Collection of Practice Abstracts

C6

carbon cycle

THE CARBON BALANCE

THE RESULTS OF SUSTAINOLIVE

SUSTAINOLIVE.EU

A COMMON MISUNDERSTANDING

Too often, the debate about the ability of olive groves to store CO_2 focuses exclusively on the ability of trees to absorb it from the atmosphere. This disregards the potential key role played by soils to store and capture CO_2. By assessing **CARBON BALANCE** at the farm level, which jointly considers carbon flows across all components of the agroecosystem, it will become possible to determine if an olive grove **behaves as a carbon sink** (positive net balances of CO_2 in the form of organic carbon) **or alternatively as a carbon source** (it emits net CO_2 thus, losing carbon).

extra info extra info

ORGANIC CARBON FLOWS

		PARTIAL APPROACH Only trees Only inputs	HOLISTIC APPROACH Trees+Soil Inputs+Outputs
INPUTS	Trunk, roots and branches	■	■
	Pruning waste materials	■	■
	Litterfall	■	■
	Olive fruits produced	■	■
	Cover crops		■
	Composted olive mill pomace		■
	Manure		■
	Leaves fallen during harvest		■
	Other organic fertilizers		■
OUTPUTS	Soil erosion		■
	Soil respiration		■
	Olive fruits harvested		■
	Leaves entering the mill		■
	Firewood		■
	Pruning waste materials (if burned)		■

Carbon flows that are usually taken into account in the above approaches are marked in dark green.

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KEEP IN MIND THAT...

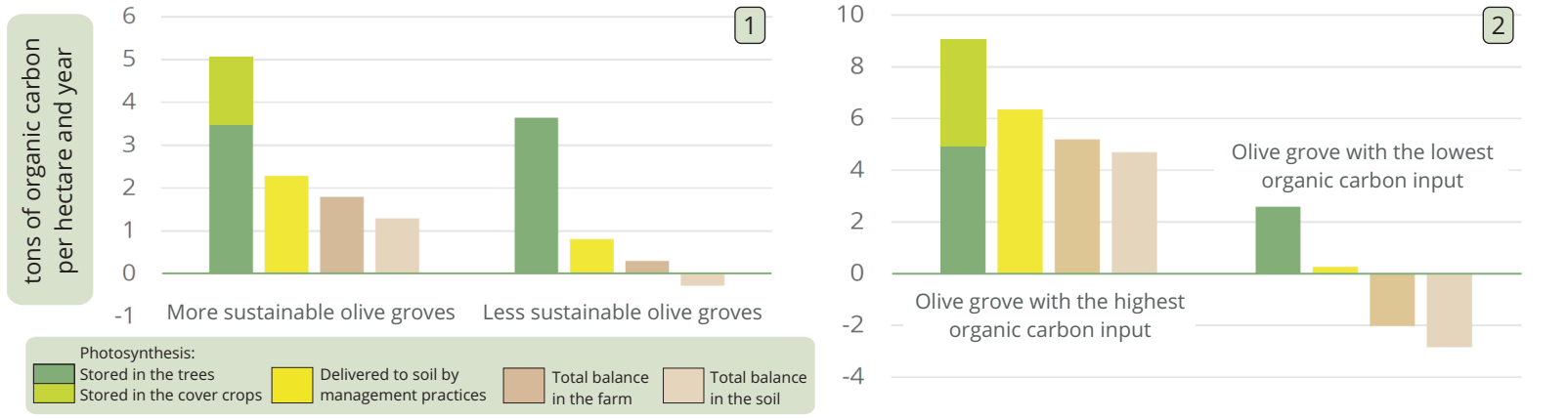
an olive grove on which sustainable management practices are not applied will most likely **lose net carbon**, occassionally in significant amounts, and even **though its olive trees capture CO_2 from the atmosphere**.

The limited or null inputs of organic matter to soils along with the intensification of erosive processes due to the lack of a protective herbaceous cover are amogst the key factors driving the net loss of organic carbon (and also of nutrients) from the olive agroecosystem.

extra info

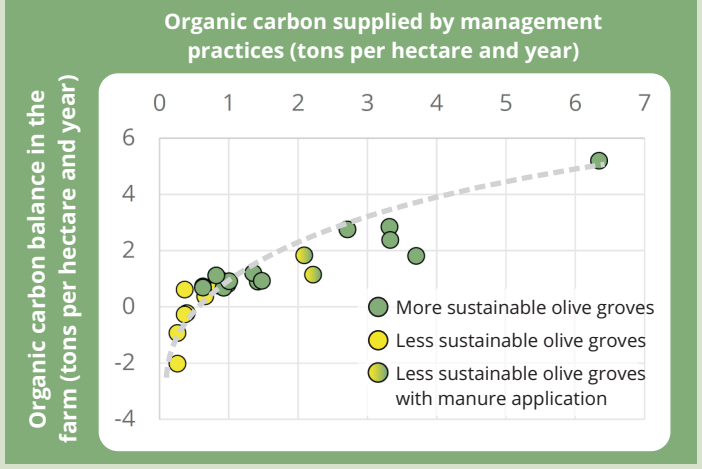
NO BALANCE CAN EXIST WITHOUT CONSIDERING SOILS

At SUSTAINOLIVE we have compared the differences in their carbon cycle flows between olive groves that apply sustainable management practices and others managed conventionally. The lower graphs show the results obtained for 3 of these flows, considering both the average values for 12 pairs of experimental olive groves (graph 1), and only the olive groves with the maximum and minimum organic carbon input values (graph 2).



The annual amount of carbon that is stored in the trees of conventional olive groves and olive groves that apply sustainable technological solutions is similar (graph 1). In terms of biomass, however, the presence of cover crops in the most sustainable olive groves results in a remarkable increase of organic carbon stocks (graphs 1 and 2). Despite if such a **higher biomass** index does not translate into an immediate economic benefit (increased harvest), it represents an excellent **investment for the future by increasing the carbon and nutrient stocks available for future harvests**. In addition, the amount of organic carbon that enters the soil as a result of certain management practices is much higher in sustainable olive groves (graphs 1 and 2). As a result, the organic carbon balance, considering the overall agroecosystem is clearly more positive in olive groves that apply different combinations of sustainable management practices (they act as carbon sinks; graph 1). This is true to the point that some conventional olive groves present a negative organic carbon balance (they act as sources of carbon that, mainly, escapes into the atmosphere as CO_2; graph 2). The key conclusion is clear: **despite olive trees invariably store carbon, in olive groves under conventional management, enough amounts of organic carbon can be lost through soils to result in a net carbon loss for the agroecosystem.**

MANAGEMENT MODELS ARE KEY FOR CARBON BALANCES



A direct correlation is found between the amount of organic carbon supplied to the olive grove soil through sustainable management practices and the final carbon balance at the farm level.

The graph on the left shows how olive groves with sustainable management practices are characterized by positive carbon balances, with values higher in some cases than **3 tons of carbon gain per hectare and year**. In contrast, some olive groves following conventional management show negative carbon balances: **they are losing carbon year after year**. The graph shows that two conventional olive groves are displaced to the right of their expected position because they applied a quantity of goat manure close to 1.5 tons per hectare during the study period, turning them exceptional cases within the category of olive groves with conventional management practices.

DON'T GET CONFUSED

The growth of trees is a genetically programmed process intensified via pruning and the supply of nutrients by the farmer. The fact that olive trees absorb atmospheric CO_2 through photosynthesis to then store it in their woody structures and fruits in the form of organic carbon is a result of their natural growth cycle.

However, **not all olive groves behave as carbon sinks. When no sustainable management practices** are implemented, especially those that involve soil enrichment with organic matter, **olive grove soils can lose considerable amounts of organic carbon and consequently show negative carbon balances.**

extra info

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