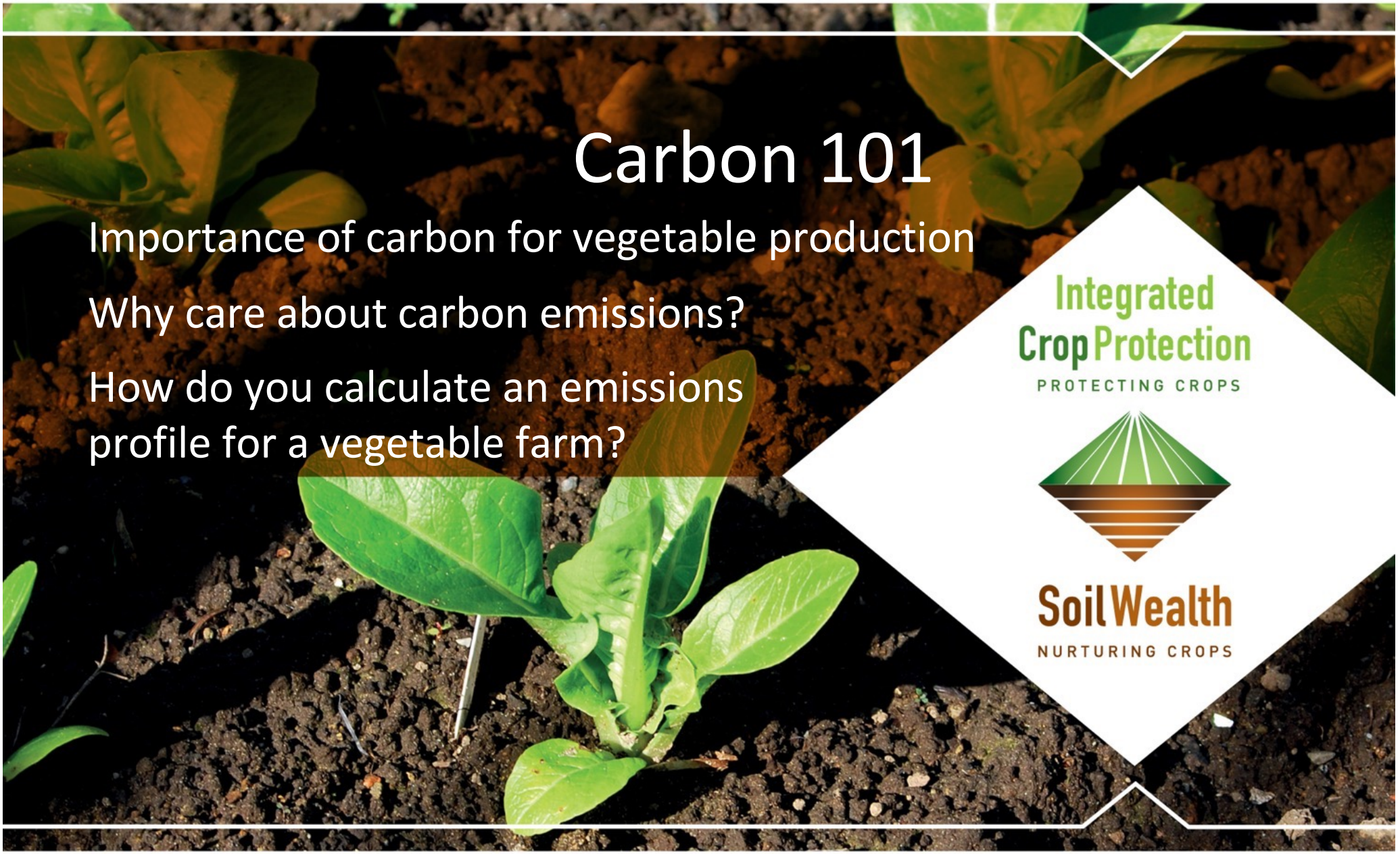

Carbon 101

Importance of carbon for vegetable production

Why care about carbon emissions?

How do you calculate an emissions profile for a vegetable farm?

Integrated Crop Protection
PROTECTING CROPS

Soil Wealth
NURTURING CROPS

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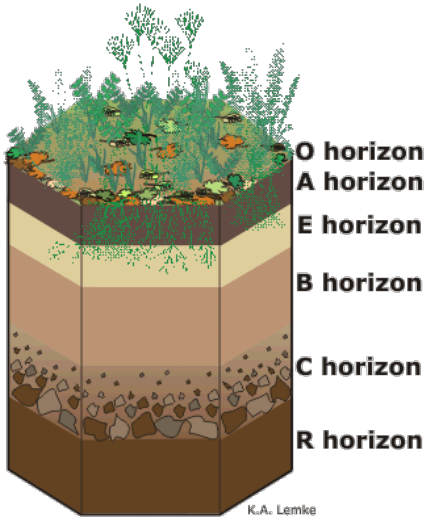
Doris Blaesing & Isabel Axiö

Carbon – what is all the fuss about?

- Soil Carbon
- Carbon Emissions
- Carbon Sequestration



Mitigation

Carbon Calculator

Adaptation

Productivity

Carbon Footprint

Carbon Neutral

Carbon facts

Carbon sequestration refers to long term storage of carbon (C) from the atmosphere in soil or vegetation (via photosynthesis)

- **Quantity of soil organic carbon in 0-30 layer** *(= carbon stocks [t/ha])* **is about:**
  - twice the amount of C in atmospheric CO_2, and
  - three times that of above-ground vegetation

  Some limitations to soil carbon sequestration
  - The quantity of C that can be stored in soils is finite
  - The process is reversible
  - The best return on investment is from your poorest soils

More facts

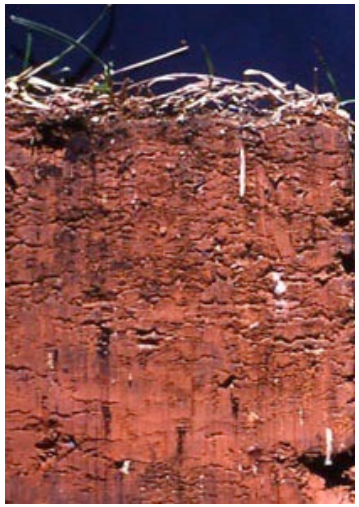
- **About 20% of total GHG emissions from irrigated production are associated with N fertiliser**
  - This is due to CO_2 and N_2O emissions during manufacturing, and
  - Direct and indirect N_2O emissions from its use
- **About 70% of total GHG emissions from irrigated cropping are due to energy consumption, especially irrigation**
- **The annual CO_2 release from deforestation is about 25% of that from fossil fuel burning**
  - This is due to loss of carbon from vegetation and soil

In agriculture overall, about 70% of emissions are due to methane

Why is more soil organic carbon good?

✓ Better soil condition and function

- Reduction of energy and fertiliser use
- Improved soil structure and thus water holding capacity and root volume
- Improvement of soil life and disease tolerance
- Improved nutrient holding and cycling

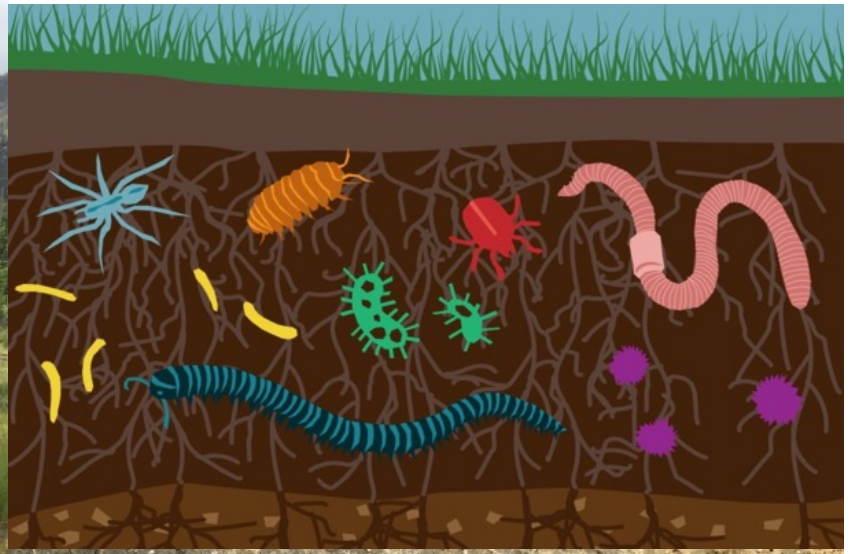


✓ Potential market benefits

- Promotion of sustainable practices & resource use efficiency
- Resilience to future markets & climate (adaptation)
- Risk mitigation (industry/consumer demand)

Organic matter/carbon feeds soil life

Organic matter = organic carbon x 2



This is how you can check how good your organic matter is

How to sequester soil carbon

- **Increase net photosynthesis**

✓ (New) areas of permanent vegetation – trees or pasture

✓ Growing 'better' crops and or cover crops – more biomass, and returning as much biomass as possible back into the soil

- **Add organic amendments**

How much organic carbon a soil can naturally accumulate depends on soil type and climate.

Low accumulation: light soils, dry climate, hot or cold temperatures

High accumulation: heavy soils, sufficient rainfall, temperate climate

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Sequestration = CO_2 removal from the atmosphere can only happen once, at the place of original plant growth

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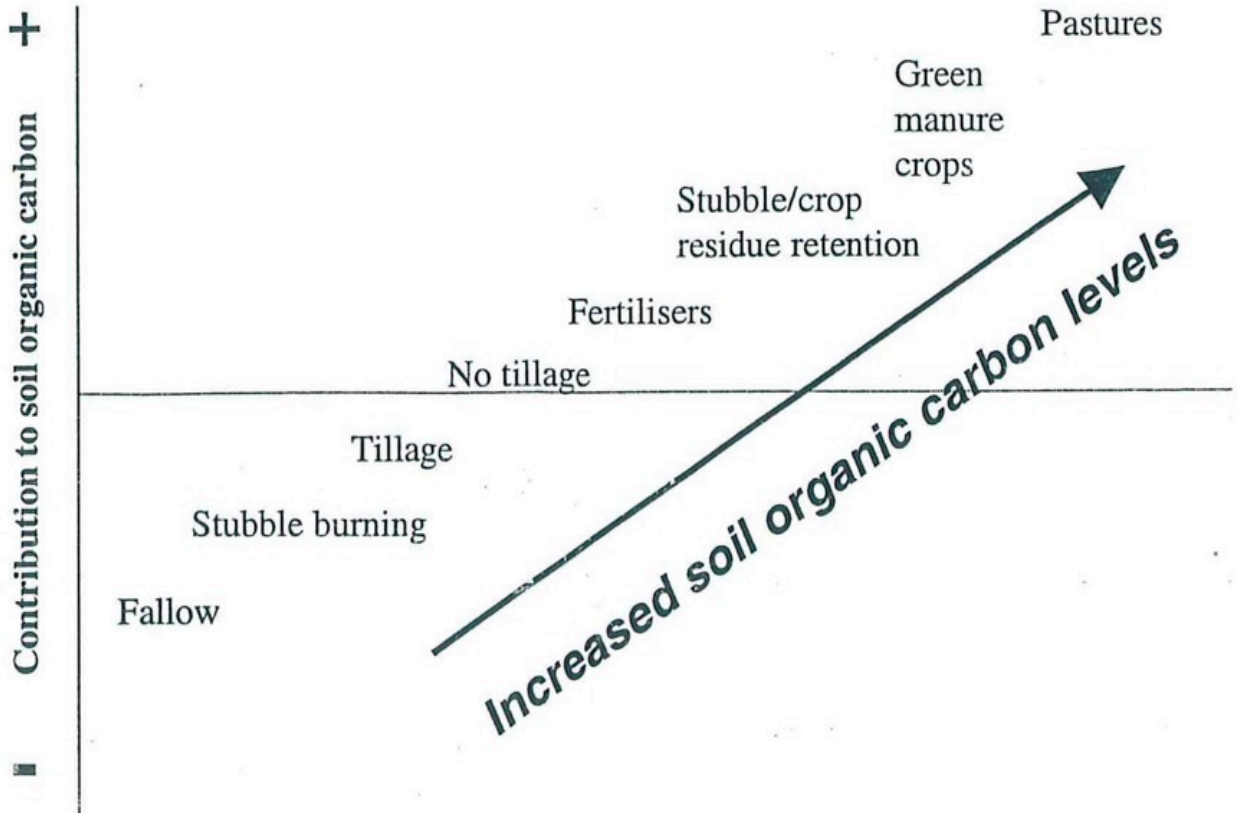
How to slow down the loss of soil carbon

mild & moist

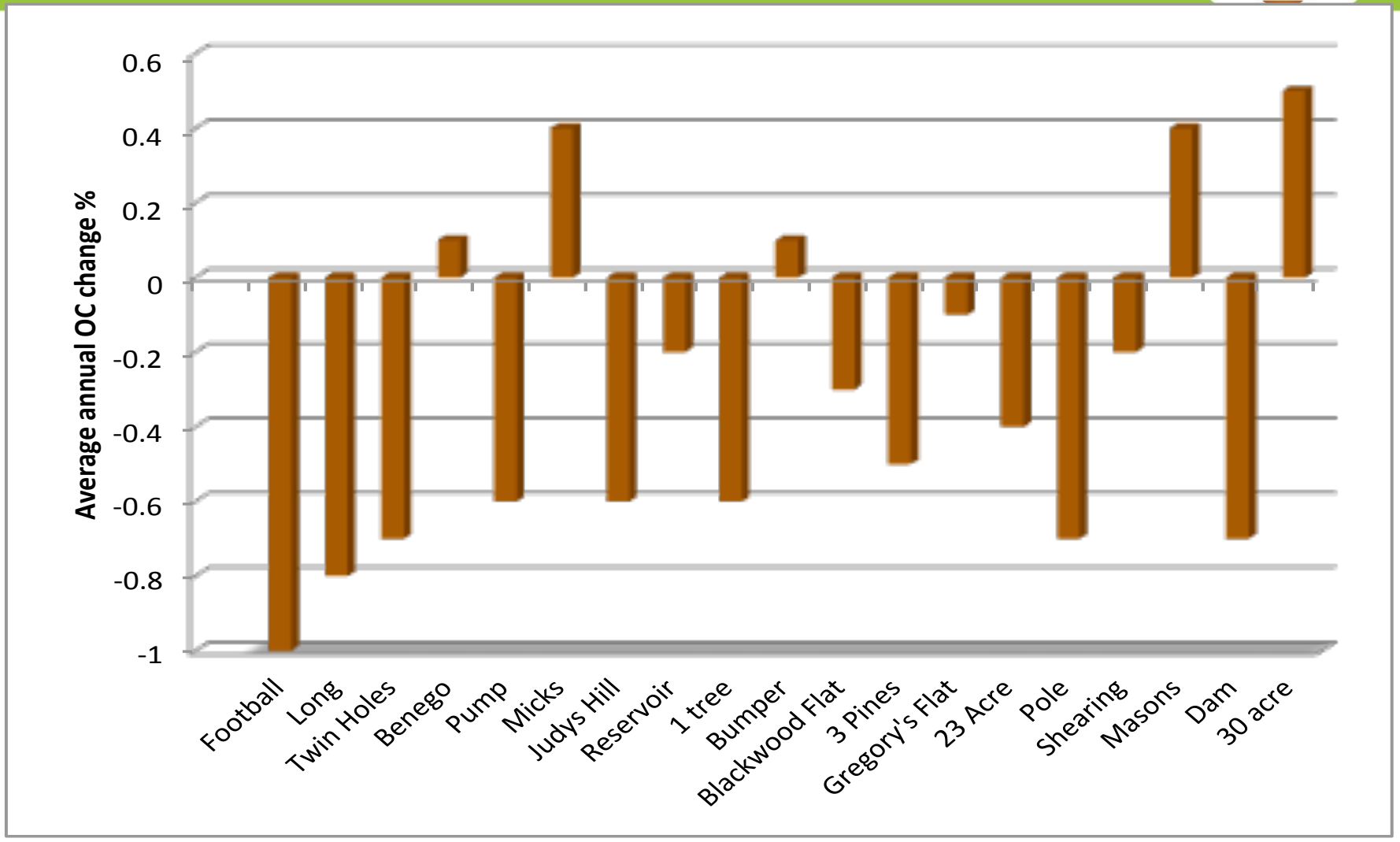
dry & cold or hot



heavier soils

light soils

Soil carbon snapshot using soil test data



Vegetable rotation, including, potatoes, carrots and onions & grazing

Carbon Emissions

Meet the experts

- Nitrous Nelly
- Methane Man
- Carbon Kid

Global Warming Potentials

CO_2

"CO_2 equivalent" is the standard measurement, which accounts for global warming potentials of the various greenhouse gases.

CH_4

N_2O

What do Carbon Calculators tell us?

- **They show which processes increase or decrease atmospheric carbon equivalents**

  - Methane emissions are high in grazing systems
  - Irrigation energy costs usually high in irrigated crops
  - N_2O emissions may be higher than expected
  - Carbon sequestration options are often not so great

Vegetable emission carbon tool (G-GAF): http://www.piccc.org.au/resources/Tools

Landscape options and opportunities for carbon abatement calculator: https://looc-c.farm/

Carbon farming definitions

- **Carbon footprinting refers to the amount of emission (CO_2-e) produced by an activity or business**
  - This refers to direct and indirect emissions from on farm AND supply chain
  - **Carbon calculators** can be used to measure Carbon Footprints
  - **Carbon Neutrality** can be achieved when all emissions of a 'Footprint' are avoided or offset
- **Life cycle assessments look at environmental, social and economic impacts of a production system or product**
  - This starts with the raw materials stage through to processing, transport, use, re-use, recycling or disposal

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