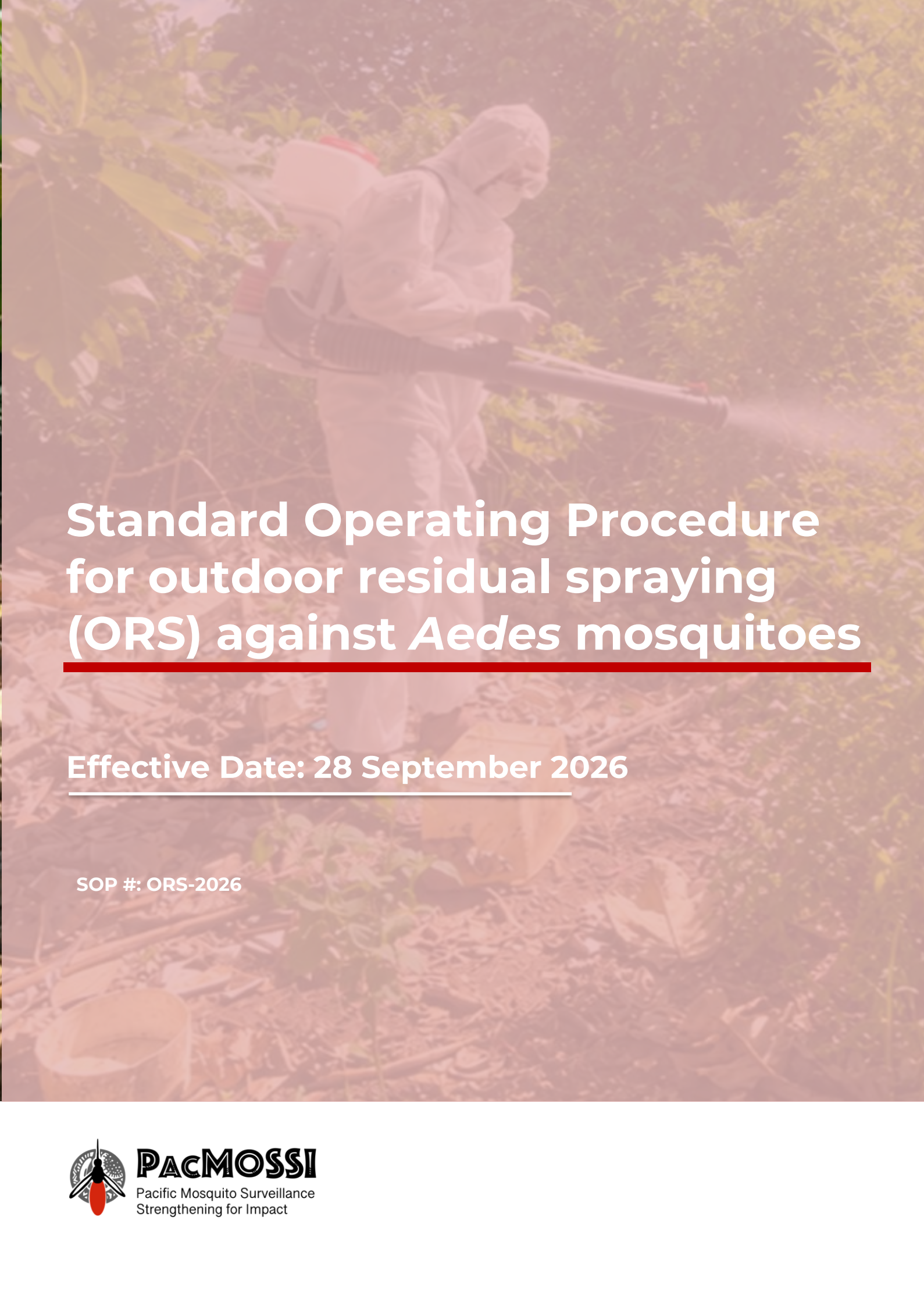


A person wearing a full-body white protective suit, including a hood and mask, is using a backpack sprayer to spray a dense forest. The sprayer is a long, dark tube with a nozzle at the end, and a fine mist of spray is visible coming from it. The background is filled with green foliage and trees.

Standard Operating Procedure for outdoor residual spraying (ORS) against *Aedes* mosquitoes

Effective Date: 28 September 2026

SOP #: ORS-2026



PacMOSSI

Pacific Mosquito Surveillance
Strengthening for Impact

1. Purpose

This Standard Operating Procedure (SOP) provides procedures for the safe and effective implementation of Outdoor Residual Spraying (ORS) against *Aedes* mosquitoes in the Pacific.

ORS involves the application of approved residual insecticides to target outdoor mosquito resting sites (harbourages) to reduce adult mosquito populations and support mosquito-borne disease control. ORS targets *Aedes* vectors that rest mainly outdoors (exophilic species), such as *Ae. polynesiensis* and *Ae. albopictus*. Where *Ae. aegypti*, which rests mainly indoors, is the principal vector, ORS should complement indoor residual spraying (IRS) rather than replace it.

2. Scope

This SOP applies to Ministry of Health (or equivalent) personnel, contractors and partner organisations involved in ORS activities.

It provides the operational procedures for planning, preparing, conducting and documenting ORS activities. Detailed guidance on spray techniques, equipment operation and insecticides is provided in other PacMOSSI guidance noted below. Components of the *WHO Operational manual on indoor residual spraying: Control of vectors of malaria, Aedes-borne diseases, Chagas disease, leishmaniasis and lymphatic filariasis* may also be applicable.

Using This SOP

The following PacMOSSI resources should be used together:

Document	Purpose
ORS SOP	Provides operational procedures for conducting ORS activities. Annex includes operational forms, checklists and supporting guides.
IRS SOP	Provides operational procedures for conducting IRS activities.
Spray Operator Field Guide	Provides practical guidance on mosquito harbourage identification, equipment use and spray techniques.
Technical Notes	Provide product-specific guidance on approved insecticides, including mixing, application, personal protective equipment (PPE), storage and disposal requirements.
Risk communications guide	Provides guidance for community engagement, risk communication and behaviour-change messaging to support residual spraying activities.

Key Message

This SOP describes **what to do**, the Spray Operator Field Guide explains **how to do it**, and the Technical Notes provide **product-specific insecticide guidance**.

3. Planning for ORS

ORS should only be undertaken where it is appropriate, feasible, acceptable and supported by available surveillance and operational information. Planning should define the objectives, timelines, roles and responsibilities, and resources required to safely and effectively implement the operation (see Figure 1). Community engagement should continue throughout the planning, implementation and post-spray phases. Where available, local insecticide resistance information should be considered when selecting residual insecticides.

Note: Where appropriate, schedule ORS before large community events (e.g., sporting events, festivals or celebrations) to maximise community protection while allowing sufficient time for sprayed surfaces to dry before use.

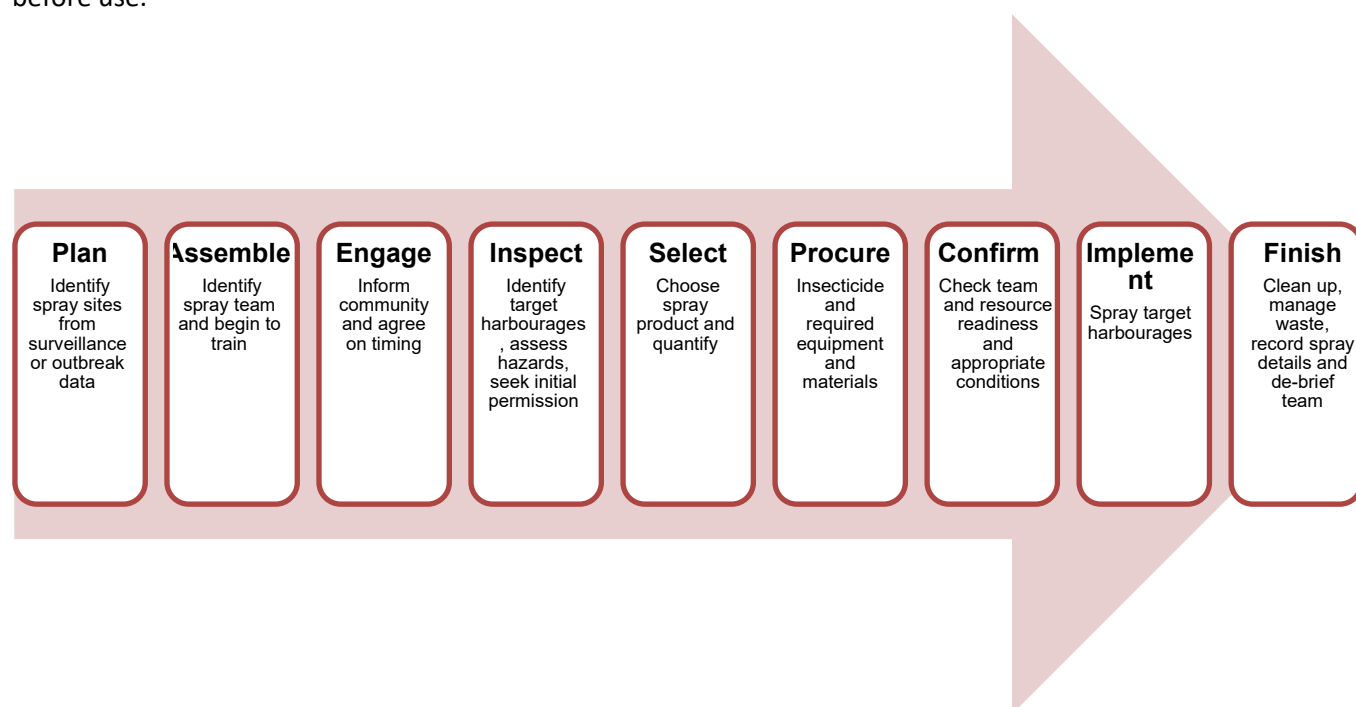


Figure 1 Key steps in planning, implementation and post-spray phases.

4. Roles and Responsibilities

Below are key roles and responsibilities for the spray team personnel tasked with implementing ORS. All personnel involved in spraying should be adequately trained and aware of the applicable SOPs, Safe Work Instruction (Annex 1), product label instructions and local health, safety and environmental requirements.

Role	Responsibilities
Spray (or Vector Control) Supervisor	Approve ORS activities, provide oversight, and review records.
Spray Team Leader	Coordinate field activities, supervise operators, complete risk assessments and operational records.
Spray Operator	Prepare and inspect equipment, conduct a pre-spray risk assessment, apply insecticide safely in accordance with SOPs, complete the Premise Mosquito Inspection and Control Form (Form A, Annex 3) after each application (including

	areas treated, insecticide used, and date/time of application), and report any hazards, equipment faults, spills, or operational issues.
All Personnel	Follow this SOP, use PPE, work safely, and treat community members respectfully.

Key Message

There should be adequate and well-trained personnel plus applicable technical resources available to support safe and effective spray operations.

5. Community Engagement

Inform communities and obtain preliminary support during planning. Note that premise-level permission will also be required before spraying.

Activity	Requirement
Community sensitisation	Engage with community leaders and residents before spraying to: • Provide information about the target mosquito, including its biting times, flight range, preferred resting sites, and the diseases it can spread. • Explain the purpose of the residual spraying operation (IRS or ORS) and why it is being conducted. • Explain what residents should expect and what they need to do before, during, and after spraying. • Explain safety precautions, including how to prepare the premise and when it is safe to re-enter treated areas. • Answer questions, address concerns, and encourage community participation and cooperation. • Provide contact details for follow-up questions, concerns, or to report any issues after spraying.
Identify appropriate spray timing	• Co-identify appropriate timing for spray activities. • Avoid spraying during church services, funerals, cultural ceremonies, school activities and community meetings where practicable. • Spray well in advance of these events (allowing sufficient time for sprayed surfaces and vegetation to dry), as this will protect large numbers of people.

Key Message

Ensure early community engagement to obtain support and permissions.

6. Pre-Spray Site Inspection

A site inspection shall be conducted before spraying to identify target harbourages, assess the suitability of premise for treatment, identify hazards, determine any areas requiring protection, and obtain preliminary permission for spraying.

Activity	Requirement
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Obtain permission	☐ Introduce yourself. ☐ Explain the purpose of the visit. ☐ Explain how ORS will be done and what residents should expect. ☐ Discuss the insecticide you will use, including any relevant safety information. ☐ Obtain permission to conduct site inspection. On public or communal land (including customary land), obtain permission from the relevant landowner, chief or authority.
Identify target harbourages	☐ Inspect shaded, sheltered and humid areas where adult mosquitoes are likely to rest. ☐ Identify harbourages suitable for residual spraying (see the Spray Operator Field Guide)
Assess hazards or potential issues	☐ Identify areas that must be protected from spray contamination, including • Drinking water tanks and water sources • Streams, wetlands, mangroves, coastal areas and other water bodies (pyrethroids are highly toxic to fish and aquatic invertebrates) • Food preparation, cooking and eating areas • Food, cooking utensils and animal feed • Vegetable gardens and edible plants • Flowering plants and beehives (to protect pollinators) • Children's toys • Laundry and clotheslines • Pets: food, water bowls, fishponds and aquarium ☐ Ensure food preparation and cooking areas are not sprayed and that all food, cooking utensils and drinking water are removed or adequately covered before spraying. ☐ Identify hazards that may affect safe spraying, including: • domestic animals and livestock • beehives • children and other bystanders • people intoxicated or under the influence of alcohol or drugs • elderly or sick people who cannot be moved • electrical hazards • slippery, uneven or obstructed ground • Weather conditions that may affect spraying (e.g., strong wind or rain) ☐ Identify any people or animals who may have difficulty maintaining a safe distance during spray.
Spray permission	☐ If the premise is suitable for treatment, obtain preliminary permission for spraying, where appropriate. Note: confirm permission again immediately before spraying on the spray day (see Section 9).

Record inspection findings on the **Premise Mosquito Inspection and Control Form (Annex 3)**.

Key Message

Inspect first to identify mosquito harbourages, assess hazards, protect people and property, and plan the spray operation effectively.

7. Residual Spray Products

Use only residual insecticide products approved for use by the relevant country authorities and preferably products that are WHO pre-qualified (see <https://extranet.who.int/prequal/vector-control-products/prequalified-product-list>). For insecticide product selection guidance, see Annex 4. Confirm that

the product label permits outdoor application to vegetation and other outdoor surfaces. Some residual products (e.g., Actellic® 300CS) are marketed and WHO-prequalified for indoor residual spraying only.

Prepare insecticide spray mixtures strictly in accordance with the product label instructions, using the recommended dilution and application rate. Refer to **Annex 5** for mixing guidance. Prepare only the quantity required for the day's operations. Unless otherwise specified on the product label, use prepared spray mixtures within 24 hours of mixing.

Key Message

Always follow the product label instructions, Safety Data Sheet (SDS) and any relevant PacMOSSI Technical Note.

8. Equipment and Materials

The table below shows anticipated requirements for ORS. The *PacMOSSI Residual Spraying Against Aedes Vectors in the Pacific: Spray Operator Field Guide* gives examples of commonly used equipment for ORS and includes detailed guidance on equipment operation, calibration, maintenance, troubleshooting and spray techniques. It is important to perform periodic equipment inspection and calibration according to the checklist provided in Annex 6.

Type	Requirement
Spray equipment	☐ Sprayer - Motorised backpack mist-blower (such as STIHL SR-series) or handheld pneumatic compression (such as Goizper iK) • Use the motorised backpack mist-blower for broad-scale ORS applications targeting large vegetation and harbourages areas. • Use handheld pneumatic compression sprayer for precision applications in sensitive, restricted, or specialized areas (e.g., barbecue zones). ☐ For mist-blowers, dosage/flow restrictor settings. For compression sprayer, spray lance and nozzle(s). ☐ Maintenance kit and spare parts
Insecticide	☐ Approved residual insecticide product ☐ Clean water supply ☐ Measuring equipment (jug or cylinder)
PPE	As required by the product label or SDS: ☐ Long-sleeved clothing or coveralls ☐ Enclosed footwear or boots ☐ Chemical-resistant gloves ☐ Helmet and face shield (or goggles and hat) ☐ Ear protection (mandatory when operating or working near motorised mist-blowers) ☐ Respirator (full or half-face), with filters as specified on the product label and SDS ☐ Neck protection (e.g., neck flap or hood) ☐ Broad-brimmed hat for sun protection
First aid kit	☐ Adhesive bandages (plasters) ☐ Gauze, tape, cloth bandages ☐ Antiseptic or antibiotic cream ☐ Eye wash solution ☐ Hydrocortisone or calamine cream ☐ Pain relief medication

Spill kit	☐ Bucket of absorbent material (sand, sawdust or soil) ☐ Long-handled brush with stiff bristles ☐ Shovel ☐ Dustpan and hand brush ☐ Fire extinguisher (where fuel is transported or stored) ☐ Plastic bags for hazardous waste disposal.
Forms	☐ Risk Assessment Matrix (Annex 2) ☐ Premise Mosquito Inspection and Control Form (Annex 3) ☐ Daily Summary Form (Annex 3)
Other	☐ Fuel (where required) in an approved, labelled fuel container, transported and stored separately from insecticides ☐ Two-stroke oil (for motorised mist-blowers, where required) ☐ Communication device (mobile phone or radio) ☐ Internet data or phone credit (where required)

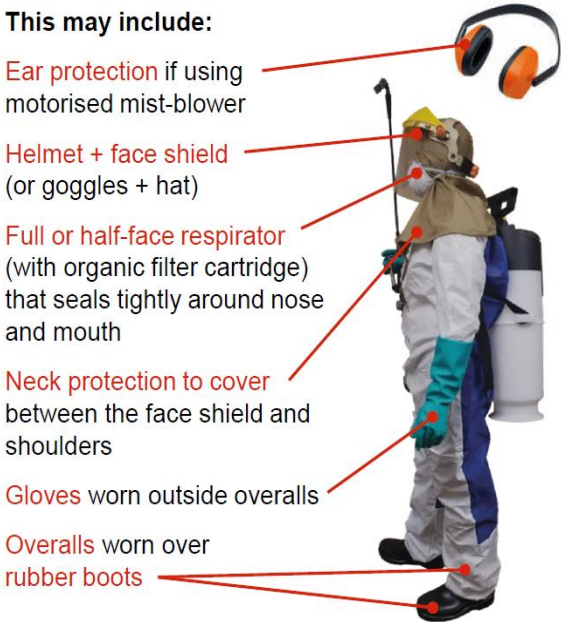
Key Message

Ensure all spray equipment and materials including PPE are appropriate for the selected insecticide product. Check equipment before every operation. Follow product labels and the relevant PacMOSSI Technical Note for product-specific guidance.

The Spray Equipment

The images below show examples of spray equipment commonly used for ORS. Detailed guidance on equipment operation, calibration, maintenance, troubleshooting and spray techniques is provided in the *PacMOSSI Residual Spraying Against Aedes Vectors in the Pacific: Spray Operator Field Guide*

Motorised backpack mistblower (e.g., Stihl SR-series)	Handheld Pneumatic Compression Sprayer (E.g., Goizper iK sprayer)
Arm components include: 	Components include:  Images source: Goizper Group

Personal Protective Equipment (PPE)
This may include:  Image source: Abt Associates/USAID

9. Spray Implementation

ORS shall be undertaken only by trained personnel using appropriate equipment, insecticides and PPE used in accordance with local requirements and regulations.

Step	Action
Pre-spray check	☐ Site inspection completed ☐ Identified spray targets (harbourages) ☐ Permission to spray confirmed ☐ Weather conditions suitable (wind, rain and temperature within the limits on the product label; no rain expected within the label rainfast period) ☐ Equipment operational and calibrated ☐ Confirm clean water is available for insecticide preparation where required. ☐ Ask whether anyone present has asthma or breathing difficulties. ☐ Ask whether birds, fish or reptiles are present and ensure they are removed or protected. ☐ Insecticide prepared according to product label ☐ PPE worn correctly ☐ People and animals are a safe distance from spray operations ☐ First aid kit and spill kit available
Permission and site entry	☐ Introduce yourself and the spray team ☐ Explain the purpose of the visit and the spray activity ☐ Obtain or re-confirm permission to spray (from the householder, or from the landowner, chief or authority for public or communal land) ☐ Advise residents to avoid contact with sprayed surfaces until completely dry (~1h). If accidental contact occurs while surfaces are wet, wash the affected skin thoroughly with soap and water. ☐ Ensure domestic animals are secured or restrained ☐ Confirm residents have prepared the treatment area by removing or covering drinking water, food, cooking utensils, pet food and water bowls, children's toys and laundry, and by covering fishponds ☐ Record refusals, access restrictions and other issues on Form A (Annex 3)
Apply Insecticide	● Spray target harbourages only ● Where practicable, spray in the early morning or late afternoon, avoiding the hottest part of the day (and periods of peak bee activity) ● Position yourself so that the wind carries spray away from you, and do not walk through freshly treated vegetation ● Maintain even spray pressure ● Direct the spray to the undersides of foliage and other shaded resting surfaces in low, dense vegetation, using smooth, uniform movements at the correct distance and walking speed (see Spray Operator Field Guide). With a mist-blower, angle the air stream upwards into the foliage to reach leaf undersides. ● Spray up to 1.5-2m from the ground. Slightly overlap spray passes ● Avoid runoff and do not spray flowering plants, edible plants, fishponds or water bodies
Caution: Follow safe work instruction (SWI) Annex 1	☐ Conduct all spraying activities in accordance with the Safe Work Instructions (Annex 1). Do not commence or continue spraying if conditions are unsafe, permission has not been obtained or if any stop-work criteria are met.
Monitor spray quality	Monitor spraying throughout the operation to ensure: ● Target harbourages receive adequate coverage. ● The correct application rate is maintained. ● Equipment remains functional and free from leaks or blockages. ● Weather and site conditions remain suitable.

	- Any operational issues are identified and corrected promptly. - Where resources allow, check residual efficacy on treated foliage with leaf or cone bioassays to guide re-treatment.
Record inspection and treatment	Record inspection findings and treatment details on the Premise Mosquito Inspection and Control Form (Annex 3)

Key Message

Only spray target harbourages when conditions are safe and suitable. Minimise spray drift, avoid runoff and protect non-target areas, people, animals and water sources.

10. Post-Spray Activities

Following completion of ORS, spray teams shall clean equipment, secure insecticides and complete required records.

Activity	Requirement
Post-Spray Advice	Advise occupants that spraying has been completed and keep everyone including animals away from treated areas until surfaces are dry. Advise residents not to hose down, prune or cut back treated vegetation, as this removes the insecticide, and to follow any withholding period on the product label before harvesting nearby produce or allowing livestock to graze treated areas.
Equipment Cleaning	- Triple rinse spray equipment. - Check equipment for damage. - Report equipment faults.
Insecticide Storage	- Secure remaining insecticide. - Keep insecticides in original containers. - Lock in a purpose built container or room - Store away from food and drinking water.
Personal Clean-Up	- Remove PPE safely. - Dispose of one-use items correctly. - Wash hands and exposed skin. - Clean reusable PPE. - Store reusable respirator filters in sealed zip-lock bags or approved containers.
Operational Records	- Record refusals, complaints or operational issues on Form A (Annex 3). - Submit records to the Team Leader or Supervisor.
Team Debrief	Discuss equipment problems, community concerns, areas completed, areas requiring follow-up, properties needing revisit and new case locations requiring treatment and lessons learned.

Key Message

Clean equipment, secure insecticides and complete records before leaving the operational area.

11. Documentation and Reporting

Accurate records shall be completed for all ORS activities.

Activity	Requirement
Risk Assessment	Complete the Risk Assessment Matrix (Annex 2) before commencing operations.
Premise Records	- Complete a Premise Mosquito Inspection and Control Form (Annex 3) for each property visited. Team Leader compiles the Daily Summary Form (Form B, Annex 3) at the end of each day from all Form A sheets and submits it to the Supervisor. - Record treated and untreated areas on operational maps where mapping systems are used to support revisit planning and treatment completion.
Operational Issues	Record refusals, complaints, untreated areas, equipment faults, dangerous animals, locked gates, no occupants present and other access restrictions on Annex 3.
Record Submission	Submit completed forms to the Team Leader or Supervisor at the end of each operational period.

Key Message

Complete and submit all required records promptly (see Annex 3).

12. Waste Management

All waste generated during ORS activities shall be managed in accordance with the product label, Safety Data Sheet (SDS), national requirements and local requirements. Waste shall be handled in a manner that protects people, animals, and the environment.

Activity	Requirement
Before spraying	Check local requirements and program procedures for the storage, transport and disposal of insecticide waste and empty containers.
During spraying	- Prevent contamination of drinking water, waterways and the environment. - Keep insecticides and waste away from humans and animals. - Have a spill kit available for accidental spill.
After spraying	- Clean spray equipment in accordance with the product label and program procedures. - Puncture or crush rinsed insecticide containers to prevent reuse. - Remove all waste and empty containers from the treatment site. - Store, transport and dispose of waste in accordance with the product label, national regulations and program procedures.

Do Not

- Dispose of insecticides, rinse water or contaminated washings into rivers, ponds, drains, stormwater systems or drinking water sources.
- Burn or bury insecticide containers unless specifically permitted by national regulations.
- Reuse empty insecticide containers for any purpose.
- Leave insecticides, empty containers or other waste at the treatment site.

Key Message

Manage insecticide waste responsibly – protect people, animals and the environment, and leave the site clean, safe and free of waste.

13. Definitions

The below definitions are adapted from the *WHO Operational manual on indoor residual spraying* (2024) and *Manual for surveillance and control of Aedes vectors in the Pacific* (2020).

Term	Definition
Application Rate	The amount of active ingredient (AI) of the insecticide applied to a unit of surface area, expressed in grams per square metre (g/m ²). For ORS, this is distinct from the spray volume (output rate, e.g., litres of spray mix per 100 m ²), which depends on the sprayer and its calibration.
Site Inspection	A systematic inspection of outdoor areas to identify suitable adult mosquito resting sites and determine whether they are appropriate for residual spraying.
Operational Area	The defined geographic area selected for ORS activities based on surveillance data, outbreak investigations, risk assessments and operational planning.
Harbourages	Shaded, sheltered outdoor locations that provide suitable resting habitats for adult <i>Aedes</i> mosquitoes, including vegetation, outdoor structures, furniture, and other protected areas.
Outdoor Residual Spraying (ORS)	The application of a residual insecticide to selected outdoor resting surfaces where adult <i>Aedes</i> mosquitoes commonly rest to reduce adult mosquito populations over an extended period.
Personal Protective Equipment (PPE)	Clothing and equipment worn by spray personnel to minimise exposure to insecticides and other occupational hazards during spraying operations.
Residual Insecticide	An insecticide formulation that remains active on treated surfaces for a specified period after application to kill mosquitoes that rest on those surfaces.
Risk Communication and Community Engagement (RCCE)	Activities undertaken before, during, and after ORS operations to inform communities, promote understanding of the intervention, address concerns, encourage participation, and support safe implementation.
Spray (or Vector Control) Supervisor	The person responsible for planning, authorising, supervising, and evaluating ORS operations, including operational planning, safety, quality assurance, and reporting.
Spray Team Leader	The person responsible for leading a field spray team during a residual spraying operation.
Spray Operator	The trained and authorised person responsible for preparing equipment, mixing and applying insecticides during spraying operations
Sprayable surface	An outdoor surface suitable for residual insecticide application in accordance with the product label, environmental requirements and this SOP.
Targeted areas	An outdoor area (generally shaded vegetation, yards and outdoor structures around dwellings and community gathering places) identified through surveillance, site inspection or operational assessment as suitable for treatment during ORS operations.

14. References and Further Reading

The following documents should be used in conjunction with this SOP and can be found on the PacMOSSI website (<https://pacmossi.org/technical-guidance>):

- *PacMOSSI Residual Spraying Against Aedes Vectors: Spray Operator Field Guide*
- *PacMOSSI Technical Notes* for selected products
- *PacMOSSI A Guide to Risk Communication and Community Engagement for Residual Spraying Against Aedes Mosquitoes (2026)*
- *WHO Operational manual on indoor residual spraying: Control of vectors of malaria, Aedes-borne diseases, Chagas disease, leishmaniases and lymphatic filariasis*
- *Pacific Community & WHO Division of Pacific Technical Support. (2020). Manual for surveillance and control of Aedes vectors in the Pacific. Pacific Community (SPC)*
- National Vector Control Guidelines
- Insecticide Product Label Instructions
- Safety Data Sheets (SDS)

Key Message

Ensure all spray team members are familiar with this SOP, the Spray Operator Field Guide and relevant Technical Notes before commencing ORS activities.

Citation

This Standard Operating Procedure may be used for training and reference purposes. Users are responsible for ensuring any edits to this document are produced and approved in accordance with all relevant legal and ethical requirements governing the vector control operation.

15. Annexes

Annex	Title
Annex 1	Safe Work Instruction (SWI) for ORS Spray Teams
Annex 2	Example Risk Assessment Matrix
Annex 3	Operational Forms
Annex 4	Residual Spray Product Key Features for ORS
Annex 5	Insecticide Quantification and Mixing Guide for ORS
Annex 6	Equipment Inspection and Calibration Checklist
Annex 7	Key Community Messages and Information for ORS

Annex 3 contains the primary operational forms used during ORS activities.

Annexes 4 and 5 provide planning guidance and should be used together with the relevant PacMOSSI Technical Notes for product-specific insecticide information.

Annex 1. Safe Work Instruction (SWI) for ORS Spray Teams

Purpose	Safe Work Instruction (SWI) guide for spray team leaders and spray operators, covering personal, community-site, and environmental safety, equipment operation, and operational record-keeping for outdoor residual spraying (ORS) against <i>Aedes</i> vectors.
Audience	Spray team members including leaders and spray operators.
Date	26 September 2026
Sources	Adapted from Queensland Health documentation. <i>Residual Spraying Against Aedes Vectors in the Pacific: Spray Operator Field Guide</i> (Version 1, October 2023) <i>WHO Operational Manual on Indoor Residual Spraying</i> (2024). Designed to complement the PacMOSSI <i>A Guide to Risk Communication and Community Engagement for Residual Spraying Against Aedes Mosquitoes</i> (2026)

Key Message

If it is not safe, do not spray. Follow the product label, wear PPE, and stop work immediately if unsafe conditions develop.

Timing	Key activities
In the Months Before Spraying	- Ensure all spray personnel are trained and formally authorised. Only trained personnel can handle insecticides or conduct spray. - Confirm the ORS SOP, product label, Safety Data Sheet (SDS), and Risk Assessment Matrix (Annex 2) are current and accessible to the team. - Procure sufficient insecticide stock within expiry date. - Service and calibrate spray equipment, including nozzles and lance extensions. For motorised mist-blowers, also service the engine, fuel system, fan and dosage settings. - Prepare first aid kits and spill kits. - Ensure each team member has correctly fitting PPE (see Equipment and Materials) and do a fit check. - Organise communication devices and safe transport arrangements for spray teams. - Establish data recording and reporting systems. - Where time allows, begin community engagement early; in outbreak responses this may happen within days.
In the Days Before Spraying	- Review the work plan and complete the risk assessment. - Check the weather forecast for spray dates. - Inspect and calibrate equipment - Confirm insecticide, equipment and materials are available. - Review the product label and Safety Data Sheet (SDS) before mixing and applying insecticide. - Confirm transport arrangements. - Confirm community notification and permission-to-spray for the target properties have been completed. - Brief all personnel on the code of conduct: wear uniform and PPE correctly, be courteous and respectful of residents and property, report any property damage immediately, and never request food or money from residents.
On the Day of Spraying	Before spraying - Introduce the team and confirm permission to spray with the household head or another adult before entering premise. - Inspect the yard for hazards (e.g., trip hazards, animals, people, and all items or areas that must not be sprayed). - Ask whether anyone present has asthma or other breathing difficulties, and advise all occupants to remain away from the spray area during application.

	• Confirm the household has prepared the area by covering or removing water containers, food, cooking utensils, children's toys, laundry on clotheslines, pet food and water bowls, and other valuables from areas to be sprayed. • Ask whether birds, fish, or reptiles are present. If so, remove them from the area, cover cages, tanks and fishponds, and turn off pond pumps or aquarium filters for 30 minutes. • Advise residents to avoid contact with sprayed surfaces until completely dry (~1h). If accidental contact occurs while surfaces are wet, wash the affected skin thoroughly with soap and water. • Confirm that all people and animals are clear of the treatment area before spraying begins. If the area is not ready, assist the household where appropriate or arrange to return later. During spraying • Work in teams of at least two people where practicable • Carry a first aid kit, spill kit, drinking water, and communication device. Rotate tasks where practicable to minimise fatigue and heat stress. • Wear full PPE and follow the product label and SDS at all times when mixing and spraying. • Position yourself so that the wind carries spray away from you. • Use approved insecticide products in accordance with product label, local requirements and PacMOSSI Technical Note. • Spray areas in order of priority. • Minimise spray drift and contamination of people, animals, water sources, flowering plants and other non-target areas. • For outdoor vegetation, consider wind direction, avoid spraying wet foliage or when rain is expected within the rainfast period stated on the product label, and avoid run-off into waterways. • Respect the privacy and property of household occupants throughout the visit. Immediately after spraying • Instruct occupants and animals to remain away from the spray area until sprayed surfaces have dried (about 1 hour, weather-dependent). • Advise the household not to wash, hose down, cover, prune or cut back sprayed surfaces or vegetation afterwards, so the insecticide continues working. • Advise occupants to contact a health facility or hotline number if unwell or with questions, and to go immediately to the nearest health facility or call emergency services for severe symptoms. • Leave the area clean and tidy, removing any rubbish generated during the visit. • Complete spraying record before leaving the site.
CAUTION	Do not spray: • Weather: Rain or strong winds affect safe spraying or access. • People and animals: People or animals remain in the spray area, an occupant cannot be moved, or aggressive animals are present. • Permission and safety: Permission has not been granted or conditions are unsafe. • Areas and items: Kitchens or food preparation areas; food containers or utensils; children's toys, clothing or bedding; water storage containers or tanks; exposed electrical wiring or fittings; vegetable gardens and edible plants; flowering plants and beehives; fishponds, streams, wetlands and other water bodies. Stop spraying immediately if: • A person or animal enters or comes within 10 m (or a greater distance where the mist-blower's horizontal throw exceeds this) of the area being sprayed.

	• Equipment fails or chemical spill or leak occurs. • Aggressive animals are present • A community member restricts safe access to the premise. • Any other condition becomes unsafe for personnel, the community, animals, or the environment. • Any team member experiences breathing difficulty, headache, fatigue, or eye or skin irritation. Stop work, inform the Team Leader immediately, and provide first aid for inhalation, skin, or eye exposure as required. • An occupant becomes aggressive, threatening or appears affected by alcohol or drugs. Leave the premise immediately and notify the Team Leader.
After Spraying Is Completed	• Clean equipment using the triple-rinse procedure, including the spray tank, filters, lance/nozzle and mist-blower delivery hose, before storage • Dispose of leftover insecticide and rinse water according to the product label and local requirements • Remove and store PPE correctly followed by a full-body wash for all spray personnel. • Complete and submit all operational records before the end of the workday.
Incident Reporting	• Report all chemical spills, accidental exposures, injuries, equipment failures and community incidents immediately to the Team Leader. • Seek medical attention promptly if exposure results in persistent or severe symptoms. • Record and report incidents in accordance with organisational procedures.

Annex 2. Example Risk Assessment Matrix for Outdoor Residual Spraying

Note: This should be adapted based on the local situation and checked against applicable occupational health and safety requirements. Re-rate hazards when a condition changes.

Province/Island District/Zone. Community/Suburb
Date:..... Assessor:

Hazard	Potential Risk/Consequence	Initial Risk Rating	Control Measures	Residual Risk Rating
Community refusal or conflict	Unsafe working conditions	High	Explain activity, remain respectful, do not enter premise if refused.	Low
Aggressive animals	Bites or injury to personnel	High	Request animals are secured. Do not enter if unsafe.	Low
Children or public entering spray area	Insecticide exposure	High	Keep children, residents and animals away during spraying.	Low
Chemical exposure	Skin, eye or inhalation exposure	High	Wear PPE and follow the product label and SDS.	Low
Insecticide mixing	Chemical exposure from incorrect mixing or handling	High	Mix insecticides in accordance with the product label and SDS while wearing the required PPE.	Low
Manual handling (including carrying loaded mist-blowers)	Muscle strain or back injury	Medium	Use safe lifting techniques, adjust the harness correctly, avoid overfilling tanks and rotate tasks.	Low
Working alone	Delayed emergency response	High	Work in teams of at least two people where practicable and maintain communication.	Low
Noise from motorised mist-blowers	Hearing damage	High	Wear ear protection at all times when operating or working near a running mist-blower.	Low
Hot engine parts and fuel	Burns or fire	High	Refuel only with the engine off and cool, away from ignition sources; use approved fuel containers; carry a fire extinguisher.	Low
Airborne debris from mist-blower	Eye injury	Medium	Wear a face shield or goggles; do not direct the air stream at people, animals or loose debris.	Low
Non-target organisms (bees, fish, aquatic life)	Environmental harm	High	Do not spray flowering plants, beehives or water bodies; keep buffer distances specified on the product label.	Low
Chemical spill	Exposure or environmental contamination	High	Stop work, contain spill and follow spill procedures.	Low
Spray drift	Off-target contamination	High	Spray only in suitable weather conditions. Use the correct nozzle/dosage setting and keep buffer distances from non-target areas.	Low
Water sources nearby	Environmental contamination	High	Do not spray water tanks, wells, streams, ponds or waterways. Maintain buffer distances specified on the product label.	Low
Equipment failure	Insecticide leaks or ineffective spraying	High	Inspect equipment before use and remove faulty equipment from service.	Low
Electrical hazards	Electric shock	High	Do not spray exposed electrical installations. Avoid contact with	Low

			damaged electrical fittings.	
Heat stress and dehydration	Illness or reduced performance	High	Carry drinking water, take breaks and work in shade where possible.	Medium
Slips, trips and falls	Injury	Medium	Assess terrain and wear suitable footwear.	Low
Dense vegetation or hidden hazards	Cuts, punctures, bites or falls	Medium	Inspect area before entry and avoid unsafe locations.	Low
Vehicle or boat transport	Injury, accident or equipment damage	High	Follow transport safety procedures and local requirements.	Medium
Severe weather	Injury or ineffective spraying	High	Suspend operations until conditions improve.	Low

Site-Specific Hazards

(Examples: cyclones, flooding, security issues, special local circumstances)

Hazard	Initial Risk Rating	Control Measures	Residual Risk Rating

Risk Assessment Outcome

- ☐ Controls implemented
- ☐ ORS can proceed safely
- ☐ Additional controls required

Assessor Signature: _____

Date: _____

Risk Rating Guide

Rating	Description
Low	Minor injury or impact. Routine controls are adequate.
Medium	Moderate injury or impact. Additional controls may be required.
High	Serious injury, environmental impact or operational disruption. Controls must be implemented before work proceeds.

Key Message

If risks cannot be reduced to an acceptable level, do not proceed with spraying

Annex 3. Operational Forms

Click the links below to access the forms. For editable versions of the forms, email pacmossi@jcu.edu.au

Form A. Premise mosquito inspection and control form	https://pacmossi.org/resource/premise-inspection-aedes-form/
Form B. Daily summary form	https://pacmossi.org/resource/daily-summary-form-aedes/

Annex 4. Residual Spray Product Key Features for ORS

This guide provides a summary of insecticides currently supported by PacMOSSI for residual spraying activities. Detailed instructions on mixing, application, PPE, storage and disposal are provided in the relevant Technical Notes.

Product	Active Ingredient	Insecticide Group	Indicative Residual Activity Outdoors*	Technical Reference
Demand® 100CS	Lambda-cyhalothrin (100 g/L)	Pyrethroid	Up to 6 weeks	<i>PacMOSSI Technical Note: Lambda-cyhalothrin (Demand® 100CS)</i>
Biflex® Aquamax	Bifenthrin (100 g/L)	Pyrethroid	Up to 6 weeks	<i>PacMOSSI Technical Note: Bifenthrin (Biflex® Aquamax)</i>

*Residual performance may vary depending on surface type, rainfall, sunlight, vegetation and local environmental conditions. Outdoor residual activity is generally shorter than indoor residual activity; figures are indicative; confirm current figures against the product label.

Insecticide Selection Considerations

When selecting an insecticide, consider:

- target mosquito species;
- known or anticipated insecticide resistance status of local vectors;
- label approval for outdoor application to vegetation and other outdoor surfaces;
- environmental conditions;
- formulation stability outdoors (e.g., capsule suspension [CS] formulations under sunlight and rainfall);
- toxicity to non-target organisms (e.g., bees, fish and aquatic invertebrates);
- expected duration of residual control;
- available application equipment and materials including PPE; and
- availability through approved procurement systems.

Key Message

Use only insecticide products approved for use by local authorities and preferably also WHO pre-qualified. Always refer to the relevant product label instructions, SDS and relevant PacMOSSI Technical Note before preparing or applying insecticides.

Annex 5. Insecticide Quantification and Mixing Guide for ORS

This supports planning and estimating insecticide requirements for ORS.

Estimating Treatment Areas

Estimate only areas requiring treatment, rather than the total village area.

Treatment areas may be estimated using field surveys, GPS mapping, drone imagery, GIS software or Google Earth.

Planning, Quantification and Quality Check

Activity	Guidance
Define spray plan	Identify geographic area to be targeted for spraying. Select insecticide. Determine number of spray cycles based on outdoor residual activity (Annex 4), and plan re-treatment after heavy rainfall. Identify target harbourages.
Estimate treatment area	Estimate the total area of target harbourages to be treated (m ²) in the geographic area to be targeted (not the total area).
Quantify insecticide	Based on the estimated treatment area and the application rate as indicated on the product label, determine the volume of spray mix and the amount of insecticide concentrate required. Refer to the product label instructions, SDS and PacMOSSI Technical Notes for product-specific mixing instructions, application rates and tank calculations.
Contingency Allowance	Include an additional 5–10% to account for calibration variation, operational losses, equipment leakage, wastage and expansion of treatment areas.
Quality Check	☐ Treatment area estimated ☐ Product selected ☐ Quantity required calculated ☐ Contingency included ☐ Calculations independently checked

Example Scenario

A program plans to conduct ORS with **Demand® 100CS** applied at **10 L of spray mix per 200 m²**. This spray volume is set by sprayer calibration; at the label mixing rate of 40 mL per 10 L it equals 0.02 g AI/m².

Estimate Treatment Area

Site	Estimated Area (m ²)
Village perimeter vegetation	15,000
Palm vegetation	8,000
Banana plantation	4,000
Community gathering areas	3,000
Total Treatment Area	30,000

Quantify Insecticide

Item	Calculation	Value
Product selected	-	Demand® 100CS
Active ingredient	-	100g/L lambda-cyhalothrin
Spray volume (output rate)	-	10 L per 200 m ²
Treatment area	-	30,000 m ²
Spray mix required for treatment area	$(30,000 \text{ m}^2 \div 200 \text{ m}^2) \times 10 \text{ L}$	1,500 L
Mixing rate	-	40 mL per 10 L spray tank
Resulting application rate (dose)	$(40 \text{ mL} \times 100 \text{ g/L} = 4 \text{ g AI per 10 L}) \div 200 \text{ m}^2$	0.02 g AI/m ²
Product required	$(1,500 \text{ L} \div 10 \text{ L}) \times 40 \text{ mL} =$	6 L

	$150 \times 40 \text{ mL} = 6,000 \text{ mL}$	
10% contingency	$6 \text{ L} \times 0.10$	0.6 L
Total product required	$6 \text{ L} + 0.6 \text{ L}$	6.6 L (~7 L)

Calculation method:

1. Calculate the total spray mix required from the treatment area and spray volume (output rate).
2. Calculate the amount of insecticide concentrate using the label mixing rate.
3. Add a contingency (e.g. 10%) to account for minor losses during mixing and spraying.
4. Always verify calculations against the product label before preparing a spray solution.

Detailed mixing instructions are provided in relevant PacMOSSI Technical Notes.

Annex 6: Equipment Inspection and Calibration Checklist

This checklist shall be completed before ORS operations to confirm that spray equipment is safe, operational and ready for use. Approved residual spray equipment may include hand-compression sprayers and, where appropriate for the product and operation, motorised backpack mist-blowers. Product-specific equipment guidance is provided in the relevant PacMOSSI Technical Notes

Province/IslandDistrict/Zone.Community/Suburb:.....

Date: Team Leader:Equipment ID/Number:.....

Equipment Inspection Checklist

Item	Check	Pass	Fail	Action Required
Spray tank	Tank clean and free from cracks, leaks or damage	☐	☐	
Tank lid/seal	Lid closes securely and seal is intact	☐	☐	
Hose	Hose secure, flexible and free from leaks or damage	☐	☐	
Lance	Lance attached securely and working correctly	☐	☐	
Trigger/valve	Trigger opens and closes properly	☐	☐	
Nozzle	Nozzle clean, correctly fitted and not blocked	☐	☐	
Filters/strainers	Filters clean and correctly fitted	☐	☐	
Engine (mist-blower)	Engine starts, idles and runs smoothly, no fuel leaks, spark plug and air filter serviceable	☐	☐	
Fan and air hose (mist-blower)	Fan housing undamaged, air hose and blower tube secure and free from cracks	☐	☐	
Dosage setting (mist-blower)	Correct dosage/flow restrictor setting for the product and target output	☐	☐	
Harness and straps	Straps intact and adjusted, back padding in place	☐	☐	
Pressure	Equipment maintains appropriate pressure (compression sprayers)	☐	☐	
Spray pattern	Spray output is even and consistent	☐	☐	
Measuring equipment	Measuring jug/cylinder clean and readable	☐	☐	
PPE	PPE available and in good condition	☐	☐	
Spill kit	Spill kit available	☐	☐	
First aid kit	First aid kit available	☐	☐	

Calibration Check

Calibration Item	Result / Comment
Equipment calibrated before use	☐ Yes ☐ No
Correct nozzle fitted	☐ Yes ☐ No
Spray output checked (timed flow at the selected dosage setting)	☐ Yes ☐ No
Spray pattern acceptable	☐ Yes ☐ No
Application rate checked against Technical Note/product label	☐ Yes ☐ No
Equipment approved for use	☐ Yes ☐ No

Note: Goizper iK sprayers have a built-in pressure regulation system and do not require routine field pressure calibration. Operators should inspect the equipment before use, ensure the correct nozzle is fitted, and verify that the spray pattern is even and consistent. Mist-blower output varies with the dosage setting and operating position, so check output by timed discharge before each operation. Always follow the product label and relevant PacMOSSI Technical

Notes.

Equipment Outcome

- ☐ Equipment ready for use
- ☐ Equipment requires repair
- ☐ Equipment removed from service

Comments:

Checked by: _____ Signature: _____ Date: _____

Key Message

Do not use leaking, damaged or uncalibrated spray equipment. Replace or repair faulty equipment before spraying

Annex 7: Key Community Messages and Information for ORS

Key community messages are provided below. Further details are available in the PacMOSSI *A Guide to risk communication and community engagement for residual spraying against Aedes mosquitoes*.

Topic	Key Message
Why are we spraying?	Outdoor Residual Spraying (ORS) is used to reduce adult mosquito populations and help prevent mosquito-borne diseases such as dengue, chikungunya and Zika. The mosquitoes we are targeting commonly rest outdoors in shaded vegetation around homes.
Where will spraying occur?	Spraying will focus on outdoor areas where mosquitoes commonly rest, including vegetation, shaded areas and other mosquito harbourages.
Is the insecticide safe?	Approved insecticides are used according to product label instructions. When applied correctly by trained personnel, they do not pose a significant risk to people or domestic animals. Some insecticides are harmful to bees, fish and other aquatic life, so the spray team will avoid flowering plants, fishponds and waterways.
What should residents do before spraying?	Move people and animals away from the treatment area. Cover or remove food, drinking water, cooking utensils and children's toys where appropriate. Cover fishponds, move pet food and water bowls, and tell the spray team about any beehives.
What should residents do during spraying?	Remain away from the treatment area until spraying is complete and surfaces have dried. Follow instructions provided by the spray team.
What should residents do after spraying?	Keep children and animals away from treated areas until surfaces are dry. Do not hose down, prune or cut back treated vegetation, or wash treated outdoor surfaces, as this removes the insecticide and reduces protection.
Will spraying kill all mosquitoes?	ORS helps reduce mosquito populations but is most effective when combined with source reduction, removal of breeding sites and community participation. Where the main vector rests indoors (<i>Aedes aegypti</i>), ORS should be combined with indoor residual spraying (IRS).
How can residents help?	Remove containers that collect water, maintain clean yards, screen houses where possible, report mosquito problems and support mosquito control activities.
Questions or Concerns	Residents should contact the local health authority or Spray Team Leader or Supervisor if they have questions or concerns about the spraying program.

Key Message for Community Leaders

Community leaders can support ORS activities by:

- providing information about the target mosquito, the diseases it spreads and the purpose of ORS;
- informing residents about planned spraying activities;
- encouraging community participation;
- assisting with access to properties and community areas;
- assisting with permission for spraying on communal or customary land;
- promoting removal of mosquito breeding sites; and
- helping address community concerns or questions.

Key Message

ORS is one part of an integrated mosquito control program. Community participation and removal of mosquito breeding sites remain essential for long-term mosquito control.