Indoor Cropping – Process Heat and Greenhouse Gas Emissions

Process Heat in New Zealand

FACT SHEET

What is process heat?

In the indoor cropping sector, process heat is used to maintain the temperature of a greenhouse for crop production. In 2016, indoor cropping in New Zealand consumed 3.4 petajolues (PJ) of fuel for process heat (or **1.7%** of New Zealand's total process heat demand). Most of this was used for low temperature (< 100° C) space heating supplied by hot water 'boiler' systems.[1]

Based on 2016 data, New Zealand had 70 indoor cropping sites using process heat; 45 in the North Island and 25 in the South Island.[2]

What is indoor cropping?

Indoor cropping refers to growing vegetables or flowers under cover in greenhouses (also called glasshouses or hothouses). A greenhouse is a structure with walls and a roof mainly made of transparent material, such as glass, in which plants requiring regulated climatic conditions are grown.

Indoor cropping is a capital intensive and high-tech form of production (high energy and labour inputs with high yields). New Zealand produces a variety of crops such as tomatoes, cucumbers, capsicums, chillies, eggplants, and lettuce.

Indoor cropping examples

Tomatoes

Most of New Zealand's fresh tomatoes come from indoor cropping, and currently, indoor tomato cultivation is a growing industry with a rise in the popularity of specialty tomatoes (i.e. increased demand for vine ripened, plum and cherry varieties). In 2018, fresh tomatoes in New Zealand had a farm gate value of over $130 million (end March 2018), with exports comprising about **9%** of the value. In 2017 New Zealand exported fresh tomatoes to 21 mainly Asian and Pacific Rim counties.[3]

New Zealand Government

MINISTRY OF BUSINESS, INNOVATION & EMPLOYMENT
HĪKINA WHAKATUTUKI

EECA Energy Efficiency and Conservation Authority
Te Tari Tiaki Pūngao

Indoor cropping examples

Capsicums

Production of New Zealand's export quality capsicums is specialised and capital intensive. All export capsicums are produced through indoor cropping. Exports of capsicums were valued at $38 million in 2013. Japan is the largest market closely followed by Australia. Together these markets comprise **98**% of all capsicum exports.[4]

What was the fuel demand and greenhouse gas (GHG) emissions volume from process heat in this sector?

The indoor cropping sector is a relatively small user of process heat compared to other sectors, such as wood processing or dairy manufacturing. In 2016, indoor cropping used 3.4 PJ of process heat. This was **1.7%** of New Zealand's process heat demand in 2016.[5] This is equivalent to the total amount of energy consumed by about 90,000 households annually in New Zealand.[6]

In 2016, greenhouse gas emissions (GHG) from process heat use in indoor cropping was 220.8 kilo tonnes of carbon dioxide equivalent (CO_2-e). This was **2.8%** of total process heat related GHG emissions.[7]

12.5% of the energy consumed was from renewable sources. This was mostly geothermal energy. Some sites have converted from using coal or gas to biomass, however their biomass energy volumes are not clearly known. Renewable energy sources accounted for less than **1%** of the sector's emissions. The remaining **87.5%** of energy consumption was from non-renewable sources – and accounted for almost all **99.2%** of its emissions (see Figure 1).

Figure 1: Process heat fuel demand and GHG emissions for the indoor cropping sector 2016 – percentages (and actuals) by energy source[8]

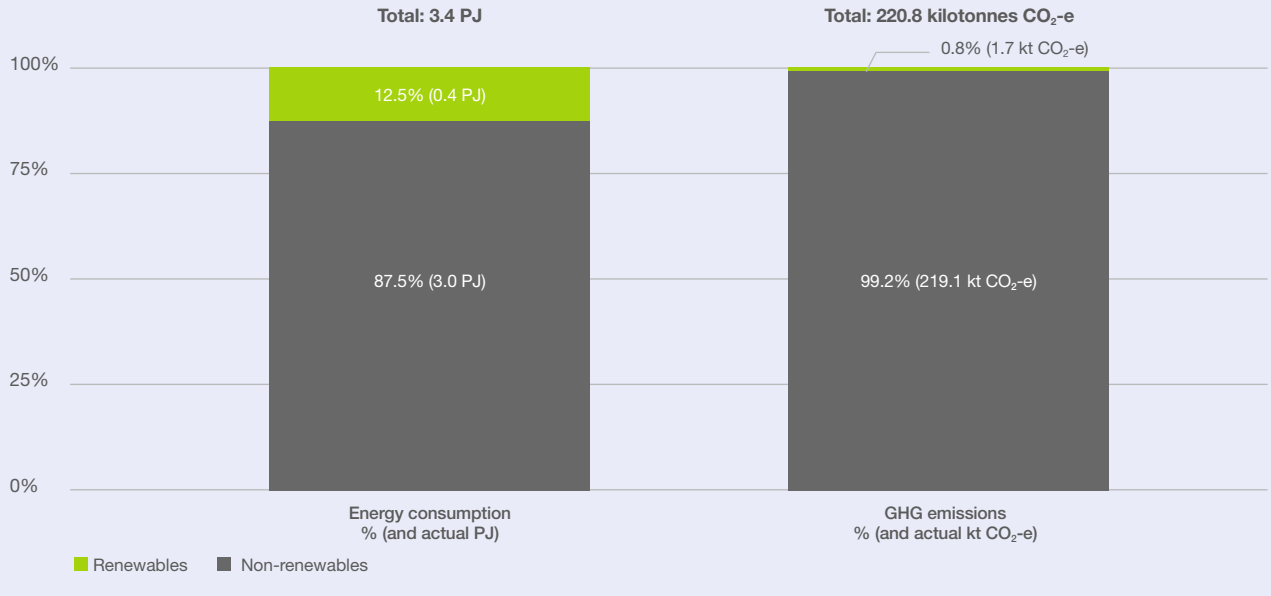

Figure 2: Process heat fuel demand and GHG emissions for the indoor cropping sector 2016 – percentages by fuel type[9]

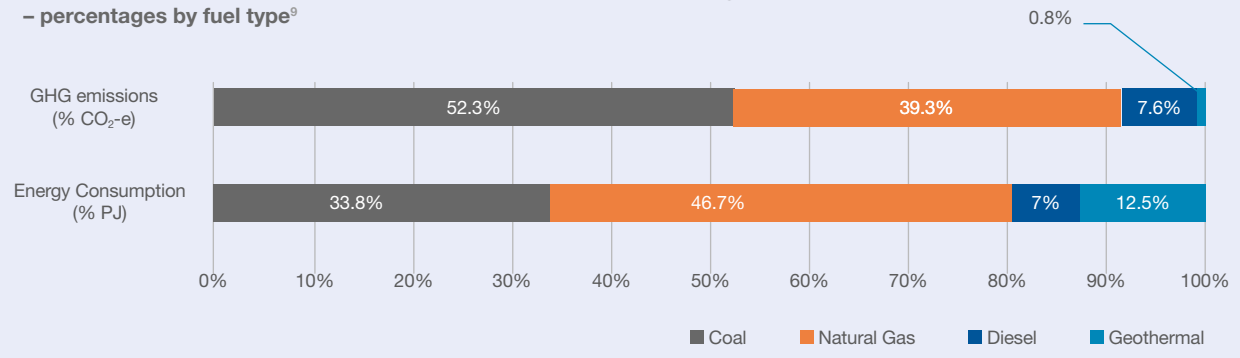

Figure 2 shows the percentages of fuel use and emissions from process heat in the sector. **33.8%** of energy consumption was from coal. This accounted for **52.3%** of all the sector's GHG emissions. In contrast, geothermal accounted for **12.5%** of consumption, yet less than **1%** of emissions.

Figure 3: Process heat fuel demand and GHG emissions for the indoor cropping sector 2016 – actuals by fuel type[10]

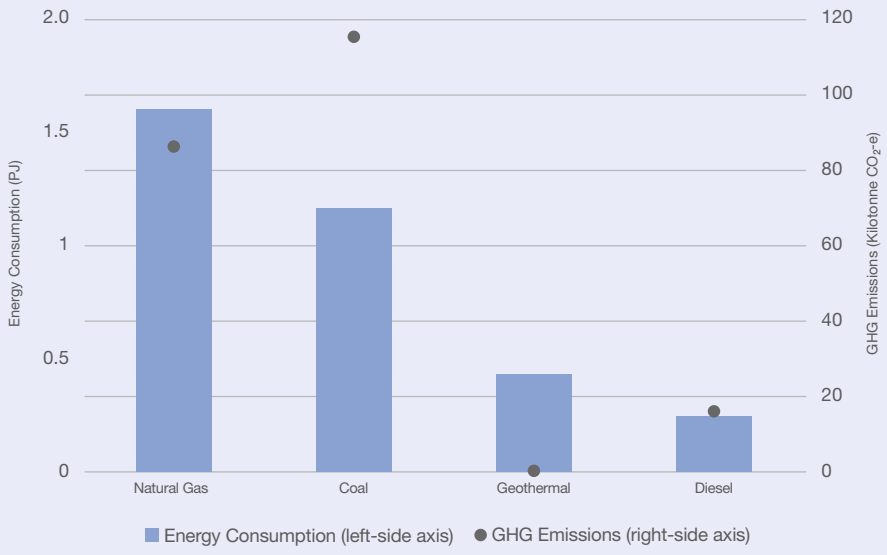

Figure 3 displays actual fuel demand and emissions by fuel type in the sector. **Reducing coal and natural gas consumption is the sector's biggest emissions-reduction opportunity.**

Sources

1. Source: 2016 Energy End Use Database (EEUD), EECA (2018) https://www.eeca.govt.nz/resources-and-tools/tools/energy-end-use-database
2. Source: 2016 Heat Plant Database, MBIE/EECA (2018). Note, the number of indoor cropping sites as at 2019 may be different from the 2016 data
3. https://www.tomatoesnz.co.nz
4. https://www.freshvegetables.co.nz/crops/covered-crops
5. Source: 2016 EEUD, EECA (2018)
6. Based on Statistics New Zealand household estimates data (as at September 2018) and MBIE 2017 Residential energy demand data (published 2018)
7. Source: 2016 EEUD, EECA (2018)
8. Source: 2016 EEUD, EECA (2018)
9. Source: 2016 EEUD, EECA (2018)
10. Source: 2016 EEUD, EECA (2018)