Soil Acoustic Meter (SAM) – User Guide

Table of Contents

1 Introduction

Welcome to your **Soil Acoustic Meter (SAM)**, developed by Soil Acoustics Limited.

The Soil Acoustic Meter (SAM) records the sounds made by invertebrates and small mammals within the soil. By measuring the amount and diversity of the sounds made by worms, beetles, ants and other invertebrates, you can measure and track the level of biological activity with the soil.

The SAM is easy to use. It is a hand-held data recorder with a probe that is pushed into the soil allowing recordings to be taken quickly (3 minutes per sample site). When you have finished the sampling session, simply plug the unit into a computer (using the USB-C to USB-A cable provided) login to our Data Portal and then upload the recordings. The report will be available almost immediately, quickly giving insights into the biological health of your soil. All data will be available to listen to and used for future comparisons, reporting and downloading, for as long as your user account is active.

1.1 Testing protocols

1. It is recommended to take a minimum of ten samples per setting/field, using a W-sampling pattern, in line with AHDB Soil Health Scorecard methodology.
2. Where there are large variations in habitat or ground conditions in one setting, more dense sampling may be useful.
3. Alternatively, design your own sampling protocol and monitoring regime, based on what you want to learn about your soil.

2 Device Overview

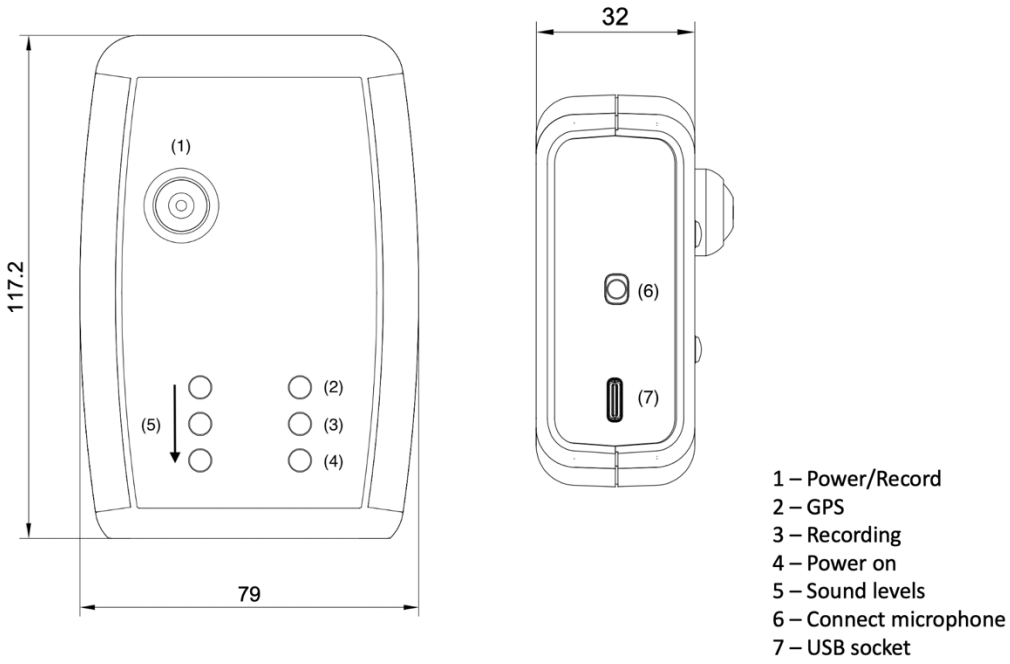


Figure 1: Soil Acoustics Meter (SAM) technical drawing

2.1 Key Features

- **Main SAM Unit**: Robust housing for all the electronic, control components and batteries.
- **Probe**: A replaceable item, containing a highly-sensitivity contact-microphone, which is inserted into the soil (Photo 3) and is connect to the SAM using port (6)
- **Multi-function Control Button:**
  - Press for 1 second and release to turn the unit on
  - Press again for 1 second and release to start a recording
  - Press and hold for 5 seconds and release to turn off. Note that the unit will auto-off, if the button is not pressed for 5-minutes.
- **USB Port**: Port (7) requires a USB-C to USB-A cable (supplied) to connect the SAM to your computer, which will then enable you to upload your recordings to the Data Portal (portal.soilacoustics.com).
- **Indicator lights:**
  - **GPS** (2) flashes red while searching for a fix. Continuous red when GPS lock is achieved

- **Recording** (3) is contiunous red while making a recording
- **Sound levels** (4) show whether a signal is being received. More lights = louder signals.

3 Getting Started

3.1 In the Box

- Soil Acoustic Meter (SAM)
- Replaceable probe
- USB-C to USB-A data cable
- Quick start guide

3.2 Setup Steps

1. Insert standard 2xAA batteries into the battery compartment. Be sure to place the ribbon under the batteries to allow for easy removal.

2. Plug in the probe to the 3.5 mm round jack socket (6 on Figure 1).

3.3 Recording Tips

- Remember to stand a minimum of 2m away when recording
- Stand still and do not move your feet
- Stay quiet during recording to prevent noise pollution impacting the score
- Do not collect recordings in the rain
- Sampling is best done when wind speeds are <10mph / 16kph
- Do not sample close to roads or idling machinery
- Do not have the probe or contact-microphone (the orange bit) in contact with any vegetation
- Avoid laying the probe cable over vegetation wherever possible

4. How to Use the SAM

1. Plan your sample sites across the field you wish to test using a W path.
2. **Select a location** where you want to test the soil.
3. **Press the control button once** to power on the device. The GPS LED will blink whilst searching for a fix – and then turn continuously red when a GPS lock has been acquired. Only take a reading once the GPS has acquired a lock.

4. **Insert the probe** gently into the soil, to a depth of 10-12 cm, being careful not to damage the cable. Do not force the probe into the soil; if you hit a stone remove the probe and try again.
5. **Place the unit on the ground and press and hold the Record button for 1 second** to start a recording. The Recording LED will turn solid red.
6. **Move a minimum of 2 meters back from the probe site to avoid noise interference**. A buzzer will be heard, indicating the start of the recording. Note there is a 15 second delay between pressing the record button and the recording starting.
7. The device will **record for 3 minutes**, stopping automatically, as indicated by the second buzz and the record light (3) turning off.
8. **Remove the probe from the soil** and move to another location, repeating steps 1-6 at least ten times in each field/setting.
9. When you have finished taking your recordings, **your need to upload your data our data portal (see section 5 below)** .

5 Data Upload & Analysis

This section describes the steps to upload your data to our Data Portal for processing.

Connect the SAM to your computer using the data cable supplied (you must use the cable supplied as it is a specific type and other cables may not work). Your SAM will appear as an external hard-drive. If your organization places restrictions on the use of external drives you may need to gain permission from your IT support team to connect your SAM unit to your computer.

Date processing is done using the Data Portal (portal.soilacoustics.com). The portal allows you to select the data you wish to upload, once uploaded the data is processed and information about the recordings you have taken will appear on your portal. Note that each recording is c.18MB in size, so this may take a few minutes, depending on your PC and the speed of your internet connection.

5.1 Getting started

- Each device is paired with a user account for the online Data Analysis Portal
- You will receive an email from noreply@soilacoustics.com with login details
- Click “GO TO SOIL ACOUSTICS” to access the portal

- If desired, you can change your password
- You are now ready to begin uploading your soil sound recordings!

5.2 Location & sample labelling

There are two ways in which your recordings can be named if you choose to do so:

- Location name – to be set by you e.g. the name of the farm, the parcel number of a specific field / plot / setting)
- A Batch Name – which you use to describe what, or why you were testing a batch in that location on that date. E.g. “August readings” or “Post-herbicide”

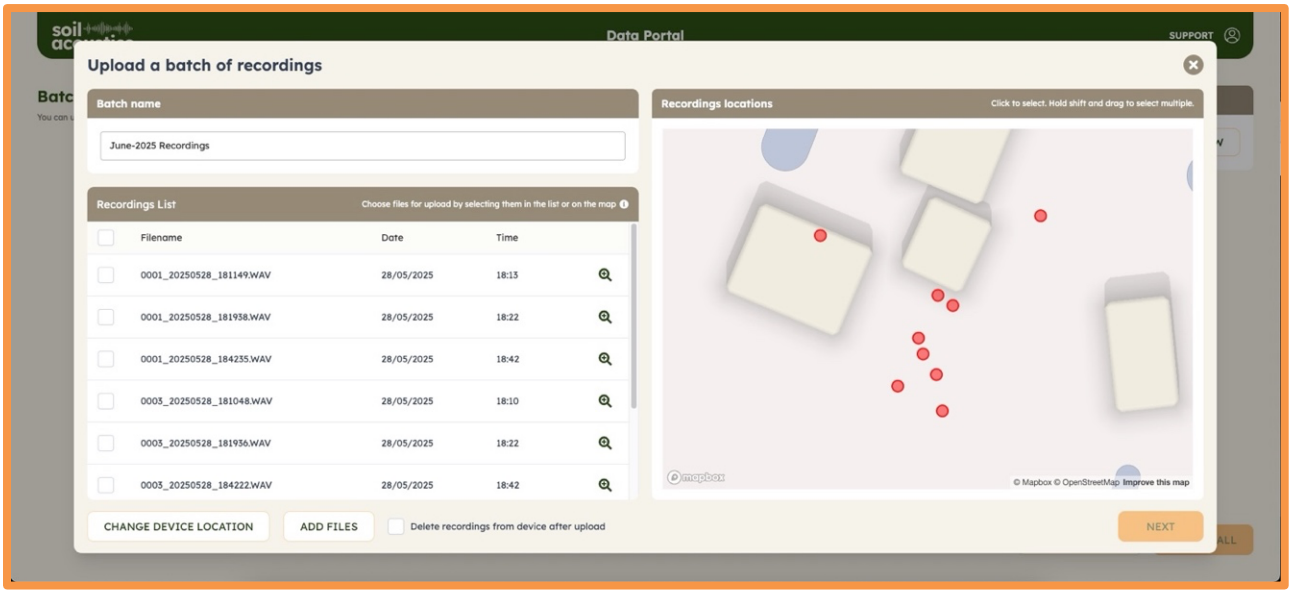
All the recordings are automatically GPS-tagged and time & date stamped.

You will then typically need to apply two levels of classifier label to each Batch, to confirm the setting in which they were recorded:

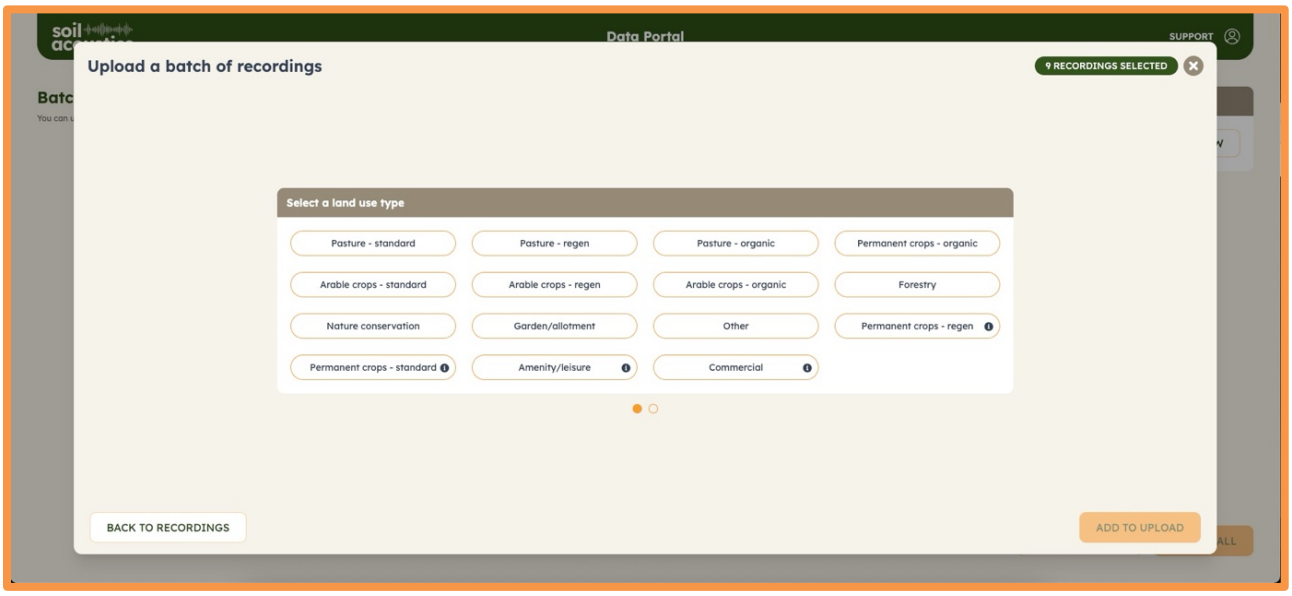
1. Land Use; and
2. Land Cover

Each sample appears as a GPS located dot on a zoomable map (with aerial photograph view option as well as a block map) and you select the correct uploads to be grouped into a batch(es) from the same land-use and cover type.

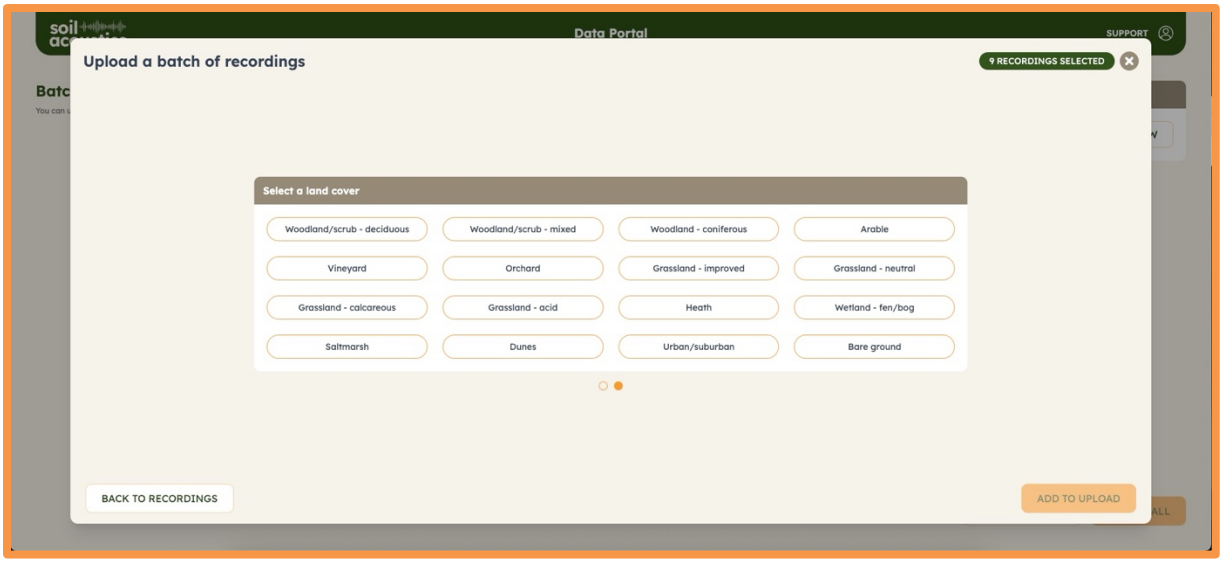
Selecting Recording for a Batch:



Land Use Options:



Land Cover Options:



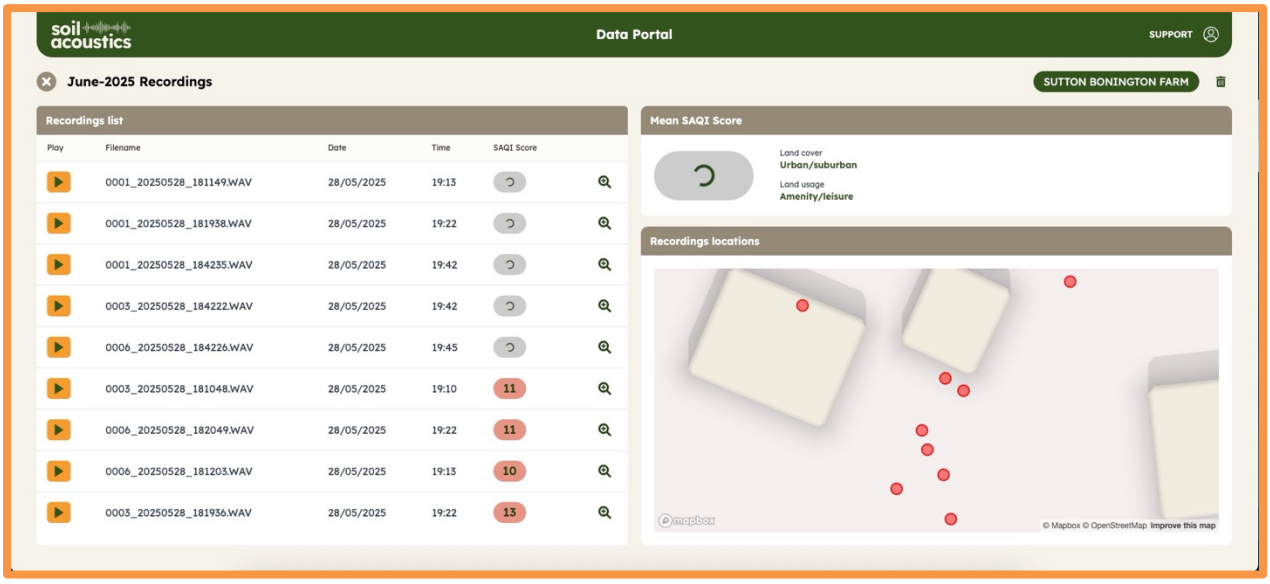
5.3 Analysis

Once all of the batches you wish to analyse have all been created and classified, click on upload and the files will be transferred from the device to the portal over the internet. The upload process may take a few minutes, depending on your PC and internet speed,

so **do not close the browser window** during this time – waiting for the progress bar to complete.

Your soil sound files are then automatically analysed and a Soil Acoustic Quality Index (SAQI) score is generated for each individual recordings – and also an average score for each batch.

Data being processed (half-completed & half in process)



6 Maintenance & Battery Replacement

- Please replace the AA batteries as needed – i.e. when the SAM Unit will no longer turn on.
- If dirty, wipe the device with a **dry or slightly damp cloth**
- Do **not** submerge the device in water
- Store in a **dry, cool location**, away from direct sunlight

7 Troubleshooting

Problem	Solution
Device won't turn on	Replace batteries
No sound detected	Check the probe is properly inserted into port (6)
No GPS Lock	Re-test in a different location, with a clear view of the sky
The sound level is clipping	Restart device or reinsert the probe in a different location

8 Safety and Care

- Do **not** force the probe into hard or stony soil as this might break the contact-microphone (the orange disk) or snap the probe
- Keep the device dry
- Avoid exposing the device to **extreme temperatures and rain**
- Do not disassemble the device – this will void your warranty

9 Technical Specifications

Feature	Specification
Power	x2 AA batteries
Recording length	3 minutes per sample (after a 15second delay at the start)
Data Storage	MicroSD card
Length	117.2 mm
Width	79 mm
Height	32 mm

10 Support & Contact Information

Users will be invited to join a WhatsApp community for sharing ideas and asking questions. This can be accessed via a QR code in the Quick Start Guide in the box.

For any other help or more information, please contact:

- **Email**: support@soilacoustics.com
- **Website**: www.soilacoustics.com

END