

**CLAYTON  
HOPS**

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HOPS**

[claytonhops.co.nz](http://claytonhops.co.nz)

**CLAYTON HOPS' JOURNEY  
TO LOW CARBON HOP PRODUCTS**

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2025 BX CARBON FOOTPRINT STUDY  
August 2025

# TABLE OF CONTENTS

<b>INTRODUCTION</b>	<b>4</b>
<b>CLAYTON HOPS' COMMITMENT</b>	<b>5</b>
<b>BX STUDY</b>	<b>6</b>
<b>RESULTS</b>	<b>10</b>
<b>AMPLIFIRE FRESH HOP OIL</b>	<b>12</b>
<b>AMPLIFIRE CONCENTRATED LUPULIN PELLETS</b>	<b>16</b>
<b>FASTER, FRESHER, BETTER HOP PELLETS</b>	<b>20</b>
<b>INDUSTRY BENCHMARKING</b>	<b>24</b>
<b>DELIVERY RELATED EMISSIONS</b>	<b>26</b>
<b>NEXT STEPS</b>	<b>32</b>



# INTRODUCTION

## INDUSTRY MOVEMENT TOWARDS GREATER SUSTAINABILITY

As the global brewing industry moves towards greater sustainability, attention has shifted upstream to the climate impacts of hop growing and processing.

Clayton Hops, a New Zealand based vertically integrated hop grower and processor, has developed the innovative Amplifire™ product range to help breweries enhance beer flavour, aroma and yields while minimising environmental impacts.

The award winning Amplifire™ range currently includes two innovative hop products:

- ◇ Amplifire™ Fresh Hop Oil; and
- ◇ Amplifire™ Concentrated Lupulin Pellets (**Amplifire™ Pellets**).

Clayton Hops also produces its Faster, Fresher, Better T90 hop pellets.

## CLAYTON HOPS TAKING A PROACTIVE AND RESPONSIBLE APPROACH TO IMPROVING CARBON FOOTPRINT

Clayton Hops engaged BX in 2024 to independently perform a study of the carbon footprint – or total greenhouse gas emissions – of its hop products. This is an important step on the journey to becoming a more sustainable operation.

BX is a leading independent environmental farm management platform based in London.

As well as being important to us as farmers and land custodians, we recognise that supply chain carbon footprint is becoming increasingly important to many brewers not only due to their own values but the values of the people who consume their beer. Regulatory initiatives like the global Science Based Targets initiative (**SBTi**) – which is a global body that enables brewers to set emissions reduction targets in line with the latest climate science – are also important factors.

BX released its first study in Q2 2025 (**BX Study**). The BX Study is discussed in detail below.

# CLAYTON HOPS' COMMITMENT

Clayton Hops intends to continue to work closely with BX over the years to come to ensure hops are grown and processed with sustainability at the core and is committed to transparency.



## REPORTING ALIGNED WITH BREWERY USAGE

The BX Study quantifies the source to packaged product carbon footprint of the two Amplifire™ products as well as Clayton Hops' T90 hop pellets, using the ISO 14067 methodology (the **Methodology**) which is an internationally recognised approach to quantifying greenhouse gas emissions.

Source to packaged product includes:

- ◇ all materials and processes needed before planting the hops, i.e. upstream impacts;
- ◇ farm level growing and harvesting, and, to the extent applicable to the product, farm-level hop cone drying;
- ◇ processing the product (into Amplifire™ Fresh Hop Oil, Amplifire™ Pellets and T90 hop pellets);
- ◇ packaging the product; and
- ◇ storage of the product in New Zealand prior to dispatch.

The results of the BX Study are expressed in brewing terms, or, more particularly, at the final beer stage, namely:

the amount of hop product – and its associated emissions – needed to flavour 100 L of beer

More specifically, the results have been expressed in:

kilograms of carbon dioxide equivalent (CO<sub>2</sub>e) emissions associated with the hop product (source to packaged product) to flavour 100 L of beer

The beer style modelled throughout is a pale ale.

This approach – expressing results in brewing terms – allows for a fair and relevant comparison across the different hop products, which differ significantly in physical form and dosage rates.

In terms of the amount of each hop product required to flavour 100 L of beer, the following equivalent hop product dosage rates (in terms of flavour/aroma imparted into beer) have been applied:

- ◇ 10mL of Amplifire™ Fresh Hop Oil;
- ◇ 250g of Amplifire™ Pellets; and
- ◇ 500g of T90 hop pellets.

By aligning impact reporting with brewery usage, Clayton Hops aims to provide transparent, actionable emissions data for its customers.

## METHODOLOGY ALIGNED WITH INTERNATIONALLY RECOGNISED STANDARDS

The BX Study follows the principles and requirements of the Green House Gas Protocol Product Life Cycle Accounting and Reporting Standard (WRI & WBCSD, 2011), supported by alignment with ISO 14067:2018 (ISO 2018) for product carbon foot-printing.

## DATA COLLECTION AND QUALITY

The BX Study is based predominantly on primary activity data provided by the Clayton farms, supplemented with carefully selected secondary datasets to fill in upstream or background processes.

The assessment period is aligned with the 2023–2024 hop growing and processing year i.e. hop harvest 2024.

At the farm level, data was collected for the Battery Hill and Blue Rock hop farms, which constituted more than 50% of the 2024 acreage under production.

The overall data quality is considered high for farming and core processing operations, with conservative or justified assumptions applied otherwise where necessary.

## ACTUAL EMISSIONS ARE OVERSTATED

It is noteworthy that the Blue Rock hop farm has significant acreage of juvenile hop plants with relatively low yields, which has inflated the emission values reported in this document.

## LAND USE CHANGE

The Clayton farms were previously intensively run mixed cropping and pastoral (dairy) farms.

We are doing more work with BX to ascertain the environmental impact of transitioning from mixed cropping and pastoral farming to hops.

In the meantime, the emissions figures below assume zero emissions for land use change.

## COMPOSTING

The Clayton farms compost hop biomass waste from each harvest and then spread the compost back on the farms. This brings a number of benefits such as improved soil health and nutrient levels.

By way of explanation, as gases and by-products are released during the decomposition of organic material in a composting process, compost emissions have been calculated by BX in line with the Methodology, i.e. they have been included in BX's emission figures.

## ENVIRONMENTAL INITIATIVES NOT FACTORED INTO THE BX STUDY

The BX Study focuses on the carbon footprint of our hop products. The Clayton farms undertake a myriad of other sustainability measures that are not covered by the BX Study. Sustainability is very important to us, as evidenced by our actions. The following are examples of measures that are not factored into the BX Study.

### WATER USE EFFICIENCY

The Clayton farms use dripline irrigation, which is a highly effective, efficient and environmentally-friendly way of watering our gardens – it offers targeted fertigation and irrigation with less evaporation and run-off and enhanced nutrient uptake efficiency and less leaching.

Two of the farms also harvest water during the winter (wetter) months, by capturing and storing the water in on-farm ponds for use during the summer period.

Compared to overhead sprinkler systems (being the irrigation system for the majority of New Zealand hop growers), drip irrigation uses up to 40% less water and supports a “little and often” approach that aligns with hop plant needs.

We monitor soil moisture and nutrient levels in real time to fine-tune application rates, ensuring optimal plant health with minimal environmental impact.

The Clayton farms have gone to considerable lengths to adopt a robust and environmentally-friendly approach to water use.

### BIODIVERSITY INITIATIVE

In partnership with a major NZ brewery we have been supporting efforts to restore biodiversity and protect waterways across Te Taihū (the top of the South Island of New Zealand). This regional initiative, led by The Nature Conservancy and the Kotahitanga mō te Taiao Alliance, aims to bring landowners and industry together to regenerate native ecosystems while maintaining productive landscapes.

Our own on-farm work includes riparian planting with native species, soil stabilisation and habitat creation for pollinators and beneficial insects. These efforts not only enhance biodiversity but also improve water quality and long-term soil health, ensuring that our region can continue to support sustainable hop growing for generations to come. We continue to explore regenerative land management techniques that restore soil structure and increase carbon sequestration.

### 100% BIODEGRADABLE STRING

The Clayton farms have transitioned fully to using biodegradable material to string hop bines up the trellis. These strings are mulched directly into the soil post-harvest, eliminating plastic waste and contributing to soil health. The biodegradable string ensures durability during the growing season while breaking down naturally afterward. This change has removed thousands of kilometres of synthetic material from our waste stream annually and supports our broader commitment to sustainable inputs.

### LIVESTOCK FOR WEED CONTROL TO REDUCE HERBICIDE USAGE

We integrate sheep into our hop gardens during the season to manage undergrowth naturally. This reduces herbicide use, lowers fuel consumption from mechanical mowing and introduces organic matter into the soil through manure. The sheep also help aerate the soil and suppress weed seed germination. This practice reflects our commitment to low-impact, circular farming systems that work in harmony with nature.

### NO FUNGICIDE USAGE AND MINIMAL PESTICIDE USAGE

We do not use fungicides.

We maintain one of the lowest pesticide application rates in the global hop industry. In some seasons, we achieve zero pesticide use. We rely on biological controls, such as predatory mites, and cultural practices like canopy management, to prevent outbreaks of the one pest we have in New Zealand, being an insect which can reduce hop cone yields.

Our approach ensures compliance with stringent international residue standards and supports the production of clean, natural hops.

# THE RESULTS

## CONCLUSIONS

The results show that Amplifire™ Fresh Hop Oil offers the lowest greenhouse gas emissions per unit (in this case, per 100 L of beer) of the three products, due primarily to low dosage requirements and efficient processing (including no kilning and processing with renewable energy).

Pellet products (Amplifire™ Pellets and T90 hop pellets), particularly those derived from varieties with low yields or immature fields, show higher emissions.

The analysis highlights that the dominant contributors to product-level emissions lie upstream, in hop growing and harvesting.

Fertiliser, fuel use for drying hops and composting of hop green waste all contribute substantially, while emissions from processing and packaging are secondary (noting that the use of renewable origin electricity for processing is a pleasing factor).

These findings reinforce that efforts to reduce carbon emissions for hop products should focus on improving farm performance and reducing input intensity or switching to inputs with lower emissions.

## ASSURANCE

The Clayton Hops product carbon footprint was internally assured by BX Technologies as a first party verification.

A Life Cycle Assessment (**LCA**) specialist conducted the calculations, while an environmental scientist independently reviewed the methodology, data and assumptions.

To avoid conflicts of interest, the LCA specialist and reviewer worked independently, ensuring an objective and transparent verification process.



# Amplifire™

FRESH HOP OIL



## 2024

Hop harvest

## 0.47

kgs CO<sub>2</sub>e  
per 100 L of beer \*

(includes upstream impacts, farm-level growing and harvesting, processing, packaging and storage in NZ prior to despatch)

## 0.35

kgs CO<sub>2</sub>e  
per 100 L of beer \*

(excluding composting)

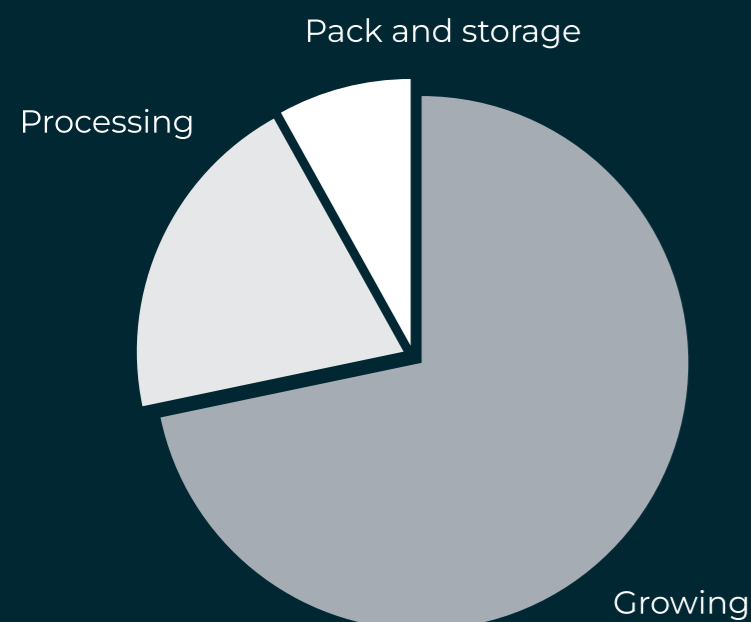
As explained above, the figures assume zero emissions for land use change pending further investigation.

\* Reported as a weighted average across hop varieties.

## RESULTS

Our Amplifire™ Fresh Hop Oil has a carbon footprint of 0.47 kg CO<sub>2</sub>e, or, for benchmarking purposes, 0.35 kg CO<sub>2</sub>e (composting emissions are typically not mentioned in industry benchmarks).

Putting this into context and for benchmarking purposes, when producing 100 L of pale ale using 10 mL of Amplifire™ Fresh Hop Oil, the oil itself has a carbon footprint of 0.35 kg CO<sub>2</sub>e (source to packaged product including storage before despatch).



## DATA

The following table shows the make-up of the 0.47 kg CO<sub>2</sub>e:

CATEGORY	STAGE	EMISSIONS CONTRIBUTION (KG CO <sub>2</sub> E PER 100 L OF BEER)	
			%
Fertiliser	Growing	0.18	37.79%
Compost application	Growing	0.03	6.83%
Crop protection	Growing	0.00	0.64%
Mobile fuel use	Growing	0.05	10.46%
Electricity	Growing	0.00	0.43%
Drying fuel	Growing	0.00	0.00%
Compost making	Growing	0.06	12.81%
Other	Growing	0.01	2.78%
	<b>Growing total</b>	<b>0.34</b>	<b>71.73%</b>
Consumables	Processing	0.07	14.30%
Energy	Processing	0.00	0.02%
Composting	Processing	0.03	5.76%
	<b>Processing total</b>	<b>0.09</b>	<b>20.09%</b>
Packaging	Packaging	0.04	8.11%
Storage	Storage	0.00	0.06%
	<b>Pack and storage total</b>	<b>0.04</b>	<b>8.18%</b>
Grand total		<b>0.47</b>	
Composting total		0.12	25.41%
Total excl composting		<b>0.35</b>	

Rounding may result in totals/subtotals looking slightly incorrect.

## OBSERVATIONS

Amplifire™ Fresh Hop Oil has an exceptionally low carbon footprint, even with composting included in the emissions calculation.

A key reason for this – and unlike the vast majority of other hop extract products on the market – being that the oil is extracted from ‘wet’ hop cones, instead of hop pellets that have been kiln dried and subject to further processing during pelletisation.

The low dosage requirements (it is a highly concentrated product) and the use of renewable energy for processing are also key reasons for the low footprint.

Amplifire™ Fresh Hop Oil's footprint is multiples lower than for industry standard T90 hop pellets.

To our knowledge this makes Amplifire™ Fresh Hop Oil in the top tier of the world's most climate-friendly hop products.

It is worthy of note that some of the measured farmland is comprised of juvenile hop plants with relatively low yields. As the plants mature their yields will increase which will have a positive impact on emissions i.e. lower emissions.

The overall carbon footprint of Amplifire™ Fresh Hop Oil (including delivered to customer) is helped by the fact that the hops are grown in New Zealand and the product is also made in New Zealand.

Unlike other processors who use semi-processed New Zealand hop materials that have been sent half-way around the world to them, Clayton Hops has a strong commitment to both growing and processing locally as this results in better quality product and is environmentally responsible.

Doing everything in-house also means a secure and stable product supply.

Further, the high concentration of Amplifire™ Fresh Hop Oil reduces its shipping and storage footprint and it can also be shipped and stored at ambient.



# Amplifire™

CONCENTRATED  
LUPULIN PELLETS



**2024**

Hop harvest

**3.38**

kgs CO<sub>2</sub>e  
per 100 L of beer \*

(includes upstream impacts, farm-level growing and harvesting, processing, packaging and storage in NZ prior to despatch)

**2.81**

kgs CO<sub>2</sub>e  
per 100 L of beer \*

(excluding composting)

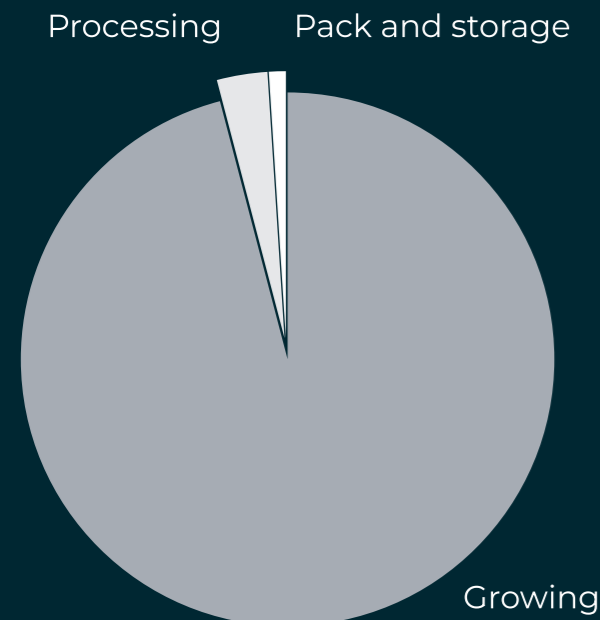
As explained above, the figures assume zero emissions for land use change pending further investigation.

\* Reported as a weighted average across hop varieties.

## RESULTS

Our Amplifire™ Pellets have a carbon footprint of 3.38 kg CO<sub>2</sub>e, or, for benchmarking purposes, 2.81 kg CO<sub>2</sub>e (composting emissions are typically not mentioned in industry benchmarks).

Putting this into context and for benchmarking purposes, when producing 100 L of pale ale using 250 g of Amplifire™ Pellets, the pellets themselves have a carbon footprint of 2.81 kg CO<sub>2</sub>e (source to packaged product including storage before despatch).



## DATA

The following table shows the make-up of the 3.38 kg CO<sub>2</sub>e:

CATEGORY	STAGE	EMISSIONS CONTRIBUTION (KG CO <sub>2</sub> E PER 100 L OF BEER)	%
Fertiliser	Growing	1.07	31.64%
Compost application	Growing	0.20	5.95%
Crop protection	Growing	0.29	8.64%
Mobile fuel use	Growing	0.02	0.71%
Electricity	Growing	0.02	0.47%
Drying fuel	Growing	1.20	35.37%
Compost making	Growing	0.33	9.80%
	<b>Growing total</b>	<b>3.21</b>	<b>94.91%</b>
Liquid nitrogen	Processing	0.07	2.07%
Energy	Processing	0.00	0.00%
Composting	Processing	0.03	1.02%
	<b>Processing total</b>	<b>0.10</b>	<b>3.10%</b>
Primary packaging	Packaging	0.06	1.77%
Storage	Storage	0.01	0.22%
	<b>Pack and storage total</b>	<b>0.07</b>	<b>1.99%</b>
Grand total		<b>3.38</b>	
Composting total		0.57	16.76%
Total excl composting		<b>2.81</b>	

Rounding may result in totals/subtotals looking slightly incorrect.

## OBSERVATIONS

These emissions reflect real-world farming practices. With ongoing improvements in fertiliser efficiency and composting as our hop gardens mature, Amplifire™ Pellets will remain a powerful solution for brewers seeking a lower emission impact. For brewers aiming to reduce Scope 3 emissions (namely upstream supply chain emissions in this instance) without sacrificing quality, Amplifire™ Pellets offer a more efficient and climate-conscious choice.

The use of renewable energy for processing is helpful.

It is worthy of note that some of the measured farmland is comprised of juvenile hop plants with relatively low yields. As the plants mature their yields will increase which will have a positive impact on emissions i.e. lower emissions.

The overall carbon footprint of Amplifire™ Pellets (including delivered to customer) is helped by the fact that the hops are grown in New Zealand and the product is also made in New Zealand.

Unlike other processors who use semi-processed New Zealand hop materials that have been sent half-way around the world to them, Clayton Hops has a strong commitment to both growing and processing locally as this results in better quality product and is environmentally responsible.

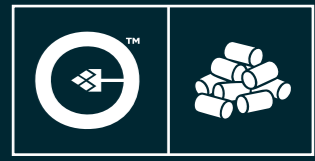
Doing everything in-house also means a secure and stable product supply.

Further, the high concentration of Amplifire™ Pellets reduces its shipping and storage footprint.





# HOP PELLETS



## 2024

Hop harvest

## 3.75

kgs CO<sub>2</sub>e per 100 L of beer \*

(includes upstream impacts, farm-level growing and harvesting, processing, packaging and storage in NZ prior to despatch)

## 3.18

kgs CO<sub>2</sub>e per 100 L of beer \*

(excluding composting)

As explained above, the figures assume zero emissions for land use change pending further investigation.

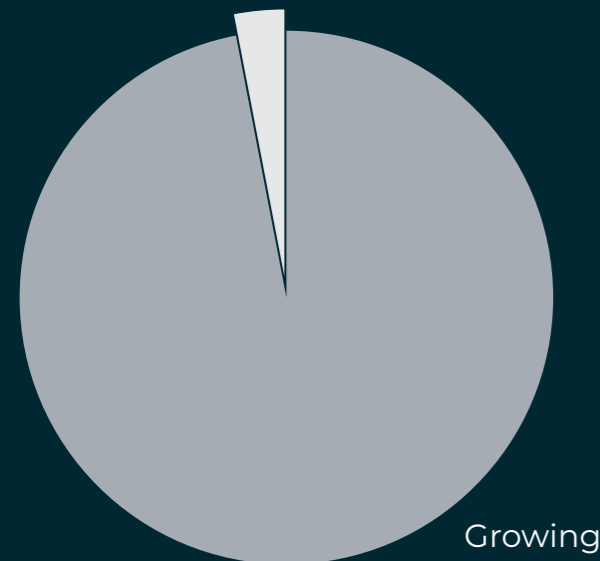
\* Reported as a weighted average across hop varieties.

## RESULTS

Our T90 hop pellets have a carbon footprint of 3.75 kg CO<sub>2</sub>e, or, for benchmarking purposes, 3.18 kg CO<sub>2</sub>e (composting emissions are typically not mentioned in industry benchmarks).

Putting this into context and for benchmarking purposes, when producing 100 L of pale ale using 500 g of T90 hop pellets, the pellets themselves have a carbon footprint of 3.18 kg CO<sub>2</sub>e (source to packaged product including storage before despatch).

Pack and storage



Growing

## DATA

The following table shows the make-up of the 3.75 kg CO<sub>2</sub>e:

CATEGORY	STAGE	EMISSIONS CONTRIBUTION (KG CO <sub>2</sub> E PER 100 L OF BEER)	
			%
Fertiliser	Growing	1.16	31.02%
Compost application	Growing	0.24	6.27%
Crop protection	Growing	0.32	8.60%
Mobile fuel use	Growing	0.03	0.67%
Electricity	Growing	0.01	0.35%
Drying fuel	Growing	1.43	38.20%
Compost making	Growing	0.33	8.81%
Other	Growing	0.09	2.43%
<b>Growing total</b>		<b>3.61</b>	<b>96.34%</b>
Energy	Processing	0.00	0.00%
Composting	Processing	0.00	0.07%
<b>Processing total</b>		<b>0.00</b>	<b>0.07%</b>
Primary packaging	Packaging	0.12	3.19%
Storage	Storage	0.02	0.41%
<b>Pack and storage total</b>		<b>0.13</b>	<b>3.59%</b>
<b>Grand total</b>		<b>3.75</b>	
Composting total		0.57	15.15%
Total excl composting		<b>3.18</b>	

Rounding may result in totals/subtotals looking slightly incorrect.

## OBSERVATIONS

These emissions reflect real-world farming practices. With ongoing improvements in fertiliser efficiency and composting as our hop gardens mature, emissions will reduce.

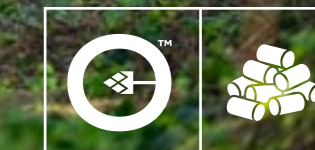
The use of renewable energy for processing is helpful.

It is worthy of note that some of the measured farmland is comprised of juvenile hop plants with relatively low yields. As the plants mature their yields will increase which will have a positive impact on emissions i.e. lower emissions.

The overall carbon footprint of our T90 hop pellets (including delivered to customer) is helped by the fact that the hops are grown in New Zealand and the product is also made in New Zealand.

Unlike other processors who use semi-processed New Zealand hop materials that have been sent half-way around the world to them, Clayton Hops has a strong commitment to both growing and processing locally as this results in better quality product and is environmentally responsible.

Doing everything in-house also means a secure and stable product supply.



# INDUSTRY BENCHMARKING – HOW DO OUR HOP PRODUCTS COMPARE?

To provide some general guidance – being a source of information rather than an exact comparison – on how the carbon footprint of our hop products compares to other hop products, BX has undertaken the following:

- ◇ It has selected two studies that it considers to be well regarded, being the following:
  - Hop Growers of America – USA Aroma Hops
  - Cal Poly Life Assessment of USA Hops
- ◇ It has taken information from those studies and extrapolated it to express the results in terms of carbon footprint of hop product per 100 L of beer, in order to offer a comparator to our hop products. For this purpose, BX has assumed a common method of beer production, such as in terms of hop product dose rates (10mL of Amplifire™ Fresh Hop Oil, 250g of Amplifire™ Pellets and 500g of T90 hop pellets).

For comparison purposes:

- ◇ BX used Clayton Hops' three largest hop varieties, Motueka™, Nelson Sauvin™ and Riwaka™. These varieties, combined, comprise over 85% of the total acreage of the Clayton Hops platform. **However, the results for Nelson Sauvin™ and Riwaka™ are materially inflated as they include significant acreage of juvenile hop plants.**
- ◇ Composting emissions have been removed (these emissions are typically not mentioned in industry studies).
- ◇ As explained above, the figures assume zero emissions for land use change.

The results are as follows:

PRODUCT	EMISSIONS CONTRIBUTION (KG CO2E PER 100 L OF BEER)	OBSERVATIONS
Amplifire™ Fresh Hop Oil - Motueka™	0.32	
Amplifire™ Pellets - Motueka™	1.53	<b>Mature hop plants</b>
Clayton T90 Hop Pellets - Motueka™	2.64	
Amplifire™ Fresh Hop Oil - Nelson Sauvin™	0.42	
Amplifire™ Pellets - Nelson Sauvin™	2.81	<b>Juvenile hop plants</b>
Clayton T90 Hop Pellets - Nelson Sauvin™	2.90	
Amplifire™ Fresh Hop Oil - Riwaka™	0.45	
Amplifire™ Pellets - Riwaka™	2.81	<b>Juvenile hop plants</b>
Clayton T90 Hop Pellets - Riwaka™	3.68	
Hop Growers of America - USA Aroma	2.05	
Cal Poly Life Assessment of USA Hops	2.21	

The results for Amplifire™ Fresh Hop Oil are exceptional. We are unaware of any hop product that has a lower carbon footprint than our Amplifire™ Fresh Hop Oil.

Amplifire™ Pellets from mature hop plants also compare favourably.

The table highlights that juvenile hop plants have higher emissions. Fortunately hop plants reach full maturity in a relatively short period of time of 3-4 harvests.

This is our starting position. We expect improvement over the years to come.

# DELIVERY RELATED EMISSIONS – GETTING OUR HOP PRODUCT TO THE MARKET

The BX Study does not include delivery related emissions i.e. delivery of hop product from the New Zealand warehouse to its final destination around the world.

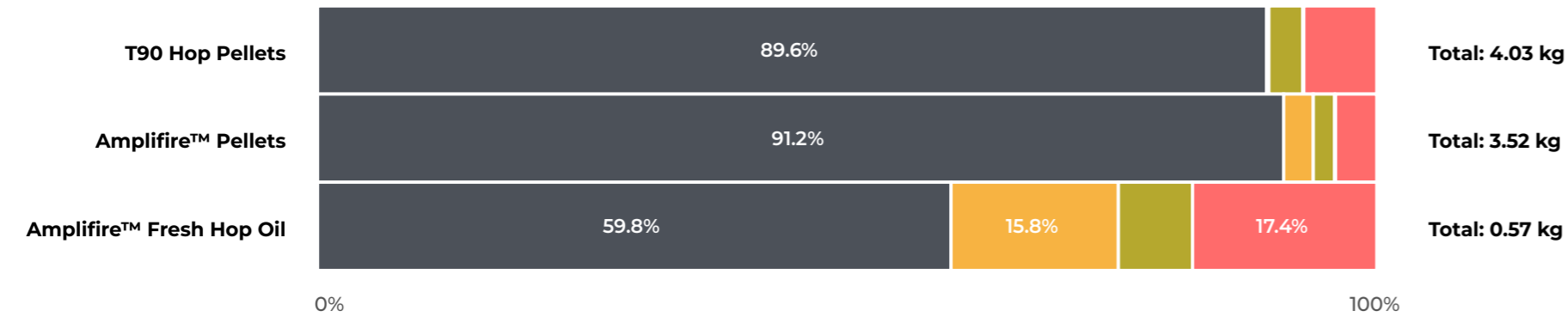
The graphs on the following pages offer a general indication of these emissions based on reputable resources.

Once again Amplifire™ Fresh Hop Oil shines, in this instance with exceptionally low delivery emissions. Amplifire™ Pellets also compare very favourably against T90 hop pellets given their high concentration.

Combined with careful route selection and full reefer loads, emission levels associated with shipping our hop product from New Zealand to the world are eminently manageable, especially so with our Amplifire™ advanced hop products.

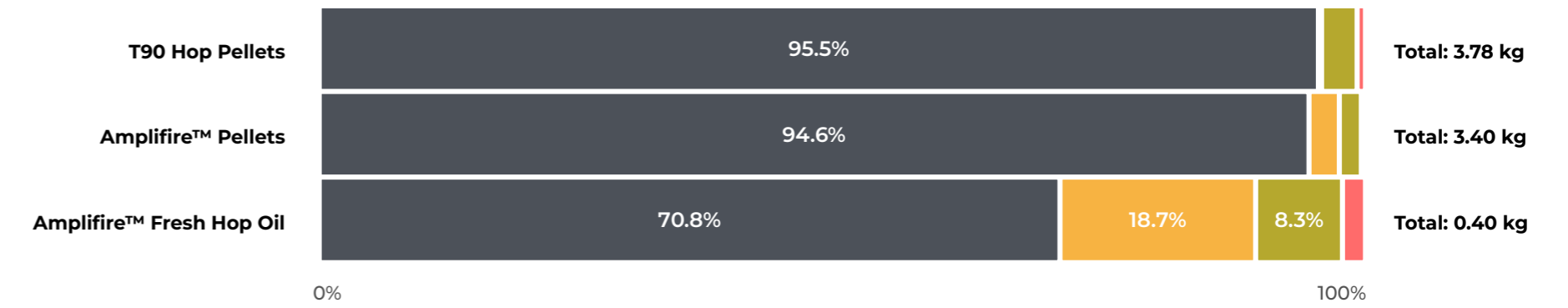


# NZ TO LONDON/ROTTERDAM



CATEGORY	T90 HOP PELLETS	AMPLIFIRE™ PELLETS	AMPLIFIRE™ FRESH HOP OIL
■ Growing	3.610 kg (89.6%)	3.210 kg (91.2%)	0.340 kg (59.8%)
■ Processing	0.010 kg (0.2%)	0.100 kg (2.8%)	0.090 kg (15.8%)
■ Packaging & warehouse	0.130 kg (3.2%)	0.070 kg (2.0%)	0.040 kg (7.0%)
■ Trucking & shipping	0.277 kg (6.9%)	0.139 kg (3.9%)	0.099 kg (17.4%)

# NZ TO SYDNEY

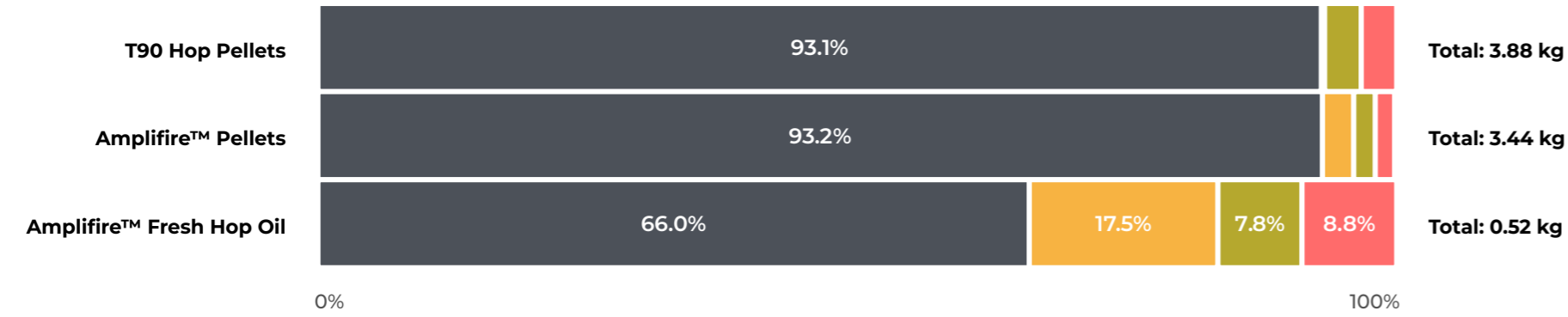


CATEGORY	T90 HOP PELLETS	AMPLIFIRE™ PELLETS	AMPLIFIRE™ FRESH HOP OIL
■ Growing	3.610 kg (95.5%)	3.210 kg (94.6%)	0.340 kg (70.8%)
■ Processing	0.010 kg (0.3%)	0.100 kg (2.9%)	0.090 kg (18.7%)
■ Packaging & warehouse	0.130 kg (3.4%)	0.070 kg (2.1%)	0.040 kg (8.3%)
■ Trucking & shipping	0.029 kg (0.8%)	0.015 kg (0.4%)	0.010 kg (2.2%)

**Notes:**  
 Emissions expressed in kgs CO<sub>2</sub>e per 100 L of Pale Ale.  
 Emissions include upstream impacts, farm-level growing and harvesting, processing, packaging, storage in NZ prior to despatch and delivery to the stated destination.  
 Emissions assume trucking (NZ warehouse to NZ port) and shipping (NZ port to stated destination) a full 20 foot reefer to the stated destination.  
 Emissions include composting (typically not mentioned in industry studies).  
 Emissions assume zero emissions for land use change pending further investigation.

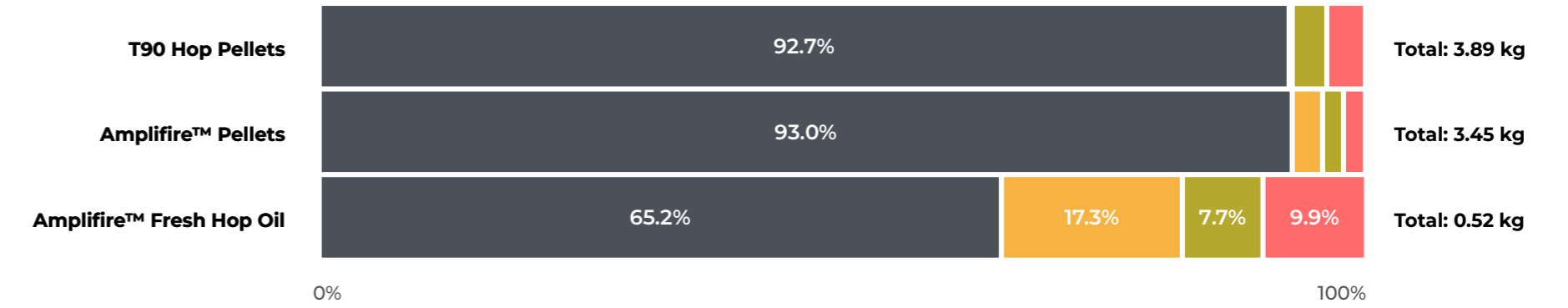


# NZ TO SHANGHAI/TOKYO



CATEGORY	T90 HOP PELLETS	AMPLIFIRE™ PELLETS	AMPLIFIRE™ FRESH HOP OIL
■ Growing	3.610 kg (93.1%)	3.210 kg (93.2%)	0.340 kg (66.0%)
■ Processing	0.010 kg (0.3%)	0.100 kg (2.9%)	0.090 kg (17.5%)
■ Packaging & warehouse	0.130 kg (3.4%)	0.070 kg (2.0%)	0.040 kg (7.8%)
■ Trucking & shipping	0.126 kg (3.3%)	0.063 kg (1.8%)	0.045 kg (8.8%)

# NZ TO LOS ANGELES



CATEGORY	T90 HOP PELLETS	AMPLIFIRE™ PELLETS	AMPLIFIRE™ FRESH HOP OIL
■ Growing	3.610 kg (92.7%)	3.210 kg (93.0%)	0.340 kg (65.2%)
■ Processing	0.010 kg (0.3%)	0.100 kg (2.9%)	0.090 kg (17.3%)
■ Packaging & warehouse	0.130 kg (3.3%)	0.070 kg (2.0%)	0.040 kg (7.7%)
■ Trucking & shipping	0.144 kg (3.7%)	0.072 kg (2.1%)	0.051 kg (9.9%)

**Notes:**  
 Emissions expressed in kgs CO<sub>2</sub>e per 100 L of Pale Ale.  
 Emissions include upstream impacts, farm-level growing and harvesting, processing, packaging, storage in NZ prior to despatch and delivery to the stated destination.  
 Emissions assume trucking (NZ warehouse to NZ port) and shipping (NZ port to stated destination) a full 20 foot reefer to the stated destination.  
 Emissions include composting (typically not mentioned in industry studies).  
 Emissions assume zero emissions for land use change pending further investigation.



# NEXT STEPS

We will be working closely with BX over the coming months to develop a plan to reduce the carbon footprint of our hop products.

This is an exciting and important initiative and Clayton Hops is proud to be leading the New Zealand hop industry on sustainability.

