



## THE PROBLEM

Soil organic matter (SOM) is the total organic content of soil, excluding non-decayed plant and animal remains. Loss of SOM negatively affects the function of soils due to a loss of nutrients, ion exchange capacity, water storage capacity, and biological activity. This happens because SOM is key for maintaining the soil's capacity for storing energy, water, and nutrients.



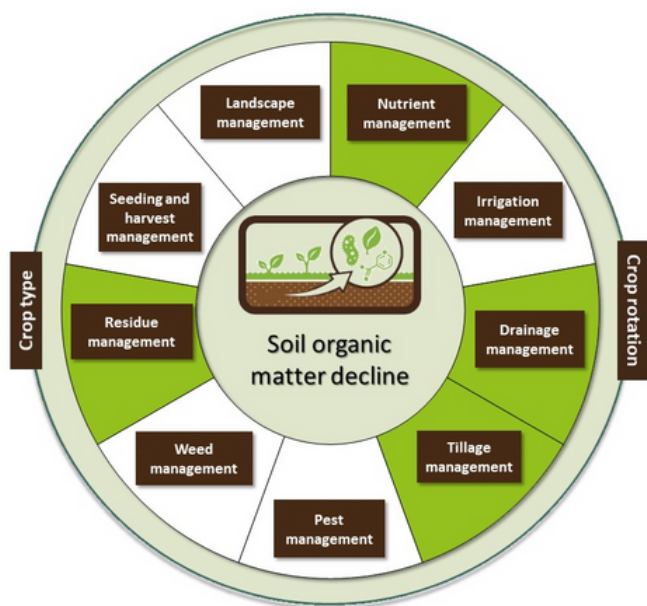
## HOW CAN SOIL-IMPROVING CROPPING SYSTEMS PREVENT & REMEDIATE SOIL ORGANIC MATTER LOSS?

Soil improving cropping systems (SICS) are specific combinations of (1) crop types, (2) crop rotations and (3) management techniques aimed at halting soil degradation and/or improving soil quality and at the same time having positive impacts on profitability and sustainability. They need to be suited individually to each farm's local environment.

### How does a loss of soil organic matter affect other soil threats?

SOM decline can strongly affect other soil threats, including:

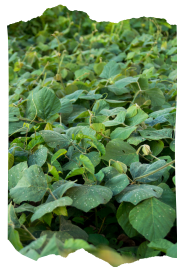
- Soil erosion
- Soil compaction
- Biodiversity loss
- Desertification



### The key principles for increasing soil organic matter are:

- Growing green manures, catch crops, or cover crops
- Applying animal manure or composts
- Leaving crop residues on the field
- Using minimum/no tillage to minimise soil disturbance

SICs component	Basic principle
Nutrient management	Applying organic matter such as farmyard manure, sludge, slurry
Residue management	Leaving residues on the field
Tillage management	Minimum/zero tillage
Crop rotation	Growing cover/catch crops and incorporating biomass



Cover crops grown over Winter can result in increased SOM levels as they add biomass to the soil at the end of their growing season. In addition, they provide a habitat for fungi which provide pathways for nutrients to enter the soil. Leguminous cover crops can increase SOM levels by 8-114%, whilst non-leguminous cover crops have been found to increase levels by 4-62%.

## DRAINAGE MANAGEMENT



Well managed drainage can minimise SOM losses by reducing soil erosion rates. For example, effective surface drainage can manage infiltration capacity, thus resulting in reduced runoff and associated SOM losses. Meanwhile, poorly drained soils are prone to compaction. This can result in soil erosion and thus loss of SOM.

## TILLAGE MANAGEMENT



Adopting minimum or no tillage can minimise SOM loss due to the resulting reductions in soil erosion and improvements to soil structure. It is, however, important to use the appropriate tillage based on the soil type as incorrect tillage practices can result in yield reductions.

## NUTRIENT MANAGEMENT



Applying recycled organic matter is one of the most efficient SICS which can mitigate or prevent SOM loss. Studies have found that municipal solid matter and sewage sludge can have the biggest effect on SOM. It appears that nutrient management can result in SOM increases regardless of climatic zones. In addition, increases in SOM as a result of applying manures can result in yield increases of around 6%. Safety precautions and appropriate applications must, however, be used to align with environmental regulations and to avoid causing excessive nutrient runoff.

N fertilisation can also have a positive impact on SOM levels, though this is likely limited where crop residues are removed.

## RESIDUE MANAGEMENT



Keeping crop residues on the field can significantly increase SOM levels alongside reducing soil erosion. There is, however, a demand for this above-ground biomass as it can, in some cases, also be used for producing livestock bedding and biofuels (e.g., maize). Forage crops may result in lower SOM increases due to their perennial cycle. In addition, climate can affect the extent to which these residues are successfully incorporated into the soil.

