HARMONIZED GUIDE FOR TRAINERS OF TRAINERS FOR IRS IN THE SADC ELIMINATION EIGHT REGION

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FIRST EDITION
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The Elimination 8 Initiative (E8) is a coalition of eight countries working across national borders to eliminate malaria in southern Africa by 2030. As the malaria subsidiary arm of the Southern Africa Development Community (SADC), the E8 is pioneering an ambitious regional approach and driving collective action to end this deadly disease once and for all. Guided by the belief that countries are stronger when they work together, the E8 is building a model that will inform coordinated efforts in southern Africa and beyond.

The SADC-MEES is a subsidiary agency of SADC and serves as the inter-governmental organisation's malaria elimination coordinating entity. Indoor residual spraying (IRS) is the key intervention under the SADC MEES Strategic Plan 2015-2020.

From 2000 to 2012, malaria significantly decreased in the Region and this was followed by a 2012-2015 period of stagnation. From 2017, however, the countries experienced major malaria outbreaks. Assessment of the outbreaks identified poor IRS coverage and quality due to inadequate skilled workforce resources including supervisors and spray operators as part of the drivers of the malaria outbreaks. In response to address the identified challenges, SADC MEES developed an Acceleration Plan (2018-2020) which aims among other activities, at scaling up the training of IRS workforce supervisors and spray operators using a harmonized regional training of Trainers of Trainers (TOT). It was against this background that the SADC Elimination Eight Regional Trainers of Trainers’ Guide was developed to standardise training materials, training techniques and operational techniques in the region.

In preparing this manual, care was taken to ensure consistency with existing E8 countries' IRS manuals and guidelines as well as WHO and other related IRS best practices guidelines. The Trainers of Trainers Manual covers topics that include malaria and mosquito control; IRS overview, IRS operations; insecticide and safety; maintaining and caring of IRS equipment; preparing to spray, environmental compliance; advocacy and community mobilization; supervision, monitoring and data management.

It is hoped that this Manual will contribute to the effective harmonised training and operations to meet IRS standard best practices towards malaria elimination in the SADC Region.
# Abbreviations

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Description</th>
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<tr>
<td>BMP</td>
<td>Best Management Practices</td>
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<tr>
<td>CFV</td>
<td>Control Flow Valve</td>
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<tr>
<td>CS</td>
<td>Capsulated Suspension</td>
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<tr>
<td>DDT</td>
<td>Dichloro-Diphenyl-Trichloroethane</td>
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<tr>
<td>E8</td>
<td>Elimination Eight</td>
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<tr>
<td>FEFO</td>
<td>First In, First Out</td>
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<tr>
<td>FIFO</td>
<td>First In First Out</td>
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<tr>
<td>IEC</td>
<td>Information, Education, and Communication</td>
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<td>IRS</td>
<td>Indoor Residual Spraying</td>
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<tr>
<td>IVM</td>
<td>Integrated Vector Management</td>
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<tr>
<td>LD50</td>
<td>Lethal Dose 50</td>
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<tr>
<td>LLINS</td>
<td>Long-Lasting Insecticide-Treated Nets</td>
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<td>MEES</td>
<td>Malaria Elimination Eight Secretariat</td>
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<tr>
<td>MSDS</td>
<td>Material Safety Data Sheet</td>
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<tr>
<td>M&amp;E</td>
<td>Monitoring and Evaluation</td>
</tr>
<tr>
<td>PMI</td>
<td>U.S. President’s Malaria Initiative</td>
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<tr>
<td>PPE</td>
<td>Personal Protective Equipment</td>
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<tr>
<td>PQ</td>
<td>WHO Prequalified</td>
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<td>SADC</td>
<td>Southern Africa Development Community</td>
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<tr>
<td>TOT</td>
<td>Training of Trainers</td>
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<tr>
<td>WHO</td>
<td>World Health Organization</td>
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<tr>
<td>WG</td>
<td>Wettable Granules</td>
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<td>WP</td>
<td>Wettable Powder</td>
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ACKNOWLEDGEMENTS

The Harmonized Regional Trainers of Trainers Manual for IRS was developed through a consultative process involving WHO (AFRO and IST/ESA), SADC MEES and E8 countries.

The work was financially and technically supported by WHO/AFRO through the recruitment of a consultant to draft the document in close consultation with SADC MEES and E8 countries.

The E8 countries provided requisite supporting documents for the development of the Harmonized IRS Trainers of Trainers Manual in the Region. Member States also contributed virtually to the technical content of the document through skype meetings during the document development process.

SADC MEES and WHO provided the initial and final review of the draft manual and will continue to contribute to future revisions of the final document.
ABOUT THIS IRS TRAINERS OF TRAINERS MANUAL

This Trainers’ of Trainers Manual is designed to guide training of individuals who will train supervisors, spray operators, storekeepers, and community mobilizers. The course focuses on building IRS training facilitation skills that are necessary to train the IRS implementing workers. The manual concentrates on essential IRS concepts and applications. Elements of the manual may vary by location according to your participants’ needs, country requirements, and other factors.

TRAINING DURATION

The standard time for the course is five days.

COURSE GOAL

To harmonize training capacity for IRS Trainers and supervisors in the SADC E8 region who can effectively explain and demonstrate IRS best practices for spray operators in their local country setting within the Region.

TRAINING OBJECTIVES

By the end of the workshop, IRS trainers will be able to:
- Describe the Trainers’ Trainers Guide package for IRS implementers
- Correctly explain and demonstrate key technical skills for IRS supervisors, spray operators, storekeepers, and community mobilizers
- Explain key elements of IRS operations necessary for supervision

COURSE CONTENT

The training content is compatible with existing SADC E8 countries’ IRS Training Manuals and Guidelines, WHO operation Manual and PMI BMP. There are 13 sessions. Training will rely on lectures, demonstrations, exercises, and group discussions covering the following sessions:

- Session 1: Malaria and Mosquito Control
- Session 2: IRS overview
- Session 3: IRS Operations and Campaign Design
- Session 4: Introduction to Insecticides and Safety
- Session 5: Familiarizing the Trainee with Equipment
- Session 6: Mixing Insecticide and marking Structures
- Session 7: Preparing to Spray
- Session 8: Establishing Correct Spray Techniques
- Session 9: Sprayer Maintenance and Storage
- Session 10: Building Communication Skills for Community Mobilization
- Session 11: Environmental Compliance and Human Health Safety
- Session 12: Data Collection, Reporting and data Quality Assurance
- Session 13: Measuring IRS Performance
PARTICIPANTS

The target cadre of this training is public health workers at national and sub-national levels in the E8 countries. The training is designed, in particular, for trainers of trainers of IRS supervisors, spray operators including storekeepers, community mobilizers and other IRS implementers. Other cadres with an interest and background in public health and malaria prevention may also benefit from this training. Selection of participants will be the prerogative of E8 countries but will be on the basis of their current work in health or involvement in malaria activities at national or subnational levels. The ideal number of participants/trainees per class session is 25-30, with a minimum of two experienced master trainers. Annex 1 is an example of a five-day training schedule.

TRAINERS OF TRAINERS

Experienced IRS staff at national and sub-national levels who have at least 2 years of experience facilitating one or more of the national IRS training workshops for spray operators. The recommended number of trainers of trainers for the training of trainers’ course is one trainer/facilitator for every 20-30 participants.

PRE- AND POST-TRAINING ASSESSMENT

Pre- and post-training assessments are recommended for this course. The pre-training assessment helps the facilitator better understand the level of knowledge and experience participants have when they enter the course, indicating areas where additional emphasis may be needed. The post-course assessment affirms that participants have gained the required knowledge and reached the required level of competency.

The pre-assessment should be administered just after the welcome and introductions and before Session one. The time allocated for the assessment is 30 minutes. Facilitators should score the pre-training assessment during Day 1 and summarize and verbally share key findings with participants. To ensure the assessment questions stay confidential, facilitators should not allow participants to keep the pre-training assessment.

The post-training assessment should be administered after the review session, as it is designed to help participants recall critical learning. Allocate 30 minutes for the post-training assessment. This assessment may be graded during the break or after the course has finished. Share scores with participants, but participants should not be permitted to keep a copy of the assessment.

TRAINING DOCUMENTS

- IRS Training of Trainers’ Guide (this document)
- National IRS Training Manuals and or Guides
- WHO Guidelines for Malaria Vector Control
- WHO IRS Operations Manual
- PMI Best management Practices (BMP) for IRS
- Materials Safety Data Sheets for the insecticides to be used
- Compression Sprayer Manuals
- Data Collection and Reporting Tools
- Supervisory Checklist(s)
PREPARING MATERIALS

Prepare all materials before the training begins. Supplies, equipment, and instructional materials needed during the training with quantities based on a class size of 30 participants.

PREPARING FOR THE TRAINING

Conduct the following at least four weeks in advance:
- Estimate the number of participants for the course.
- Identify facilitators for the course.
- Send invitations to participants.
- Identify the training venue. If possible, visit the training room to assess space available for spray practice and the need for a sound system. Ensure the venue can accommodate the needs of all participants.
- Procure materials for the course. For practice sessions, participants will need personal protective equipment (PPE) and compression sprayers (1 set shared between 2 people).

Conduct the following at least two weeks in advance
- Invite a guest speaker to open and close the workshop.
- Share the Facilitator's Guide and course materials with the facilitation team (in digital form).

Conduct the following at least one week in advance
- Assess whether translation will be needed (live, as sessions are delivered).
- Identify areas of the curriculum that need to be adapted to the local context. Give special consideration to:
  ◘ Data collection procedures
  ◘ Forms and paperwork
  ◘ Transportation arrangements
  ◘ Specific problems or challenges facing the country program (these areas can be given increased emphasis during the training)
- Print facilitator's guides, participant materials, and handouts.
- If conducting the field simulation, identify several houses near the training venue (1 house for every 5-10 participants). Work with community leaders to identify houses and obtain oral or written permission to use them during the course.

Conduct the following at least one day in advance
- Prepare participant folders, inserting the following handouts in each folder:
  ◘ Pre-course assessment
  ◘ Training schedule
  ◘ Daily feedback forms
  ◘ End-of-course feedback forms
- Place a participant folder, notebook, and pen at each participant's place.
- Confirm equipment needed for the training is available and ready for participants' use.
- Make sure all elements of required PPE are available and sprayers are fully assembled, with all parts, including the control flow valve (CFV).
- Identify the wall that will be used for spray practice.
REQUIREMENTS FOR A CLASS OF 30 TRAINER PARTICIPANTS

For lecture sessions:
- Ballpoint pen (30)
- Pencil with eraser (30)
- Black marker (30)
- Blank flip chart (3 with 20 sheets each)

For exercise sessions:
- Compression sprayer (30)
- Box of chalk (1)
- 10-liter (L) Bucket (30)
- Measuring cylinder (30)
- Set of personal protective equipment (PPE) (30)
- 1-meter (M) rule (1)
- Nylon string (100 M)
- 6-inch nails (1 kg) For participants:
  - Training guide (30)
  - Handouts, e.g., spray round-related materials, forms for spray operators, team leaders, supervisors (30 copies of each)
  - Notepad (30)
  - Course schedule (30)
  - Pre-test assessment for trainers (30)
  - Post-test assessment for trainers (30)

For trainers:
- Trainers’ of Trainers guide (2)
- Course schedule with roles
- Projector
- Laptop computer
- Printer/copier
- Large training room
- Blank wall 2½ to 3 meters high and 20 meters long

CUSTOMIZING THIS TRAINING

This Trainers of Trainers Manual will continue to be assessed for its application to SADC MEES training needs to ensure that participants reach the highest level of mastery of IRS knowledge and skills. The Training Manual may be adapted according to specific country’s laws and regulations for pesticides, participant experience, culture, local housing types and conditions, and other factors.
OPENING SESSION
COURSE INTRODUCTION

- Welcome participants to the course
- Tell participants that we would like to take a few moments to get to know each other, mentioning that we each bring different expertise to the workshop focusing on our role as trainers.
- Ask participants to introduce themselves sharing their names, organizations, their roles as trainers, skills, knowledge and experience and your expectations.
- Ask the participants to come up with norms for the next five days written on a flipchart at the front of the room, sample norms may include:
  - One person at a time speaking
  - Mobile phones off please
  - You do not have to agree, but seek to understand
  - etc.
- Introduce the guest of honour and invite him/her to officially open the training workshop
- Explain that the course is designed for SADC E8 Regional Trainers of Trainers of IRS implementers, mainly IRS supervisors, spray operators, storekeepers and community mobilizers
- Show slide and review the course goals and objectives
- Show slides and review the Training Schedule highlighting start and end time.
- Distribute the pre-test. Explain the purpose of the 30 minutes - pre-test and assure participants that if they do not know an answer, they will learn the content during the training in the coming days.

COURSE STRUCTURE

- Show slide on the course structure
- Briefly present what will happen during each of the coming 5 days of the training programme by focusing on the topics of the sessions.
- Emphasize that most sessions start with a technical explanation and demonstration, followed by practice. During the practice session, you will be asked to demonstrate or explain the skill as if you were teaching a group of trainees.
SESSION 1

MALARIA AND MOSQUITO CONTROL
As a pre-ample to this session, describe the National Policy and Strategic Framework for IRS in the country highlighting national goals, objectives and linking them to regional and global strategic goals and objectives. Present and explain the objectives of the current Malaria Strategic Plan and list in bullet form the strategic objectives with emphasis on objectives relating to malaria vector control.

Present and discuss the malaria epidemiology profile in the country. Using the slide on malaria epidemiology, show the country predicted malaria prevalence map and point out the highest risk areas and link it back to the government’s strategy to prioritize malaria intervention based on districts’ risk.

Present the malaria by the numbers and explain according to the latest Health Management Information System (HMIS) report, what malaria accounts for out of all outpatient visits, and hospitalization and out of all hospital deaths. Show the malaria case fatality rates per year for the previous five years and discuss country agenda towards malaria elimination.

**DEFINITION OF MALARIA**

Ask participants what malaria is and how it is spread. Record participants’ responses on the flipchart. Discuss the responses from participants.

Malaria is a parasitic disease spread by the bite of an infected female Anopheles mosquito. It is characterized by a headache, hot and cold body, joint pains and a feeling of wanting to vomit. Malaria is caused by parasites in the blood belonging to the genus Plasmodium. Of the four Plasmodium species; falciparum, vivax, malariae and ovale which affect humans, P. falciparum causes the most severe malaria illness and death and is the most common in East and Southern Africa.

**LIFE CYCLE OF MALARIA PARASITE**

Ask the participants to explain the life cycle of the malaria parasite. Show a slide and explain the parasite transmission cycle as simple as possible focusing on P. falciparum.

The female Anopheles mosquito requires a blood meal for the eggs to mature. When a female mosquito bites an infected person it sucks up blood with malaria parasites. The parasite changes in the mosquito and the mosquito becomes infective. It takes 8-14 days for the mosquito to become infective. If the same infected mosquito now bites a healthy person it injects saliva, which carries malaria parasites. This person may become ill with malaria within the period of between 10 and 14 days. The malaria transmitting mosquito usually bites people indoors between sunset and dawn and normally rests on the walls after biting or before biting.

The injected parasites (sporozoites) infect liver cells and multiply by splitting (mitosis) and form liver schizonts which burst to release liver parasites (liver merozoites). The liver merozoites infect the red blood cells (erythrocytes) and multiply again by splitting to form red blood schizonts which burst releasing red blood cell merozoites which in turn infect more red blood cells. The process continues and more blood cells are destroyed and toxins are released. The release of toxins during the destruction of red blood cells is what causes the disease. Some of the blood parasites (merozoites) change to sexual forms (male and female gametocytes) which the mosquito takes as it feeds on the infected human.
The male and female gametocytes fuse in the mosquito stomach to form cysts. The cyst multiplies by splitting producing more parasites (sporozoites) which migrate to the salivary glands. When the infected mosquito now bites a healthy person it injects saliva which carries malaria parasites (sporozoites.)

MOSQUITO LIFE CYCLE

Ask participants if they can name the different stages of the life cycle of the mosquito. Present the life cycle of the Anopheles mosquito on the slide.

The female mosquito needs blood meal to develop her eggs. It takes about 10-14 days to develop from an egg to adult mosquito. The eggs are very small and laid singly on water surface. They hatch into larvae after 2-3 days. The larvae feed on micro-organisms in the water and develop to pupae after 7-10 days depending on the weather (longer in cold weather and shorter when hot). The pupa stage is a resting non-feeding stage that the mosquito turns into an adult. After a few days the pupal skin splits and the mosquito emerges as adult.

HOW CAN ANOPHELES MOSQUITOES BE DISTINGUISHED FROM OTHER GENERA?

Distribute handouts to participants. Anopheles can be distinguished from Aedes and Culex mosquitoes at all stages of the life cycle. The key larval and adult stages can easily be distinguished by their normal positions at rest - the Anopheles larva rests horizontal under water surface and the adult rests at an angle (characteristic “head down”) attitude of the resting adult.

MOSQUITO CONTROL

Ask the participants how mosquitoes are controlled or biting prevented. Divide participants into pairs and ask the groups to make a list of all the ways in which mosquitoes can be controlled or biting can be prevented. Allow 5-10 minutes for this. Obtain one method in turn from each pair, and make a list on the flipchart. The list should include:

- Use of suitable clothing to prevent biting
- Use of repellents e.g. deet, burning mosquito coils, repellent topical creams, repellent papers etc.
- Use of bed nets (treated or untreated)
- Environmental management e.g. draining or covering water sources
- Biological control e.g. predatory fish or other mosquitoes to control larvae
- Use of chemical insecticides and biological larvicides
- Residual treatment of buildings with insecticides to control adults
- Space spraying (interior and exterior) with insecticides to control adults

Conclude that while residual spraying has been most effective for controlling malaria vectors, an integrated approach using several of the above methods in the context of integrated vector management (IVM) may be used. Indoor residual spraying (IRS) and insecticide-treated nets are considered the core malaria vector control interventions with high public health value. However, these two core interventions target only malaria vectors that rest and bite indoors. Recent reports of outdoor malaria transmission in the E8 countries, call for the use of other secondary interventions in the context of IVM.

Explain that it is important that once high coverage with one core intervention has been achieved, supplementary interventions, namely the deployment of chemical and biological larvicides can be used in addition to the core intervention in specific settings and circumstances.
WHY IS IRS MOST OFTEN USED FOR CONTROL/ELIMINATION OF MALARIA?

- Indoor residual spraying (IRS) is the application of an insecticide with a residual effect on the inside walls, roofs, ceilings and eaves of all habitable structures in a given area, in order to kill the adult malaria vector mosquitoes that land and rest on these surfaces. It relies on the fact that most Anopheles mosquitoes enter houses to feed on the occupants and rest on the walls or ceilings prior to and/or after feeding.

- Exterior space spraying is used for mosquitoes which do not rest inside houses, but is less effective and involves more frequent re-treatment. WHO in Guidelines for Malaria Vector Control (2019) does not recommend the deployment of space spraying for malaria control or prevention.

- Larviciding can be very inefficient as a strategy because of the wide range of habitats available to mosquitoes, especially in rural areas, and difficulties in treating all these larval habitats with enough frequency.

- Indoor residual spraying has been the traditional malaria vector control method in Southern Africa since 1940s before the introduction of LLINs in recent years.

INTRODUCTION TO INTEGRATED VECTOR MANAGEMENT (IVM)

Ask participants: What do you think of when you hear “IVM? Define Integrated Vector Management (IVM):

Integrated Vector Management (IVM) approach is a rational decision-making process for the optimal use of resources for vector control. The aim of IVM is to improve the efficiency, effectiveness, and ecological soundness of vector control interventions, and to contribute to achieving national, regional and global targets set for vector borne disease control.

To achieve this, vector control programmes need to be increasingly based on local evidence, integrate interventions where appropriate, collaborate within the health sector and across other sectors, and actively engage communities (see Table 1).

The process of planning and implementing of IVM includes assessing the epidemiological and vector situation at the country level, analysing the local determinants of disease, identifying and selecting the vector control methods, assessing needs and resources, developing locally-tailored implementation strategies, and monitoring control efficacy to guide subsequent programmatic decisions.

Table 1. Key elements of the IVM strategy

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<th>Key Elements</th>
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<tr>
<td>Advocacy, social mobilization and legislation</td>
<td>Promotion and embedding of IVM principles in the development policies of all relevant agencies and humanitarian interventions, organizations, and civil society; establishment and strengthening of regulatory and legislative controls for public health; and empowerment of communities</td>
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<tr>
<td>Collaboration within the health sector and with other sectors</td>
<td>Consideration of all options for collaboration within and between public and private sectors, as well as international organizations and non-governmental organizations; application of the principles of subsidiarity in planning and decision making; and strengthening channels of communication among policymakers, vector-borne disease control program managers and other IVM partners</td>
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<tr>
<td>Integrated approach</td>
<td>Ensure rational use of available resources through a multi-disease control approach, integration of non-chemical and chemical vector control methods, and integration with other disease control measures.</td>
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<td>Evidence-based decision-making</td>
<td>Adaptation of strategies and interventions to local ecology, Epidemiology and resources, guided by operational research and subject to routine monitoring and evaluation</td>
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<tr>
<td>Capacity-building</td>
<td>Development of essential physical infrastructure, financial resources and adequate human resources at national and local level to manage IVM strategies based on a situation analysis</td>
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IVM requires a problem solving approach to vector control, where current and historical field observations, surveillance and situation analysis constitute the basis for a plan of action. An IVM-based process should also be intrinsically cost effective, have indicators for monitoring efficacy with respect to impact on vector populations and disease transmission, and use acceptable and sustainable approaches compatible with local health systems. It should also ensure compliance with local regulations and customs, and reduce the probability of pesticide resistance in mosquitoes.

The Malaria Vector Control Program should recognize that malaria is focal and variable in nature—even within a single district or municipality, there may be great differences in transmission risk—and, as a result, there is no single answer to vector control that can be applied in all circumstances.

Show slide on the malaria vector's life-cycle and ask the participants to describe what is happening in the diagram - this will be a review from the past two slides. Now define the malaria control interventions that can be combined in the context of IVM during the various life stages of the mosquito.

■ Begin with the eggs: Environmental modification is changing the environment permanently to reduce mosquito breeding habitats, for example converting a swamp to an agricultural area. Environmental manipulation is changing the environment on a regular basis, for example, doing away with standing water.

■ When the eggs hatch into larvae: There are different larvicides both chemical and biological that can be used to kill larvae.

■ Once the pupae maturity, the adult mosquitoes emerge. Females feed on blood, there are strategies that may be used to reduce man-vector contact, for example siting houses further away from mosquito breeding areas; using screening to prevent the mosquitoes from entering homes; sleeping under bed-nets; using of repellents on skin or coils that emit fumes to drive mosquitoes away, zooprophylaxis to put livestock, e.g. cattle, in areas between mosquito breeding sites and homes, so that mosquitoes have their blood meal from the animals which do not get malaria.

■ Where a mosquito population rests indoors before and/or after feeding, IRS and LLINs are the primary IVM options.

Explain the importance of understanding the mosquito life cycle in the context of IVM.
Ask participants if there are any questions.
SESSION 2
IRS OVERVIEW
Explain that this session is designed to make sure we all have a good understanding of how IRS works, in clear and simple terms, and can explain it to others.

**INTRODUCTION TO IRS**

Ask participants to explain, in simple language, what IRS is and how it works. Take several responses and review.

Indoor residual spraying involves periodic spraying of the inside surfaces of houses with an insecticide that has a persistent residual effect to reduce mosquito lifespan and density, resulting in a reduction of malaria transmission, thus contributing towards malaria elimination or control. The IRS relies on the fact that most malaria vectors enter houses during the night to feed on the occupants and rest on the walls or roofs prior to and/or after a blood meal. When the walls, roofs and eaves are treated with an effective residual insecticide, the mosquitoes pick up a lethal dose as they rest, and later die, mostly within 24 to 48 hours...

Ask participants: What makes IRS successful? Take a few responses and comments. **Explain that to implement IRS successfully, the program must have at institutional level:**

- adequate program and health system capacity to deliver high quality IRS and high coverage, in a timely manner.
- adequate knowledge of the local vector, including resting behaviour and susceptibility status to insecticides.
- adequate and sustainable financial, logistical and human resources.
- adequate political commitment to, and social acceptability of IRS.

**At operational level a successful IRS the programme requires:**

- Well-trained and motivated spray operators, storekeepers, and other seasonal workers. This is why we are here—to focus on how to effectively train spray operators and other seasonal workers.
- Precise planning, preparation, and logistics
- Correct insecticide selection (effective against targeted malaria vectors and has a significant residual life)
- Dedicated and disciplined IRS workforce
- Correct mixing of insecticide and correct application technique
- Good data collection, communication, and community relations
- Timely procurement and delivery of logistics, human safety and environmental compliance.
- Close supervision using a checklist

**IRS BENEFITS**

Explain that spray operators, community mobilizers, and other IRS team members need to clearly explain the benefits of IRS. Many of the most common myths can be addressed by explaining IRS facts and benefits.

Ask participants: What are the benefits of IRS? Record responses on a flipchart. Show slide and review the benefits.

The insecticide sprayed on the surfaces stays for a period of time during which it continues to kill the mosquitoes when they rest on the treated surfaces. This leads to increased mosquitoes mortality, which reduces mosquito bites and in turn a reduction in malaria transmission, morbidity and mortality. The reduction in malaria infection has a socio-economic benefit through increased agricultural productivity, reduced school absenteeism, reduced family and government expenditure on malaria treatment and prevention.
Debrief by explaining that this discussion is used in several seasonal worker training courses to help teams understand important facts about malaria and IRS.

**CONDITIONS FOR EFFECTIVE IRS**

Ask participants to suggest where IRS when applied will yield optimum results. Take responses and discuss using a slide where IRS will yield optimum results.

**IRS will yield optimum results when applied where:**
- the majority of malaria vector population feeds and rests inside houses
- the vectors are susceptible to insecticide in use
- targeted people predominantly sleep indoors at night with a high IRS acceptance
- targeted prevailing structures are suitable for spraying and crowded - not far apart
- high IRS coverage and quality
- adequate resources and timely delivery
SESSION 3
IRS OPERATIONS AND CAMPAIGN DESIGN
Effective IRS operation requires adequate planning, organization and logistics. The operation involves people at national, district and community levels. Commodities and other consumables need to be procured in advance. All these activities need proper coordination to ensure smooth synergy of events. Good knowledge of the target areas and the challenges in accessing each house are key to ensuring good planning and operations.

PRE AND POST IRS SURVEYS

IRS operation is a costly undertaking and for this reason, sufficient baseline information should be gathered to facilitate appropriate planning and implementation. Pre and post implementation epidemiological, entomological, and demographic surveys should be conducted to guide proper planning and measure program performance. These surveys also provide indications as to the areas needing spraying at any particular time.

Divide participants into 2-3 groups. Ask them to discuss: What is the baseline - pre-spray assessment data that are required for planning. Let the participants record their response on a flipchart and present in a plenary after 10 minutes. Present a slide to sum up the IRS activities and information generated during pre-spraying preparations or planning, IRS implementation and post IRS implementation. The pre-spraying assessment leads to availability of baseline data on targets: entomological and parasitological data, IRS eligible structures and target population.

Mapping and targeting of IRS: Mapping is essential to identify areas of spraying and gives a basis upon which coverage is monitored and evaluated. These entail identification of vector breeding sites, location and type of house structures to target for IRS. The use of survey results as stated above in mapping is of importance to delineate low- and high-risk areas for prioritization. To facilitate efficient IRS operations, geo-referenced maps need to be developed to guide the process of accessing target sprayable structures.

Timing and cycles of spray: Malaria transmission is largely influenced by climatic and environmental factors particularly the rains. IRS therefore will be timed to take place before rainy season begins. Ideally, the spray cycles depend on the transmission pattern and insecticides protective duration.

Estimation of IRS requirements: Several factors need to be considered while establishing the quantities of required resources. In establishing the number of structures for spraying, population to be protected and to perform spraying systematically and effectively with a better coverage, geographical reconnaissance should be undertaken for the selected areas to make available the following information:

- Total number and locations of structures to be sprayed
- Average size (sprayable surface area) of structure to be sprayed
- Total surface area of structure to be sprayed
- Types of structures
- Total population to be protected

Explain that using the above information the calculation of requirements for the operations, including amount of insecticide, human resource (number of spray operators, team leaders, supervisors, mobilizers etc), sprayers, protective clothing, transport needs, and spraying duration can be done.
**IRS Human Resource needs estimates:** The backbone of the IRS campaign lies on the spray teams and their supervisors. In order to maximize the efficiency and effectiveness of the spray teams, they should consist of no more than six persons per team. Each team will have a team leader to report all team activities and submit the spray record to the field supervisor. The field supervisor will have no more than five teams under his/her control (this structure can be modified according to field conditions and the amount of area that a team needs to cover). The field supervisor will collate and summarize all the team's activities and provide the Site Supervisor with the information. This Site Supervisor will use this information to keep track of the spray progress to determine the coverage achieved and inform the district or national supervisor. The number of spray teams per district ranges between five and ten depending on the size of district. National supervision is done by National Malaria Control Program (NMCP) and partners. The composition of a team is as follows:

- One team leader whose function is to provide immediate supervisory support to spray operators; and record and report on the households and housing rooms/units to be sprayed and those missed for follow up mop-up spraying;
- Not more than six spray operators (depending on the level of dispersion of the target houses) each with a 10-litre liquid capacity compression pump.
- One Warner’ (Community Crier) or community mobilizer to inform and prepare household and communicate with traditional and local government leaders;
- One driver with a vehicle capable of safely and comfortably transporting the spray team, their equipment and approximately 250 litres of water;
- One supervisor is assigned to coordinate 3-5 spray teams;

**Recruitment of spray personnel:** The success of IRS operation requires well trained and disciplined personnel. To ensure good cooperation of the community and satisfactory coverage, spray personnel will be drawn from within the local communities where the spray exercise will be undertaken. Certain recruitment criteria will be adhered to.

The following factors will be considered in recruiting spray operators:

- Should be resident in the local community
- Should be able to read and write
- Should be above 18 years
- Should not be pregnant or lactating
- Should be accepted and trusted by the community
- Should have sound physical and mental health
- Should have no criminal record including stealing

Explain to participants that before recruitment, the communities within the IRS areas will be sensitized on the recruitment process and criteria for selecting IRS operators. The recruitment process should always be fair and transparent based on the national IRS guidelines and employment criteria. The communities will participate in identifying the potential spray personnel after which a selection process will be carried out jointly with the district health teams. The seasonal workers will be subjected to written, oral, physical and medical examinations.

**PLANNING IRS CAMPAIGN**

Explain that we will begin by discussing what IRS activities need to take place before, during, and after the spray campaign. Show flipcharts with the headings “before” “during” and “after.” Start a discussion by encouraging participants to identify activities that need to be accomplished before the spray campaign begins. Ensure the group mentions the following:

**Before the spray campaign:**

- Reviewing key successes and challenges from the previous spray campaign
- Planning the schedule for the spray campaign
- Establishing the sub-county IRS committee
- Planning social and behaviour change communication strategies for informing communities about IRS
- Planning and implementing IRS radio talk shows
- Implementing community mobilization campaigns
- Identification and preparation of IRS commodities storage facilities
- Transporting supplies and equipment for the spray campaign to the operating base
- Hiring spray teams and storekeepers
Training spray teams and storekeepers
- Selecting the operating sites and assessment of environmental compliance facilities e.g. soak pit sites, ablution facilities and water supplies
- Preparing the soak pit and bathing sites, ensuring all areas are suitable for both men and women
- Servicing of vehicles or hiring of adequate vehicles for transporting spraying teams

During the spray campaign:
- Mobilizing the community
- Daily issuing of PPE and insecticides to spray teams
- Preparing households for spraying (removing furniture and so on)
- Pre-spraying room inspection
- Mixing of insecticides
- Spraying homes
- Completing the Daily Spray Card
- Collating sprayed and unsprayed houses (done by team leaders)
- Communicating the spray schedule to community leaders and communities
- Daily cleaning and maintenance of the operating site
- Overseeing the operating site
- Washing sprayers and overalls
- Completing daily delivery of updated spray data
- Overseeing spray operations
- Overseeing environmental compliance at the operating site, at the soak pit, and in the community
- Completing daily inventory of insecticide
- Planning and implementing community mobilization/ sensitization activities.

After the spray campaign:
- Collecting PPE from spray teams (this may not be the case in some countries)
- Keeping the inventory of all spray equipment and supplies
- Completing inventory forms for equipment and supplies
- Post spraying education for community safety e.g. when to reopen and enter the sprayed rooms, disposal of sweepings, what to do should anyone suspect insecticide adverse effects
- Returning all equipment, waste, and supplies to the district operating site
- Cleaning the operating site
- Reviewing actual spray campaign performance against targets for houses sprayed, units of insecticide used.
- Concurrent assessment of client satisfaction status
- Mop up spraying/call backs

Emphasise that good planning is the foundation of a successful IRS spray campaign. Every activity that occurs during and after the spray campaign should also have a planning step that happens before the spray campaign begins. Highlight that these activities are managed by the district coordinator, but it is every supervisor’s responsibility to make sure the right activities happen at the right time.
CHOOSING A START DATE FOR IRS

Show slide and give guidance on how the date for starting IRS campaigns is chosen. Explain that the decision about how often to conduct a spray campaign is based on two important considerations:

- Malaria trends in the country or area being sprayed:
  - When malaria rates are at their highest, the mosquito population is also highest.
  - To get the most from IRS, we need to be sure the insecticide is on the wall, killing mosquitoes before they can transmit malaria to humans.

- The residual life of the insecticide that you have decided to use
  - Residual life is an indication of how long the insecticide will continue to kill mosquitoes after being sprayed on the wall.
  - Each insecticide has a different residual life. Some are effective for 3 months, others for 6 months or longer.

Explain that to understand the importance of malaria peak seasons, we will work through three examples that assuming in the examples we are using an insecticide that will effectively kill mosquitoes for 4-6 months. Remember that we want the spray campaign to be over (and insecticide on the wall) before malaria rates peak.

Explain that analysis of malaria case data from health centres provides malaria rates - malaria rates peak/s and whether malaria transmission is seasonal or perennial.

Example 1: In a calendar year, analysis from health centres shows that malaria rates increase or decrease with the seasons depicting two peaks in malaria transmission during the year.

Asks participants: How often and when should we conduct IRS? Show slide and explain that the spray campaign should be over (and insecticide on the wall) before malaria rates peak.

Example 2: We have a short malaria season with a gradual peak. Ask participants: How often and when should we conduct IRS?

Show slide and explain that the spray campaign should start and ends before the peak season.

Example 3: In this example, malaria transmission over a one-year period is steady throughout without significant peaks. Ask participants: How often and when do you think we should conduct IRS?

Show slide and explain that we should spray two times per year in countries with endemic malaria.

Explain that there is no set formula in choosing the right day to begin IRS. Emphasize that program managers must consider a number of factors when choosing the right day to begin IRS to ensure that the insecticide be on the wall, killing mosquitoes before they can transmit malaria, but we don't want insecticide sitting on the wall when there are no mosquitoes around that need to be killed. The goal is to find the time that makes our work most effective.

PLANNING IRS ACTIVITIES

Show slide and hand out the IRS Operational Plan (see Annex 2). This is a programme implementation timeline that covers a one-year period covering:

- 7 months before the spray campaign begins
- 2 months of spraying,
- 3 months after spraying.

Show slide and hand out the WHO Timeline for IRS Program Activities template and explain that this tool is used for a specific period covering:

- 6 months before spraying
- 2 months during spraying
- 2 months after spraying

Ask participants: When is the most important time for IRS planning? Nine weeks before we start IRS is the most important period, with many activities happening at the same time.
Because so many activities take place during the same time, a different tool is needed—one that gives greater detail and more precise planning. Explain that VectorLink, Mozambique has developed the Race to the Starting Line Tool, which is a week-by-week Gantt chart of key activities that have to happen leading up to the start of spraying campaign. The tool maps out the activity, when it needs to be completed, and who is responsible for that activity. The tool makes the basis for agreeing on the timeline for when activities are expected to be completed. Hand out the Race to the Starting Line tool.

Show slide and emphasize that Race to the Starting Line Tool focuses on the planning stages in more detail and breaks out activities by week. Highlight that the activities should begin well before the deadlines to ensure they are finished on time. Ensure to include the person responsible for the task although many people could be involved in completing the task, only one person is responsible for making sure the activity is completed. The tool should be updated weekly. It is one way we can monitor our preparedness to conduct IRS. Show slide and let participants familiarize on the use of the tool.

Recap the key messages on planning IRS activities and highlight the following point:

When is the right time to begin IRS?

- In general, it is best to have IRS completed before the rainy season begins, to avoid problems with transportation and access to certain locations.
- We also want to be sure that the insecticide is already on the walls and killing mosquitoes when cases of malaria peak.
- The best answer is rests with the national programmes being informed by the malaria transmission trends/epidemiology and entomological profile in the country.

Show slide: Highlight that when it comes to choosing the start date for IRS operations, there often is no single right answer. We need to think about several important factors and then use our knowledge of the location to make the right choice. To choose the best date, we should consider:

- Data showing when malaria cases peak.
- Qualities of the specific insecticide and residual life.
- When the rains will begin, which will make spray operations more difficult.
- Duration of the spray campaign. Most of our planning starts from getting the right end date for spray operations and working backward to determine the best start date.
- Any other factors that are relevant in your context, such as major events like holidays, elections, etc

Explain that once the start date for the IRS campaign is decided, planners at the district level work backward using the three tools introduced in this session. Effective IRS operates on a specific timeline. Everyone should be aware of these planning guides and understand their role in completing all activities in a timely way.
SESSION 4

INTRODUCTION TO INSECTICIDES AND SAFETY
A pesticide is any substance or mixture of substances intended for destroying, preventing, repelling or mitigating any pest. Pests can be insects, mice and other animals, unwanted plants (weeds), fungi, or microorganisms like bacteria and viruses. Though often misunderstood to refer only to insecticides, the term pesticide also applies to herbicides, fungicides, and various other substances used to control pests.

All pesticides are poisons - they are pest killing agents, but some are more toxic than others. The WHO classification provides a basis on which practices of pesticide management can be geared towards toxicity ratings.

PESTICIDE LABELLING

Tell participants to refer to the information about the product attached to the container. Legal document in most countries needs government approval. The layout of a label is usually in three parts:

- The main technical section - trade or brand name, active ingredient and concentration, formulation type, net contents, particular of manufacturer, registration number, approved uses, formulation batch, warnings and hazard symbols.
- How and when to use the product - how to mix and apply, where to apply
- Precautions and first aid - handling, storage and disposal

METHODS OF PESTICIDE CLASSIFICATION

- Why classification of pesticides is important
- The most important methods of classification

Explain why classification is needed:
- To provide ready means of recognition or identification
- To enable logical means of segregation in transport and storage
- To guide storekeepers and users on inherent hazard and therefore on precautions for storage and use.
Summarize methods of classification:

By target pest
What type of pesticide can you think of which are described by the type of pest they control
Insecticides, larvicides, acaricide, avicide, fungicide, bactericide, herbicide, nematocide, adulticide, rodenticide.

By formulation type
What type of formulations of insecticide are available?
- Wettable powder
- Emulsifiable concentrate (EC)
- Capsulated suspension (CS)
- Dispersible grains,
- Ultra-low volume
- Wettable granules (WG)
- Dusts
- Baits

How does knowledge of classification help a storekeeper?
- Certain formulations (e.g. E.C.s) require extra care in handling as they may be flammable
- Liquid formulations should always be stored below solid formulations to avoid contamination and therefore spoilage

By hazard
The WHO classify pesticides according to hazard, ranked Ia, Ib, II, and III in decreasing order of toxicity. This classification is arrived at by reference to the LD50. The LD50 of the product is the dose required to kill 50% of a population of test animals - “the dose makes the poison.” Many commonly used substances are poisonous but they are normally used in small quantities and therefore pose no threat to life.

Why is the WHO hazard classification relevant to spray operators and storekeepers?
Explain that this classification is used in guiding regulatory authorities on the precautions which should be included on the label, protective clothing, colour coding on the label, hazard symbols to be used. It also indicates to the user the degree of precaution necessary for handling the pesticide.

By chemical family
This classifications comprises all the insecticides used for public health including in IRS.
- Organochlorines
- Organophosphates
- Carbamates
- Pyrethroids
- Neonicotinoids

Ask participants to name WHO recommended insecticides for IRS in each classification. Use of pyrethroid insecticides has increased, while that of the organochlorines and carbamates insecticides has decreased in recent years. The continued use of DDT for disease vector control is conditionally approved under the Stockholm Convention on Persistent Organic Pollutants, in accordance with WHO recommendations and guidelines. New classes of insecticides are also being developed and introduced in the shopping basket for public health use e.g. Neonicotinoids (NN)

By mode of action
The classification describes the modes of action (the way in which products act on their target)
- Contact - direct and residual
- Systemic action
- Fumigant of vapour action
- Repellency

The chemical family and mode of action classification are mainly relevant to people designing vector control programmes and responsible for selecting appropriate insecticides.
PESTICIDE TOXICITY

Although pesticides are, by definition poisons, they are not the only substances which are potentially dangerous and that it is the dose which makes the poison.

Ask participants: What are the routes by which pesticides enter the body.
- Through the skin - dermal toxicity
- Through the mouth - oral toxicity
- Through the lungs - inhalation toxicity

Ask: what situations can lead to poisoning through the skin?
- Handling of leaking or badly closed containers
- Spilling or splashing when pouring concentrate
- Handling a leaking sprayer
- From spray drift
- Continuous use of contaminated clothing

What situations can lead to poisoning through the mouth?
- Splashing concentrate
- Eating, drinking, smoking before washing
- Decanting pesticides into unlabelled or drinks bottles
- Consuming contaminated foodstuffs

What situations can lead to poisoning through the lungs?
- Handling volatile pesticides
- Working in spray drifts
- Handling dust formulations

The hazard of most of these situations can be greatly reduced by observing proper precautions, especially careful handling and good hygiene practices.
- Read the label carefully
- Excise caution at all times
- Good personal hygiene
- Care and maintenance of application equipment
- Protective clothing

Protective clothing should be considered to be the LAST line of defence.

FACTORS TO CONSIDER WHEN SELECTING INSECTICIDES FOR IRS

Divide participants into groups of five and ask them to discuss factors to be considered in the selection of an insecticide. In addition, ask them to list the IRS WHO prequalified recommended insecticides for IRS and their duration of effective action. Record their responses on flipchart and review using a slide.

The following factors need to be considered when selecting insecticides for IRS:
- WHO prequalified insecticides for IRS
- Effective against the target malaria vectors
- Low toxicity to humans and animals in and around the home
- Adequately persistent on treated surfaces to be effective as a residual insecticide, yet sufficiently biodegradable.
- Minimal adverse effects on the environment (water, soil, wildlife, etc)
- No hazard to spray operators even with minimal PPE.
- Active against other household pests - cockroaches, flies, fleas, etc
- Low odour
- Easy to spray with conventional spray equipment
- Non-corrosive with minimal wear on spray equipment
HUMAN SAFETY

In accordance with WHO health and safety regulations, all persons working on IRS and IRS beneficiaries must be protected against potential harm due to exposure from pesticides. All persons with potential direct contact or exposure to pesticides during handling, transportation, storage, use and cleaning of pesticide contaminated materials must wear appropriate personal protective clothing in accordance with the safety instructions on the product label or material safety data sheet (MSDS). Informational campaigns and mobilization are critical to ensure the safety of residents.

Human Exposure to insecticide

During spray operations, scrupulous attention to personal hygiene is essential for the safe use of pesticides. For spray staff, safety precautions will depend largely on personal hygiene, including washing and changing clothes. The following are the staff members that are involved in IRS campaigns and are vulnerable to coming in contact with insecticide.

- District Health Management Team members and other stakeholders providing leadership and technical staff
- Spray operators recruited on casual basis
- Support staff for warehouse and administration
- Transport staff for the spray operators and equipment

Possibilities of Exposure

Exposure to insecticides may occur when handling and spraying insecticides as follows.

- During opening of the package, mixing and preparation of the spray.
- During storage
- When transporting
- While spraying the insecticide, especially in high places.
- When cleaning PPE or equipment
- Accidental or intentional ingestion

SAFETY PRECAUTIONS

Pesticide Safety

Whenever working with pesticides, the most important consideration is safety

- to the user
- to the population
- to domestic animals
- to the environment
  - Safety is everyone's responsibility!!!
  - Safety is attitude

The following guidelines should be followed:

- Eating, drinking and smoking while applying pesticides must be strictly forbidden.
- Spray operators should take off gloves and wash hands with soap and water before eating, smoking or drinking any liquids
- Shower or bathe at the end of every day's work and change into clean clothes.
- Wash your overalls and other protective clothing at the end of each working day in soap and water and keep them separate from the rest of the family's clothes.
- If the insecticide gets on your skin, wash off immediately with soap and water.
- Change your clothes immediately if they become contaminated with insecticides.
- Inform your supervisor immediately if you do not feel well.
PERSONAL PROTECTIVE EQUIPMENT (PPE)

In accordance with WHO health and safety regulations, all persons working on IRS must be adequately protected against potential harm due to exposure from pesticides. All persons with potential direct contact or exposure to pesticides during handling, transportation, storage, use and cleaning of pesticides or pesticide contaminated materials must wear appropriate personal protective clothing in accordance with the safety instructions on the product label or material safety data sheet (MSDS). The following guidelines should be followed:

- Have adequate sizes of coveralls and boots that are appropriate for the specified work force (women's sizes and men's sizes).
- There must be extra gloves, boots, face shields, and helmets to mitigate for breakage and loss (calculate at 10%).
- Spraying staff must have two uniforms minimum to allow for frequent changes.
- New filter masks must be replaced each day for spray operators. For the 8-hour filter mask, the masks can be changed once every two days.
- Replace worn out/torn gloves with new gloves immediately.
- Particular attention should be given to washing gloves, as wearing contaminated gloves can be more dangerous than not wearing gloves at all.
- Overalls must be changed daily for spray operators using carbamates, pyrethroids, or organophosphates.
- Overalls must be changed immediately when a direct spill occurs onto the overalls.
- Overalls should not be tucked inside the boots.
- Gloves should be worn over the sleeves ensuring there is no space between
- The Supervisor shall ensure that all workers wear protective clothing.
- Specific protective clothing must be worn in accordance with the safety instructions on the product label (Material Safety Data Sheet MSDS).
- During spraying, change your clothes immediately if they become contaminated with insecticides.

Table 2 Minimum PPE Required for IRS Workers

<table>
<thead>
<tr>
<th>Role</th>
<th>Minimal PPE Required</th>
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| Store Manager & All Workers handling equipment and pesticides | ■ Boots and overalls at all times  
■ Gloves and filter mask when handling equipment and pesticides  
■ Goggles when cleaning dry or wet pesticide spills |
| Washers                             | ■ Overalls, aprons, boots  
■ Filter mask  
■ Nitrile rubber, neoprene, PVC or butyl rubber gloves long enough to cover forearm and very flexible to use in washings, without inside lining (lining can retain pesticide and increase dermal exposure for staff routinely exposed to pesticide-contaminated water) |
| Site Managers/Supervisors           | ■ Overalls, boots, gloves, and filter mask (when entering houses to supervise spray operations) |
| Spray Operators                     | ■ Filter masks (as identified in the MSDS for the pesticide being used), overalls, face shield, nitrile rubber, neoprene, PVC or butyl rubber gloves, broad-rimmed helmet (protects head, face and neck from spray droplets)  
■ Face shield or goggles (face shield preferable -protects face and eyes against spray fall-out)  
■ 2 or 3 cotton long-sleeved overalls per spray operator (keep overalls outside of boots)  
■ Rubber boots or heavy canvas boots that are unlined and can be easily rinsed  
■ Helmet/hat  
■ Neck protection |
| Drivers                             | Boots, gloves, filter mask (when washing vehicle after a spill)                      |

Demonstrate the items of protective clothing and the use of each item. Using a volunteer describe the various items and get the volunteer to put on each item, starting with rubber boots, long trousers and long sleeved shirt etc.
Divide participants into groups and each group is given a situation to investigate and make recommendations for the protective clothing in that situation, assuming there is no recommendation on the product label and product is not classified on the label as toxic. The situations suggested are:

- Mixing and measuring liquid concentrate
- Mixing and measuring wettable powder
- Spraying dilute product
- Cleaning spray equipment

Each group through their spokesman should be invited to outline the recommendations to the rest of the trainees. The trainer will have to lead the discussion towards a sensible set of recommendations for the four situations.

- Mixing and measuring liquid concentrate: Long sleeved shirt, long trousers (or coverall), nitrile gloves, boots (rubber boots), eye protection - goggles or face shield, preferably and impervious apron.
- Mixing and measuring wettable powder: As above but also the addition of a particle mask
- Spraying dilute product: Long sleeved shirt, long trousers (or coverall), nitrile gloves, boots (rubber boots), a hat if spraying tall buildings upwards
- Cleaning spray equipment: Long sleeved shirt, long trousers (or coverall), nitrile gloves, boots (rubber boots), eye protection - goggles or face shield, preferably and impervious apron.

Emphasize the need to wash protective clothing after use, to wash gloves and boots inside as well as outside, necessity for good handling and hygiene. Remind participants to always read the label to check whether specific items of clothing must be worn when handling a certain pesticide.

The following are the steps taken when cleaning PPEs at the end of the day:

- Contaminated protective clothing should be thoroughly washed using detergent followed by several rinsings.
- Wash overalls daily for spray operators using carbamates, pyrethroids, or organophosphates.
- Protective clothing should only be washed in Wash Areas. Gloves should be worn when washing protective clothing.
- Washed clothes should be hung to dry in the soak pit or evaporation tank wash area.
- Where there is a large patch of fabric that has been contaminated by toxic concentrates and replacement clothing is available, it is best to dispose of the clothing as per the Solid Waste Disposal.

TRANSPORT OF INSECTICIDES

The principles of safe transport of insecticides are almost always common sense. The session follows a logical path of:

- Inspection of vehicles used for transport
  - General safety considerations
  - Loading and unloading
  - Handling emergencies
  - Dealing with spillage or leakage

The points which will be discussed are relevant to all transportation stages in the distribution chain: from importer to storehouses and users

Package inspection
Ask: What aspects of packaging are important when preparing for transport. Let trainees list points on the flipcharts.

- Inspect for leaks
- Inspect for corrosion
- Inspect for other serious damages
- Check that labels are intact
Pay attention to advice on labels on the packaging, e.g. this way up or WHO hazard symbols

Vehicle inspection
What aspects should be considered when assessing a vehicle’s suitability for transporting insecticides? Ask the trainees list the points on flipcharts.

- Regularly maintained and road worthy
- Design: right size for the quantity of product, protection from weather
Safety equipment: fire extinguisher, first aid pack, protective clothing
Clean up equipment (shovel, absorbent material and marked receptacle for contaminated material)
Vehicle body should be clean, free from projecting nails

Other considerations
What other points should be considered when planning to transport insecticides? Ask: the trainees list the points on flipcharts.
Qualified driver
■ Transport emergency card
■ Route planning (e.g. avoid steep hill if possible)
■ Insecticides should never be transported with foodstuffs

Divide participants into 6 groups - 3 to consider loading and 3 to consider unloading.

Allocate 10 minutes for discussion

Loading and stowage
■ Distribute weight of load evenly
■ Load light items on top of heavier items
■ Load liquids below dry goods with their closures uppermost
■ Use wood, hardboard or sacking to prevent movement of load
■ Observe "This way up" indications on packages
■ Secure load properly to prevent movement

Unloading
■ Handle carefully. Do not throw or drop packages from the vehicle
■ Heavy drums should be lowered down a ramp, using a rope to control the drum
■ Check packages for leaks or other damage
■ Store correctly - safe stacking, segregation etc.

Divide participants into groups. All groups should design a checklist or instruction card to be used by lorry drivers in an accident or emergency. The card should cover what steps to take to minimize hazard and what steps to follow in the event of a spillage or leakage. Receive feedback from the groups’

Emergency Procedures
■ In an even of an accident or emergency what steps should be taken to minimize hazard?
■ Switch off the engine
■ Do not smoke
■ Refer to transport emergency card
■ Send for help
■ Keep other people and animals away

Clean up after spillage and leaks
■ In the event of spillage or leakage, what procedures should the driver be advised to follow:
■ Wear protective clothing
■ Do not smoke, drink and eat before washing
■ Consult transport emergency card and product label
■ Observe precautions as advised
■ Contain the insecticide by bunding to prevent it from spreading or running into drains or waterways
■ Use absorbent materials to contain and soak up spillage
■ Sweep up and shovel contaminated materials into marked closable drum
■ Dispose of contaminated materials, clothing after making it unusable, damaged containers
■ Thoroughly wash down any contaminated equipment and vehicle
SYMPTOMS AND RECOGNITION OF POISONING

Ask which of the participants has had any personal experience of pesticide poisoning, what were the circumstances and what happened?

It is very important to know how to recognise pesticide poisoning symptoms, and also to know what to do because it could be a case of life or death. Medical personnel in the IRS targeted areas need to be trained to manage insecticide poisoning.

Divide participants into pairs.

What symptoms would you expect to observe in the case of?

- Mild poisoning (2 groups)
- Moderate poisoning (2 groups)
- Severe poisoning (2 groups)
- Advice the groups to consider what effects might be observed in different parts of the body.

- Head, eyes, mouth
- Chest, lungs and heart
- Digestive system
- Nervous system
- Skin
- Body temperature
- Physical condition

Allow 20 minutes for the discussion.

Taking each degree of poisoning in turn record symptoms on a flipchart or separate charts to make comparison (see Annex 6 for the given symptoms).

Whether the ill effects are due to pesticide poisoning or other ailments, medical help should be obtained as quickly as possible, appropriate first aid measures should be given to the victim until expert help arrives.

Emergency Procedures

Explain that responding quickly is very important. Symptoms become more severe when treatment is delayed. Highlight the steps to follow in case of insecticide exposure:

Emergency Kit

- Clean dry cloth or paper
- Ample clean water for decontamination
- Blanket to cover in case of shock
- Plastic container/sack to store contaminated clothing
- Activated charcoal

Emergency procedure

- 1st priority is not to panic
- After a careful assessment move patient from source of contamination
- Ensure the person is still breathing and apply artificial breathing if just stopped breathing
- If eye injuries wash thoroughly with water
- Put patient in a recovery position
- CALL FOR MEDICAL ASSISTANCE AS EARLY AS POSSIBLE
- If patient is sweating and very hot cool him by sponging with cold water; if cold cover with blanket or sheet

What to do

- Do not induce vomiting unless indicated on the label
- Never induce vomiting to an unconscious person
- Do not allow patient to drink or smoke
- Do not restrain a person having a fit
- Put padded material between teeth avoiding restricting breathing
- Remember to give the medical doctor or assistant full details of the pesticide involved- label
For a direct spill onto clothing/skin:
- Remove contaminated clothing.
- Wash the skin that was exposed with soap and plenty of clean water.
- Continue to flush the affected area with large quantities of clean water.
- Move the person to a cool, shady, quiet area and keep them calm.
- Transfer the person to the nearest health clinic as soon as possible.
- Ensure the incident is reported to supervisors and documented in writing.

For a splash in the eye(s):
- Flush the affected eye(s) with clean cool water for at least 15 minutes.
- Lift the eyelids and rinse underneath.
- If stinging or vision problems persist, take the person to a clinic.
- An eyewash kit is available at the operating base. Team leaders should ask the storekeeper where the eyewash kit is stored, in case it is needed.
- Ensure proper reporting and documentation.

For breathing problems, immediately move out of the building being sprayed to fresh air.

For swallowing insecticide or contaminated water:
- Any insecticide ingestion should be treated immediately at the nearest health clinic.
- Keep the person calm, cool, and in a quiet place and transport them to the nearest health clinic as quickly as possible.
- Ensure documentation is completed and signed by someone at the health facility.

Explain that first aid kits should be kept at all storage facilities and in transport vehicles. Emphasise that all wounds beyond minor cuts and scrapes should be treated at the local clinic.

Note: Check the incident reporting protocols used for your program and review them during this session. Every trainer and supervisor should know the correct reporting procedure. You may wish to adapt the scenarios described below to fit your procedures.
Ask participants what they would do in each of the short scenarios, giving several participants the chance to respond to each scenario.

### Scenario 1: The team leader was mixing insecticide when a goat knocked over the sprayer, splashing insecticide onto his arm, knee, and lower leg. How should he respond?
- Remove the overalls and move to an area where he can wash the exposed skin with soap and clean water.
- Provide plenty of additional water so he can continue to rinse the affected area.
- If there is skin irritation or damage, transport him to the nearest clinic as quickly as possible.
- Ensure the incident is reported verbally to the supervisor and that a written incident report is completed.

### Scenario 2: One of your team members was spraying inside a home and was not wearing a face shield. He leaves the house and his eyes are burning. What should he do?
- Assist him to find clean water to rinse his face.
- Irrigate the eyes for several minutes to clear out any remaining insecticide.
- Transport him to local medical facility as soon as possible.
- Call his supervisor and ensure a written incident report is completed.

### Scenario 3: A spray operator is walking through the community and she trips. Her elbow is bleeding a little, but it quickly stops. What should she do?
- Wash the scrape with soap and water to remove dirt.
- Use an antibiotic cream and cover the scrape with an adhesive bandage.
- For minor incidents that do not involve insecticide, an incident report is not needed. If the incident is serious enough to require medical attention, a report should be completed.

### Scenario 4: A spray operator arrives at the operating site in the evening with a minor headache. What should she do?
- An aspirin from the first aid kit could help the headache. If the headache continues more than a few hours, it could be related to insecticide exposure; a medical professional should be consulted.
- An incident report is not needed unless medical attention is required.
HANDLING INSECTICIDE SPILLS

Explain that insecticide spills are also important to manage correctly, since they affect the environment and could lead to contamination of water sources. All seasonal workers should be well-trained to respond to insecticide spills. Facilitators and supervisors should also be aware of reporting requirements.

Explain that seasonal workers need to exercise care to avoid spilling insecticide.
Ask: Where do you imagine spills could occur? Solicit for several responses.
- In the community, especially when mixing insecticide
- In the vehicle, traveling to and from work sites
- Near the operating site and near the soak pit
- Anywhere we work with or travel with the insecticides!

Write “The 3 Cs” on a flipchart. Add each “C” to the flipchart as you discuss it.
Explain: There are three “Cs” to minimizing the impact of a spill:
- **Control**: Minimize the amount of liquid that spills.
- **Contain**: Minimize how far the spill is allowed to spread; keep it in the smallest area possible.
- **Clean**: Respond to the spill as soon as possible after it occurs, removing the contaminated sand or water from public areas.

Explain that the most likely place for a spill is in the community, especially while mixing insecticide.
- When a spill occurs, keep all community members and animals a safe distance from the spill.
- Next, use sand or earth to cover the spill. Do not try to wash away the spill with water or other liquids.
- After the spill has been soaked up with earth or sand, use a dustpan and broom to sweep the contaminated soil in a container for collection and disposal at the central warehouse.
- Emphasize that any spill should be reported to a team leader or area supervisor, so they can assist with proper disposal.
- If a spill occurs during transport, the vehicle should be thoroughly decontaminated as soon as possible.
- Since vehicles are often used for transporting food or people, it is especially important that insecticide spills are reported to the driver and cleaned up immediately.

*Explain that every operating base has a spill kit that can be used to respond to an incident.*

Prepare trainees to manage spills - to practice cleaning up a spill using just water, so trainees can practice how to clean it up properly. Practice will help them remember the process.

Also ask the trainees to practice filling out the incident reporting form. When an incident occurs, reporting should be completed the same day.

*Discuss challenges new spray operators face in remembering how to respond to an insecticide spill.*
SESSION 5

FAMILIARIZING THE TRAINEE WITH EQUIPMENT
The effectiveness of IRS depends on the performance of spray teams and their supervisors. These men and women are literally the face of the program; their behaviour and competency will influence the acceptance of the program by the general population. In order to maximize the efficiency and effectiveness of the spray teams, they will be equipped with sufficient skills in the application of insecticides for IRS and communication skills. In this regard, training of Trainers and annual re-training of all spray teams just before the spray operations is emphasized to update technical knowledge and skills of trainers, supervisors, spray operators, storekeepers and community mobilizers.

Show slide and explain that now we will discuss technical skills you need to know to train seasonal workers. In this session, we will focus on techniques for helping trainees get familiar with the equipment they will use most: the sprayer and PPE.

UNDERSTANDING THE SPRAYER

Ask 2-3 volunteers to define what a compression sprayer is. Ensure that the volunteers mention the following:
- Insecticide and water are put into the spray tank.
- The handle is pumped until the pressure gauge reaches 55 psi.
- The spray operator lifts the sprayer onto the shoulder and then shakes the tank to mix the insecticide.
- Then, the spray operator takes the lance, pulls the trigger, and sprays insecticide onto the wall.

Thank the volunteers for the explanation and emphasize that it can sometimes be challenging to explain ideas that we know very well to a beginner. However, when we are introducing this equipment to a beginner, we need to start with a simple explanation and fill in more details as they begin to learn.

Ask why the compression sprayer is used for public health spraying inside houses.

It is a sprayer which is pressurised before commencing spraying, not continuously pumped during spraying. It then becomes easier for the spray operator to concentrate on speed of spraying down a wall if he does not have to think about continuously pumping the sprayer at the same time. In addition, it can be difficult to pump while spraying in a confined space inside buildings, so it is better to pump before starting to spray.

PARTS OF THE SPRAYER

Show slide: Ask participants to name the parts of the sprayer. “Raise your hand if you can name them all.” Record the parts on a flipchart as they are identified. Review the list on the flipchart against the slide to ensure all parts have been mentioned, highlighting the control flow valve (CFV). Every sprayer used for IRS should have a CFV installed. It helps ensure the correct amount of insecticide is deposited on the wall as the pressure in the sprayer changes.

Hand out a copy of the Sprayer Diagram, showing all the parts and the CFV installation instructions.

World Health Organization (WHO) sets standards for IRS to assist National Malaria Control Programs (NMCP) in selecting quality sprayers for IRS. The sprayer for IRS should consist of a tank, usually cylindrical, equipped with a hand-operated air pump with a two-handed handle and locking device, separate from the tank lid; pressure-release safety device; hose attached at the top of the tank to a dip-tube; trigger valve with locking-off device; lance; control flow valve and nozzle. The sprayer should have a pressure...
gauge and a system for parking the lance when not in use and a foot rest to provide balance and leverage when pumping.

Ask: Why is it important for new spray operators to learn the names of each part of the sprayer? Take several responses.
- Learning to use the correct language to describe our equipment helps reduce misunderstandings during the spray campaign.
- For example (point at a small part of the sprayer), if this part broke in the field, a spray operator might need to call someone to bring a spare part. If he doesn't know the correct name, how will he describe it on the phone? What if he called it a nozzle, but what he actually needed was a CFV?
- Spray operators (and especially trainers) need to communicate with precision and professionalism.

Keep the slide with the parts on the screen while presenting the actual compression pump and each part. Give an explanation of what each part does. Tell participants that they will have an opportunity to disassemble and reassemble the pump after the presentation.

Highlight that when you introduce the parts of the sprayer, it is important to go through them systematically. There should be a logical start and end point. For example, you can move from bottom to top, from larger parts to smaller ones, or another order that makes sense to you.

Focus on getting the right level of detail about each part. As you explain the function of each part, limit yourself to one or two sentences that are precise and clear.

Hold up a sprayer and explain that we will pass it around the room and when you receive the sprayer, share a simple explanation of one of the sprayer parts and how it works. When you are finished, pass the sprayer to the next person. Allow the sprayer to circulate until all parts have been named once or twice.

Correct any information that is unclear or inaccurate in a clear and respectful way.
- Tank is to hold and transport pesticides. It is made of stainless steel. Most tanks have four openings on top: a large one for filling, fitted with a removable cover; and openings for the air pump, discharge system and pressure gauge.
- The tank cover consists of: (1) a rubber gasket; (2) a handle; (3) a pressure-release valve, operated by hand or by giving the handle a quarter turn; (4) a chain to prevent the cover from being lost.
- Tank Lid is to fill and empty the tank with pesticide and should be large enough to reduce risk of spilling and splashing. An inward opening inner-seal lid is preferable to a screw thread, since the seal can be easily replaced.
- Shoulder strap facilitates positioning and carrying the sprayer. It should be wide enough to prevent it from cutting into the shoulder of the person using the sprayer. It is fastened to the tank with steel buckles. It is adjustable for comfort and removable for maintenance.
- Pressure gauge is used to measure and monitor the amount of pressure in the tank.
- Control flow valve is attached between lance and nozzle. It controls pressure. When pressure is low, this valve will stop discharge or decrease the flow. It signals it is time to re-pressurize the tank. It supports continuous discharge of the insecticide.
- Air pump with 2-handed handle is to create the necessary pressure to spray the pesticide. Also point out the locking device to keep the pressure under lock, and maintains the pressure level in the tank and protects the spray operator.
- Safety device/valve is to release extra pressure for safety since otherwise the lid may blow off the tank, it is also used to deflate the pump.
- Hose is to deliver the insecticide from tank to nozzle to surface.
- Dip-tube transports the insecticide from the tank to the hose.
- Trigger valve controls the flow of liquid from hose to nozzle. Point out the locking-off device, it protects from insecticide from leaking out of the hose into the nozzle and into the environment.
- Lance is a rigid extension from the hose to assist with insecticide spraying. It allows for better spray control and for reaching high walls and ceilings. There may be lance extensions available for particularly high spaces.
- Control flow valve is attached between lance and nozzle. It controls pressure. When pressure is low, this valve will stop discharge or decrease the flow. It signals it is time to re-pressurize the tank. It supports continuous discharge of the insecticide.
- Nozzle controls the amount of insecticide discharged, as well as the size and shape of swath, to achieve recommended dosage. The nozzle or spray tip is the most important part of the sprayer - yet may be one of the most neglected components of any spray program. The nozzle is designed to deliver a precise volume of liquid per minute at a given pressure and to maintain a uniform spray pattern and swathe width.
INTRODUCTION TO PERSONAL PROTECTIVE EQUIPMENT (PPE)

It is mandatory and a legal requirement for spray operators to put on the appropriate personal protective clothing when handling insecticides. Absorption of insecticide occurs mainly through the skin, lungs and mucous membranes. Specific protective clothing will be worn in accordance with the safety instructions on the product.

Show slide and explain that PPE is also essential equipment for every spray operator. Ask what PPE is each seasonal worker required to wear? List each piece of required PPE for spray operator, spray team leader, store keeper, wash person. Record responses on the flipchart and refer to section 4.

Hand out the PPE for Seasonal Workers summary sheet, which shows all PPE and which pieces are required for each seasonal worker.

Ask for volunteers to explain each piece of PPE, starting with the piece that should be put on first. Explain that each volunteer will explain one piece of PPE.

- Introduce your piece and its function.
- Demonstrate how to put it on properly.

Highlight any items or steps that have been missed. If time allows, ask the following discussion questions:

- Do some spray operators resist wearing PPE during the spray campaign? What are their reasons?
- Some reasons may include too hot, uncomfortable, poor fit, difficult to handle equipment, and so on.
- When you introduce PPE, you can acknowledge some of the reasons that spray operators may resist and emphasize that wearing PPE is not optional.
SESSION 6

MIXING INSECTICIDE & MARKING STRUCTURES
Explain that helping spray operators clearly understand each step of the spraying process is critical for achieving a good-quality spray. In this session, we will break down spray skills step by step, ensuring the people we train master the foundational steps before we cover more advanced ones.

**MIXING INSECTICIDE**

Ask why proper mixing of insecticide is important? Take several responses.

- If insecticide is not mixed properly, we risk depositing insecticide that is too strong or too weak, possibly allowing mosquitoes to rest on the wall without being killed.

Ask participants: What is the proper procedure for mixing insecticide? Invite one volunteer to show how insecticide is mixed demonstrating and explaining each step. Highlight that every sprayer must have a CFV installed. Point to the CFV and emphasize that the CFV should be there even during training. Ensure the volunteer covers all of the steps below. If any step is missed, the facilitator should repeat the procedure, following all the required steps:

- The final volume of diluted insecticide should be 7.5 liters.
- When mixing, place the sprayer on top of the plastic sheet and on firm ground outside the house, away from any household items.
- Use a filter cloth to sieve all the water being introduced into the sprayer.

*For Liquid Formulations*

Introduce 3 liters of water through the filter cloth or sieve into the sprayer.

01. Remove the sieve and then completely empty the contents of the insecticide bottle into the tank. Remember to shake the bottle before opening it.
02. Use the filter cloth to sieve the water you will use to rinse the empty insecticide bottle.
03. Rinse the empty insecticide bottle into the spray tank using half a liter of water. Repeat this 2 more times to make it a total of 3 rinses.
04. Close the empty bottle tightly and put it back in your haversack.
05. Close the lid of the sprayer.
06. Pump the sprayer with 5 full strokes.
07. Pick up the sprayer with both hands. Hold it by the tank body and vigorously shake it side to side 10 times.
08. Place the sprayer back on the plastic sheet.
09. Depressurize the sprayer.
10. Open the lid and, using the filter cloth, add water up to the 7.5-liter mark. (If necessary, use your flashlight/torch to confirm the position of the 7.5-liter marking.)
11. Place your foot firmly on the sprayer’s footrest, with the sprayer to the side of your body.
12. Pump the sprayer to the 55 psi mark if using a Hudson sprayer
13. Listen for leaks as you pressurize the sprayer. Notify your team leader if you notice pressure is escaping from the tank.
For Powders and Granules:

01. Introduce 3 liters of water through the filter cloth or sieve into the spray tank.
02. Remove the sieve and then completely empty the contents of the insecticide sachet into the tank.
03. Fold the empty sachet into half and put it back in your haversack.
04. Close the lid of the sprayer.
05. Pump the sprayer with 5 full strokes.
06. Pick up the sprayer with both hands. Hold it by the tank body and vigorously shake it side to side 10 times.
07. Place the sprayer back on the plastic sheet.
08. Depressurize the sprayer.
09. Open the lid and using the filter cloth, add water up to the 7.5-liter mark. (If necessary, use your flashlight/torch to confirm the position of the 7.5-liter marking.)
10. Place your foot firmly on the sprayer's footrest, with the sprayer to the side of your body.
11. Pump the sprayer:
12. To the 55 psi mark if using a Hudson sprayer
13. Or, if using a Goizper sprayer, until the safety valve begins releasing pressure and the green mark shows.
14. Listen for leaks as you pressurize the sprayer. Notify your team leader if you notice pressure is escaping from the sprayer.

Thank the volunteer. Explain that each morning spray operators should use water left from the night before to mix the first tank of insecticide instead of using fresh water from the tap.

- At the progressive rinse area, dip water from barrels 1, 3, 5, or 7.
- Fill to the 3-liter mark—do not use a filter cloth.
- When barrel 1 has been emptied, spray operators should move to the third barrel, then the fifth, and so on.

Remind participants that when new spray operators are learning to spray, they must be taught to agitate the tank after completing 10 swathes to ensure the insecticide stays well-mixed while spraying.

Explain that in addition to understanding how to mix insecticide, we should all be able to explain the mixing process in clear and simple terms to trainees.

Emphasise that the spray operators should always consider the following when using/ mixing insecticides:

- Always read and make sure you understand the label before starting to use any pesticide
- Handle pesticides carefully at all times to avoid contact or contamination
- Maintain sprayers well to avoid leaks occurring during use
- Practice good personal hygiene when using pesticides
- Always use appropriate protective clothing when using pesticides
- Prepare the insecticide spray charge according to the manufacturer's instructions. The insecticide may be mixed separately in a bucket and poured into the sprayer depending on the manufacturer's instructions.

Debrief: Ask for another volunteer to read the steps as the facilitator performs the actions.
MARKING THE HOUSE

Ask: How do you know when a structure has been sprayed? Explain the method used in your country for marking structures identified and those that have been sprayed. Ensure the following points are mentioned:

- All structures found by spray teams should be marked with chalk. In some countries, in addition to chalk marking, the spray operator also places a sticker at the home.
- Structures that are sprayed should be marked with the following information, in this order: Date / Spray Operator Code / S “S” indicates the house was sprayed.
- Structures found but not sprayed (for example, the homeowners were away), should be marked with Date / Spray Operator Code / X “X” indicates the house was not sprayed, but it is expected that the spray teams will come back around and spray it.
- Structures that are NOT sprayed (homeowner refused or multiple attempts but no adult at home) should be marked with Date / Spray Operator Code /NS.
- During mop-up activities, any “X”s still out there should be changed to “NS.”

_Demonstrate how houses are marked, using the flipchart._
SESSION 7
PREPARING TO SPRAY
For a spraying program to be successful the community needs to be informed of the benefit of protection against malaria vectors afforded by IRS. The community needs to have been made aware about the implementation of the spray operation in their localities. It is therefore important that spray operators should be knowledgeable about IRS so as to help communities appreciate and collaborate in the operation. Trainees must understand that they are the de facto representatives of their country’s vector management program and that the image they project has a direct bearing on the effectiveness of the program. Trainees should be able to:

■ Advise the residents the reasons why spraying is needed.
■ Explain to the residents the reasons why spraying is conducted.
■ Explain to the residents the necessary safety precautions needed to protect children, pets and other domestic animals from accidental contamination with the material applied.
■ Answer any reasonable question made by the resident in a courteous and professional way.

Explain that helping spray operators clearly understand each step of the spraying process is critical for achieving a good-quality spray. In this session, we will break down spray skills step by step, ensuring trainees master the foundational steps before we cover more advanced ones.

**PREPARING STRUCTURES FOR SPRaying**

Tell participants that when we are teaching spray operators, we need to emphasize that they **must** prepare the house before they begin to spray.

Ask participants: What are all the things that should be done before the spray operator arrives? Talk through the steps a spray operator should take when arriving at a household. Ensure the following steps are mentioned:

■ Greet the household members and explain what you are about to do.
■ Complete the Daily Spray Record with the head of household.
■ Explain to the residents the reasons why spraying is conducted.
■ Explain to the residents the necessary safety precautions needed to protect children, pets and other domestic animals from accidental contamination with the material applied.
■ Answer any reasonable question made by the resident in a courteous and professional way.

■ Ensure the house is cleared of items, particularly food items, including:
  ◘ Food and food containers
  ◘ Water and water containers
  ◘ Cooking utensils
  ◘ Items hanging on walls
  ◘ Clothing
  ◘ Toys
  ◘ Furniture
  ◘ Animals
■ Be sure to check the rafters.
■ Cover any furniture or other items that remain in the house with a plastic sheet.
■ Ensure that 10 liters of water are available for the spray operator to use.
Conduct the spray:
- If there are any people who are unable to leave the structure, such as the sick or elderly, it should not be sprayed.
- Doors and windows should be kept closed as the home is sprayed.
- Review the post-spray instructions with the head of household.
  - Keep all people and animals out of the house for 2 hours after spraying.
  - Sweep up dead insects and dispose of them in a pit latrine, or bury them.
  - Do not paint, repaint, plaster, or smear the walls after spraying.
  - Continue to sleep under an insecticide-treated bed net.
  - Visit the health center if you don’t feel well.
- Check with the head of household to see if they have any remaining questions.

Highlight that the reason we move items away from walls is to allow adequate space to spray with the correct technique. Typically, the community mobilizer or team leader will visit each household before the spray operator arrives to ensure the structure is ready for spraying. However, if any of these steps have been missed, it is the spray operator’s responsibility to correct the situation.

**Emphasize that one of the biggest problems we find in the field is that a house was not correctly prepared for spraying.**

Ask: What are the consequences of spraying a house that was not prepared correctly?
- If the family has furniture that has not been removed or well-covered with a plastic sheet, they could be exposed to insecticide. Be especially aware of beds, mats, pillows, blankets, and other materials that are used for sleeping.
- Toothbrushes are often forgotten: sometimes they are stored in the eaves or hidden in a small spot. If insecticide is sprayed on a toothbrush, a member of the family (even a child) could get insecticide directly into their mouth. Spray operators must check the structure well.
- Animals must be contained and should not be inside the structure for at least 2 hours following spraying.
- Chickens and other animals can eat insects that have been sprayed with insecticide, potentially causing the animal to be poisoned.

Highlight that when we are teaching new spray operators to properly prepare a house for spraying, practicing all the steps helps ensure that they will not forget.

**PRESSURIZING THE SPRAYER**

Ask: Why is it important to have the sprayer at the right pressure? What can go wrong if the pressure is not correct?
Highlight that having correct pressure in the tank helps ensure the correct amount of insecticide is deposited on the wall of each house.
- If pressure is too high, too much insecticide will be deposited. This can cause dripping during IRS, which is both a health risk and a waste of valuable insecticide.
- If the sprayer pressure is too low, too little insecticide can be deposited and it might not be effective in killing mosquitoes that rest on the walls. This could give a community the impression that IRS is not an effective intervention.
- The CFV also helps ensure that we deposit the correct amount of insecticide on the wall. When pressure drops below the required level, the CFV cuts of the flow.

Ask the participants: What is the correct pressure for IRS? Take several responses and explore whether there is disagreement among the group.

Emphasize that every single person in this room should know the correct pressure for IRS, since it is a crucial aspect of our work.
- Correct pressure for a sprayer is 55 psi.
- For a sprayer that is about three-quarters full, you can reach 55 psi by pumping the tank with 55 full, even strokes.

Explain that short, irregular strokes are less efficient, so it is better to lift the handle all the way up. As you spray, it is important to check the pressure gauge often. As the tank begins to empty, a few additional strokes might be needed to maintain the correct pressure.
Explain that over-pumping can damage the equipment. Always release the pressure when the sprayer is not in use, especially if the outside temperature is warm or the sprayer is being transported to or from the operating base.

**Explain the steps for pressurizing the sprayer:**
- Place the sprayer on the ground next to you. Proper position is to put the sprayer next to your feet to the left or right—not directly in front of you. This helps protect the spray operator in case the lid is not fully fixed on the tank.
- Place your foot firmly on the footrest, with the sprayer at your side.
- Pull the handle upward until it stops, then press down. This is one full stroke.
- Pump about 55 times, until the pressure gauge shows 55 psi.
- As you pump, listen for leaks (air escaping) from the sprayer. Inform your team leader if you suspect that the sprayer has a leak.

Show the picture of pressurizing positions and explain that this picture shows the proper pressurizing position. The sprayer is to the side of the spray operator, with the outside of the foot on the footrest. The spray operator turns the T-handle and sprayers in this position.

**Demonstrate how to release the pressure from the sprayer.**
- It is important that sprayers are depressurized when spray operators are not spraying. Sprayers should be depressurized when loaded onto vehicles and when walking between houses.
- To depressurize the tank, release the pressure valve. Do not attempt to open the lid of a pressurized sprayer.

Remind participants that trainees need to understand that the sprayer will need to be pressurized again after about 10 complete spray swathes. The sprayer should be pressurized again if the pressure falls below 40 psi. If the pressure drops too low, the CFV will stop the flow of insecticide from the sprayer automatically. This prevents ineffective doses of insecticide from being deposited on the wall.

Ask participants if they have any questions. Ask when a new spray operator is pressurizing the sprayer, what mistakes do they most commonly make? Take a few responses. Ask: How can we help new spray operators succeed?

**LIFTING AND CARRYING THE SPRAYER**

Explain that there are common errors in lifting, carrying, and positioning the sprayers for spraying. Errors can increase fatigue and cause injury for spray operators, potentially resulting in fewer houses sprayed per spray operator per day.

Explain that lifting and managing a full sprayer is quite different from lifting and managing an empty one.

Remind the group that the weight of the sprayer will change throughout the day as the tank is emptied and refilled several times.

Tell participants they will work in four groups to discuss and list the correct ways of lifting and carrying the sprayer. The group should reflect on carrying full and empty sprayers. Each group should detail all the steps for lifting and carrying. Each group should write down the process on note paper. Tell participants they have 10 minutes to discuss.

After 10 minutes: Ask each group report the outcomes of their discussion. Ask why they think it is important to lift and carry the sprayer correctly. Emphasize that improper lifting and carrying can result in back strain, which can affect the quality and speed of spraying.

Ask one participant to demonstrate the correct lifting procedure, first using an empty sprayer, then using a full one. The correct procedure includes the following steps:
- Place the sprayer next to your right foot, with the shoulder strap facing forward (the same direction you are facing).
- Fully bend the right knee, but keep your back straight.
- With your right hand, grasp the upper part of the shoulder strap (including the metal clasp) and lift the sprayer onto your shoulder, supporting the bottom of the tank with the left hand to keep it in position.
- Release your grip on the tank and adjust it to the correct position on your back.

Thank the volunteer. Explain that this lifting procedure can be done on the left side for left-handed spray operators.
Ask participants to look at the picture and describe how to move the sprayer from “walking position” to “spraying position.” Explain the correct way to carry the sprayer when spraying.

- The sprayer rests under the left arm, with the strap over the shoulder. The top of the sprayer is forward, so the spray operator can see it.
- One hand should hold the sprayer T-handle; the other holds the lance.
- Make sure you can easily see and read the pressure gauge.
- Hold the flashlight/torch in the left hand, with the arm resting on the T-bar.

Explain that this position allows easy handling in narrow spaces and in rooms with low ceilings. Also, the sprayer will not interfere with the helmet and nose mask.

Emphasize the importance of the flashlight/torch. Flashlights/Torches are part of the required gear for all spray operators. Since spray operators often work in dark spaces, the flashlight/torch is necessary for two reasons.

- First, the extra light helps prevent accidents. The spray operator can better see items on the floor, preventing trips and falls that can lead to injury and/or spilled insecticide.
- Second, the extra light helps spray operators see the wall more clearly, enabling them to see any spots that have been missed with the spray.

Repeat correct lifting and carrying position as participants watch. Demonstrate how to shift the sprayer from “walking position” to “spraying position.” Emphasize that when we talk about lifting and carrying the sprayer, we have three positions that new spray operators need to understand:

**Position 1 - preparing to lift:** Place the sprayer on the floor, strap facing forward (in the same direction the person is facing).

**Position 2 - walking position:** Lift the sprayer onto the shoulder and hold it with the right arm, centred on the shoulder.

**Position 3 - spraying position:** Transfer the sprayer from behind the shoulder to in front of the shoulder, with the lance in one hand and the other hand on the T-handle of the sprayer.

Using the sprayers, instruct participants to practice lifting, positioning, and carrying.

**PRACTICE: DESCRIBING LIFTING AND CARRYING**

Explain that you would like participants to practice explaining how to properly lift and carry the sprayer, focusing on the three positions we have discussed. In this activity, we are not just demonstrating the proper technique—we are explaining to a group of new spray operators how to manage their equipment. Be sure to explain in simple language, step by step.

Ask them to return to their pairs to practice explaining the process. Highlight that they have 15 minutes to complete the practice. After the demonstration, they should give their partner feedback on how well they did and what could be improved.

When participants are finished with practice, guide them in a brief discussion about their experience and review common errors in carrying and positioning the sprayer.
SESSION 8

ESTABLISHING CORRECT SPRAY TECHNIQUE
Explain that we will now focus on the most important set of technical skills for spray operators—correct spray technique. As with most skills, new learners might perform the skill correctly but slowly. With time, the positions will become more natural and the spray operators will gain speed.

**INSPECTING THE HOUSE**

Ask participants to briefly tell you how they know a house or structure is ready for spraying. Make sure they list the following:

- Families have removed all household goods except heavy furniture.
- Heavy furniture should be moved to the center of the room and covered with a polythene sheet.
- The following have been removed from the house:
  - Items hanging on walls
  - Clothing
  - Agricultural implements
  - Food, food containers, and water jars
  - Cooking utensils

Mention that the spray operator must inspect the house before spraying begins, paying special attention to the eaves, where household items might have been left behind by mistake.

Ask: What if there is a sick person in the home who cannot walk? Discuss options: If possible, the family should try to move the sick person outside so spraying may be completed. If the person cannot leave the house, then the house must not be sprayed.

**PREPARING THE WALL FOR SPRAY PRACTICE**

Ask: When teaching these skills, where do we start? What is the first thing we do to teach correct spray technique? When new spray operators learn to spray, they often have difficulty determining the correct distance from the wall and they might spray inconsistently, leaving gaps on the wall with no insecticide. We can help them learn the right techniques by teaching them in steps. When spray operators first start working, it is helpful if they can see their mistakes.
Describe the method for preparing the wall for spray practice. As you describe the method, ask one volunteer to follow the instructions and mark the wall.

■ Mark the width of one spray swathe with a solid line.
  ◘ Start at a corner or edge of a wall, at the bottom (about 30 cm from the ground). Measure 75 cm from the edge and make a small mark.
  ◘ About halfway up the wall, measure 75 cm from the corner and make another small mark.
  ◘ At the top of the wall, measure 75 cm and make a third mark.
  ◘ Start at the top and connect the three marks with a solid line down the wall.

■ Mark the width of the second spray swathe, with a dotted line indicating the 5 cm overlap.
  ◘ Starting at the top, measure 5 cm to the left of the solid line you marked in the previous step. Mark the wall.
  ◘ About halfway down the wall, measure 5 cm to the left of the solid line. Mark the wall.
  ◘ At the bottom of the wall, measure 5 cm to the left of the solid line. Mark the wall.
  ◘ Connect these three marks by creating a dotted line down the wall.
  ◘ The dotted line marks the start of the second spray swathe.

■ From the dotted line, measure 75 cm to the right and draw a solid line. This width, from the dotted line to the solid line, represents the second spray swathe.
  ◘ Continue this pattern until the wall is fully marked for spray practice.

Ask for several volunteers to demonstrate correct wall marking, taking turns drawing the lines. Explain that we will use this marked wall to practice explaining spray technique and giving feedback.

Ask participants what needs to be done next to prepare the wall for practice. Our practice sessions are normally done on outdoor walls, and there is an important difference with indoor walls: there is no ceiling!

Before we begin our spray practice, mark one horizontal line across the top. This symbolizes the corner where the wall would meet the roof in a normal house. We want to make sure spray operators reach the top of the wall, without leaving gaps. Marking the top of the wall allows us to easily check for gaps. If we fail to mark the top of the wall, spray operators could develop bad habits during training that carry over into their work in the field. Our goal is to create practice sessions that resemble working conditions as closely as possible.

Show an example of a fully marked practice wall and explain. Notice that each spray swathe is marked using a different colour chalk—white marks one swathe, orange marks the next and pink the third. Each swathe has that 5 cm overlap. These lines serve as a visual guide, helping new spray operators understand more clearly correct spray technique.

Note: The height of the horizontal mark may vary from country to country. The standard is a 2-meter wall, which requires a 5 second spray swathe to cover it. However, if the structures you are spraying have taller walls, you may need to adopt these instructions to address the realities of your specific environment.

OVERVIEW OF CORRECT SPRAY TECHNIQUE

Explain that learning correct spray technique is essential for a good-quality spray. If spray operators do not perform their jobs correctly, it can jeopardize the impact of the whole spray campaign. Highlight that when we teach spray operators correct spray technique, several parts of the technique are all important:

■ Distance from the wall
■ Speed of moving the lance up and down the wall
■ Pattern and rhythm for moving across the wall

Explain that we will start with a demonstration of all steps together. Emphasize that the demonstration will be done silently the first time. Participants should observe the process and ask questions afterward.
Ensure that all these steps are included:
- Lift sprayer properly onto the shoulder in “ready to spray” position.
- Facing the wall, ensure your feet are 1 meter from the wall.
- Starting in the lower position, with the nozzle pointed at the corner where the wall meets the floor, engage the trigger and slowly begin spraying.
- Slowly raise the extended arm, bending at the elbow as you reach the middle position, maintaining a 45 cm distance from the wall.
- As you reach the top position, ensure the arm is bent and the nozzle tip is still 45 cm from the wall.
- Stop the spray and take one large step to the right.
- With a 5 cm overlap with the first swathe, start at the top position.
- Engage the trigger and slowly bring your arm down the wall, making sure to keep the 45 cm distance from the wall.
- In the middle position, ensure your elbow is bent.
- In the lower position, the arm should be fully extended.
- Ask participants to explain what they have observed, noting the specifics of proper spray technique.

Explain that we will explore each part of good spray technique in greater detail, starting with distance from the wall.

**SPRAY TECHNIQUE: CORRECT DISTANCE**

Explain that it is important to teach trainees how to assess the correct distance from the wall and guide them on how to maintain that distance throughout spraying.
- Start with feet 1 meter from the wall, as pictured on the slide.
- With the sprayer over your shoulder, extend your arm straight toward the corner where the wall meets the floor. This is referred to as the “lower position.”
- The nozzle should be about 45 cm from the wall. While spraying, the nozzle should always be 45 cm from the wall.

Highlight that there may be circumstances when the spray operator cannot maintain a distance of 45 cm from the wall; for example, in small spaces or when heavy furniture or other obstacles are in the way. As trainers, we need to reinforce correct technique. When spray operators are in the later stages of their training, exceptions may be mentioned. The spray operator should try as much as possible to maintain the correct distance. If an obstacle can’t be moved, it should be covered, and we do our best to spray around it.

Explain that in the “top position,” the arm is fully extended. It is only bent in the “middle position.”

Explain that trainees could have difficulty imagining a distance of 45 cm. When do you think was the last time they held a ruler in their hands? Ask: So, how can you help trainees understand the required distance (45 cm)? What can you say to make it clear for them? You can also take a small stick and mark it at 45 cm to help trainees see and understand the correct distance from the wall.

Ask: What typically happens when trainees raise their arms to spray the middle part of the wall?
- New spray operators often struggle with this part: They must bend their elbows in the middle position to ensure they maintain the 45 cm distance.
- It can be easy to lose the 45 cm distance unless you are consciously thinking about preserving it.
- Experienced spray operators learn what position their arm should be in and then gauge the distance by routinely putting their arm in the right position.

Ask: What can we do to help trainees understand how their arm position should change as they move up and down the wall? One technique is to take a stick and tie it to the end of the lance. The stick should extend 45 cm beyond the end of the lance. Attach the stick to the end of your lance, measuring it against the papers on the wall to confirm the length from the end of the lance is correct.

Explain that we will ask trainees to move the lance up and down, keeping their feet in the same position and making sure the stick never breaks contact with the wall. As they move their lances up and down on the wall, they should note how their elbows must bend to keep the lance at the correct distance. In general, when in the “lower position,” the elbow is straight. In the “middle position,” the elbow is fully bent. And in the “upper position,” the arm is again fully extended.
Explain that in pairs, they should again explain the process of maintaining the correct distance from the wall. Ask all participants to take a sprayer and a stick marked at 45 cm and return to their pairs for the activity. Explain. In this activity, we will use the stick extension as a teaching tool to help new spray operators get a feel for the right distance from the wall. Once the learner has practiced with the stick, we remove it for later practice sessions. Again, the idea is that we teach them one thing at a time, breaking down spray technique into smaller steps that allow the learner to perfect one part of the technique before moving to the next one.

Explain that in their pairs, one person will perform the action of spraying the wall. The other person will verbally guide the process, explaining each instruction step by step. Both participants should make sure all the essential steps are covered:

- Start with feet 1 meter from the wall.
- With the sprayer over your shoulder, extend your arm straight toward the corner where the wall meets the ceiling. This is called the “upper position.”
- The nozzle should be about 45 cm from the wall.
- While spraying, the nozzle should always be 45 cm from the wall.
- Give pairs 7-10 minutes to practice, then have them switch roles.

Debrief the activity as a large group, using the following questions:

- As the facilitator, what parts of this technique were difficult to explain?
- How often did you refer to the parts of the sprayer? Did you refer to each one by its correct name?
- What mistakes are new spray operators likely to make when they start learning spray technique?
- What questions might trainees ask when viewing this demonstration?

Emphasize that when new spray operators learn to spray, they must always wear proper PPE—even during practice sessions. This helps reinforce correct behaviour. It should feel strange for a spray operator to touch a sprayer with bare hands.

**SPRAY TECHNIQUE: SPEED**

Explain that we have now discussed how to maintain proper distance from the wall and correct body position while spraying. The next part of spray technique to learn is how to maintain the correct speed.

Ask: What happens if we do not maintain the correct speed when conducting IRS?

- Too much or too little insecticide is deposited on the wall.
- Too little might not kill mosquitoes sufficiently.
- Too much could lead to insecticide shortages at the end of the spray season.

Ask: How do you know you are achieving the correct speed when spraying? How did you learn to maintain the correct speed when you started?

The standard speed is about 2.2 seconds per 1 meter of height. With the average wall just over 2 meters high, the average time from top to bottom is 5 seconds. Most spray operators count out loud while spraying: "One-rand, two-rand, three-rand ..." or some version of this.
SPRAY TECHNIQUES: PATTERN AND RHYTHM

Emphasize that because we all learn differently, this step-by-step approach helps ensure every trainee gains a deep understanding of the skills we are teaching. It also helps those who are slower to learn to keep up with the process. At this point, we have covered spray distance and speed. We will now move into pattern and rhythm for spraying a full wall.

Show slide and Ask: Looking at this diagram, who can explain correct spray swathe? Invite one participant to explain. Ensure the following points are covered:

■ As we spray a wall, the spray operator should start at the top of the wall, moving downward.
■ After that swathe is complete, the spray operator takes one step to the right and moves from bottom to top for the second swathe.
■ In this way, the spray operator alternates spraying upward and downward.
■ Each spray swathe should overlap the previous one by 5 cm.
■ This is the correct spray pattern.

Ask: Why is the overlap of 5 cm important? It is to ensure the wall is fully covered. There must not be any place for mosquitoes to rest for IRS to be effective.

Explain that spray operators use a particular rhythm. Ask: What do we mean by "rhythm"? The word is most often associated with music. Rhythm is the repeating sound in the music. When people clap with a song or tap their feet that is the rhythm. When we put together all the steps for spraying, spray operators have their own rhythm when spraying—a bit like a dance.

Invite participants to observe a quick demonstration. The facilitator should conduct several spray swathes, while counting out loud. Explain, using the steps below:

■ Start at the bottom of the wall.
■ As I spray, I’ll count, “one-rand, two-rand, three-rand, four-rand, five-rand.”
■ Step to the right. “One-rand, two-rand, three-rand, four-rand, five-rand.”
■ Step to the right.

Explain that the last component of spray technique focuses on the order in which we spray parts of the house. Ask: Can anyone explain which part of the house we start with?

■ Enter the house and close the front door.
■ Spray the inside of the front door.
■ Spray all of the edges and frame of the door.
■ Open the door to allow light into the room.
■ Start with the top corner of the wall to the right of the door, then continue alternating downward and upward swathes until the entire house is sprayed.
■ After every 10 swathes, shake the tank to ensure insecticide is mixed. Check and re-pressurize the tank, if needed.
■ Take care to spray all edges and corners of windows.
■ Spray the backs and undersides of immovable furniture, and so on.
■ After finishing the interior surface, spray the ceiling only if it is grass-thatched or ceiling board/plywood (non-metal).
■ Spray the under-part of the eaves (do not spray the top of eaves).
■ Remember that if the pressure drops, the CFV will cut the flow of insecticide. Check the sprayer pressure as you spray.

Ask participants about their experiences teaching spray swathe and rhythm:

■ What areas do new spray operators sometimes struggle with?
■ What techniques have you used to help them learn?
■ What challenges have you had in teaching this part of spray technique?
Explain that the success of IRS depends greatly on spray quality. Spray operators can perform at their best only if they are well-trained and supported in the field.

- Proper spray technique enables the spray team to cover the required number of houses each day.
- Proper spray technique ensures we do not run out of insecticide before the end of the spray campaign.
- Proper spray technique covers all wall surface areas, leaving no place for mosquitoes to rest.

Ask all participants to stand up and come to the front of the room. Explain that we will practice our rhythm together, using imaginary sprayers. Form a circle in the front of the room, with participants facing away from each other. This should mirror the process of spraying a round structure. Take a place in the circle and lead the activity with spoken instructions. Remind participants that we will use imaginary sprayers.

- Everyone pick up your sprayer and put it in the correct position.
- Enter the house and close the front door.
- Draw your lance and prepare to spray the door. Start at the bottom and slowly spray upward to the top of the door: “one-rand, two-rand, three-rand, four-rand, five-rand.” Good.
- Now, open the door to let light into the house.
- Next, we will start on the wall. Place your lance in the upper position. Let’s start the spray and move down the wall. “One-rand ...
- Take a step to the right. Start the next spray swathe, moving up the wall. “One-rand ..
- Now all together, step to the right, move down the wall. “One-rand...
- (periodically) Don’t forget to check your pressure gauge! Don’t forget to shake your sprayer to keep the insecticide mixed!

INTRODUCTION TO THE COMPETENCY CHECKLIST

Explain: As we teach spray operators to perform these spray techniques, it can be helpful to have a guide to assess how well they have performed.

Hand out the Spray Operator Competency Checklist.

The Competency Checklist is a tool to help facilitators give feedback to trainees about their performance. We share it with trainees to help them clearly understand what is expected of them and how their performance will be assessed. Specific competencies (skills) are scored indicating how well the trainee has performed the skill. The checklist has four sections:

- Communication with head of household
- Mixing insecticide and pressurizing the sprayer
- Distance from the wall and speed
- Spray swathe and rhythm

Explain: We will practice using the Competency Checklist during the next session.
**PRACTICE: ALL SPRAY TECHNIQUES TOGETHER**

**Note:** This practice session may be conducted with water on the practice wall or as a field simulation in actual homes. Working in homes yields better discussions related to wall hangings, furniture, and so on. It also allows master trainers to demonstrate how to lead trainees through the field simulation. For a field simulation, you can have no more than 5-10 trainees in each home at one time. This option is logistically difficult for groups larger than 50 participants.

Explain that in this practice session, we will focus on bringing together all the spray techniques we have learned. Ask participants to go to the practice area. Ask them to form pairs, with one partner standing in front (close to the wall) and the other partner standing directly behind. Explain that those standing in front should be one arm's length apart from their partner. For this activity, we will do a series of steps to help trainees build confidence and get feedback.

- First, we will go through the first five spray swathes together, explaining each step as we go to make sure everyone hears the instructions one more time.
- Then, we will ask the partner who is not spraying to observe and give feedback, using the Spray Operator Competency Checklist.
- Then, we will switch roles.
- As we practice spray swathes, we will step to the right as we move across the wall. As we reach the end of the wall, the last person will move to the front.
- Remember to maintain correct nozzle distance and correct spray speed.
- Let’s go through the first swathe together. As we do, I would like one volunteer to call out the steps as we do them together.

Repeat the guided practice for five swathes. Explain that the spray operator can now focus on performing the swathes correctly. Partners who are behind should observe the spray operators’ practice, using the Competency Checklist to record good technique and areas to improve. Switch roles and repeat the process.

Debrief by asking the following questions:

- How do new spray operators feel when they first start bringing together all the skills they have learned?
- What do they struggle with the most?
- How did it feel to use the Spray Operator Competency Checklist? What are the advantages and disadvantages of this tool?
SESSION 9
SPRAYER MAINTENANCE AND STORAGE
Explain that we have now learned the basic techniques for spray operators to conduct effective spray operations. In addition to good technique, regular checking and maintenance of spray equipment can keep spray operators working effectively.

Ask participants to quickly name the **key parts** of the sprayer. Focus on the most important ones, not every single part.

### USE AND MAINTENANCE OF SPRAY EQUIPMENT

Mention that routine maintenance, cleaning, and checking of the spray equipment are crucial to the IRS program's success.

Ask: What should be routinely checked on the sprayer each day? Take a few answers. Show slide with the following:
- Hose wear
- Hose connection—for tightness
- Trigger—for smooth operation
- Overall condition of seals and washers, pump, trigger valve, pressure release valve, CFV, filters, and strap

Ask: When should this happen? Participants should answer that checking the sprayer should happen **every day**, before spray operators go out to the field. Explain that storekeepers need to be aware of any sprayer that is malfunctioning and ensure it is not released to any spray operator until it is repaired.

Ask participants what they think are common problems spray operators encounter in the field. Record responses on a flipchart, ensuring participants mention the following:
- Nozzle blockages
- Malfunctioning pressure gauges
- Leaks along the hose or lance, especially where the hose meets the trigger On/Off valve
- Improper pressure

Go through common problems, one by one, and discuss the necessary steps for resolving each problem. When possible, demonstrate, highlight that one of the most common issues with sprayers is nozzle blockage.
- It is not unusual to develop blockages in the nozzle, due to undissolved insecticide or debris in the water used to mix the insecticide.
- Blocked nozzles can be cleaned by soaking them in water.
- Once the nozzle has soaked for several hours, you can use a soft toothbrush to clear any remaining blockage.
- Never clean nozzles with a piece of wire or a hard pin, because this will widen the nozzle, causing it to release incorrect amounts of insecticide.
- Never put a nozzle to your mouth to blow through it.
- Remember that the CFV helps ensure that the correct amount of insecticide is deposited on the wall. When the sprayer loses pressure, the flow of insecticide stops. Some spray operators mistake this for a blocked nozzle.

Explain that keeping sprayers in good condition is an important responsibility for spray operators and for storekeepers. Store sprayers upside down, with the lid open, and separate from other field equipment. After storage, check each sprayer to make sure it is in working order before it is given to a spray operator.
Explain that this shows proper storage of sprayers. Every store should have hooks or pegs on the wall that can be used to hang sprayers. They are stored open to ensure they dry fully—to prevent rusting.

Ask: What is the most common cause of damage to sprayers? Emphasise that most sprayers are damaged during transportation to and from the field. Ask: What principles should we keep in mind for transporting sprayers to ensure they are not damaged in transit? EMPHASIZE the following best practices:

- Carry sprayers upright in the vehicle.
- Secure sprayers to keep them from falling or bouncing and sustaining damage while traveling.
- Release pressure before loading the sprayer into the vehicle. Never travel with a pressurized sprayer!
- Take participants through the Table below that shows common pump faults and suggested remedies and discuss

<table>
<thead>
<tr>
<th>Fault</th>
<th>Cause</th>
<th>Remedy</th>
</tr>
</thead>
<tbody>
<tr>
<td>No spray</td>
<td>Tank empty</td>
<td>Refill tank</td>
</tr>
<tr>
<td></td>
<td>Nozzle blocked</td>
<td>Clear or replace nozzle</td>
</tr>
<tr>
<td></td>
<td>Filter blocked</td>
<td>Clean or replace</td>
</tr>
<tr>
<td></td>
<td>Trigger valve faulty</td>
<td>Clean or replace valve</td>
</tr>
<tr>
<td></td>
<td>Pump faulty</td>
<td>Check seals and plunger cap, clean and replace</td>
</tr>
<tr>
<td>Liquid in pump</td>
<td>Faulty pump valve</td>
<td>Drain liquid, clean or replace the valve</td>
</tr>
<tr>
<td>Pressure drops too rapidly</td>
<td>Lid seal not fitted correctly</td>
<td>Check and refit lid seal, replace if damaged</td>
</tr>
<tr>
<td></td>
<td>Lid seal or cap threads worn out</td>
<td>Replace seal if damaged</td>
</tr>
<tr>
<td></td>
<td></td>
<td>If unthreaded temporarily repair with thread tape or replace cap</td>
</tr>
<tr>
<td>Tank split</td>
<td>Small leaks in stainless steel tank</td>
<td>Tank to be replaced or sealed with silver soldering</td>
</tr>
<tr>
<td></td>
<td>Decompression valve stuck</td>
<td>Check and replace if necessary</td>
</tr>
<tr>
<td></td>
<td>Pressure regulating valve faulty</td>
<td>Clean or replace valve</td>
</tr>
<tr>
<td></td>
<td>Pressure gauge loose</td>
<td>Tighten, use thread tape if necessary</td>
</tr>
<tr>
<td>Inaccurate readings on pressure gauge</td>
<td>Gauge inlet blocked or gauge broken</td>
<td>Clean inlet or replace the gauge</td>
</tr>
<tr>
<td>External leaks</td>
<td>Leaks in hose</td>
<td>Temporarily repair with tape</td>
</tr>
<tr>
<td></td>
<td>If near hose end, cut off split part and refit hose or replace whole hose if necessary</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Loose connections at connectors</td>
<td>Tighten hose clips or hose ends connectors</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Check washers and replace</td>
</tr>
<tr>
<td></td>
<td>Leaks in trigger assembly</td>
<td>Check valves and valve seals</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Check connections and washers for tightness</td>
</tr>
</tbody>
</table>
TESTING AND CALIBRATING THE SPRAYER

Define again what a nozzle is. Explain that nozzle or spray tip is the most important part of the sprayer - yet may be one of the most neglected components of any spray program. The nozzle is designed to deliver a precise volume of liquid per minute at a given pressure and to maintain a uniform spray pattern and swathe width.

Explain that the standard nozzle is the Teejet /unijet nozzle 8001 or 8002 - which is recommended by WHO for malaria control programs. Specification for flat fan shaped spray recommended by WHO is recommended for absorbent surfaces such as mud or cement plaster.

80 = represents spray angle i.e. 80°
02 = describes flow rate i.e. 0.2 US gallons or 757 ml per minute at 40Psi (276) Kpa).

Explain that the Tee jet 8001 nozzle can be used on non-absorbent surfaces where early run-off will result in target deposit not being achieved. Here the 01 represents 390 ml per minute at 40 psi i.e. half the volume flow rate. NB: Spray concentration needs to be adjusted i.e. double the concentration.

**Note:** Procedures below describes the approach for the Hudson.

Ask: What do you understand by the term “calibrate”? Take a few responses and make sure participants understand that to calibrate is to check, adjust, or determine something by comparison to a standard. When we do this, we are checking the sprayer nozzle to confirm it meets the IRS standards of performance.

Emphasize that calibration of the nozzle should be done **once per week**.

Remind participants that before they put insecticide in the sprayer, it is important to check the sprayer thoroughly to confirm it is not leaking, the pump mechanism is working properly, and the pressure rises when the T-handle is pumped.

Ask participants to pay close attention as you demonstrate how to check and calibrate the sprayer. Emphasize that they will be asked to demonstrate how to check and calibrate the sprayer after your demonstration.

**Demonstrate, using the steps below.**
The first time you conduct these steps, do so silently. Then repeat the process, explaining each step as you perform it.

- To check the sprayer, follow these steps:
  - Pour clean water into the sprayer. Never fill the sprayer more than three quarters full.
  - Fit the lid and turn the handle to lock the lid in position.
  - Place the sprayer at your side, with the footrest near your foot.
  - Operate the sprayer using both hands, with a foot on the footrest. Pump to the working pressure of 55 psi (3.8 bar). Every full pump stroke gives about 1 psi (1 bar = 1,000 millibars = 14.5 psi = 100 kPab).
  - Check the pressure gauge to confirm the tank is holding pressure. Listen for a hissing sound of escaping air, which indicates that a tank is losing pressure.
  - The pressure gauge should show an increase in pressure as you pump.
  - Make sure there are no leaks along the lance and hose, especially where the hose joins the tank and around the On/Off valve.
  - Operate the trigger around the On/Off valve to make sure spray is emitted from the nozzle.
  - Check the spray pattern from the nozzle by spraying a dry wall surface. The pattern should be even and without streaks.
  - Make sure the nozzle does not drip when the trigger On/Off valve is released.

- To calibrate the nozzle (with water in the tank), follow these steps:
  - Pump to 55 psi (3.8 bar).
  - Open the trigger On/Off valve for 1 minute. Collect the discharge and measure the amount in a measuring jug. Empty the jug.
  - Discharge again for 1 minute and measure the amount.
  - Repeat for a third discharge.
  - Calculate the average of the three 1-minute discharges.
  - The average discharge of an 8002 nozzle is about 757 ml per minute.
  - If the discharge is incorrect (15 ml per minute, more or less than 757), check the nozzle and the screen filters to confirm they are not clogged.
  - If the discharge is not correct, the nozzle might need to be replaced.

*Repeat the calibration to confirm.*
Calibrating the nozzle with CFV attached:

■ Adding a CFV set on the lance ensures the flow rate does not decrease as pressure in the sprayer falls. However, a worn nozzle will allow too much insecticide to be deposited on the wall.
■ Pressurize the sprayer. Regardless of the pressure in the tank, the CFV should create a consistent flow.
■ Open the trigger On/Off valve for 1 minute. Collect the discharge and measure the amount in a measuring jug. Empty the jug.
■ Discharge again for 1 minute and measure the amount.
■ Repeat for a third discharge.
■ Calculate the average of the three 1-minute discharges.
■ The average discharge of an 8002 nozzle with a CFV is about 600 ml per minute.
■ If the discharge is incorrect (15 ml per minute, more or less than 757 ml), check the nozzle and the screen filters to confirm they are not clogged.
■ If the discharge is still incorrect, the nozzle might need to be replaced.

Repeat the calibration to confirm.

When done, ask if participants have any questions. After answering relevant questions, put them into groups of three. Hand out the Testing and Calibrating the Sprayer guidelines. Ask for one volunteer to explain how to calibrate the sprayer to a group of new trainees. If time allows, Ask participants to return to their pairs to practice explaining calibration of the sprayer. Give each partner 5 minutes to explain the process, then switch roles.

TEACHING TECHNIQUES THAT WORK

Ask participants which methods they think work best to teach sprayer maintenance. Take a few comments and Emphasise that skills such as maintaining and calibrating the sprayer are better taught when participants have a chance to touch actual sprayers and practice the process. NOTE that these are sessions where participants should have a lot of practice so they can perform the tasks well and succeed in their work. Therefore, showing them how to do it (demonstration), giving them an opportunity to ask questions (Q&A), and practicing in smaller groups and receiving feedback (group work and exercises) are important methods for teaching practical sessions like this one.
SESSION 10

BUILDING COMMUNICATION SKILLS FOR COMMUNITY MOBILIZATION
For a spraying program to be successful the community needs to be informed of the benefit of protection against malaria vectors afforded by IRS. The community needs to have been made aware about the implementation of the spray operation in their localities. It is therefore important that spray operators should be knowledgeable about IRS so as to help communities appreciate and collaborate in the operation.

Explain that most seasonal workers interact with households as they go through the day. This mainly refers to spray operators and community mobilizers, but other seasonal workers may also have contact with communities. All seasonal workers should be able to answer questions as they come up, and all should understand the role of the community mobilizer.

ROLES OF COMMUNITY MOBILIZERS

Explain: This session is meant to help you teach approaches for community mobilization, delivering clear IRS messages, explaining community members' IRS concerns, and addressing them effectively.

Highlight that to achieve 85% and 95% for control and elimination, respectively, or better uptake of IRS, we must have strong community involvement. The success of IRS depends on community support. Community members are better able to support IRS when they are properly sensitized and mobilized. The roles of the mobilizers include the following:

- Conduct door to door mobilization sensitizing households on IRS
- Ensure household preparedness for IRS
- Distribute IRS brochures to households mobilized
- Submit daily reports on households mobilized
- Ensure data quality and accuracy
- Disseminate consistent and quality messages to the community

The mobilisers will target the community with information on purpose, benefits and precautions of the intervention, answer questions and issue simple pamphlets containing information on malaria and IRS to the households. They establish an initial contact with the village elders and ensure that his/her team members mobilise all households in each village and ensuring that villages being sprayed on the day are ready by sending out alerts.

Show slide with a list of who is involved in IRS community mobilization. Briefly discuss with the participants each position's key functions. Ask:

- How do community leaders support mobilization?
- How do community health workers support mobilization?
- And so on, for community mobilizers, spray operators, provincial/district coordinators, and other stakeholders.

Tell participants we will take a bit of time to discuss the roles of the community mobilizer and spray operator in community mobilization. They have separate but complementary roles.

Ask: What responsibilities does the community mobilizer have? And what responsibilities belong to the spray operator?

Show slide with the community mobilizer's role in IRS. Show slide with the spray operator's role in community mobilization.
Explain that the community mobilizer is expected to visit homes first to inform them the spray operator will arrive soon and they should make sure their belongings are out of the house.

- The mobilizer gives information about IRS, how to make structures or houses ready for the spray operators to do their jobs, and what families need to do during and after the spraying operation.
- The mobilizer plays an important role in ensuring the spray team can move quickly through the community.

Explain that the spray operator reinforces information given to the members of the household, including safety and removal of household items before spraying.

**TEACHING KEY MESSAGES**

Explain that like other seasonal workers, community mobilizers must practice the skills they are learning to remember them.

- The most common way to teach communication skills is by using role play. A good role play presents a scenario and allows trainees to think carefully about what they will say.
- After the role play, trainees should receive feedback about how they performed. This feedback is usually given in the large group, so trainees can learn from each other’s mistakes. When the feedback is balanced (both positive and negative/constructive), trainees tend to receive it well. Explain that we will conduct a role plays to become more familiar with this teaching method.

Divide participants into three groups. Explain that their groups should each develop a short role play to help new community mobilizers practice delivering key messages to households. Assign one topic to each group, as follows:

- Group A: Key messages to households before spraying
- Group B: Key messages to households during spraying
- Group C: Key messages to households after spraying

Explain that participants have 15 minutes to develop their role plays, then 5 minutes for each group to deliver it. Caution participants that the role play should be quite short. Emphasize that all group members should have some role to play. Ensure the following are mentioned:

**Before spraying:**
- Paint, plaster, or smear the walls before spraying.
- Remove all people, animals, and household goods from the home and ensure they are a safe distance away.
- Provide 10 liters of water for the spray operator.

**During spraying:**
- An adult should remain near the home during spraying.
- The home should be unlocked and an adult should be home.
- An adult in the household should confirm that the spray operator has actually opened the package of insecticide and mixed it in your presence.
- An adult should be available to sign the spray card.

**After spraying:**
- Keep all people and animals out of the house for 2 hours after spraying.
- Sweep up dead insects and dispose of them in a pit latrine, or bury them.
- Do not paint, repaint, plaster, or smear the walls after spraying.
- Continue to sleep under an insecticide-treated mosquito net.

Debrief the role play using the following discussion questions:

- What skills would a community mobilizer practice or learn when they participated in your role play?
- What challenging situations can be explored through a role play?
- What are some best practices you saw your peers use during this activity?

Explain the role of IRS advocacy, IEC campaign and community participation.

**IRS advocacy:** Involve politicians through: periodic IRS campaign launches and IRS campaign closing ceremonies, featuring national and international celebrities

**IEC campaigns:** IEC campaigns should be carried out before spraying operations are launched countrywide or in specific districts
in order to: raise awareness around IRS; facilitate community mobilization; ensure acceptance of IRS; and encourage participation in IRS operations at the family and household level. IEC campaigns use simple messages through different media. Educational materials such as pamphlets, posters and cartoons need to be produced and widely distributed. Where possible, these should be supported by radio and TV spots. Meetings organized by community leaders to explain the procedures and benefits of IRS programmes should be one of the tools used in health education.

Community participation: For a spraying programme to be successful, people must be informed of the benefits of protection against malaria using the following target groups: K traditional leaders, political leaders, religious leaders, civil society leaders, women’s group leaders, youth leaders, and school children.
SESSION 11
ENVIRONMENTAL COMPLIANCE
The safety of the population from insecticide poisoning and the prevention of the environment from unnecessary contamination are crucial for an IRS program, and any other program that uses chemicals. Explain that we have focused on maintaining the sprayer. An essential part of maintenance is cleaning the sprayer regularly. Learning to protect the environment and clean equipment properly ensures the equipment will function properly the next day.

Show slide: Review the session objectives.

ENVIRONMENTAL COMPLIANCE AND INSECTICIDE STORAGE

Ask: What comes to mind when we talk about environmental compliance? What does it mean to be “environmentally compliant”?

We are really talking about two essential things—protecting the natural environments where we work and safety for the people who live and work in those environments—including IRS spray operators. Environmental compliance is not something we do; it is the result of conducting our IRS activities in a way that is environmentally responsible. Our focus is on ensuring that all insecticide and insecticide-contaminated materials (boxes, bottles, sachets, masks, and PPE) are handled in a way that is safe for the environment and the people living in it.

Tell them that we will discuss several aspects of environmental compliance:
■ Correct storage of insecticides
■ Choosing appropriate sites for IRS operating bases
■ Set up and use of the soak pit and wash areas, including the progressive rinse
■ Management of solid waste

Explain that every IRS program will perform environmental compliance assessments and inspections before, during, and after the spray campaign to ensure procedures are correctly and consistently followed.

Emphasize that correct insecticide storage helps us avoid insecticide spills, leaks, and accidents. When insecticide is managed correctly, we also improve accountability, making sure the insecticide our program procures is used only for IRS.

Explain that district-level supervisors should conduct periodic checks at storage facilities that operate in their districts. Ensuring correct environmental practices is everyone’s responsibility. Mishandled insecticide can contaminate to the soil, water, and air around storage facilities, and can have a negative impact on the health of people living and working in the area around the facility.

Review what should be checked at the central warehouse to ensure full environmental compliance. Ensure the following are mentioned:
■ Storage facilities are expected to have double locks, and be guarded at all times
■ Roofs should be well maintained (e.g. no leakage)
■ A notice should be prominently displayed on the outside of the store in the local language(s) with a skull and crossbones sign saying “Danger, Keep Out, Pesticide Storage”
■ Pesticide Stacking: Containers should be arranged to minimize handling and thus avoid mechanical damage giving rise to leaks.
■ Floor spaces should be uncluttered to permit easy inspection and allow free airflow. This also enables immediate clean up in the event of any leakage or spills
Explain the importance of checking these key areas in each storage facility, especially the principles of “first in, first out” (FIFO) and “first expiry, first out” (FEFO) for insecticides. Older items are closer to the door, so they go out first. For items that expire, such as insecticide, we want to ensure the units that are closest to their expiration dates are used first. Pesticide stocks should be distributed on a “first-in/first-out” basis to avoid the risk of stocks becoming obsolete (past their useable life dates). Explain that the insecticide inventory should be reviewed during environmental compliance checks.

Ask participants what good environmental practices are needed inside the central warehouse.

- Pesticides should always be shelved on wooden pallets and not directly on the floor to prevent them from getting wet.
- Pesticide stacking should not be unreasonably high. A general rule is to not exceed a height of 2m to prevent: 1) risks of tipping, and 2) risk of perforation of the boxes at the bottom due to weight.
- Do not store liquid materials above dry materials to prevent any liquid leaks to the dry product.

Confirm that participants understand the importance of carefully checking stock cards and other documentation. Explain that supervisors should ask the store keeper about the procedures for signing out insecticide and returning it at the end of each day.

Point out proper placement of polythene sheeting and location of the insecticide spill response kit. Highlight the importance of separating used materials (insecticide and equipment) from new materials to avoid contamination. Empty insecticide packages should be clearly separated from new (full) ones.

Emphasize that FEFO has been noted as an ongoing challenge across IRS countries. When you train and supervise, this is something you should check every time. Ask storekeepers to describe their process when they receive a shipment of insecticide. If they do not mention FEFO, you have an opportunity to reinforce the idea.

Introduce the topic of operating bases. Explain that storage sites are often planned as a cascade, with larger sites (at national/district level) feeding smaller ones (at community level).

Ask participants what criteria are important for finding a good location for a new site. Explain that when the site is chosen, the facility should meet these minimum criteria.

- Away from schools, animal feed depots, water courses and residential homes (generally 100 meters away)
- Minimum of 50 meters away from health clinics, and generally away from pedestrian routes to the clinic
- Out of potential flood zones, water zones, wells and other supplies of water for domestic or stock animal use
- Away from areas where ground water is close to the surface
- Easily accessible by transport and easy exit in case of an emergency

Ask participants: What qualities the IRS storage structure have that make it suitable as an IRS storage facility?

- Thick polyethylene sheeting on floor (if surface is not concrete or otherwise impermeable)
- Wooden pallets
- Ramps at entrance to contain leakage
- Entrance door with lock to prevent unauthorized entry
- Secured windows and ventilators to prevent unauthorized entry
- Extra PPE
- Empty pesticide containers (preferably 200-litre drum)
- Empty bags to repack heavily damaged or leaking containers
- Self-adhesive warning labels for marking First aid kit
- Stock record sheets
A spraying operation generates two types of waste that requires appropriate disposal to prevent environmental contamination:

- Solid waste
- Effluent or liquid waste

Explain that indoor residual spraying implementation generates solid wastes in the form of empty pesticide sachets, damaged PPE, used cleaning equipment, materials such as sawdust used to clean up spills and contaminated soils from accidental spills. These wastes should be disposed of according to national guidelines. Solid wastes from IRS activities should be collected and stored in warehouses while waiting disposal.

Certain IRS wastes like empty sachets/bottles and respirators are collected on a daily basis while other waste types (e.g. torn gloves and covering sheets) are collected periodically when replaced. All empty packaging should be returned to the supervisor for SAFE disposal according to the national guidelines.

Explain that Indoor residual spraying wastes awaiting disposal should be stored in secure stores to ensure that they are not stolen and used for other purposes. The storage facility must be:

- Lockable, with a roof in good condition, adequate ventilation, accessible and away from flood prone areas.
- Having security guards available at all times of the day.
- Having a storekeeper responsible for maintaining an accurate inventory of all IRS wastes using the forms for stock management.

Sachets spray operator sign-out of sachets and inventory of empty sachets returned to supervisors should be tracked daily.

Ask participants how to dispose of containers that have been in contact with pesticides. Write down their responses.

- Empty containers awaiting disposal should be stored in a special, secure area in the pesticide store area to ensure that they are not stolen and used for other purposes.
- Empty sachets should always be cleaned out, as far as is practicable, before disposal to minimize both hazard and waste of residual pesticide. Sachets that have contained emulsifiable concentrate, or wettable powder (wp) formulations should be rinsed with water several times and the rinsing added to the spray pump before the tank is filled to the required volume.
- Container rinse that has not been added to the spray pump, should be added to a soak pit or evaporation tank (please see Effluent Waste Disposal BMP).
- Heavily contaminated PPE should be triple rinsed, shredded or punctured and sent to central disposal centers.
- Highly contaminated cardboard, paper and jute materials should be collected and sent to the central disposal centers along with other contaminated waste.
- Containers rendered unusable should be collected and sent to a central location for disposal.
- Glass containers should be smashed, and steel drums and metal and plastic containers punctured and crushed (do not puncture aerosol containers) to ensure that they cannot be reused, before being sent to a central location for disposal.

Explain that, to avoid excess waste, use the correct amount of insecticide for each day's operations, and prepare the correct amount to fill each spray pump as needed. Pesticides are best disposed of by burning in a special incinerator that burns at 1100°C-1300°C. A list of commercial facilities that are licensed by the host governments to dispose toxic waste may be obtained from the national environmental agencies/authorities.

Describe the standard for incinerators used by IRS programs. Incineration facilities must meet a minimum set of criteria to be environmentally compliant.
Incineration of IRS wastes is the standard method used in the disposal of solid wastes. Empty insecticide containers should NOT be burned or buried. The wastes will only be disposed in incinerators that meet the following WHO/FAO requirements: That meets international standards (WHO/FAO).

- That consistently burn at between 1100 and 1300 degrees Celsius
- That have air scrubber to ensure minimal impact to air quality
- That have two second after-burner
- Alternatively, cement kilns or furnaces can also be considered for disposal in countries where cement factories or copper furnaces meet the above criteria are available.

Emphasize that full PPE is required for all incineration activities.

Highlight several innovative recycling programs that allow insecticide packaging to be reused in safe and environmentally compliant ways.

SOAK PIT AND WASH AREAS

In IRS activities, waste water (effluent) is generated on a daily basis, at the end of each spray day, during the cleaning process. Because this water is contaminated with pesticide, it should be disposed in a manner that does not result in environmental contamination. Never pour the remaining insecticide into rivers, pools or drinking-water sources.

Review the concept of the soak pit and wash areas:

A soak pit is a specially designed hole in the ground for disposing of effluent to protect the environment from contamination. A soak pit measures 2m by 1m by 1m to absorb the effluent produced from 20-30 spray operators. The bottom of the pit is lined with 1-2 bags of sawdust followed by 1.5-2 bags of charcoal. A layer of stone aggregate is then placed on top, followed by a layer of course gravel, and then a layer of small gravel to create a filter 1m in depth. As the effluent percolates through the materials, pesticide filter out and degrade before reaching the sounding soil. A concrete curb should be built around the soak pit to contain effluent and divert runoff from the sounding area. Soak pit should be adjacent to or co-located with both rinse area and wash area to avoid potential spills when transporting effluent to the pit.

Explain that the soak pit is where all liquid waste (including contaminated water) should be deposited. All cleaning of equipment and bathing is done in and around the soak pit to avoid contaminating the environment. All cleaning activities should be conducted in the soak pit area, including cleaning sprayers, washing PPE, and bathing.

As a best practice, we aim to minimize the amount of contaminated water that enters the soak pit. When possible, insecticide should be sprayed on the walls of structures rather than put into the soak pit.

Wash areas should be a structured cabin for bathing at the end of each spray day. The cabin is built over the wash pit to ensure proper handling of contaminated bathing water.

The cabin should have fully private walls (without holes or gaps) that extend to the ground. The door should lock from the inside and have separate facilities for men and women.

Additionally, each operating base must have separate toilets for men and women. The toilet door should lock from the inside and a covered waste basket should be provided (unless a pit latrine is used). Outside the toilet, there must be a handwashing station.

Ask for a volunteer to explain the proper setup for a progressive rinse (also called a progressive rinse) before spraying begins. Place seven 200-liter barrels in a line. The second, fourth, and sixth barrels are filled with clean water. A pitcher should be available for dipping the clean water from each barrel.
Ask a second volunteer to explain how spray operators use the progressive rinse to clean their equipment after spraying. Here are the instructions given to spray operators at the end of the day. Before removing your PPE:

- Pour all leftover insecticide from the field into barrel 1, which should always be covered.
- From barrel 2, take 2 liters of water and pour into the spray tank.
- Pressurize the sprayer to allow the CFV to work and shake it, then discharge some of the solution into barrel 3 by pressing the trigger and discharging through the nozzle.
- Depressurize the sprayer and empty the remaining solution into barrel 3.
- Take 2 liters of water from barrel 4 and repeat the same process of pressurizing and agitating the sprayer, discharging some of the liquid into barrel 5 by pressing the trigger and discharging through the nozzle before emptying the remainder into barrel 5.
- Take 2 liters of water from barrel 6 and repeat the same process of pressurizing and agitating the sprayer, discharging some of the liquid into barrel 7 by pressing the trigger and discharging through the nozzle before emptying the remainder into barrel 7.
- After barrel 7, dismantle the CFV, nozzle, and strainer. Use the clean water from the additional container to scrub the nozzle and strainer with the toothbrush. Remember to also rinse the small screwdriver used to remove the CFV.
- After unscrewing the nozzle and CFV, use the CFV to scoop water from the additional container, using the hollow side that has a metal tip in the center. Press the screwdriver against this metal tip until all the scooped water flows out from the other side of the valve. Repeat this process 3 times.
- Thereafter, reassemble the CFV, nozzle, and strainer.
- Wash your face shield, gloves, boots and plastic sheet using soap, and water from the additional container.
- Hang the spray tank upside down on the pump hanger.
- Remove your PPE and take a bath before going home.
- Hand over your overalls to be washed.

Highlight that in general, the water used in the progressive rinse process is not put in the soak pit each evening. When the progressive rinse is finished for the day, lids are placed on each barrel and they are left overnight.

- The next morning, spray operators take some water to fill their sprayer. They will start with barrel 1 and will take 3 liters of liquid to use for mixing insecticide. After barrel 1 is empty, spray operators will take liquid from barrel 3, then barrel 5. Any water that remains after spray operators have finished is then put into the soak pit.
- Also, remember that our goal is for spray operators to NOT bring back insecticide at the end of each day. They should be putting that insecticide on a wall rather than dumping it in the barrels. Best practice is for the team of spray operators to work together to spray the last structure, each using the remaining insecticide in their tanks.

**MOBILE SOAK PIT**

Introduce the mobile soak pit. When IRS is conducted in more remote locations, it is not practical for spray teams to return to a fixed operating base each night. Mobile soak pits travel with spray teams. They are constructed using a simplified set of layers to filter liquid waste.

Explain that a mobile soak pit is constructed using a large plastic bucket. Several holes are made in the bottom of the bucket to allow filtered water to flow onto the ground. Layers include a filter for fine matter on the bottom (usually a circle cut from a foam mattress), filtered carbon (about 18 cm deep), and another layer to filter fine matter at the top.

Explain how to install the mobile soak pit.

- Find a flat location for your mobile soak pit.
- Mark off an area of 4 meters by 4 meters and mark the center. Shift the soil to create a gentle slope toward the center— this is where we will install the mobile soak pit. We want any spilled liquid to move toward this hole.
- Dig a hole in the center of your marked area, slightly larger than the size of the bucket on each side and about 12 cm deeper.
- Pour 10 cm of charcoal in the bottom of the hole. Break the charcoal into small pieces and level it.
- Place the mobile soak pit (with the lid still on) inside the hole. Avoid getting dirt or mud into the mobile soak pit; excess soil can clog the filtration system.
- Using soil, create a small hill (about 10 cm high) around the 4x4 wash area. This will help prevent rainwater and mud from entering the soak pit.
- Pack soil around the mobile soak pit, ensuring it is stable and the top rim of the bucket is even with the ground. Remove the lid of the mobile soak pit.
- Center the tarpaulin over the sloped wash area. Cut a small X over the mobile soak pit: the X must be smaller than the mobile soak pit container to ensure all wastewater goes inside.
Highlight the design of the mobile soak pit area. Then SHOW the photo of an actual mobile soak pit area.

- A large, shallow basin should be set up for washing boots before spray operators enter the wash area. Any excess dirt or mud can clog the mobile soak pit. The basin should be large enough to step into it with both feet.
- On each side, there are three barrels that hold clean water.
- At the back, the larger blue barrel is for contaminated wastewater.
- Only two spray operators may enter the wash area at a time—one using the barrels on the left and the other using the barrels on the right.
- The basic procedure for conducting the progressive rinse in the mobile soak pit is quite similar to the standard soak pit. Instead of having several empty barrels to receive contaminated rinse water, there is only one.
- As the last step, remove the CFV and rinse it in any of the barrels.

Review the guidelines for selecting a location, which are similar to those for standard soak pits.

Emphasize that mobile soak pits were developed as a creative solution to an efficiency problem. IRS teams should be looking for ways to improve their processes without compromising spray quality or environmental safety.

GROUP WORK: PROGRESSIVE RINSE PROCEDURES

Explain that for the second part of this session, we will focus on how to explain the procedure to new spray operators. For the next activity, form four groups.

Note: There should be a maximum of 10 participants in each group. If you have more than 50 participants in your course, you can increase the number of groups.

Inform them that they have 15 minutes to discuss how to create practice sessions for the progressive rinse procedures for a group of new spray operators. Each group should produce a description of the activities they would use to teach the progressive rinse to new spray operators. Be creative! How can we help trainees remember this important procedure?

After 10 minutes, tell them they have 5 minutes to wrap up their discussion. When groups are done, ask each group to present. Encourage other participants to ask clarifying questions.

Discuss the following questions:

- Which ideas do you think represent training best practice?
- Were there some approaches that might work better than others?
- What would you do if supplies were not available? How could you teach the lesson without actual barrels and water?

EVAPORATION TANK

Introduce participants to evaporation tank. Ask: What is an evaporation tank?

The tank is a sealed tank for disposing non-biodegradable liquid pesticide waste contaminated with DDT. The evaporation tank should hold about 15750 litres or 4100 gallons which should be sufficient to allow disposal of effluent from 20-30 spray operators. The tank should have maximum surface area to allow evaporation. It should be constructed with impervious concrete and covered with lockable wire mesh.

Once evaporation is complete, the dried DDT residue is collected and disposed of together with other solid DDT waste through incineration. If overflow is a risk, a berm should be constructed around the perimeter of the tank to help contain the waste. The tank should be constructed away from flood prone areas, steep gradients and slopes, and water surfaces.
MOBILE DDT FILTRATION SYSTEM FOR IRS

The use of DDT comes with a lot of restriction due to its nature to persist in the environment in case of any contamination. As such environmental compliance must be adhered to at all times (transportation, storage, mixing, spraying, management of waste both solid and liquid etc).

In view of this, each district that will use DDT must have an evaporation tank for managing the liquid waste of DDT. However, we are aware that most of the districts do a lot of camping during the IRS campaign and management of liquid waste is a critical issue. It is against this that a mobile DDT filtration system comes into play to help with management of DDT liquid waste during camping or while implementing IRS in areas without a static evaporation tank.

Review the mobile soak pit discussed previous and explain that the DDT filtration system is similar to the mobile soak pit with a few differences. List construction materials for DDT mobile soak pit and explain how to install the soak pit.

Construction materials
- 20 litre bucket/container
- 2 x 40 litre bucket/container
- 7 cm thick of foam or saw dust
- Granulated charcoal or activated charcoal
- Tarpaulin tent or high density plastic sheet (1mm thick)
- Hoe/pick
- Shovel
- A stand

Explain the steps in construction of the filtration system

Make a stand similar to that for the hand washing bucket and stand. It should be 90 cm high and wide enough to support the bucket.

Construct the filtration system as follows:
- Get the 60 litre bucket/container and drill one 1.5 cm hole in the center of the bottom of the bucket before adding any materials.
- Then place a 7cm thick of form or wood shavings at the base of the bucket; Followed by 20cm of granulated charcoal or activated carbon and finally 11cm of gravel or foam. This will provide a deep bed of granulated charcoal, and greater capacity for pesticide adsorption.
- Place a fine nylon or netting material at the bottom of the bucket, in between the wood shavings/foam and granulated charcoal layers, as well as between granulated charcoal layers and gravel or foam.

Mount the filtration system on stand and place the 20 litre under the stand to be receiving the filtrate. Show a diagram on handouts.
SESSION 12
DATA COLLECTION, REPORTING AND DATA QUALITY ASSURANCE
Explain that IRS is an extensive intervention that requires frequent monitoring of pre-spray, operational, and post-spray activities through a system of collecting and utilizing data through a comprehensive set of tools and indicators toward four basic goals:

- **Coverage**: Protect as many people as we can, especially pregnant women and children under 5 years.
- **Acceptance**: At least 85% of households in a community must accept IRS for it to be effective in a community.
- **Effectiveness**: For IRS to kill mosquitoes, spray operators must deposit insecticide correctly and in the right amount on the wall. Spray operators should cover the walls completely and at the right speed.
- **Efficiency**: Enough houses must be sprayed each day for the spray campaign to be completed as planned. If it takes longer, costs increase.

To track our progress against these goals, we collect data about our spray operations each day. Explain that data collected during the spray campaign flows from one person to the next with a very quick turnaround time. We need to use the data we receive as quickly as we can.

Spray operators and community mobilizers, as they move from house to house, they collect information from the people who live there.

- Community mobilizers collect data about the number of people who receive IRS messages and information, education, and communication (IEC) materials.
- Spray operators record data about the number of people living in the house and number of structures (or rooms) sprayed. In addition, spray operators record how many units of insecticide they use each day.
- Spray team leaders: At the end of each day, team leaders collect and review the data. Team leaders also compile the data into reports that are transmitted to district/region and national levels.

These forms are collected from the operating base and sent to the data center at the end of each day.

- Data entry clerks enter the data into the monitoring and evaluation database within 24 hours after the data are received.
- Data entry supervisors verify a certain percentage of the records and check for data errors within 1-3 days after entry.

Explain that the data are is then shared with program leaders and used to make important program decisions. The success of the IRS program depends on good data.

### Session Time
75 minutes

### Learning objectives
By the end of this session, participants will be able to:
- Describe the flow of data from households to data collection centres
- Describe essential forms used for IRS data collection and how they are used during operations
- Identify processes that help ensure quality data is collected

### Materials
Laptop, projector, and screen, Copies of data collection forms, Daily Spray Card, IEC Mobilization Form, IRS Card and Team Leader form.
**IRS Card or Household Card:** At the beginning of the project, the community mobilizer gives one card to each household where IRS will be conducted. The head of household keeps the card to track if and how many times the house is sprayed over the next few years. Supervisors check this data from time to time to ensure houses are sprayed consistently from one spray campaign to the next.

**IEC Mobilization Form:** The community mobilizer encourages acceptance of IRS and makes sure households are prepared when spray teams arrive. During one or two visits, the community mobilizer educates the household about IRS, answers questions, and collects data that spray operators, team leaders, and supervisors need for planning.

**Daily Spray Operator Form:** The spray operator collects data about the people living in the household and the structure sprayed.

**Daily Team Leader Form:** Each spray team had one team leader. At the end of each day, the team leader collects the spray operators’ forms and summarizes the data in the Team Leader Form up to district, region and national levels.

**ENSURING DATA QUALITY**

Highlight the role of the data entry clerk and the quality checks that are done. Emphasise the need to have accurate data that can be used to make critical program decisions.

Supervision and data verification measures should be conducted to ensure that data is collected in a timely, efficient and high-quality manner. These include:

- Review and modification of the data collection and analysis tools in order to ensure a common understanding of the data collection tools and IRS indicators.
- Training of data clerks on data management and reporting, focusing on proper completion of data forms, data quality assurance (including detection of errors and appropriate corrective measures to take), data entry into the IRS database.
- Pre-spray meetings with data entry clerks to discuss data collection, checking, entry and analysis.
- Compilation of coverage reports on a daily and weekly basis, which should be shared with IRS implementers and other stakeholders.
- Conduct data auditing during supervision visits and spot checks through:
  - Verify completeness and accuracy of cards/reports
  - Examine actual cards/forms and refer to summary reports
  - Randomly pick household for verification and quality control of data.
  - Randomly select household and discuss with them on KAP regarding sensitization messages given, their experience after house was sprayed etc.
  - Compare raw data and district daily, weekly and monthly reports
SESSION 13

MEASURING IRS PERFORMANCE
Explain that IRS is an extensive intervention that requires frequent monitoring of pre-spray, operational, and post-spray activities through a system of collecting and utilizing data through a comprehensive set of tools and indicators.

Ask the participants to tell you what they understand by monitoring, supervision, evaluation and data management. Record their responses and thank them for their contribution.

Explain that IRS programme activities provide a means for learning from past experience, improving service delivery, planning and allocating resources, and demonstrating results as part of accountability to key stakeholders. It helps to collect and analyse data, compile quality reports, utilize results to inform decision making to improve program performance.

- **Supervision** is the directing and overseeing performance of others while transmitting skills, knowledge, and attitudes for good program performance practice. It is on the spot close tracking of IRS operations to direct, correct, assist, assess and motivate operators.
- **Monitoring** is the systematic collection, analysis and use of data to determine whether what was planned is being implemented
- **Data management** is the process of data collection, sorting, verification, entry, analysis and reporting

Emphasize that in order for IRS Program data to be of good quality and be useful for decision-making:

- There should be a clear data flow/trail from collection to reporting.
- The data should be reviewed at multiple levels to reduce data errors including transcription, and ensure that the data is complete (no missing or double-counting of attributes/variables
- It should meet data quality standards of validity, reliability, integrity, precision and timeliness;
- Indicators should directly measure the program activities and have no attribution problems.
- Those collecting data should adequately be trained so as to accurately complete data forms.
- Need to provide support supervision for quality assurance of results.

Introduce and discuss data collection, management, monitoring and supervision. Explain that data collection for a successful IRS implementation is a continuous process that extends from pre-spraying planning to IRS implementation and finally to post-spray campaign.

Divide participants into 2-3 groups. Ask them to discuss the following questions.

- What is the baseline (pre-spray assessment data)?
- What are the mid-spray assessment data?
- What are the post-spray assessment data?

Let the participants record their response on a flipchart and present in a plenary after 10 minutes. Ask other participants to comment on or ask questions on the group presentations. Present a slide to sum up the IRS activities and information generated during pre-spraying preparations or planning, IRS implementation and post IRS implementation.
PRE-SPRAYING PLANNING

- Availability of baseline data on targets: entomological and parasitological data, IRS eligible structures and target population.
- Review of data collection and analysis tools: spray operator data collection forms; mobilization forms; development of data base and supervision checklists. Personnel trained should be adequately documented by type, number and duration of training. Categories/types of training include: Training of Trainers (SO), Training of Trainers (IEC), Spray operators, Mobilizers, Team Leaders, Supervisors, Clinicians training (post exposure management), Stores management (Storekeepers), Data management & reporting (data clerks), Pump maintenance (Pump technicians), Field Entomological Technicians, Mapping training/Enumerators. Other categories include: Washers, Guards and Drivers.

IRS IMPLEMENTATION - DATA FLOW (DAILY/WEEKLY ROUTINE)

- Daily and weekly supervision and monitoring of data collection and entry into the forms and database.
- Review and analysis of daily and weekly summary data.
- Compilation and sharing of weekly IRS updates.

POST IRS CAMPAIGN

- Spray performance data analysis.
- Compilation and sharing of IRS performance report.
- Post IRS community satisfaction/feedback survey.
- End of spray performance report.
- Annual review and planning meeting of IRS stakeholders.

Introduce the participants to the monitoring and evaluation framework. Emphasize that IRS is an extensive intervention that requires frequent monitoring of pre-spray, operational and posy-spray activities through a system of collecting and utilizing data through a comprehensive set of tools on indicators. The monitoring and evaluation framework helps to:

- Routinely monitor IRS activities
- Inform planning, particularly with regard decisions about spray timing and transitioning from one phase of the spray programme to the next
- Measure key indicators on the effectiveness and impact of IRS in controlling malaria in targeted areas.

Emphasize that the implementation of the framework requires appropriate data collection and prompt analysis. Simple tools for collection, recording, reporting, processing and analysing data are essential for effective information management.

Make a presentation to show and discuss IRS indicators that the M&E framework monitors before, during and after IRS. One way to engage the participants in discussing the indicators from planning - implementation and monitoring and evaluation is the question and answer approach as shown below:

Did we receive what we needed? INPUTS

- Insecticides, equipment and supplies
- Human resources
- Financial resources
- Transport and fuel
- Storage and maintenance facilities

How did we do it? PROCESS

- Planning
- Procurement
- Recruitment and training
- Advocacy and community mobilization
- Distribution
- Spraying campaigns - implementation
Supervising
Monitoring and evaluation

What was done? OUTPUTS
- Human resources - trained
- Financial resources - received
- Supplies - purchased and received
- Transport and fuel - provided
- Storage and maintenance facilities - provided

Did we achieve our objectives? OUTCOMES
- Operational coverage
- Proportion population protected
- Change in vector density
- Change in parasite prevalence
- Change in community behaviour

Core IRS operational performance indicators
- Number of rooms to be sprayed and not sprayed
- Proportion of rooms sprayed in relation to those not sprayed
- Proportion of rooms not sprayed in relation to those sprayed
- Number of people living in rooms which have been sprayed
- Number of people living in rooms which have been sprayed
- Proportion of malaria risk population protected by IRS
- Proportion of malaria risk districts covered by IRS

Entomological performance standard indicators
- Vector species
- Adult and larval densities
- Vector resting, feeding and breeding behaviour
- Human blood index - human - vector contact:
- Sporozoite rate
- Entomological Inoculation rate
- Wall bioassays
- Insecticide resistance

IRS Data collection:
- Data must be collected by trained personnel/SOs
- Data must be collected using a standard form
- Ongoing (daily) field spot checks to be conducted by team leaders and other IRS supervisors to ensure forms are being filled in/completed accurately
- Completed forms by SOs must be reviewed by team leaders and supervisors for completeness.
- Team leaders to compile daily team coverage summaries
- Site managers to compile daily site coverage summaries

IRS SUPERVISION AND MONITORING
Supervisors should carry out close supervision and monitoring of activities to ensure that corrective measures are taken in a timely manner and hold the implementers accountable to standard procedures, techniques, and environmental compliance guidelines. This will result in appropriate and adequate spray performance data and ensure a high-quality, cost-effective, and environmentally compliant IRS program.
Supervision and monitoring should cover the following key areas:

- Spraying schedule, technique and coverage
- Availability and appropriate use of PPE
- Progressive rinsing
- Management of waste
- Store and stock management
- Community mobilization
- Data collection and analysis
- Transport usage and fuel consumption

Supervision and monitoring should:

- Involve continually following up with the spray operators and observing the spray operations in the villages.
- Entail assessing the success of the IRS through discussions with randomly selected households and local leaders using checklists.
- Include spot-checks on the insecticide utilization and reviews of completed spray operator data forms.
- Include site and district review meetings to assess and share the progress of the IRS campaign, challenges, and lessons learned.

LEVELS OF SUPERVISION AND MONITORING

Emphasise that supervision and monitoring activities are implemented at all levels: the field, district, and national as explained below.

Field Level Supervision:

*Supervision of spray operators and team leaders:* The team leaders report to supervisors who in turn report to site managers. This direct reporting mechanism ensures appropriate checks and balances

*Supervision of spray operations by district coordinators:* Site managers are responsible for administering operations in their sites, including field monitoring and supervision of the IRS operations. Supervisors directly report to site managers and the site managers directly report to the district IRS Coordinator.

*Meetings held by site managers:* Site managers conduct team meetings with supervisors, team leaders, and spray operators at the site level on a daily basis to review each day's operations and plan for the next day's mobilization and spray plans. During the site meetings, teams discuss issues on coverage, compliance and community mobilization challenges identified are resolved at site level and those beyond the capacity of the site are reported to the district for solution.

*Supervision of spray teams by communities:* Communities should also provide supervision support by observing the actions of spray operators and guiding the spray operators to the structures to be sprayed and communicate with supervisors on the spray operators' actions.

District level:

*Supervision of spray operations by district supervisors:* Using a checklist, a senior level team of supervisors from the district provides additional supportive supervision to all teams to ensure adherence to IRS practices and guidelines. The district supervisors should, where practical, make daily field visits to selected sites to follow up with the spray teams and to observe them in action.

*IRS progress review:* Weekly IRS progress reviews by district staff, site managers, team supervisors should be held at the district level to assess and share the progress of the IRS campaign, challenges, and lessons learned.

National level:

National level technical staff should also conduct periodic field supervisory operations and participate in district weekly review/planning meetings.
REFERENCES


Pesticide storage and stock control. FAO (http://www.fao.org/docrep/V8966E/V866E00.htm)


ANNEX 1

SADC E8
TRAINERS OF TRAINERS
TRAINING SCHEDULE
<table>
<thead>
<tr>
<th>Day</th>
<th>Time</th>
<th>Topic</th>
<th>Facilitator/s</th>
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<tbody>
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<td>Arrival and Registration</td>
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<td>08:30 - 08:40</td>
<td>Introduction</td>
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<td>08:40 - 08:45</td>
<td>Welcome Remarks</td>
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<td>08:45 - 09:00</td>
<td>Opening Remarks</td>
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<td>Workshop Objectives</td>
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<td>Workshop norms and organisation</td>
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<td>Pre-course assessment (Pre test)</td>
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<td>Review of Course Program</td>
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<td>SADC Malaria E8 Strategic Framework</td>
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<td>11:30 - 13:00</td>
<td><strong>Malaria and Mosquito Control</strong></td>
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<td>■ Definition of malaria</td>
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<td>■ Life cycle of malaria parasite</td>
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<td>■ Mosquito life cycle</td>
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<td>■ Mosquito identification</td>
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<td>■ Why IRS most often used for malaria control/ elimination</td>
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<td><strong>LUNCH</strong></td>
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<td><strong>IRS Overview</strong></td>
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<td><strong>IRS Operations and Campaign Design</strong></td>
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<td>■ Pre and post IRS surveys</td>
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<td>■ Planning IRS spray campaign</td>
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<td>■ Choosing a start date for IRS</td>
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<td>Prayer and Administrative Announcements</td>
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<td>Recap of Previous day</td>
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<td>Preparing to Spray</td>
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<td>■ Preparing structures for spraying</td>
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<td>■ Pressuring the sprayer</td>
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<td>■ Lifting and carrying the sprayer</td>
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<td>■ Practice: describing lifting and carrying</td>
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<td>10:45 – 13:00</td>
<td>Sprayer Maintenance and Storage</td>
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<td>■ Use and maintenance of spray equipment</td>
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<td>■ Testing and calibrating the sprayer</td>
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<td>■ Teaching techniques that work</td>
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<td>LUNCH</td>
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<td>Building Communication Skills for Community Mobilization</td>
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<td>■ Roles of spray operators and Community Mobilizers</td>
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<td>■ Teaching key messages</td>
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<td>TEA BREAK</td>
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<td>General Discussions on the theory and practical work and other critical matters for quality IRS.</td>
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<td>Prayer and Administrative Announcements</td>
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<td>Recap of Previous day</td>
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<td><strong>Introduction to Insecticides and Safety</strong></td>
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<td>■ Pesticide labelling</td>
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<td>■ Methods of pesticide classification</td>
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<td>■ Pesticide Toxicity</td>
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<td>■ Factors to consider when selecting insecticides</td>
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<td>■ Transport of insecticides</td>
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<td>■ Symptoms and recognition of poisoning</td>
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<td>■ Handling insecticide spills</td>
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<td><strong>Familiarizing Trainee with Equipment</strong></td>
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<td>■ Understanding the sprayer.</td>
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<td>■ Parts of the sprayer and their functions</td>
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<td>■ Introduction to PPE</td>
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<td>11:15 - 13:00</td>
<td><strong>Mixing Insecticide and Marking Structures</strong></td>
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<td>■ Mixing insecticide</td>
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<td>■ Marking the house</td>
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<td>LUNCH</td>
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<td><strong>Establishing Correct Spray Techniques</strong></td>
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<td>■ Overview of correct spray techniques</td>
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<td>■ Spray technique - correct distance</td>
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<td>■ Spray technique - pattern and rhythm</td>
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<td>■ Introduction to competency checklist</td>
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<td>Environmental Compliance</td>
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<td>■ Management of solid waste</td>
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<td>■ Soak pit and wash areas</td>
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<td>■ Mobile soak pit</td>
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<td>■ Group work: Progressive rinsing</td>
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<td>■ Evaporation tank</td>
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<td>■ Mobile DDT filtration system for IRS</td>
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<td>10.00 - 10.30</td>
<td>TEA BREAK</td>
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<td>Data Collection, Reporting and Data Quality Assurance</td>
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<td>■ Understanding the data flow</td>
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<td>■ Ensuring data quality</td>
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<td>Recap of Previous day</td>
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<td>08.30 - 10.30</td>
<td>Measuring IRS Performance</td>
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<td>■ Pre-praying planning assessment</td>
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<td>■ IRS implementation: flow (daily, weekly, routinely)</td>
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<td>■ Post IRS campaign data</td>
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<td>■ Key indicators for IRS monitoring and evaluation</td>
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<td>11.15 - 11.45</td>
<td>Post Course Assessment (Theory) - Post test</td>
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<td>OFFICIAL CLOSING</td>
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<td>LUNCH and dispersal</td>
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ANNEX 2
IRS OPERATIONAL PLAN
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<td>Conduct meetings (strategy, selection of insecticide, target spray locations, timing of operations)</td>
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## ACTIVITY

### Pre-IRS Activities

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### Post spray campaigns

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ANNEX 3

MONITORING AND EVALUATION FRAMEWORK FOR IRS AND INDICATORS
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<td>District, province/region, country</td>
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<tr>
<td></td>
<td><strong>Environmental Compliance</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>17</td>
<td>Number and percentage of base stores where physical inventories are verified by up-to-date stock records</td>
<td>Store records</td>
<td>Daily, weekly, monthly</td>
<td>District, province/region, country</td>
</tr>
<tr>
<td>18</td>
<td>Number of storage facilities/stores available</td>
<td>Malaria programme IRS reporting system</td>
<td>Daily, weekly, monthly</td>
<td>District, province/region, country</td>
</tr>
<tr>
<td>19</td>
<td>Number of staging sites (soak pits and wash areas) available</td>
<td>Malaria programme IRS reporting system</td>
<td>Daily, weekly, monthly</td>
<td>District, province/region, country</td>
</tr>
<tr>
<td>20</td>
<td>Number of adverse reactions to pesticide exposure documented</td>
<td>Malaria programme IRS reporting system</td>
<td>Daily, weekly,</td>
<td>District, province/region, country</td>
</tr>
<tr>
<td>21</td>
<td>Number and percentage of soak pits and storehouses inspected and approved prior to spraying</td>
<td>Malaria programme IRS reporting system</td>
<td>Annually</td>
<td>District, province/region, country</td>
</tr>
<tr>
<td></td>
<td><strong>IEC</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>22</td>
<td>Number of IRS print materials disseminated</td>
<td>Malaria programme IRS reporting system</td>
<td>Annually</td>
<td>District, province/region, country</td>
</tr>
<tr>
<td>23</td>
<td>Number of people reached with IRS messages via door-to-door mobilization</td>
<td>Mobilizer data cards</td>
<td>Daily, weekly</td>
<td>District, province/region, country</td>
</tr>
<tr>
<td>24</td>
<td>Level of community knowledge and perceptions (expressed as a proportion)</td>
<td>Malaria programme IRS reporting system</td>
<td>Annually</td>
<td>District, province/region, country</td>
</tr>
<tr>
<td></td>
<td><strong>Entomology</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>25</td>
<td>Number of entomological sentinel sites established to monitor vector bionomics and behaviour (vector species, distribution, seasonality, feeding time, and location)</td>
<td>Malaria programme IRS reporting system</td>
<td>Annually</td>
<td>District, province/region, country</td>
</tr>
<tr>
<td>26</td>
<td>Number of wall bioassays conducted within 2 weeks of spraying to evaluate the quality of IRS</td>
<td>Malaria programme IRS reporting system</td>
<td>Weekly, monthly, Annually</td>
<td>District, province/region, country</td>
</tr>
<tr>
<td>NO</td>
<td>Indicator name</td>
<td>Method</td>
<td>Frequency</td>
<td>Applied To</td>
</tr>
<tr>
<td>----</td>
<td>--------------------------------------------------------------------------------</td>
<td>---------------------------------------------</td>
<td>----------------------------</td>
<td>--------------------------------------</td>
</tr>
<tr>
<td>27</td>
<td>Number of wall bioassays conducted after the completion of spraying at monthly intervals to evaluate insecticide decay</td>
<td>Malaria programme IRS reporting system</td>
<td>Weekly, monthly, Annually</td>
<td>District, province/region, country</td>
</tr>
<tr>
<td>28</td>
<td>Number of vector susceptibility tests for different insecticides conducted in selected sentinel sites</td>
<td>Malaria programme IRS reporting system</td>
<td>Annually</td>
<td>District, province/region, country, globally</td>
</tr>
<tr>
<td>29</td>
<td>Vector population density/abundance</td>
<td>Malaria programme IRS reporting system</td>
<td>monthly, Annually</td>
<td>District, province/region, country</td>
</tr>
<tr>
<td>30</td>
<td>Insecticide decay rates/residual effect</td>
<td>Malaria programme IRS reporting system</td>
<td>monthly, Annually</td>
<td>District, province/region, country</td>
</tr>
<tr>
<td>31</td>
<td>Insecticide resistance level in local vectors</td>
<td>Malaria programme IRS reporting system</td>
<td>Annually</td>
<td>District, province/region, country, globally</td>
</tr>
<tr>
<td></td>
<td><strong>M&amp;E</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>32</td>
<td>IRS data quality control and quality assurance system established/strengthened</td>
<td>Malaria programme IRS reporting system</td>
<td>Daily, weekly, monthly, Annually</td>
<td>District, province/region, country</td>
</tr>
<tr>
<td>33</td>
<td>Number of IRS reviews/assessments conducted</td>
<td>Malaria programme IRS reporting system</td>
<td>Annually</td>
<td>District, province/region, country</td>
</tr>
</tbody>
</table>
ANNEX 4
MONITORING AND EVALUATION THREE-YEAR PLAN INDICATOR MATRIX
### Performance Indicator: Ensure adequately skilled staffing for technical and programmatic coordination, supervision, and implementation

<table>
<thead>
<tr>
<th>Performance Indicator</th>
<th>Data Source / Reporting frequency</th>
<th>Annual Targets and Results</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Year 2</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Target</td>
</tr>
<tr>
<td>Number of Trainers of IRS Trainers trained</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Number of IEC Trainers trained</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Number of IRS Supervisors trained</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Number of IEC Supervisors trained</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Number of Team Leaders trained</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Number of Spray Operators trained</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Number of Mobilizers trained</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Number of storekeepers and Logistics Assistants trained</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Number of M&amp;E personnel (data collection, entry, quality and database management) trained</td>
<td></td>
<td></td>
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<tr>
<td>Number of Pump Technicians trained</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Number of Health Workers trained in poison management</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Number of Drivers trained in transporting insecticides</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Number of Security Guards trained stores security</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Number of Entomologists trained</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Number of Entomology Field Technicians trained</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Number of Laboratory Technician trained</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Number of Mosquito Collectors trained</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Refer to Annex 5 for the description of Trainings*
ANNEX 5

DESCRIPTION OF TRAININGS OF IRS IMPLEMENTERS
<table>
<thead>
<tr>
<th>Type of training</th>
<th>Participants</th>
<th>Key topic covered</th>
<th>Duration / days</th>
</tr>
</thead>
<tbody>
<tr>
<td>Training of trainers: IEC assistants</td>
<td>IEC Coordinators, Operations site IEC assistants</td>
<td>Introduction to malaria, IRS, and IEC; IEC resources and role of IEC in IRS; Stakeholders in IEC and mobilization strategies; Communication, motivation, and interpersonal relations skills; engaging the target community; IRS key messages - before, during, and after; Myths and misconceptions of IRS; Roles of IEC mobilizers; IEC/mobilization data collection form; Developing an IRS community mobilization plan; Community mobilization strategies.</td>
<td>3</td>
</tr>
<tr>
<td>Training of Trainers for spray operators</td>
<td>MOH-Malaria focal point National, Provincial and District Malaria Focal Points, National, Provincial and District IRS Supervisors, IRS Supervisors, Operations site supervisors</td>
<td>Malaria epidemiology and IRS; IRS planning, logistics, and evaluation; Storage and safe insecticide handling, and environmental safety; Safety of residents and environment: workers' safety during and after spraying; Medical Check-up of seasonal personnel; Pregnancy Testing; Transportation of spray operators; Insecticide transportation; Solid and effluent waste disposal; IEC and community mobilization; Compression pump components, use, and maintenance, Spray Techniques; Insecticide Handling, Household data collection, (M&amp;E Supervision of spray operations; Field simulation (live-fire); bridge classroom learning with real life situations; Effective training methodology and tools in health</td>
<td>5</td>
</tr>
<tr>
<td>Spray operators and team Leaders training</td>
<td>Spray operators, Team leaders</td>
<td>Basic information on transmission and prevention of malaria; Safe handling of insecticides and environmental safety issues in IRS; IEC and community mobilization; Spray pump parts, operation, maintenance, transport, and storage; Spraying techniques; Insecticide mixing; Data collection and management; Supervision of spray operations; Gender and sexual harassment policy; Field simulation (live-fire); bridge classroom learning with real life situations; For team Leaders only: Prepare team leaders in their roles through the campaign. Focus on leadership, spray supervision and spray operator (people) management.</td>
<td>6</td>
</tr>
<tr>
<td>Storekeeper and Logistics Assistants training</td>
<td>Logistics Assistants, Storekeepers, Warehouse Assistant</td>
<td>Warehouse and Stock management; Inventory tracking; IRS planning and procurement; Logistics needs assessment and resource estimation; Environmental safety and security; Cleanliness and washing; Use of first aid kits; Solid Waste management (collecting and storing IRS waste); Spray pump parts, operation, maintenance, transport, and storage; Transport, receipt, and distribution of IRS commodities</td>
<td>3</td>
</tr>
<tr>
<td>Pump technician training</td>
<td>Pump technicians, Warehouse Assistant</td>
<td>Spray pump component parts and functions; Handling and operation of the spray pump; Cleaning and storage; Servicing, repair, and maintenance; Nozzle calibration and maintenance; Disassembling and assembling the spray pump; Support to spray operators</td>
<td>1</td>
</tr>
<tr>
<td>Washers training</td>
<td>Washers</td>
<td>Washing techniques, use of PPE; Environmental compliance/effluent disposal</td>
<td>1</td>
</tr>
<tr>
<td>Driver training</td>
<td>Drivers</td>
<td>Personnel transportation; Handling an accident/ emergency; Spill management and reporting; Vehicle decontamination guidelines</td>
<td>1</td>
</tr>
<tr>
<td>Poison Management</td>
<td>Health Facility Supervisors</td>
<td>Insecticide handling and insecticide safety; Insecticides used for IRS and potential risks to spray operators, households, and environment; Spray operator safety, household safety, and environmental safety; Management of emergencies and insecticide poisoning</td>
<td>1</td>
</tr>
<tr>
<td>Type of training</td>
<td>Participants</td>
<td>Key topic covered</td>
<td>Duration / days</td>
</tr>
<tr>
<td>-------------------------------------------------------</td>
<td>--------------------------------------------------------</td>
<td>-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
<td>-----------------</td>
</tr>
<tr>
<td>Monitoring and Evaluation (data collection, entry, quality and database management)</td>
<td>Database coordinators, M&amp;E assistants, data entry clerks</td>
<td>M&amp;E for IRS operations; Target setting; IRS data collection and management, integrity, and security; Data reporting; Handling data collection and reporting tools; Documentation; Data quality control and assurance (including data collection verification); Introduction to IRS database; IRS data entry and practice</td>
<td>3</td>
</tr>
<tr>
<td>Security Guard training</td>
<td>Security guards</td>
<td>The training will consist of operational site security procedures and protocols, roles and responsibilities of the security guards.</td>
<td>1</td>
</tr>
<tr>
<td>Journalist training</td>
<td>Journalists, IEC Coordinators</td>
<td>IRS; the intervention to malaria prevention; Homeowner house preparation, before, during and after spraying; Key Messaging; Spray and Mobilization Calendars; Spray coverage and reporting channels</td>
<td>1</td>
</tr>
<tr>
<td>Mobilizers training</td>
<td>Community mobilizers</td>
<td>IEC and community mobilization; Community mobilization strategies; Interpersonal Communication and Counselling; Homeowner house preparation, before, during and after spraying; Door to door Mobilization data collection</td>
<td>1</td>
</tr>
<tr>
<td>Finance and Admin Assistants training</td>
<td>Finance and Admin Assistants</td>
<td>Completing time sheets for seasonal workers; Completing logbooks for rented vehicles; Performing fuel analysis for prompt payment; Compiling needed information for payment of seasonal staff with special attention on community leaders and mobilizers</td>
<td>2</td>
</tr>
</tbody>
</table>
ANNEX 6

SYMPTOMS OF INSECTICIDE POISONING AND MANAGEMENT
<table>
<thead>
<tr>
<th>Mild poisoning</th>
<th>Moderate poisoning</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Head</strong></td>
<td>Head</td>
</tr>
<tr>
<td>headache</td>
<td>headache</td>
</tr>
<tr>
<td><strong>Eyes</strong></td>
<td>blurred vision, narrow or widened pupils</td>
</tr>
<tr>
<td>itching, burning, watering</td>
<td>salivation, vomiting</td>
</tr>
<tr>
<td><strong>Mouth</strong></td>
<td>burning, nausea</td>
</tr>
<tr>
<td><strong>Lungs</strong></td>
<td>coughing</td>
</tr>
<tr>
<td><strong>Heart</strong></td>
<td>slow rapid pulse</td>
</tr>
<tr>
<td><strong>Digestive system</strong></td>
<td>nausea, stomach pains, diarrhea</td>
</tr>
<tr>
<td><strong>Nervous system</strong></td>
<td>dizziness, restlessness</td>
</tr>
<tr>
<td><strong>Skin</strong></td>
<td>irritation, burning itching</td>
</tr>
<tr>
<td><strong>Body temperature</strong></td>
<td>cold/hot</td>
</tr>
<tr>
<td><strong>Physical condition</strong></td>
<td>weakness, tiredness</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Severe poisoning

<table>
<thead>
<tr>
<th>Body Part</th>
<th>Symptoms</th>
</tr>
</thead>
<tbody>
<tr>
<td>Head</td>
<td>Severe headache</td>
</tr>
<tr>
<td>Eyes</td>
<td>Blurred vision, widened or narrowed pupils</td>
</tr>
<tr>
<td>Mouth</td>
<td>Vomiting</td>
</tr>
<tr>
<td>Lungs</td>
<td>Difficulty in breathing, no breathing</td>
</tr>
<tr>
<td>Heart</td>
<td>Rapid, weak or absent pulse</td>
</tr>
<tr>
<td>Digestive system</td>
<td>Vomiting, diarrhea</td>
</tr>
<tr>
<td>Nervous system</td>
<td>Staggering, twitching, convulsions</td>
</tr>
<tr>
<td>Skin</td>
<td>Sweating, rashes</td>
</tr>
<tr>
<td>Body temperature</td>
<td>Cold/hot</td>
</tr>
<tr>
<td>Physical condition</td>
<td>Extreme weakness, death</td>
</tr>
</tbody>
</table>

Clearly symptoms may be similar in mild or severe cases, but in any event it is necessary to do something.

What other common ailments can cause similar symptoms?
These include: fever, drug/alcohol abuse, diabetes, allergic reactions, epilepsy.

What can be done to establish whether the symptoms are caused by pesticide poisoning?

**Ask:**
- Has the victim been using pesticide?
- Which product
- Is the pack plus label available?
- When was he using the product and for how long?
- Did he contaminate himself with concentrate of spray solution?
- What ill effect has he noticed?
- Has he been taking alcohol or drugs?

If the victim is unable to answer the above, ask work mates or his family the same questions.

**Observe the following:**
- Evidence of spray equipment, pesticide containers with labels
- Evidence of contamination, wet or stained clothing, spillage
- Defective spray equipment
- The physical condition of the victim
- Whether he is wearing some “medic alert” for a condition such as epilepsy

**Smell**
- Evidence of characteristic pesticide smell on or around the victim, around his mouth
- Evidence of other smells, such as alcohol