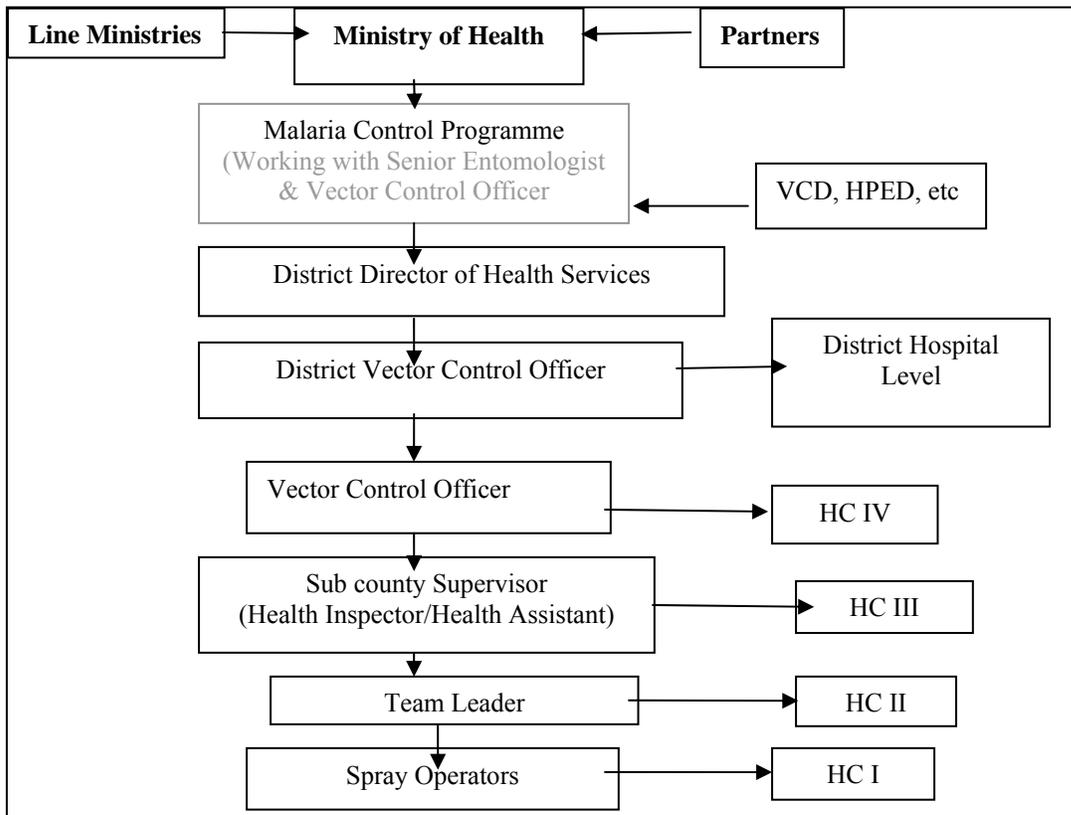


Figure 07: Proposed Organization Structure for IRS in Republic of Uganda
(Reference: IRS Guidelines, MOH, Uganda)

2.2.3 Experience with IRS in Kabale

Under the Malaria Eradication Program between 1959 and 1963, elimination of malaria was nearly achieved in Kabale using DDT (de Zulueta *et. al.* 1963 and 1964). *Anopheles funestus* was practically eliminated while *An. gambiae sensu latu (s.l.)* densities showed spectacular reductions in the sprayed areas resulting in a marked reduction in hospital mortality and hospital admissions due to malaria and outpatient attendance due to malaria. In 2001, targeted indoor residual spraying with lambda-cyhalothrin (ICON™ 10% WP) successfully controlled a malaria epidemic that occurred in the district (IRS Guidelines, MOH, Uganda). In June and July of 2005, a scattered IRS program was conducted in sub-county Rukiga with support from World Vision using ICON™ 10% WP which also controlled the epidemic situation in the area.

2.2.4 Justification for IRS in Kabale

In recent years, a series of malaria epidemics occurred in highland areas of Uganda. In 1992 and 1994, malaria epidemics occurred in Rukungiri and Kabale, and in 1997 occurred in Kapchorwa (Mouchet, *et.al.* 1998; Lindblade, *et al.* 2000). In 1998 most of the low endemicity areas of Uganda and especially highland districts in South-western Uganda experienced a severe malaria epidemic following the El Nino rains (Kilian *et. al.* 1999; Lindblade, *et al.* 1999). This epidemic resulted in high mortality and serious socio-economic consequences. Some of these epidemics were partially controlled using IRS with ICON™ 10% WP (Malaria Control Program Reports). However, the program felt that the magnitude and impact of these epidemics could have been minimized if the epidemics had been forecast and control measures (including IRS) had been used.

The major malaria vectors in Kabale, *Anopheles gambiae s.l.* and *An. funestus* are both highly endophagic and endophilic (feed and rest indoors). They are amenable to IRS because of their behaviour. There is therefore a need to establish an IRS system in malaria epidemic-prone districts. In addition to epidemic-prone districts, IRS will be applied in congested places such as peri-urban areas, IDP and refugee camps, institutions and agricultural and industrial estates. With the great impact seen in malaria case load after IRS and high public acceptance for spraying, the NMCP is keen on conducting larger-scale, well-targeted IRS campaigns in unstable transmission areas.

2.2.5 House Construction Types, Sprayable Structures/Surfaces

The range of house construction types in Kabale district can be classified based on the type and size of the house as given in table below.

Table 03: Description of Typical House Types in Kabale District

House type	Description of Walls	Roof	Number of rooms	Sprayable area (Sq M)
Better	Plastered/smooth Painted	Iron	5-6	200-250
Moderate	Mud/smooth	Iron	4-5	180-200
Poor	Mud/rough	Thatched	1-3	120-150

The type one could be described as “better” houses, which have plastered and painted walls made from bricks. These houses have corrugated iron sheet roofing and cement flooring. The number of rooms varies from 5 to 6, with an average sprayable area of 225 square meters. This type of house may represent 20% of the total houses in the district. Most of the houses in Kabale district (70%) belong to the “moderate type,” which consists of mud, smooth walls and corrugated iron sheet roofing. In general, this type of house has 4-5 rooms, one sitting room, 2 bed rooms and average sprayable area is 200 square meters. The third house type named “poor,” and these houses have 1-3 small rooms with rough mud walls and thatched roofing. The average sprayable area in this house type range from 120- 150 square meters.

There are many associated structures found in many households, such as small, fully or half-covered kitchen with walls (either mud or wood), a toilet with mud- or cement-plastered walls and one or two stick sheds for animals (cow/goat). In some houses the kitchen is within the main house and in some it is a separate structure. If the kitchen is separate, usually it is small and with rough mud walls and a thatched roof. Considering all the house types and their sprayable areas, an average of 200 square meter sprayable area used for the calculations in the Needs Assessment.



(a) Toilet

(b) Kitchen

(c) Animal shed

Figure 06: Associated structures of a typical house in Kabale district, Uganda



Figure 07: A “moderate” house type in Kabale district, Uganda

3 PROPOSED IRS PROGRAM FOR KABALE DISTRICT

3.1 Timing of IRS implementation

The available monthly and weekly malaria case data for last 4 years did not identify clear malaria seasonality in Kabale district. Reasons for this include the quality, reliability and consistency of the data. With experience from the national and district malaria control technical staff, a minor malaria peak was identified just after the April rain and a major malaria peak was identified in November/December after the October rain. The ideal time frames for IRS in Kabale are time frame of February/March or August/September. The malaria control program felt that these time frames are not suitable for IRS because of the rains. They strongly recommended avoiding IRS operations during rainy months because of transport difficulties due to bad roads, households being engaged with their farming activities, and poor household cooperation as a result of the need to move furniture and food-stuffs out of doors..

The program officials felt that the June/July months would be the best period for an IRS campaign in Kabale district. This is because these months are usually dry for Kabale, and most of the residents are available to participate in the program (either as sprayers or by removing furniture and food-stuffs from the home) during the post-harvesting period. Conducting IRS in this period will affect the June/July malaria peak; if ICON-CS™ remains effective for more than 6 months, it could also help reduce malaria transmission during October/November. Therefore, it is planned to conduct the first spray cycle in early June, spanning 2 months until late July.

3.2 The Insecticide of Choice for IRS in Kabala

The MOH/NMCP would like to use ICON-CS™, a new formulation of Lambda-cyhalothrin as the insecticide choice for IRS in Kabale district. The following reasons were given for the selection:

- a) The MOH/NMCP chose to use ICON CS™ based on prior experience with the ICON™ Wettable Powder formulation. However, there has been no entomological evaluation of ICON™ in Uganda, only anecdotal evidence of its impact on malaria transmission.
- b) In Uganda, pyrethroid resistance ranges from 3 percent to 30 percent, depending on the district. In Kabale District, *Anopheles gambiae s.l.* was detected as having 14 percent resistance. The MOH recommends that public health insecticides be replaced when resistance reaches 25 percent.
- c) Lambda-cyhalothrin is currently registered in Uganda for use with IRS, per WHO recommendation. According to the US Environmental Protection Agency, lambda-cyhalothrin is low to moderately toxic, not carcinogenic, readily breaks down in the environment, and does not bio-accumulate. It is registered for use on the following residential non-food sites: general indoor/outdoor pest control (crack/crevice/spot), termiticide, ornamental plants and lawns around homes, parks, recreation areas and athletic fields, and golf course turf (USEPA 1997).

3.3 Human Resource Requirement

The proposed two-month spraying program requires a total of 332 full-time staff. Spraying of 98,268 houses in a single spray cycle requires 12,284 spray-operator days. Completing the campaign within 46 working days, a total number of 267 spray operators need to be deployed. With past experience in the district, the malaria control program suggested that a single spray operator should spray 8 households in an eight-hour working day.

Considering this factor and the geography in the district, as well as condition of road network and other infrastructure availability, it was agreed to have 45 spray teams, each consisting 5-7 spray operators. To lead each spray team, a team leader will be appointed among spray operators. This team leader must have literacy, leadership qualities, supervisory capability, and the ability to work well with the public.

Within each parish, community members will select the spray operators and 45 team leaders that will spray their own communities. The selection criteria for this temporary recruited staff will be developed by the national/district malaria control program. The same procedure will apply to select wash person locally to wash and dry the personal protection equipment daily.

A total number of 20 supervisors which corresponds to the total number of sub-counties will be deployed for day-to-day supportive supervision of IRS activities. One supervisor will be selected within each sub-county to supervise the spray teams. Thus far, seven Health Sub-District Health Inspectors have been identified as potential supervisors, and health assistant, environmental health technicians and vector control technicians will be recruited from the Health Sub-Districts for the remaining supervisory positions. The supervisors will travel between spray teams and will observe spray operators and team leaders in the preparation, application, cleanup, and disposal of IRS waste products during the IRS campaign, as well as data collection.

Table 04: Human Resource Requirement- IRS Program, Kabale District

Category	Number
Spray teams	45
Spray operators	267
Team Leaders	45
Sub county supervisors	20
Total	332

3.4 Logistical needs

3.4.1. Insecticides

The proposed insecticide for this program is ICON-CS™, as described previously. Since this is a new product, the required details are not yet available. Therefore, all estimates in this report were based on ICON 10% WP. According to the estimates, the total sprayable surface in 98,268 houses is 19,653,600 square meters. 4,913 kg of ICON 10% WP are required to spray all the houses.

3.4.2. Equipments

Spray pump: The spray equipment used for IRS will be Hudson X-Pert® sprayers, which are WHO-approved for IRS operations. 314 spray pumps will be needed for the whole operation, and one extra spray pump will be allocated to each spray team for emergency use.

Spare parts for sprayer: A large-scale spraying program needs a set of spare parts for day-to-day repair and maintenance of sprayers. Therefore, following item needs to provide to each spray team:

- Five Extra Spare Nozzle Tips
- Shoulder Strap
- Gaskets
- O-rings

Toolkit*: A toolkit for repair maintenance of sprayers will be provided to each spray unit, and includes the following items.

- Folding Flyer
- Adjustable Spanner
- Screw Driver
- Cutting Knife

Total number of toolkits required is 100 (two sets per each spray team leader- 5-7 spray operators and some for supervisors).

Personal protection equipment*: Each spray operator and the team leader will be provided with the following safety equipment, in accordance with WHO specifications:

- 3 Khaki Overalls
- Broad-rimmed Hat
- Clear Face Shield
- Mouth/Nose Mask (5 unit)
- Hard Rubber Gloves (2 unit)
- Rubber Boots
- Soap (5 unit)

Total number of personal protection kits required is 314.

Safety equipment for wash person* (total 20 sets, one for each sub county wash person)

- 2 Aprons
- 2 Nose/Mouth mask
- 2 Hard Rubber Gloves
- Rubber Boots
- Soap (5 unit)
- 2 Tubs for washing

Other items*

- Filter cloths (534)
- Haversacks for carry insecticides/other equipment (90)
- 10 Barrels for each sub county for progressive rinsing
- Data forms

Materials for Geographical Reconnaissance

- Clip Board* (45)
- Pen* (45)
- Pencil* (45)
- Compass (45)
- Drawing Sheet Set* (30pages) (45)
- GPS/Palmtop Data Loggers (45)
- GR Data Collection Forms* (100,000)

Materials for entomological surveys

- Bio assay Cones (100)
- Light Traps (2)
- PSC Sheets (10)
- Pyrethrum (5 Liters)
- Mosquito Cups (100)
- Stationary *
- Battery and other consumables*

* These items are found available in the market in Kampala

Please refer the attached estimates document for more details.

3.5 Storage and Safer Use of Insecticides

The existing District Medical Store has enough space to store new spray pumps, spare parts, tools, personal protection equipment, and other non-insecticide materials until those items are distributed in the field; however, the district requires a central store for insecticide storage. The Kabale District transport yard, located in Kabale Town, contains a spacious storage facility that will be outfitted for insecticide storage. The facility is in need of renovation, specifically:

1. Replacement of wooden doors with metal doors
2. Installation of an additional door for exiting the facility
3. Roof stabilization/patching holes
4. Replacement of large grates with walls to prevent exposure to rain and entrance of vermin
5. Top and bottom ventilation (with grates/screens to prevent entrance of vermin)
6. Installation of sills and a sump
7. Installation of a partition to separate insecticides from protective equipment
8. Outfitting of small office adjacent to storage facility
9. If soap and a water supply are not available within the storehouse or in the yard, then the storehouse will be outfitted with a supply of clean water and soap
10. If necessary, replace current electrical fittings with those that are mineral insulated or armoured cable with flame/dust-proof fittings (necessary for fire prevention)
11. Provide necessary fire safety equipment
12. Pallets for insecticide stacking

In addition to central storage facility, each sub-county in Kabale District (20 total) need to have temporary space for insecticide and equipment storage. The NMCP suggested using converted cargo containers for this purpose. It is recommended that two containers be provided to each sub-county; one to be used for insecticide, sprayer, barrel and tub storage, while the other to serve as a storekeeper office and storage for personal protective equipment. These cargo containers will be located at the sub-county offices, where guards are posted 24 hours, 7 days per week. If the proposed location site is flood-

prone, then the cargo containers must be relocated at a non-flood-prone site. Each cargo container will be double-locked to deter pilferage.

The cargo container used for insecticide storage will be renovated as appropriate:

1. Construction of roof to shade the container and prevent high interior temperatures.
2. Top and bottom ventilation (with grates/screens to prevent entrance of vermin)
3. Installation of sills
4. Installation of a sump (if feasible)
5. Laying of concrete flooring with bunds for the entire container storage site (to prevent environmental contamination from spills)
6. Electricity (electrical fittings should be mineral insulated or armoured cable should be used with flame/dust-proof fittings, as necessary for fire prevention)
7. If soap and a water supply are not available in the immediate area, then the container will be outfitted with a supply of clean water and soap
8. Pallets for insecticide stacking

(Reference: PERSUAP document, Uganda, 2005; for further information on safety use of pesticides please refer this document)

4. PLANNED ACTIVITIES AND TIMELINES

The table below depicts the planned activities and timeframe for implementation

Table 05: Planned activities and timeline for IRS program in Kabale District

Activity	Dec: 2005	Jan: 2006	Feb 2006	March 2006	April 2006	May 2006	June 2006	July 2006	August 2006
Partner meetings									
Micro planning									
Logistics arrangements									
Development of IEC material/ messages									
Pre-testing IEC materials/messages									
Production of IEC materials									
Preparations for training courses									
TOT (supervisors / team leaders)									
Spray operators training									
Preparations for Geographical reconnaissance									
Baseline ento: survey									

IEC campaigns									
Environmental/ecological monitoring									
Spraying operations									
Geographical reconnaissance									
Field supervision									
GR data entry/ compilation									
Post ento: survey									
Report preparation									

The proposed activities discussed here are eight-fold and include

1. Partner Consultation Meeting
2. Micro planning
3. Recruitment and Training
4. Entomological Surveys
5. Geographical Reconnaissance
6. Awareness and Community Mobilization Campaign
7. Supervision of IRS Program
8. Monitoring and Evaluation

4.1 Partner Consultation Meeting

Once the proposed IRS program is approved and funding is secured, it is recommended that a partner consultation meeting be organized to get wider participation for planning and implementation of the proposed plan of action. This will also allow the program to discuss and identify contributions from various partners.

4.2 Micro planning at the District Level

The next step will be the preparation of a detailed operational plan for parish/village level IRS in Kabale district. It will review all human resources and logistics according to practicability of the program and make all arrangements with parish/sub county level staff/partners. This will be a more comprehensive exercise and it will also identify detail activities, resource requirements, their time frames and responsible entities etc.

4.3 Recruitment and Training

As described under the human resource requirement section, spray operators, team leaders and wash persons will be selected from spray localities by communities according to the guidelines set up by the MOH/NMCP. Selection of supervisors is the sole responsibility of the District Health Office, and these supervisors will be selected for each sub-county in the district.

Training for supervisors, team leaders, and spray operators will be conducted over a 7 to 14 day period. Supervisors and team leaders will participate in a “Training of Trainers” (TOT) course (Three TOTs each for 24 participants), and then train spray operators within their respective Health Sub-Districts. Training will be conducted according to the WHO’s “Manual for Indoor Residual Spraying” (WHO 2002) and H.D. Hudson Manufacturing Company’s “Indoor Residual Spray Team Training: A Cascade Training Guide and Checklist.” Spray operators will receive intensive training on the use, operation, calibration and repair of the sprayers, as well as practical exercises during a 14 day period prior to the beginning of the spraying campaign. This training will occur within fourteen training sessions that will contain 18-20 participants each. The team leaders will receive additional training on personnel management, environmental aspects, entomological monitoring, geographical reconnaissance, and data recording and analysis.

4.4 Geographical Reconnaissance

In order to perform spraying systematically and effectively with adequate coverage ($\geq 80\%$), geographical reconnaissance should be undertaken to make the following information available:

- Map of the district and large scale maps of areas of operation (sub-counties, parishes and villages) showing important ecological and topographical features, land use, road networks, etc.
- Types of structures and total number of structures to be sprayed
- Average size (surface area) of structures to be sprayed
- Total surface area of all the structures to be sprayed
- Total population to be protected, age groups and status e.g. occupation, pregnant mothers etc.
- Social factors (customs and cultural behaviours, etc.) from community surveys

The above information will assist in developing more accurate and comprehensive operational plan that defines the geographical area, the method and procedures of house spraying, duration of the program, personnel required, supplies and estimated cost. This information will be used to calculate the following:

- Amount of insecticide needed
- Duration of the spraying period
- The required logistics, such as spray pumps, spare parts, protective wear, transport, etc.
- Required man power for spraying (e.g. number of spray operators, drivers, etc.)
- IEC and social mobilization requirements for all levels
- Financial estimates.

Under this program, a detailed data collection form will be developed and each spray team leader will use GPS/palmtop data loggers to record the following data:

- Location Details (County, Sub-County, Parish, Village, GPS points for each house)

- Family Data (Names, Ages, Sex, Occupation, Education Level, Pregnancy Status)
- House Data (House Construction Type (walls and roof materials), House Size, Number of Rooms)
- Malaria History (Number of Episodes Last Month/Last year)
- Malaria Control Data (Number Bed Nets, IPT, EM Activities, Distance from Health Facility)
- Resistance Data (Name of any pesticides used in farming).

4.5 Awareness and Community Mobilization Campaign

It was found that community education is a vital component of IRS programs in Uganda because of perceptions of insecticides used for IRS. Therefore, an extensive awareness campaign focusing on the correct information regarding the IRS insecticide used should be conducted to gain public acceptance and achieve high spray coverage. The district health educator and sub-county health educators will lead this component in collaboration with NGOs, CBOs, health center staff and the parish councils. They will conduct sensitization meetings and community mobilization programs in collaboration with NGOs, so households are aware of the IRS campaign, are informed about the dates that spray teams will visit their houses, and advise to cooperate with spray teams.

The NMCP will schedule and sponsor a series of -

- Radio announcements and discussions (talk shows) at local radio explaining the NMCP's IRS related goals and objectives, and how the public needs to be assisted for IRS activities.
- 120 half-day seminars for school teachers and children
- 14 half-day seminars for religious leaders
- 120 half-day awareness programs at the village level involving the Village Administrators, Health Committee, Religious Leaders and other stakeholders
- Produce 5,000 posters for IRS and display in public places in each village.

These activities will include both MOH and NMCP overall community health goals and objectives, while emphasizing a greater awareness of IRS and motivation for greater village-level cooperation and participation in IRS-related activities.

4.6 Supervision of IRS Program

Routine supportive supervision of IRS activities needs to be carried out consistently throughout the spray campaign using appropriate forms and checklists to ensure spray quality, accuracy, and completeness. Three levels of supervision will be included in the campaign:

- National to District/field level
- District to Country/sub country/ village level
- Country/Sub County to village level

The objectives of supervision are;

- To ensure that the approved plan of action is being implemented according to technical guidelines from MOH and the PERSUAP
- To make sure the planned work schedule is strictly adhered to, take corrective measures on-the-spot, especially on technical deficiencies.
- To stimulate, encourage and advise for effective functioning of the field workers.
- To ensure that strict discipline is maintained.
- To assess, evaluate and appreciate the work output of individuals
- To assess the overall performance of the IRS exercise and make recommendations to appropriate authorities for action.

4.7 Monitoring and Evaluation

The following sections detail the views of the MOH/NMCP on monitoring and evaluation of IRS activities at the district level in Uganda.

a. Monitoring

In malaria vector control, monitoring should be a continuous process with the purpose of:

- Correcting actions through planning and re-planning
- Improving actions through enhancing efficiency, performance and quality
- Minimizing human and environmental exposure to IRS insecticides
- Determining effectiveness and controlling costs
- Measuring accomplishments and needs versus time
- Disseminating knowledge and techniques
- Modifying IRS implementation
- Justifying IRS technically, socially, economically, environmentally and politically
- Establishing priorities for resource allocation and IRS activities

b. Evaluation

- Assessing the impact of the IRS on malaria morbidity and mortality.
- Assessing the impact of IRS on people and the environment.
- Assessing the overall performance of the IRS exercise against the plan.

The program monitoring and evaluation will be designed to provide information on:

- Monitoring of IRS process:** documenting whether activities are carried out as planned, to ensure accountability and to detect problems early
- Evaluation of IRS outputs, outcomes and impact:** documenting expected results in terms of improved quality of delivery and coverage (targets), and of the desired changes in vector dynamics, and malaria morbidity and mortality (objectives)
- Evaluation of environmental impacts:** see PERSUAP for details.
- Operational research needs:** answering questions tied to specific problems that require more rigorous studies than simply tracking of indicators.

- v) **Periodic IRS review:** bringing together all the information collected as a basis for re-planning. This includes assessment of broader aspects such as the quality, effectiveness and efficiency of the intervention, its sustainability and management
- vi) **Timing:** timing of the spray round in relation to the onset of malaria transmission season and the estimated duration.
- vii) **Equipment:** status and performance of spraying equipment checked regularly.
- viii) **Operational Costs:** salaries, allowances, equipment, insecticides, transport, etc should all be recorded in order to provide information for cost-effectiveness analysis.

4.8 Indicators for Operational Monitoring and Evaluation of IRS:

The following indicators will be recommended for monitoring and evaluation of IRS activities in Kabale district.

1 Output Indicators:

- Percentage of structures sprayed in relation to targets
- Proportion of the amount of insecticide used in relation to estimated quantities
- The dosage used in relation to recommended application rate
- Refusal rate per spraying cycle
- Absentee rate per spraying cycle

2 Entomological Indicators:

- Persistence of insecticide on treated surfaces using bioassays
- Vector susceptibility status to insecticides used
- Anopheline indoor and outdoor resting density
- Indoor and outdoor night biting rates

3 Outcome/Impact Indicators:

- Reduction in out-patient department (OPD) attendances
- Reduction in in-patient (IP) admissions
- Reduction in malaria related mortality

3 Environmental Indicators

- See PERSUAP for details

5 ROLES AND RESPONSIBILITIES OF VARIOUS STAKEHOLDERS FOR IRS IN KABALE

This section summarizes the roles and responsibilities of various levels/partners for IRS programs in Uganda. This guideline document was recently developed by the MOH/NMCP.

1 Ministry of Health and Malaria Control Program

The NMCP and MOH will develop IRS-related standards and guidelines, IEC materials/messages, and tools for monitoring and evaluation related to IRS. Provide technical assistance; conduct basic technical training, monitoring, evaluation and quality assurance of IRS and also coordinate and conduct operational research on IRS.

2 District Director of Health Services (DDHS)

The DDHS office will be involved in planning, implementing, managing, coordinating, monitoring and evaluating IRS activities as well as social mobilization and IEC. The office will be responsible for estimates for operational requirements and equipment. They will recruit and manage appropriate personnel, identify training needs for them, and conduct training in collaboration with NMCP. Report progress to district council and to the MOH/NMCP also a part of responsibility of this office.

3 District Vector Control Officer (DVCO)

District Vector Control Officer will be responsible for the day-to-day running of IRS field activities, coordination of geographical reconnaissance and mapping of operational areas, participation in training of personnel, and supervision of IRS operations as well as the entomological impact assessment.

4 Vector Control Officer at Health Sub District

This officer will organize and coordinate day-to-day implementation of IRS activities in the Health Sub District (HSD) and responsible/report to the HSD in-charge. The officer's main responsibility will be to make sure all activities are in place according to the plan and will conduct supervision, monitoring and evaluation of IRS activities. In addition, the officer will compile IRS field reports and reports to the HSD in-charge and DVCO.

5 Sub-county Supervisor (Health Inspector/Health Assistant)

Each supervisor will report to Health Center (HC) III in-charge (i/c) of the sub-county where he/she is based. The supervisor's main responsibility is to supervise spray teams in the sub-county and ensure the quality of spraying. The supervisors will work with existing community-based structures (e.g. Village health Teams (VHTs), Parish Development Councils (PDCs), etc.) to maximize community mobilization and sensitization (to ensure participation and ownership which will lead to the success of IRS activities). Each supervisor will participate in the recruitment of spray operators and ensure proper storage and distribution of insecticides and spray pumps. The other responsibilities are assist spray operators on minor spray pump repairs and maintenance and prepare technical reports to the HC III in-charge, Sub county Council and the Health Sub District Vector Control Officer. In addition, these supervisors will supervise wash persons' activities and make sure they follow the PERSUAP mitigation recommendations.

6 Spray Team Leaders

The team leaders to manage and supervise each spraying unit will be selected among the spray operators during training who has qualification to be a team leader according to the guidelines set up by the MNCP.

- Reports to the Sub-county Supervisor
- Supervises spray operators
- Distributes insecticides and arranges for the security of insecticides and spray pumps
- Makes spraying reports including recording type and amount of insecticide used per house sprayed and other data as indicated in the Team Leader's Daily Record Form
- Enforces health and environmental safety mitigation measures (as described in the PERSUAP) and discipline among spray operators

7 Partners' contribution

The program will seek material and technical assistance from other partners in the areas of M & E, training, research, quality assurance, environmental/ecological monitoring, development of guidelines and standards, etc. World Vision supported some IRS operations in the district last year. They provided insecticides (ICON 10% WP), personnel protection equipment, and training and payments for spray operators. They also mobilized their field staff and volunteers for community sensitization campaigns. The following partners were identified for supporting IRS operation in Kabale district.

Partners	Possible contributions
World Vision, Uganda	Health education/community mobilization
Red Cross Society	Health education/community mobilization
Prime West Project	GIS and risk mapping for malaria
Malaria Consortium	Technical assistance and support for logistic management
WHO, Uganda office	Supervision, monitoring and evaluation, and technical assistance to IRS in following areas Policy/guideline development Malaria risk mapping/stratification, Epidemic preparedness and response Training on IRS Monitoring and evaluation
The Global Fund	The Global Funds allocated 1.3 million US dollars for procurement of spray pumps, spare parts, insecticides, training and BCC related to IRS in the country.

6 RECOMMENDATIONS

- 1 Train national and district malaria control officers in data management in relation to GR and IRS.
- 2 Use HIMAL data base and Prime West GIS facilities for mapping malaria risk in Kabale and utilize that information for planning purposes.
- 3 Develop and implement a data recording system for IRS.
- 4 Investigate and implement strategies to prevent insecticide pilferage.
- 5 Get involvement of other government and non-government agencies including communities for planning and implementation of IRS activities.
- 6 Train relevant staff for logistical management.

7 BUDGET

The table below summarizes the funds required for the IRS program in Kabale district, which is going to be implemented in early 2006. All estimates were calculated according to the current market prices and rates that MOH/NMCP and USAID-Uganda recommended (please refer Annex 2; **Sheet: 01** for assumptions/rates considered in the estimates). In this exercise, some options were presented for transport and number of spray rounds to decide later if funds restricted or limited.

The total budget for implementation of proposed IRS related activities with purchased vehicles will be 1.38 million US dollars and greater part of the budget consumed by insecticides (45%), transport (22%) and equipments including personal protection equipments (15%).

If the required trucks are hired and sub-county supervisors are paid transport allowances, the budget can be cut down by 20% (\$257,475) from the total cost. According to the estimates, spraying an additional round in 2006 will cost an extra \$809,302 if vehicles are purchased for the program, and \$847,823 if vehicles are rented.

Item no	Cost item	Cycle 1	Cycle 2
		in US Dollars	
1	Allowances: Spray operators/wash persons	61,157	61,157
2	Subsistence: Supervisors	8,003	8,003
3	Training: Supervisors/Team Leaders & spray operators	39,905	
4	Equipment	143,841	
5	Insecticide	621,054	621,054
6	Storage	85,450	
7,a	Transport: Purchase vehicles	300,692	3,855
7,b	Transport: Rent/payments	42,376	42,376
8	Personal Protection Equipment (PPE)	74,176	74,176
9	IEC/ Community Mobilization	31,962	
10	GR and Entomological monitoring	16,057	16,057
11	Environmental/Ecological monitoring (prelim. est)	25,000	25,000
Total (if vehicles purchased)		1,406,459	809,302
Total (if vehicles rented)		1,148,980	847,823

The accompanying budget is divided into 10 categories according to the program components previously described (Please refer to attached Excel Program budget formula for further details; sheet nos. 4-8)

1. Allowances - identifies payments the allowances for team leaders, spray operators and wash persons and subsistence for spray team supervisors. A daily allowance of 7,000 UG Sh is provided for both spray operators and wash persons and 8,000 UG Sh for team leaders for the days that they actually worked. These rates were based on the current market price in the country and consider the payments made last year for such staff engaged in World Vision-supported IRS campaign in the district.

2. Subsistence – identifies the daily meals and incidental payments (Per Diem) eligible to the government officials who are going to be involved in the supportive supervision activities to the program. All supervisors’ payments are calculated according to the USAID rates that apply to the Government Officials in Uganda. In this section, supervisor means national level supervisors for the districts and levels below, district supervisors to sub county/villages and sub county supervisors to the villages.

3. Training - identifies costs associated with training courses for team leaders/supervisors and spray operators, the central storage facility storekeeper— related Per Diem, resource payments, venue rent, stationeries and transport to and from the designated training venues.

4. Equipment – Cost for sprayers, tools and spare parts for performing IRS-related activities in each village, as previously described.

5. Insecticides – Bulk purchasing of 4,913 kg of ICON™ 10% WP (or ICON-CS™) at a rate of US\$ 126.4 per kg (total cost \$621,054). The cost excludes other insecticide purchase related expenses such as storage, transport, demurrage, etc.

6. Storage – As previously described, cost under storage covers renovation of district warehouse in Kabale and cost related to convert used cargo containers for stores, two containers will renovate per each sub county cost US\$85,450.

7. Transport – As previously discussed, this has two estimates. The first includes the purchase of 8 trucks , 20 motor cycles, and fuel costs for all vehicles (assuming average daily travel distance of 35 kilometers per vehicle). This also includes government subsistence payments for 8 divers for 48 days at UG Sh 3,000. The second estimate includes the hiring of 8 trucks, provision of fuel for those trucks, and an additional payment for supervisor transport. The main assumption made here is that the government or the owners of the vehicles bear the cost for repair and maintenance.

8. Personal Protection Equipment – This includes bulk purchasing of personal protection equipment such as overall/apron, boots, gloves, mouth/nose masks, clear face shields and soap for spray operators/team leaders and wash person. The materials needed

for washing spray operators' cloths, decontamination materials, tubs and barrels for progressive rinsing also included to the budget under this heading. In addition, cost for training clinicians on pesticide poisoning management and purchase of medicines required to manage such patients is also included.

9. IEC/community mobilization – identifies all costs for the proposed awareness campaign and community mobilization activities. Five items are identified with a fixed cost associated to each event or purpose. For example, it is assumed that one weekly radio broadcast (or 14 total broadcasts) will occur to explain the IRS-related goals and educate the public to seek their corporation to maximize spray coverage. Similarly, 120 school seminars will be scheduled and undertaken at a cost of 100,000 UG Sh per school. 14 religious leaders' seminars at a cost of UG Sh 300,000 per one seminar and 120 parish level awareness programs at a cost of UG Sh 100,000 per program. These funds are for refreshment, transport, training materials and any other appropriate expenses deemed necessary by the malaria control program. Also included is the budget for production of 10,000 posters. This will include cost for design, pre-test and production. All other identified items are self-explanatory and deemed necessary.

10. Surveys and entomological monitoring - As previously discussed, one geographical reconnaissance (GR) and two entomological surveys need to be conducted in this program, and cost US\$ 16,057. Because GR coincides with the spray operation, it will not cost much to the program. Funds will only be needed for GPS, data forms and other related stationeries. The baseline and post-entomological surveys include cost for personnel, transport, laboratory consumables, and rental costs for a field station.

11. Environmental/ecological monitoring – monitoring of pesticides will be conducted to determine the environmental impact of the IRS campaign. The cost includes the design of the monitoring plan, collection of samples, lab work, and data analysis.

REFERENCES

De Zulueta, J, Kafuko, G.W., McCrae, A.W.R., Cullen, J.R., Pedersen, C.K. and Wasswa, D.F.B. 1964. A malaria eradication experiment in the highlands of Kigezi (Uganda). *East African Medical Journal*, 41 (3), 102-120

H.D. Hudson Manufacturing Company. Indoor Residual Spray Team Training: A Cascade Training Guide and Checklist

Kilian A.H.D., Langi, P., Talisuna, A. and Kabagambe G. 1999. Rainfall pattern, El Nino and malaria in Uganda. . *Transaction of the Royal society of Tropical medicine and Hygiene*, 93 22-23.

Lindblade, K.A., Walker, E.D. and Wilson, M.L., 2000. Early warning of malaria epidemics in African highlands using Anopheles (Diptera, Culicidae) indoor resting density. *Journal of Medical Entomology*, 37: 664-674.

Lindblade, K.A., Walker, F.D., Onapa, A.W., Katungu, J. and Wilson, M.C. 1999. Highland malaria in Uganda: prospective analysis of an epidemic associated with El Nino. *Transaction of the Royal society of Tropical medicine and Hygiene*, 93 (5): 480-487.

Ministry of Health, Republic of Uganda, 2005. Guidelines on indoor residual insecticide spraying (IRS) for national and district managers.

Mouchet, J., Sircoulon, J., Manguin, S., Onapa, A.W. and Lowenture, S 1998. Evolution of malaria in Africa for the past 40 years: Impact of climatic and human factors. *Journal of American Mosquito Control Association.*, 14 (2): 121-130.

Research Triangle Institute, 2005. Pesticide Evaluation Report and Safer Use Action Plan (PERSUAP) for IRS for malaria control in Uganda.

World Health Organization (WHO), 2002. Manual for Indoor Residual Spraying: Application of Residual Sprays for Vector Control (WHO/CDS/WHOPES/GCDPP/2000.3).

ANNEXES

Scope of Work

Uganda: Environmental Assessment and Logistical Needs Assessment for Indoor Residual Spraying

Under RTI Project No. 08954.001.100.XXX

Background

The U.S. Agency for International Development (USAID) intends to offer technical and financial support to Uganda's National Malaria Control Program (NMCP) under the President's Malaria Initiative (PMI). The NMCP would like to make greater use of indoor residual spraying (IRS) as a principal intervention for malaria prevention and control. In recent discussions, USAID and the NMCP have agreed to use IRS in at least one epidemic-prone district early in 2006 as a demonstration and initial "jump start" activity under the PMI.

Under the Integrated Vector Management Task Order, RTI International, Inc. (RTI) has prepared planning assessments to support IRS activities in several countries (Eritrea, Angola, Zambia). RTI is also preparing a global Programmatic Environmental Assessment of IRS and other malaria vector control methods. USAID has asked that RTI provide similar support to the anticipated IRS activity in Uganda.

Purpose

RTI will prepare two assessments to support preparations for an indoor residual spraying program to be conducted in 2006 in at least one epidemic-prone district in Uganda:

- A Pesticide Evaluation Report and Safe Use Action Plan (PERSUAP) to support USAID's environmental review as required under 22 CFR 216;¹ and
- A Logistics Needs Assessment, to identify the material, logistical, and financial support required for an IRS program of the scope anticipated.

Proposed Team

RTI proposes the following team for this assignment.

- Dr. Gunewardena (Team Leader) is an epidemiologist and medical entomologist with over 15 years experience managing malaria control operations as a senior Regional Malaria Officer in Sri Lanka. He served as RTI's resident advisor to the malaria control program in Eritrea from 2004-05.

¹ This Scope of Work assumes that the MOH intends to use the insecticide lambda cyhalothrin (ICON ®) in the IRS demonstration program. Under this circumstance, USAID's environmental review requirements may be satisfied by preparing an Initial Environmental Examination (IEE), augmented by the PERSUAP. This level of review may not be sufficient to satisfy the requirements of 22 CFR 216 if other insecticides will be used.

- Ms. Biscoe is the principal author of USAID environmental review documents for malaria vector control in Eritrea, Angola, and Zambia, as well as the global Programmatic Environmental Assessment for Integrated Vector Management. She holds an MS degree in Environmental Management from Duke University.
- Mr. Lluberis is a medical entomologist with over 20 years' experience in vector control, including 10 years with the US Navy and subsequent years as an international advisor working for the H.D. Hudson Manufacturing Co., makers of the Hudson Expert ® compression sprayer, the industry standard for use in IRS. Mr. Lluberis has consulted with public and private clients on vector control activities in over 25 countries in Africa, Asia and Latin America, often in close coordination with WHO regional offices and programs.

USAID may also wish to invite Mr. David Kinyua of the REDSO/ESA office, and/or Dr. John Chimumbwa of the Roll Back Malaria Partnership Secretariat, ESARO office to participate in these assessments. Mr. Kinyua is the cognizant regional environmental advisor for Uganda; Dr. Chimumbwa contributed to the evaluation of potential vector control activities during the recent PMI planning meetings

Workplan

Week 1. Dr. Gunewardena and Ms. Biscoe will travel to Kampala to meet with representatives of the NMCP and USAID to clarify the scope and scale of IRS operations proposed as part of the PMI first year program, and with representatives of the relevant regulatory agencies within the Government of Uganda to confirm the requirements related to pesticide usage in Uganda and the current regulatory status of ICON®. They will then travel to the district(s) in which IRS operations are anticipated in 2006 to gather detailed information on field conditions at the proposed spraying sites, infrastructure (such as available storage sites, security conditions, potential insecticide disposal sites, availability of incinerators for waste, etc.) and human and other resources. They will obtain from local officials or recent demographic surveys estimates of the population, household size, and proportion of houses of various types of construction in the IRS target areas.

Week 2. Dr. Gunewardena and Ms. Biscoe will return to Kampala to evaluate the information collected and prepare draft versions of the PERSUAP and Logistical Needs Assessment. Mr. Lluberis will join the team in Kampala to assist in preparing the assessments. The full team will meet with USAID staff responsible for supervising the PMI program and for approving the environmental review, to report their findings and provide clarifications. They will also meet with representatives of the NMCP and relevant regulatory agencies, together with USAID staff to report their findings and clarify steps that will need to be taken before and during IRS operations to satisfy the requirements of the PERSUAP.

Post-Travel. Ms. Biscoe will make additional revisions to the PERSUAP as required to ensure its approval, and will obtain input as needed from other team members and other sources.

Duties

D.M. Gunewardena will perform the following duties:

- Work with the MOH and USAID/Uganda to determine the intended scale of the National Malaria Control Program's IRS operations, and how such operations interact with other vector control activities.
- Lead the team's effort to gather information necessary for preparing the Logistical Needs Assessment, including evaluating the availability of adequate storage and staging facilities, transport, trained supervisors, spray team members, and training facilities. He will also contact local suppliers of the selected insecticide, compression sprayers, personal protective equipment, and other supplies to verify prices and availability of material.
- Prepare the draft and final Logistical Needs Assessment documents.

Melanie Biscoe will perform the following duties:

- Determine the status of environmental reviews for other USAID work in vector and pest control as relevant for acquiring information on pesticide practices in Uganda.
- Determine the status of the in-country environmental assessment being conducted by Uganda's National Environmental Management Authority (NEMA) for IRS, including the potential use of DDT and conjoin USAID's efforts with NEMA's if and as appropriate.
- Determine the status of environmental assessments for other donors' vector control interventions, and conjoin USAID's efforts with those other donors' as necessary.
- Acquire information on insecticide procurement, transport, storage, handling, disposal, and other IRS issues in RTI's IVM Environmental Assessment Checklist.

Manuel Lluberas will perform the following duties:

- Assist in preparation of the Logistical Needs Assessment, in which he determines the volume of insecticide (DDT), number of sprayers, number of personnel, amount and type of personal protective equipment (PPE), amount and type of transport, and amount and type of logistical support necessary for implementing USAID/Uganda's proposed IRS activities.
- Develop a budget for USAID/Uganda's proposed IRS activities.
- Provide input to the PERSUAP for USAID/Uganda's proposed IRS activities.

Deliverables

- Draft PERSUAP – upon departure from Uganda o/a November 15
- Revised PERSUAP – by November 30, 2005
- Logistical Needs Assessment – upon departure from Uganda o/a November 15