

# Resilience and sustainability in organic greenhouse horticulture:

## Role of crop rotations and biodiversity

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# Crop rotations

- To prevent a build up of pests and diseases
- To assist with weed control
- To build soil fertility (particularly when legumes are included)
- To balance the uptake of nutrients from the soil (differing crop requirements and rooting depths)
- To maintain economic stability of the farm

# Crop rotations – often restricted in greenhouse horticulture (even organic)





More diverse rotations are possible, subject to market considerations





# Green manures in greenhouses

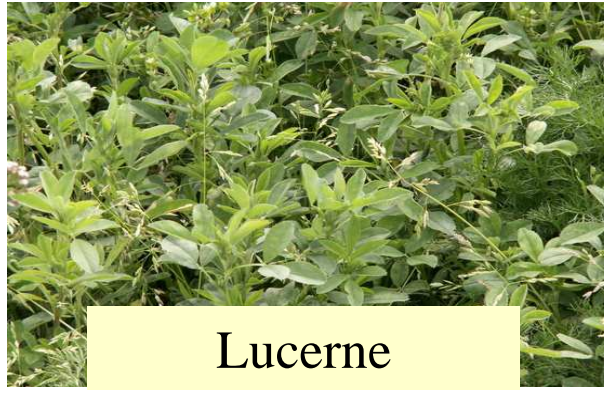




# Many different green manure species!



Persian clover



Lucerne



Red clover



Sweet clover



Fenugreek



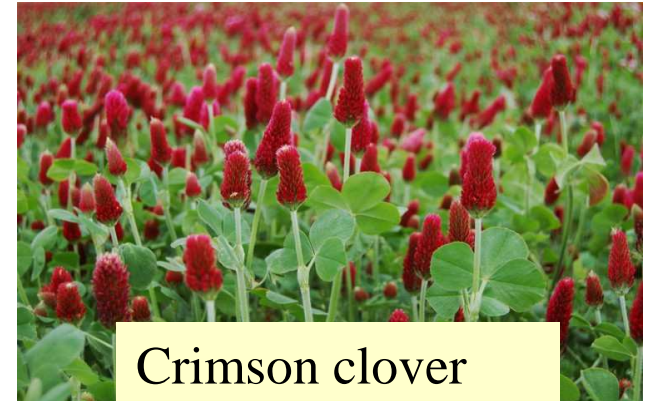
Vetch



Yellow trefoil



White clover mix



Crimson clover

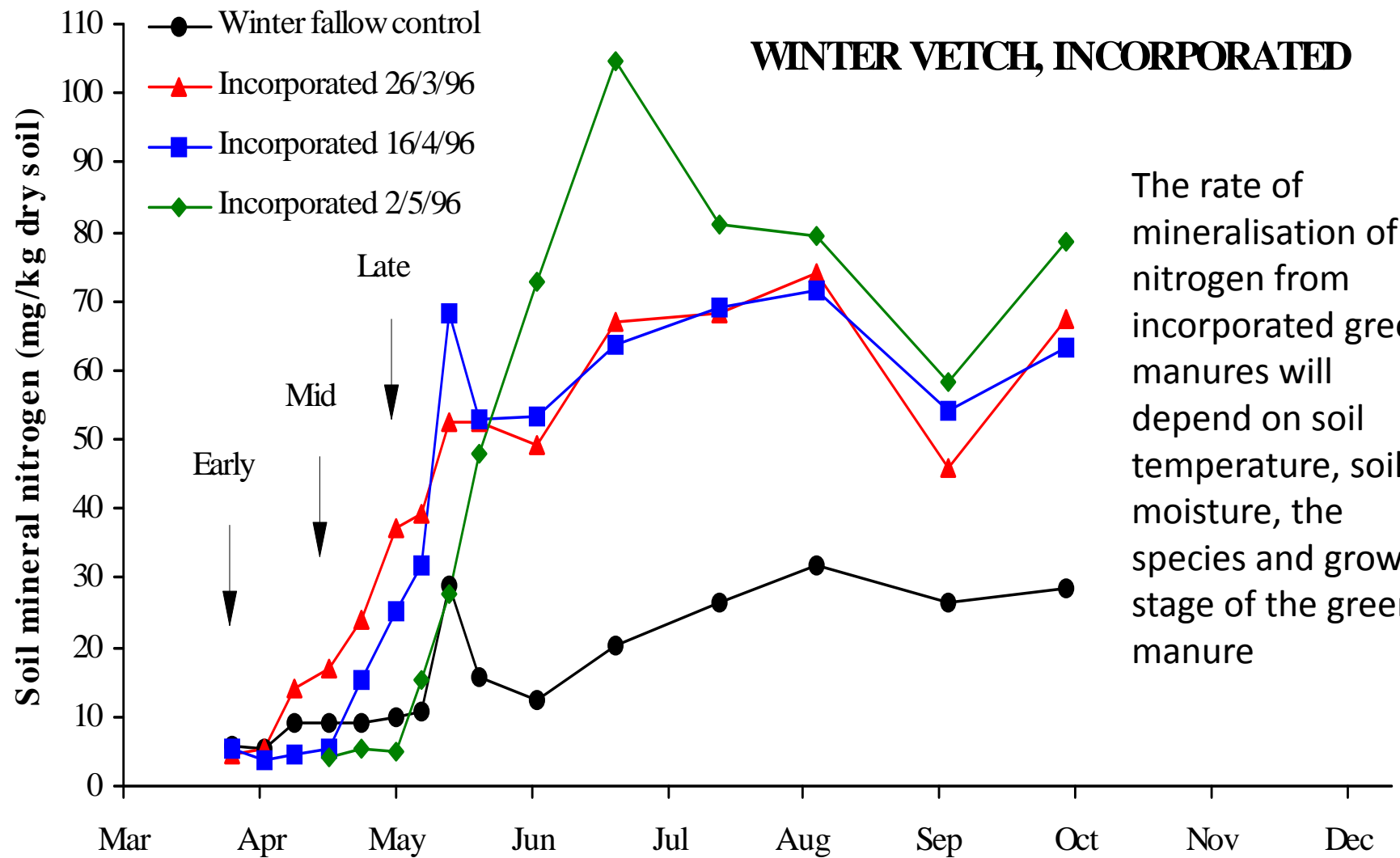
# Green manures - benefits

- To add nitrogen to the system by fixation
- To prevent leaching
- To modify the availability of nitrogen and other nutrients
- To build soil organic matter and encourage microbial activity
- To prevent erosion
- To help with pest, disease and weed control

# Green manures - disadvantages

- Cost of seed
- Cost of cultivations (time)
- Loss of cropping space in the greenhouse
- Increased need for water
- Possible 'green bridge' effect encouraging pests and diseases
- Uncertainty regarding the availability of plant nutrients





The rate of mineralisation of nitrogen from incorporated green manures will depend on soil temperature, soil moisture, the species and growth stage of the green manure

# Intercropping with green manures



A tomato crop  
undersown  
with clover



# ‘Mobile’ green manures – not incorporated into the soil in the same place as they are grown

*They could be grown in the  
greenhouse or on adjacent  
outside land*

- Cut and mulched (as fresh material)
- Composted (perhaps mixed with other organic wastes)
- Anaerobically digested



Windrow composting

# Anaerobic digestion

- Can be used to process a variety of wastes or specifically grown crops
- The methane produced can provide heat and power
- The liquid digestate is rich in available nutrients
- The digestate fibre can be used as a growing medium





# Crops grown specifically to provide biodiversity

- To provide a source of pollinating insects
- To provide a source of parasites and predators of pest insects

*Growing plants for biodiversity will reduce the need to buy commercial biological controls*



The plants comprising the 'agro-ecological infrastructure' can be sited either inside or outside the greenhouses

Both wild and cultivated species can be used





# Conclusions

- Diversity of cropping within the greenhouse brings many benefits
- A variety of cash crops, green manures or plants grown to attract beneficial insects can be used
- The whole site should be considered, not just the inside of the greenhouse structure itself
- There is a lot of scope for innovative approaches



# Thank you

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