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Guidance

How to do the SFI actions for soils

Find out how you could do the SFI actions for soils.

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Applies to England

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It's up to you how you complete each SFI action, as long as you do it in a way that can reasonably be expected to achieve the action's aim (which is described in each action).

This voluntary guidance includes advice on how you could do the SFI actions for soils (SAM1, SAM2 and SAM3).

You may find it helpful to read this guidance, but you do not have to follow it. The requirements you must follow for each SFI action are explained in the 'Details of the SFI actions', which you can find in either:

- section 2 of the SFI handbook (https://www.gov.uk/government/publications/sfi-handbook-for-the-sfi-2023-offer)

- the webpage versions of the details of the SFI actions (https://www.gov.uk/government/collections/sustainable-farming-incentive-guidance#details-of-the-sfi-actions-in-the-sfi-2023-offer-)

How to assess soil, produce a soil management plan and test soil organic matter (SAM1)

What you're aiming to achieve

The aim of SAM1 (https://www.gov.uk/guidance/sfi-actions-for-soils#soil-1) is that you:

- understand the condition of your soil
- effectively plan how to increase the long-term health, productivity and resilience of your soil

Completing a soil assessment

You can choose how to complete the soil assessment required by SAM1. There is no standard format, but you'll usually need to assess:

- soil type, texture, structure and biology
- risks to your soil

Try to assess the soil and take soil samples when it is not too dry or wet. Spring or autumn are usually the best time of year to complete a soil assessment.

Where possible, avoid taking soil samples on any area within a land parcel containing historic or archaeological features identified on your SFI Historic Environment Farm Environment Record (SFI HEFER). If you need to take soil samples, read the information on historic and archaeological features (https://www.gov.uk/guidance/regulatory-issues-and-consents-that-could-affect-you-and-the-land-in-an-sfi-agreement#historic-and-archaeological-features-including-scheduled-monuments) before doing so (or read section 4.3.2 of the SFI handbook (https://www.gov.uk/government/publications/sfi-handbook-for-the-sfi-2023-offer)).

You can find out more about assessing your soil in the following guidance:

- The Environment Agency's 'think soils' practical guide to soil assessment (https://projectblue.blob.core.windows.net/media/Default/Imported%20Publication%20Docs/ThinkSoils.pdf)
- The National Institute of Agricultural Botany (NIAB) soil health assessment guide (https://www.niab.com/sites/default/files/imce_uploads/VirtualEvents/ASDA%20soil%20health%20assessment%20handbook%20-%20May%202020.pdf)

- Championing the Farmed Environment (CFE) soils information (https://www.cfeonline.org.uk/environmental-management/soils/)

Assess soil type, texture, structure and biology

Soil types include sand, silt, clay, loam, chalk and peat. Find out more about these soil types in the Agriculture and Horticulture Development Board (AHDB) information about the characteristics of different soils (https://ahdb.org.uk/knowledge-library/characteristics-different-soils).

To check the soil type, you can search for your location in the Soilscapes soil types viewer (http://www.landis.org.uk/soilscapes/) produced by the National Soil Resources Institute of Cranfield University.

Soil texture depends on the mix of sand, silt and clay in the soil. Read Natural England's Technical Information Note about soil texture (http://publications.naturalengland.org.uk/publication/32016?category=9001) to find out about:

- the main soil texture types
- what you're likely to feel and see for each texture class

Soil structure affects how air and water move in the soil and how well crops and grass can grow. You can assess soil structure by:

- looking at the soil surface to assess the quality of the crop or grass sward and identifying areas where there may be soil structure issues
- taking a soil sample by digging out a block of soil to a depth of around 30cm (12 inches)
- scoring the soil sample by visually assessing it

It may save time if you assess soil structure when you test soil organic matter.

You may find it helpful to read:

- the Environment Agency's 'think soils' guide to identifying soil structural problems in the field (https://projectblue.blob.core.windows.net/media/Default/Imported%20Publication%20Docs/ThinkSoils.pdf#page=50)
- the SRUC Visual Evaluation of Soil Structure (VESS) chart (https://bbro.co.uk/media/50172/vess_score_chart-1.pdf) to help with a visual assessment

Soil biology includes:

- the presence of earthworms and other visible creatures, such as millipedes and spiders – you can count these in the same soil samples taken to assess soil

structure, or dig another pit
- soil organic matter (SOM) – the SOM testing you do will tell you about this
- microorganisms – these can be quite difficult to assess yourself, but you can ask a commercial laboratory to test soil samples for this

You may find it helpful to read AHDB's factsheets on:

- how to count earthworms (https://ahdb.org.uk/knowledge-library/how-to-count-earthworms) (and use the earthworm recording sheet (https://ahdb.org.uk/knowledge-library/earthworm-recording-sheet))
- an introduction to soil biology (https://projectblue.blob.core.windows.net/media/Default/Imported%20Publication%20Docs/IntroSoiBiology_WEB2074_280219.pdf)
- biological tests for soil health (https://projectblue.blob.core.windows.net/media/Default/Imported%20Publication%20Docs/GREATsoils%20Factsheet%20-%20Biological%20Tests%20for%20Soil%20Health.pdf)

Assess risks relating to soil

You can assess the risks relating to soil from:

- runoff or soil erosion, including connection to water bodies or sensitive habitats
- wind erosion
- nitrogen leaching

Once you've assessed these risks you can make an overall assessment of the risk for your land.

You can follow the steps below to assess risks to your soil.

Step 1: Risk of runoff and soil erosion

Runoff occurs when there is more water than land can absorb, meaning that water drains away directly over the surface of land. This can:

- carry fine soil particles, nutrients, pesticides and manures to water bodies, such as ponds, lakes, ditches, stream and rivers
- cause pollution and potentially harm animals and plants that live in the water bodies

Runoff can wash material directly from a land parcel into a water body. It can also travel in other ways, such as:

- through yards
- along tracks or roads
- via field drains

To assess the risk of runoff and soil erosion, you can consider:

- the gradient of a slope – steeper slopes have a greater risk of runoff and soil erosion as water runs more quickly over the surface
- how long a slope is
- soil texture - this affects whether rain soaks into the soil or runs over the surface, and how easily soil particles will be washed away
- how often the land floods - it is more susceptible to erosion and runoff if it floods frequently
- how close the land is to a water body

Step 1a: Assess the gradient of the slope

To measure the gradient of the slope you can, for example, use a clinometer.

The risk of runoff is:

- high for steep slopes – these are slopes with an angle of 7 degrees or more (12%+ gradient)
- moderate for moderate slopes – slopes with an angle of 3-7 degrees (5-12% gradient)
- lower for gentle slopes - slopes with an angle of 2-3 degrees (3-5% gradient)

Step 1b: Assess other runoff and erosion factors

After you've assessed the risk of runoff (step 1a), you can assess other runoff and erosion factors to adjust your assessment to reflect:

- slope length
- soil texture
- flooding frequency
- history of runoff or ponding

For example, lighter soils on moderate slopes have a high risk of runoff. Land that regularly floods (at least once every 3 years) has a high risk of erosion or runoff.

Step 1c: Assess how close land is to water

You can assess the risk of runoff based on how close the land parcel is to a water body (such as a pond, lake, ditch, stream or river),

The risk of runoff is:

- high – if the land parcel you're assessing is directly next to a water body

- moderate – if the land parcel is separated from a water body by at least one other land parcel
- lower – if the land parcel is some distance from a water body

Step 1d: Risk based on history of runoff or ponding

You can refine the risk assessment for each land parcel based on the history of runoff and ponding. The risk of runoff is:

- high – if visible runoff and ponding happens to the land you're assessing in most years during wet periods
- moderate – if visible runoff happens in most years during wet periods
- lower – if runoff happens occasionally during wet periods

Step 1e: refine your risk of runoff and soil erosion

Once you've considered the risks above, you can use your experience and judgement to adjust the level of risk for each land parcel, taking into account additional factors such as:

- soil structure
- organic matter content - higher organic content usually increases the ability of soil to absorb water
- valley features, as they tend to concentrate runoff water
- long unbroken slopes
- land use

Step 2: Risk of wind erosion

Wind erosion is most likely on fine sandy soils and light peaty soils. It will be worse in dry conditions or where there is drainage, bare land or fine dry seedbeds.

Signs of wind erosion include drifting soil, buried seedlings, and soil blown into hedgerows, ditches and onto nearby roads.

If there are fine sandy soils or light peaty soils and wind erosion occurs at least once every 3 years, identify this area as high risk in your soil assessment. If there are chalk or limestone soils, the risk is likely to be moderate. Other soil types are likely to be lower risk.

Step 3: Risk of nitrogen leaching

Light sandy and shallow soils are less able to store nitrogen. It can be easily lost as water filters through the soil. If you have land parcels with this type of soil where you add nitrogen-based fertilisers, identify this as being at risk of nitrogen leaching.

Step 4: Make an overall risk assessment

Once you've completed steps 1-3 above, and made any adjustments you judge are relevant, you can make your overall risk assessment for your land. You can do this by classifying the overall risks as very high, high, moderate or lower. For example:

- if there are a number of high risks, it's likely to be an overall very high risk
- if there are some high risks, some mediums and a few lower risks, it's likely to be an overall high risk
- if there are mainly medium and lower risks, it's likely to be an overall medium risk
- If there are mainly lower risks, it's likely to be an overall lower risk

Producing a soil management plan

You can choose how to produce the written soil management plan required by SAM1. There is no standard format.

Information you can record in your soil management plan

You can use your soil assessment to record information in your soil management plan for each land parcel or area where the soils or slopes differ. This will help you plan how to manage your land parcels to improve soil health and reduce the risks you identified in your soil assessment.

The information you record in your soil management plan could include:

- soil type, structure and composition
- risks and problems that need to be addressed
- how you currently manage the area
- proposed management actions to improve soil health

CFE has produced some helpful guides about managing soils for a range of farming systems (https://www.cfeonline.org.uk/environmental-management/soils/uk-soil-health-initiative-guides/) which may help with your proposed management actions to improve soil health.

In your plan, you can record any areas within a land parcel that contain historic or archaeological features, as identified in your SFI HEFER. This will help you to plan how to manage land above and around these features.

How to record your soil management plan

You can choose how to record your written soil management plan. It can be recorded on paper or digitally. For example, you could use a map or spreadsheet to record the information.

This table is an example of how you could choose to record a soil management plan.

Field or part field reference	Field details	Risks and problems identified in the soil assessment	Proposed management actions
Field 1, part 1 ST0000 0000	Lower risk of runoff and erosion. Medium textured well-drained stable soil in combinable crop rotation. Slopes under 3 degrees. Soil structure good, no signs of runoff or erosion.	None identified	Maintain current management. Reconsider if cropping changes.
Field 2, SY0000 0000	High runoff and erosion risk. Erodible light sandy soil in combinable crop rotation. Slopes over 7 degrees. Buried remains of Roman Villa. Next to road and watercourse.	Soil/sediment deposition. Risk of compaction increasing runoff and erosion	Include cover crop in rotation to improve soil organic matter content.

Review your soil management plan each year

SAM1 requires you to review your soil management plan each year, updating it to take account of:

- new soil analysis you undertake, including soil organic matter testing
- new risks or continuing issues identified in your land parcels
- updated proposed management actions for the forthcoming year

Testing soil organic matter

Testing soil organic matter will help you assess the health of your soil. To do this, you can take soil samples and analyse them, which will usually be done by a commercial laboratory.

How to select a sample area

Before you take soil samples, you'll need to select your sample areas. A sample area is an area of land across which you will take soil samples.

When you select sample areas, try to choose areas which have a similar soil type and have been managed in a similar way in the past.

If the soil type and past management is similar, take account of the size of the land parcels when you're selecting sample areas. You can:

- select one sample area in each land parcel if you consider the land parcels to be an average size
- select a number of smaller sample areas within a large land parcel
- combine small land parcels into a single sample area, so you take soil from each land parcel and combine it into a single sample – try to avoid the combined area being too large as this will reduce the soil testing analysis accuracy

If you combine a number of small land parcels into a single sample, you can decide what size land parcel is a 'small land parcel'. There are no precise area requirements.

When to take soil samples

You may find it easier to take soil samples in the spring or autumn, before you cultivate land, if it's arable or horticultural. This will also avoid damaging the crop.

It's advisable to avoid taking soil samples if:

- the soil is waterlogged or very dry, because it may reduce the quality of the soil analysis
- manure or slurry has been applied within around the last 3 months, as it may affect the soil organic matter levels and give you a false result

How to take soil samples

You can take multiple soil samples on each sample area and combine them into a single sample that represents the soil across each sample area. It's up to you how many soil samples to take, but to take enough to gain a good understanding of the soil organic matter across each sample area.

Where possible, avoid taking soil samples on any area of land containing historic or archaeological features identified on your SFI Historic Environment Farm Environment Record (SFI HEFER). If you need to take soil samples, read the information on historic and archaeological features (https://www.gov.uk/guidance/regulatory-issues-and-consents-that-could-affect-you-and-the-land-in-an-sfi-agreement#historic-and-archaeological-features-including-scheduled-monuments) before doing so (or read section 4.3.2 in the SFI handbook (https://www.gov.uk/government/publications/sfi-handbook-for-the-sfi-2023-offer)).

Also, avoid taking soil samples on areas of land where there are features like manure heaps, pylons, gateways, headlands and around trees. These features can distort the soil analysis results.

To get a representative sample of the sample area you're testing, aim to take cores up to a depth of around 15cm (6 inches).

You can follow these steps to take soil samples for soil organic matter:

1. Walk a 'W' pattern across the sample area, with 5-7 stops along each leg of the 'W'
2. This will give you around 25 soil samples across the sample area
3. Combine the soil samples in a clean plastic bag, to form one bulk sample of about 0.5kg

If you want to assess the soil structure and soil biology (as part of assessing the soil for SAM1), at 5 to 10 stops across the whole 'W' you can:

- assess topsoil structure
- count and record earthworms

You can also assess the subsoil structure at 3 of the stops, one of which should be on a headland.

You may find it helpful to read the AHDB guidance about how to collect a soil sample (https://ahdb.org.uk/knowledge-library/how-to-collect-a-soil-sample).

How to test the soil samples

If you have the right equipment and expertise, you can test the soil samples yourself. However, sending your soil samples to a commercial laboratory will usually give more accurate results. You can find a list of laboratories where you can send your soil samples (https://ahdb.org.uk/knowledge-library/soil-and-forage-testing-companies) on the AHDB website.

Try to use the same laboratory and method of testing if you are repeating the tests over a number of years. Having a consistent approach will help you see how the soil organic matter is increasing or decreasing over time.

If you use a laboratory, you can ask them to test organic matter content by using the:

- loss on ignition test (as a minimum level of analysis)
- Dumas test, which uses dry combustion to burn the samples

How to establish and maintain multi-species winter cover (SAM2)

What you're aiming to achieve

The aim of SAM2 (https://www.gov.uk/guidance/sfi-actions-for-soils#sam2-multi-species-winter-cover) is that there's a well-established multi-species cover crop over the winter

months.

SAM2 explains that the winter months will usually include December, January and February, but this may vary according to your location and setting.

Establishing the multi-species cover crop

Choosing a seed mix

SAM2 (https://www.gov.uk/guidance/sfi-actions-for-soils#sam2-multi-species-winter-cover) explains the minimum requirement for species in the seed mix. The table below shows examples of what you could use.

Plant family	Species
Brassicae	Yellow mustard, brown mustard, oil radish, tillage radish, stubble turnip, kale
Legumes	Common vetch, hairy vetch, red clover, white clover, alsike clover, sweet clover, crimson clover, lucerne, black meddick, peas and beans
Grass or cereals	Italian ryegrass, festulolium, black oats, forage rye, barley, winter triticale
Herbs	Phacelia, buckwheat, linseed

Choosing a varied mix (with multiple species from different plant families and with different characteristics) will normally bring greater benefits to your soil.

If you're in an area with a shorter growing season you may need to choose plants that germinate and grow in cooler weather.

Your seed supplier can help you choose a seed mix that's the best match for your land and local conditions.

You may find it helpful to read the AHDB information sheet about cover crops (https://projectblue.blob.core.windows.net/media/Default/Imported%20Publication%20Docs/IS41%20Opportunities%20for%20cover%20crops%20in%20conventional%20arable-rotations%20(2018).pdf).

Sowing the multi-species cover crop

Your seed supplier can advise you on an overall sowing rate for the seed mix you choose.

To achieve a well-established multi-species cover crop, with leafy vegetation to protect the soil over the winter months, it will usually help to sow into warm soils. Depending on the species in your mix, this will be late summer or early autumn.

You can drill or broadcast the seed mix. Drilling seeds is usually more reliable and gives a higher germination success than broadcasting. However, broadcasting is cheaper.

After you've sown the seed mix, if the soil is dry enough, you can roll the seeds to improve seed-to-soil contact, retain moisture and reduce the risk of slug damage.

Maintaining the multi-species cover crop

Maintain the multi-species cover crop so there's sufficiently well grown leafy vegetation to protect the soil surface for the duration of the winter months. You can graze the cover crop, as long as this is the case.

Destroying the multi-species cover crop

If you're destroying the multi-species cover crop after the winter months, it's up to you what method you use. Try to minimise risks such as compaction, poaching, soil run-off or erosion.

How to establish and maintain herbal leys (SAM3)

What you're aiming to achieve

The aim of SAM3 (https://www.gov.uk/guidance/sfi-actions-for-soils#sam3-herbal-leys) is to provide varied root structures.

Establishing the herbal leys

Choosing a seed mix

You can choose what mix of grasses, legumes and herbs to use in the herbal ley.

The correct seed mix is vital to growing a high-quality herbal ley. It will usually include at least:

- 5 species of grass, such as cocksfoot, festulolium, meadow fescue, perennial ryegrass, smooth-stalked meadow grass, tall fescue and timothy
- 3 species of legumes, such as bird's-foot-trefoil, lucerne, red clover, sainfoin winter vetch and common vetch, and black medick
- 5 species of herbs, such as burnet, chicory, ribwort plantain and yarrow

Avoid festulolium and perennial ryegrass combined making up more than 70% by weight of the total seed mix.

Your seed supplier can help you choose a seed mix that is the best match for your land, local conditions and how you'll manage the ley.

Maintaining the herbal leys

You can maintain herbal leys by grazing them with livestock or cutting them.

Between the start of May and the end of July, you can rest the herbal leys from cutting and grazing for a period of at least around 5 weeks. This allows the flowers to open and provide a source of pollen and nectar for insects.

It can take up to 4 years for the roots to grow enough to improve soil structure and fertility.

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