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# WILDLAND FIREFIGHTING TOOLS AND EQUIPMENT GUIDE



**Practical Advice and Orientation  
for Individuals and Organizations  
Working in Wildland Firefighting  
in Madagascar**

FEBRUARY 2023



Community members from the Menabe region practice using firefighting equipment during a partner practical training.

*Photo: Josepha Duchene*

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## Background and Context for this Guide

The following guide is meant to serve as a reference for sourcing of basic wildland firefighting tools and supplies to support a safe and efficient response to forest and other wildland fires. This guide is informed by US Forest Service experience in training and providing guidance to partners and communities in Madagascar. This guide is not meant to be an exhaustive list of sources or suppliers of such items but rather to provide some starting points for partners engaging in wildland firefighting efforts. USFS and partners sought to source tools that can be procured and/or made within Madagascar to reduce cost and ensure greater likelihood of long-term availability. The prices mentioned here are approximate to aid in planning and budgeting but may vary according to the supplier. USFS does not endorse any specific brand or equipment but with this guide aims to

share some standards. The USFS team welcomes feedback from partners on other tools or adaptations that may be useful to consider in a future edition of this guide.

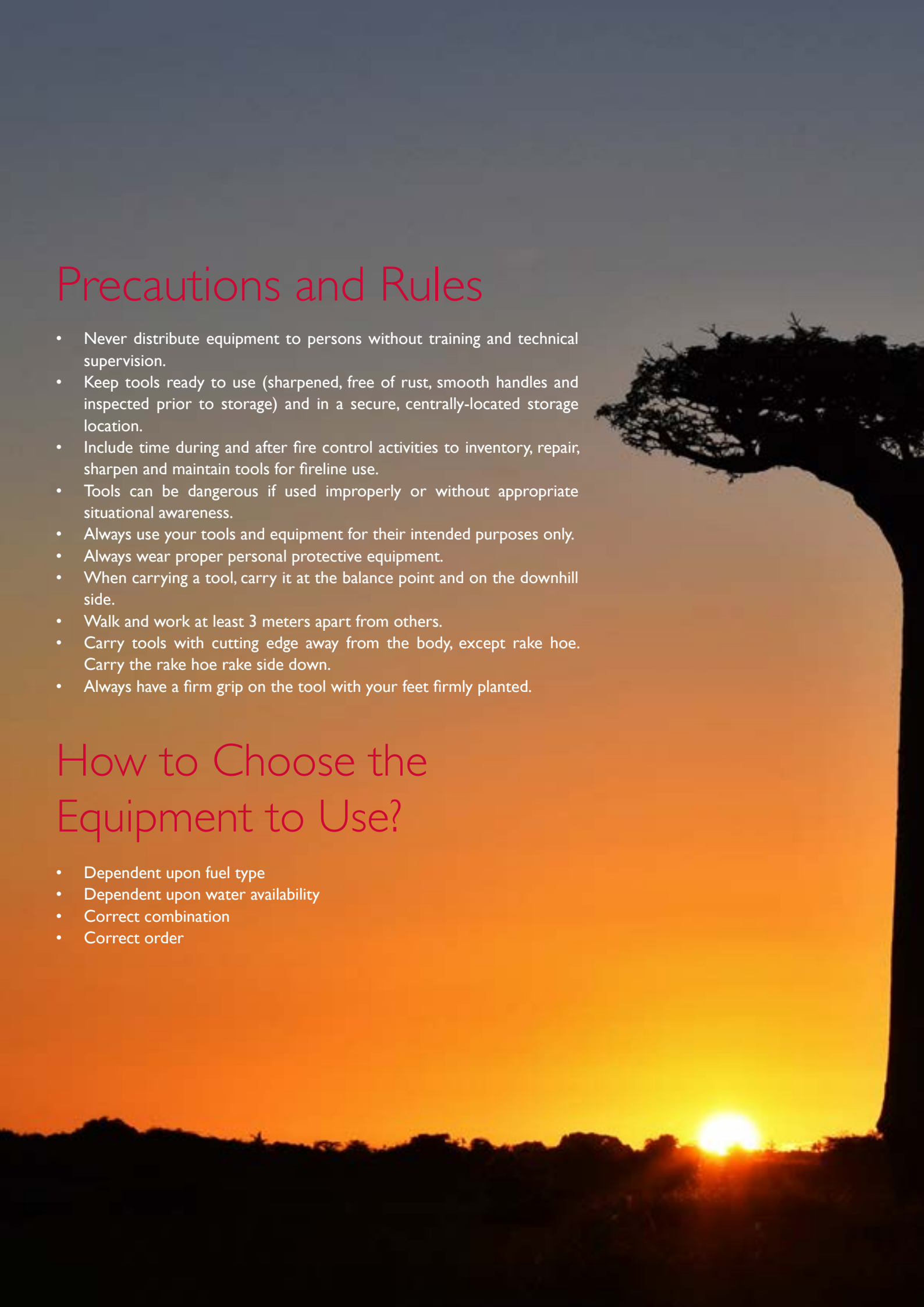
This guide is meant to be used in parallel with a training program and the tools described herein should be used under the supervision of a trained fire leader so as to be able to make revisions and adaptations as needed. Safety of personnel in responding to a wildfire is of utmost importance and thus, the tools described here, including sections on personal protective equipment, are vital to the success of a firefighting program. Finally, this is a guide for basic tools and any additional, advanced equipment may also be used as needed and should be based upon abilities of firefighters and partners to use and manage.

# Precautions and Rules

- Never distribute equipment to persons without training and technical supervision.
- Keep tools ready to use (sharpened, free of rust, smooth handles and inspected prior to storage) and in a secure, centrally-located storage location.
- Include time during and after fire control activities to inventory, repair, sharpen and maintain tools for fireline use.
- Tools can be dangerous if used improperly or without appropriate situational awareness.
- Always use your tools and equipment for their intended purposes only.
- Always wear proper personal protective equipment.
- When carrying a tool, carry it at the balance point and on the downhill side.
- Walk and work at least 3 meters apart from others.
- Carry tools with cutting edge away from the body, except rake hoe. Carry the rake hoe rake side down.
- Always have a firm grip on the tool with your feet firmly planted.


# How to Choose the Equipment to Use?

- Dependent upon fuel type
- Dependent upon water availability
- Correct combination
- Correct order



# Cutting Tools

- Cutting tools are used in fireline construction and mop-up (containing and subduing a fire so that it can no longer continue to burn or spread beyond control lines or objectives) by cutting small brush and trees.
- They are often used before scraping tools for clearing away bigger vegetation and roots.
- There are motorized models (chainsaws, Brush cutters) but they are often not adapted for remote use (requiring purchase of fuel, maintenance not accessible in the bush)

PHOTO	NAME	USE	SUPPLIER & ESTIMATE PRICE
	AXE	Cut small stems, branches, and small trees	Locally available \$2-\$10
	SLASHER (BRUSH HOOK), PANGA (MACHETE)	Clearing brush, tall grasses, or small branches. They are best used at the beginning of the tool order.	Locally available \$2-4
	PULASKI	An axe on one side and a grubbing blade on the other. The grubbing blade can be used for multiple tasks.	Manufacture by local artisans. \$10-20  Model available from USFS Madagascar staff




# Scraping Tools

- Primarily used to break the fire triangle by removing fuel.
- Operators should seek a grip, posture, and rhythm that is maintainable for long durations of work. Proportionately dividing up the work between team members with scraping tools prevents fatigue.
- With tools that have a heavier head, it is important to conserve energy by allowing the weight of the tool to do the cutting and scraping, while guiding its direction and conserving energy for necessary pulling and lifting motions. Use your knees not your back.

PHOTO	NAME	USE	SUPPLIER & ESTIMATE PRICE
	SHOVEL	<ul style="list-style-type: none"> <li>• Digging</li> <li>• Scraping</li> <li>• Trenching</li> <li>• Smothering</li> <li>• Cutting Light Fuels</li> <li>• Throwing Dirt</li> <li>• Aiming water into a hard to reach spot</li> </ul>	Locally available \$2-\$10
	RAKES	<ul style="list-style-type: none"> <li>• Pull unburned fuel away from fire</li> <li>• Scrape light or loose fuels (e.g., leaves)</li> <li>• Move medium-weight fuels</li> </ul>	Locally available \$2-4
	MCLEOD (RAKE HOE)	<ul style="list-style-type: none"> <li>• Rake on one side and a hoe on the other</li> <li>• Can be used to pull unburned fuel away from fire</li> <li>• Cut and scrape light, loose fuels</li> <li>• Rake burning fuels away from main fire</li> <li>• Cut a fireline using the hoe</li> </ul>	Manufacture by local artisans. \$10-20  Model available from USFS Madagascar staff
	HOES	<ul style="list-style-type: none"> <li>• Digging</li> <li>• Scraping</li> <li>• Smothering</li> <li>• Cutting light fuels</li> <li>• Cutting a fireline</li> </ul>	Price unknown

# Smothering Tools

- The beater/swatter is a large flap of rubber material attached to a long, straight handle. This hand tool is used to knock down and smother the flames.
- Fire beaters are used by lightly patting or dragging directly on the fire edge. Wild movements will scatter embers. Keep the tool in motion to prevent its ignition or melting.

PHOTO	NAME	USE	SUPPLIER & ESTIMATE PRICE
	BEATER (SWATTER)	Smothering tools are used to break the fire triangle by suppressing the flow of oxygen to fuel the flames.	Manufacture by local artisans. \$12
	WET GUNNY SACKS	<ul style="list-style-type: none"> <li>• Very effective when the conditions are right</li> <li>• Only use sacks made from natural burlap, not synthetic materials</li> <li>• Wet the sack if possible</li> <li>• Grab a corner of the sack</li> <li>• Swing it down on the flames</li> </ul>	Locally available
	BRANCHES	Branch fronds found locally can be used as swatters when other materials are not available.	Locally available



# Water Handling Equipment

- Water cools the fire, thus breaking the heat side of the fire triangle (1 part of water puts out 300 parts of fire).
- The success of controlling fires at a small size can be attributed to the skillful application of water. This can be very effective during mop up.

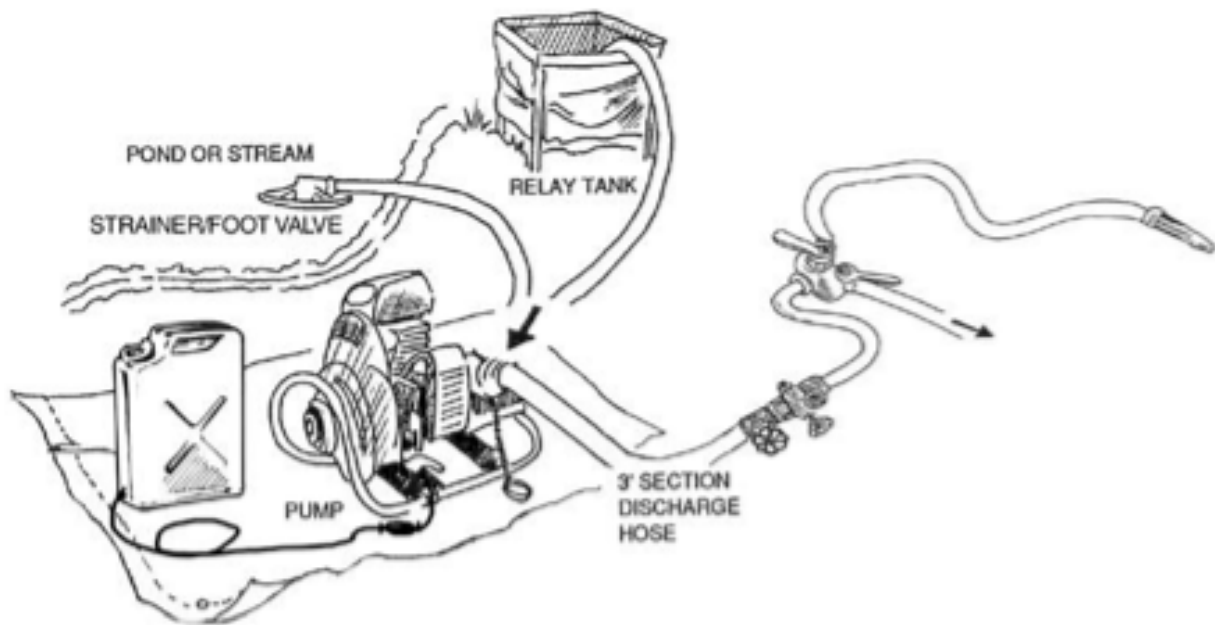









PHOTO	NAME	USE	SUPPLIER & ESTIMATE PRICE
	BACKPACK PUMP	Mop up operation and controlling slow to moderately spreading fire in light fuels. Utilizing a nozzle allows you to form and direct a stream of water under pressure at the fire.	Not available in Madagascar. \$25 – \$40
	HIPPO ROLLER 90 LITERS	Storing and transporting water	Locally available \$35

PHOTO	NAME	USE	SUPPLIER & ESTIMATE PRICE
	<p>PUMPKIN TANK, SELF SUPPORTING TANKS</p> <p>7,750 LITERS</p>	<p>Relay Tank</p>	<p>Not available in Madagascar</p>
	<p>BLIVETS 272 LITERS</p> <p>380 - 1135 LITERS</p>	<p>Relay Tank</p>	<p>Not available in Madagascar</p>
	<p>PILLOW TANK</p> <p>1900 – 11,356 LITERS</p>	<p>Relay Tank</p>	<p>Not available in Madagascar</p>
	<p>FOLDING TANK SINGLE FOLDING</p> <p>3785 - 7,950 LITERS</p>	<p>Relay Tank</p>	<p>Not available in Madagascar but manufacturing possible in Madagascar</p>
	<p>REFER TO THE TECHNICIANS WHO HAVE RECEIVED THE ADVANCED FOREST FIRE FIGHTING TRAINING FOR SPECIFICS</p>	<p>Discharge hoses, suction hoses, nozzles and strainers</p>	<p>Locally available</p> <p>The price will depend on the quality, diameter and length.</p>







Use of McLeod by a community fire brigade.

Photo: Association Fanamby

PHOTO	NAME	USE	SUPPLIER & ESTIMATE PRICE
	<p>SLIP ON UNIT</p> <p>REFER TO THE TECHNICIANS WHO HAVE RECEIVED THE ADVANCED FOREST FIRE FIGHTING TRAINING FOR SPECIFICS.</p>	<p>Slip on pump, water tanks, reel and hose for trailer or vehicles.</p> <p>280 - 1136 liters</p>	<p>Local purchase may be possible \$2,500 - \$10,000</p>
	<p>PORTABLE PUMP</p> <p>REFER TO TECHNICIANS WHO HAVE HAD ADVANCED FOREST FIRE TRAINING FOR SPECIFICS</p>	<p>Pump, fuel can and hose</p>	<p>Local purchase may be possible \$1,200 - \$3,000</p>

# Firing Equipment

It is important that firefighting crews have some means of burning fuels, establishing a black line, and setting fires when needed during fire-control activities.

PHOTO	NAME	USE	SUPPLIER & ESTIMATE PRICE
	MATCHES OR LIGHTERS	Establish a black line, and set fires when needed during fire control activities	Locally available
	OIL-SOAKED RAGS ON A STICK	Establish a black line, and set fires when needed during fire control activities	Locally available
	FIRING DEVICES – DRIP TORCH	Establish a black line, and set fires when needed during fire control activities	Not available in Madagascar \$25 – \$40  Model available from USFS Madagascar staff
	FUSES	Establish a black line, and set fires when needed during fire control activities	Not available in Madagascar

# Personal Protective Equipment (PPE)

- No synthetic materials
- Cotton or fire-resistant clothing (shirt & pants or coveralls). Wash after each use to remove harmful chemicals from fire smoke and sweating.
- Proper dress for responding to a wildland fire:
  - Helmet
  - Leather boots
  - Leather gloves
  - Goggles
  - Headlamp with spare batteries
  - Drinking water canteen and belt or pack






PHOTO	NAME	USE	SUPPLIER & ESTIMATE PRICE
	FIRE SHIRT, PANTS OR COVERALLS	<ul style="list-style-type: none"> <li>• 100% long sleeve cotton or fire resistant materials</li> <li>• Preferably brightly coloured (orange or yellow for visibility)</li> <li>• 100% cotton T-Shirt (second layer)</li> </ul>	Locally available \$5-\$12
	HELMET	<ul style="list-style-type: none"> <li>• Polycarbonate Shell</li> <li>• High resistance to impact</li> <li>• Resistant to high temperature</li> <li>• Chin strap mandatory</li> </ul>	Locally available \$4-\$6
	LEATHER FOOTWEAR	<ul style="list-style-type: none"> <li>• Leather boots that protect the ankles are required when fighting wildfires. Gumboots and shoes are not acceptable.</li> <li>• Full grain leather upper</li> <li>• 200mm in height from the base of heel</li> <li>• Ankle support</li> <li>• Heat resistant sole (up to 300°C)</li> <li>• No steel toe cap</li> <li>• Wool or cotton socks</li> </ul>	Not available in Madagascar \$25 – \$40  Model available from USFS Madagascar staff







PHOTO	NAME	USE	SUPPLIER & ESTIMATE PRICE
	GOGGLES	Eye protection from smoke, and wind-blown debris	Locally available
	BACKPACK	<ul style="list-style-type: none"> <li>• Fire resistant or cotton pack</li> <li>• The fires can go beyond one day, which leads to the need for a backpack to bring items such as food, torch, first aid kit, spare stockings</li> </ul>	Locally available \$10-\$20
	WATER BOTTLE	Wildland firefighters need to carry sufficient water – at least 4 Litres per person per day	Locally available \$5
	GLOVES	Leather 2-3mm thick 50mm above the wrist	Locally available \$3-\$5
	FIRST AID KIT	Treat burns, wounds immediately	Locally available \$20-\$45



PHOTO	NAME	USE	SUPPLIER & ESTIMATE PRICE
	HANDHELD GLOBAL POSITIONING SYSTEM (GPS) OR SMARTPHONE WITH APPROPRIATE APPLICATIONS	Determine and mark location	Locally available \$100 - \$500
	2-WAY PORTABLE RADIOS (TALKIE WALKIE)	Communicate with dispatch and fire crews	Locally available \$80 - \$800

Training on the use of handtools for forest firefighting.

Photo: Johnnah Ranariniaina



# Measuring Fire Behavior According to the Weather

PHOTO	NAME	USE	SUPPLIER & ESTIMATE PRICE
	KESTREL WEATHER METER	Assess the factors that influence fire <ul style="list-style-type: none"> <li>• Wind (direction &amp; speed)</li> <li>• Temperature</li> <li>• Relative humidity</li> </ul>	Not available in Madagascar. \$80 - \$180  Model available from USFS Madagascar staff
	KESTREL CALIBRATION KIT	Tool to calibrate Kestrel every 2 years	Not available in Madagascar \$75



# Suppliers Identified in Developing Madagascar Training

This is not meant to be an exhaustive list but rather to provide references for some of the tools, styles and price ranges for sourcing outside of Madagascar. Please note, as stated earlier, many tools can be sourced or procured within Madagascar to avoid importation and significant shipment costs.

## South Africa Suppliers:

<https://ncc-group.co.za/product-sales/>

<https://deltafire.co.za/>

## USA Suppliers:

<https://www.supplycache.com/>

<https://www.forestry-suppliers.com/>

## Madagascar Suppliers (Water equipment)

MAKIPLAST

Email: [trade@makiplast.com](mailto:trade@makiplast.com)

Tel. 032 07 467 12 – 22 467 12

Community members expose themselves to burn hazards as they attempt to suppress a fire. They should instead use personal protective equipment including cotton-based clothing.

Photo: Hajaniaina Razafimandimby / U.S. Forest Service





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