Energy inputs and greenhouse gas emissions in UK strawberry crop production

Doug Warner
Agriculture and the Environment Research Unit
University of Hertfordshire

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Overview

Defra funded research project

Collaboration between the University of Hertfordshire and East Malling Research

In kind industry support from
  K.G. Fruits and Berryworld
  20 Growers
Strawberry production systems in the UK

spring or summer planted

ICM or organic

protection or no protection

soil or container

fumigation or no fumigation  peat or coir

grown for between 1 and 3 years
Energy (GJ/ha) Junebearer crops

System and soil type

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GWP (eq tCO$_2$/ha) Junebearer crops

System and soil type

1st crop

2nd crop

3rd crop

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De-nitrification (kgN/ha)
Percent Class 2 fruit

![Bar chart showing mean percentage of Class 2 fruit across different cropping years with and without protection. The chart indicates a higher percentage of Class 2 fruit without protection compared to with protection over the years.]

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Energy (GJ)/t class 1 fruit

1st crop

2nd crop

3rd crop

Post harvest
Cultivations
Nutrition
Crop protection
Culture

System and soil type
GWP (eq tCO₂)/t class 1 fruit

1st crop

2nd crop

3rd crop

System and soil type
Key energy and GHG sources

Nitrate fertiliser (Jenssen & Kongshaug, 2003)

Plastics (mulch, polytunnel covers, container bags, irrigation pipe) (Bousted, 2003; British Plastics Industry; Eggels, 2001)

Pesticides (in particular soil fumigants) (Green, 1987; Pimentel, 1980)

Diesel use for field operations (mostly bed preparation) (Carbon Trust, 2004; Donaldson et al., 1994; Hulsbergen & Kalk, 2002; Hunt, 1995)

De-nitrification (mostly from FYM) (deVries, 2003; Smith et al., 1996)
Nitrate fertiliser

Low N requirements relative to other crops:

Soil analysis before planting and leaf analysis during growth

Improvements in irrigation efficiency

Media that require less N
Plastics

Many growers stated supermarkets specify must be grown under protection

Maximise number of years the crop is grown to extend life of mulch between 2 or 3 crops.

Recycle plastics as many times as possible - easily separable waste stream energy requirements and emissions heavily dependent upon level of soiling (polytunnel uses virgin plastic and relatively clean so low costs) increased availability to growers and minimise transport distance final end use - landfill or incineration for heat generation
Pesticides

Mainly soil fumigants
maximise number of years the crop is grown
soil tests for *Verticilium*, target fumigant applications
land available to the grower maximise rotation

Large number of spray applications, particularly fungicides -
crop monitoring
Diesel use for field operations

Mainly bed preparation
maximise number of years the crop is grown
De-nitrification

Mainly from FYM in organic systems (but recycling nutrients)
current use 40 t/ha,
latest recommendations 25t/ha
Margins

Protection: £4840/ha increase compared to no protection

Fumigation £3810 /ha increase compared to no fumigation
Summary

Strawberries have a high energy input and associated GHG emissions relative to, for example, combinable crops.

Possible to reduce energy and GHG emissions by:
- maximising the period for which the crop is grown (3 years)
- recycling plastics
- targeting inputs, in particular soil fumigants.