



Carbon Report 2021

Life Cycle Analysis of
Three Selected Meals

by Green
Element



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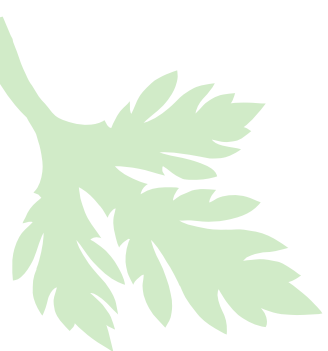
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Welcome

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From the beginning Parsley Box has set out to build a business with a social and environmental conscience.

We're serious about achieving growth, but we're just as serious about doing the right thing for our customers, our staff and our suppliers whilst treading lightly on our planet.

Reducing our carbon footprint at every step

We hear our Baby Boomer+ customers when they say they want to be **caretakers of the environment** for

their grandchildren. That's why our ready-meals, delivered directly from our warehouse to our customers, don't need to be stored in a fridge or freezer and are ready in minutes in the microwave.

We commissioned this research by Green Element to look at the carbon emissions from a selection of three of our meals to understand where we could make further improvements. This is just the start for Parsley Box and we won't stop here because for us, being ethical is about listening to our customers and following our conscience.

Put the customer first



Drive quality & value



Deliver culinary knowledge



Achieve nutritional balance



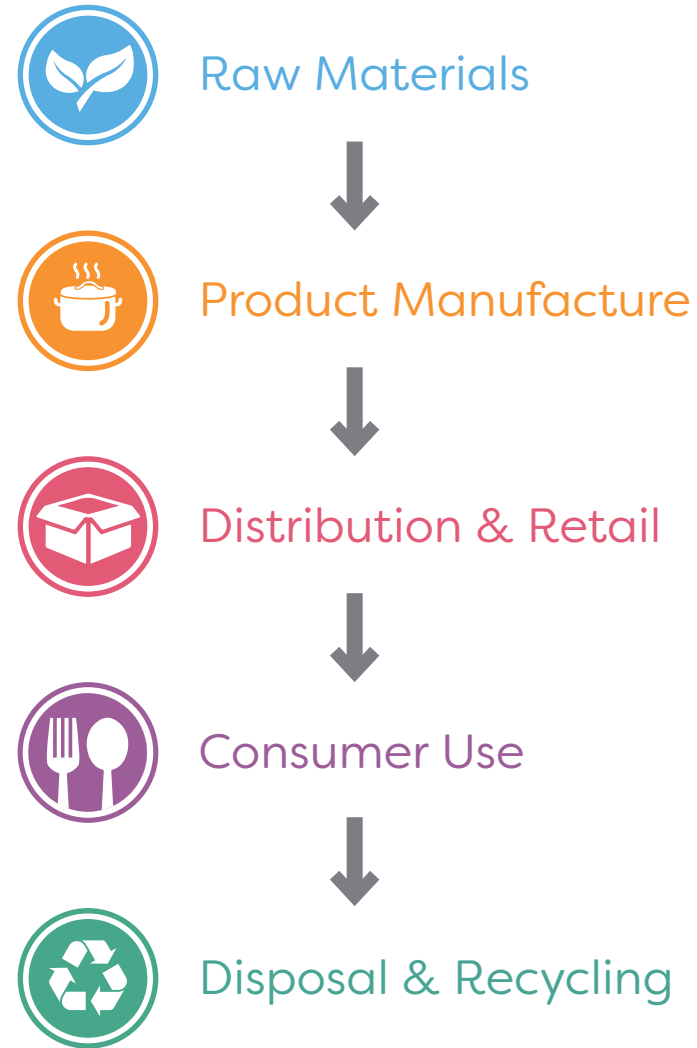
Reducing environmental
impact

Life Cycle Analysis (LCA) Cradle to Grave

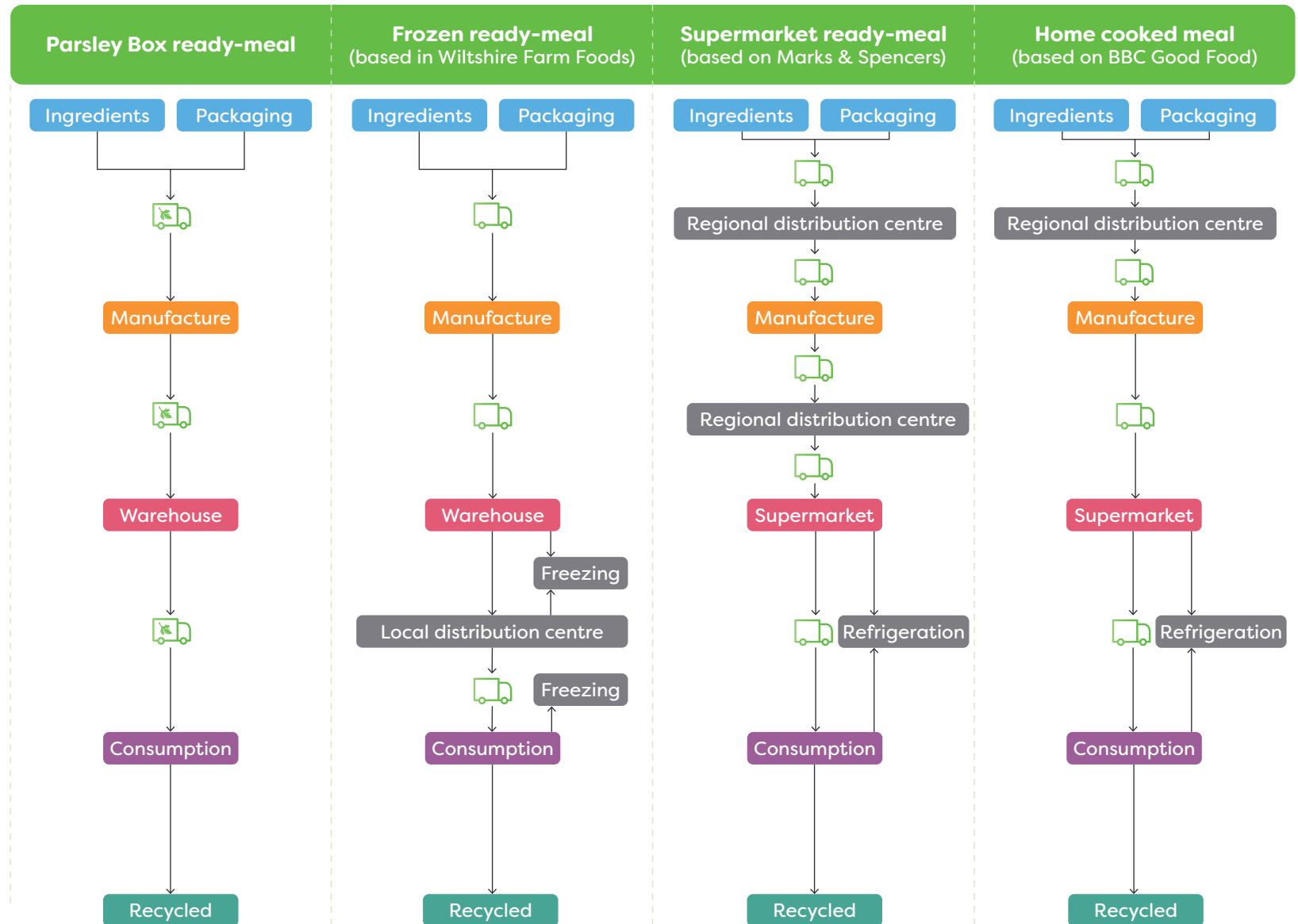
LCA has been used as a tool to estimate the carbon impact of Parsley Box ready-meals and to compare the carbon impacts from an equivalent supermarket meal, frozen-meal and homemade meal.

The functional unit has been defined as the preparation and consumption of a meal for one person, from cradle-to-grave.

Cradle-to-grave includes all stages of a product/service's 'life', including raw ingredients (cradle) to the consumer use stage and disposal (grave).



Life Cycle Analysis (LCA) Cradle to Grave

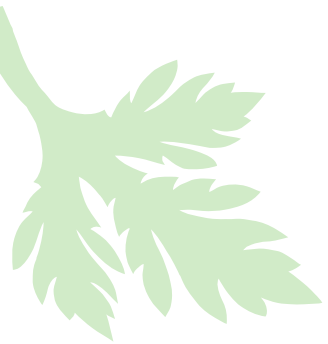


Parsley Box 3 Meals

A full **Life Cycle Assessment** has been completed for three popular and varied recipes.

This assessed the impact of ingredients, transportation (from each stage between supplier, manufacturer, warehouse and customer), energy use for manufacture, packaging, energy use at repackaging warehouse, the end use (cooking and storage), and waste/disposal.

This analysis complies with **ISO 14064**.



Beef Stew



**Chicken &
Leek Hotpot**



**Vegetarian
Cottage Pie**

Parsley Box Meals Methodology



Ingredients:

Ingredients (and supplier addresses) were provided for each 270g (one serving) ready-meal.



Transportation:

Includes three transportation legs: from supplier to manufacturer, manufacturer to logistic warehouse, and warehouse to customer.

The first two legs have been calculated from researching journey distance between provided supplier address, manufacturer address, and warehouse address. The last leg (to customer) has been calculated through estimating the average journey distance from Sept-Nov 2020 shipment reports. The last mile of this journey is assumed to be by light van.



Manufacture:

Electricity and gas were provided as a total for each meal. This was apportioned to a single meal by dividing each value by the total number of each of the 3 meals produced.



Packaging:

Packaging per item, including transportation boxes/cases/pallets was based on primary data supplied by Parsley Box.



Repackaging:

Electricity, gas, water and waste were provided for the whole warehouse. This was apportioned to the space (m²) used by Parsley Box only, then further apportioned to a single meal.



Consumer Use:

As the ready-meals can be put in the cupboard, it was assumed no energy use was needed to store. Energy use from cooking the meal was calculated based on the ready-meal microwave instructions (2 minutes for each meal).



Disposal:

Meal container, case and sleeve assumed recycled, whilst film lid assumed general waste. Assumed that there is no food waste.



Competitor Meals

The **Life Cycle Assessment** of each Parsley Box meals has been compared to a supermarket-based ready meal, a frozen ready-meal competitor, and a homecooked meal.

To ensure a direct comparison, the exact same meals (beef stew, chicken & leek hotpot, vegetarian cottage pie) were researched.

Where possible, data has been gathered from each specific meal:

- 🌿 Ingredients
- 🌿 Storage and cooking instructions

Where it was not possible to collect this data, Green Element have researched previous LCA analyses on chilled ready-meals, frozen ready-meals and home cooked meals to find data for each stage of the supply chain:

- 🌿 Energy usage to manufacture each meal
- 🌿 Transportation
- 🌿 Packaging
- 🌿 Waste





Supermarket Ready-Meal

Based on M&S similar one serving meal alternatives.

Raw ingredients, cooking instructions and disposal of packaging were based on actual data from the M&S website.

Estimates for transportation, processing energy usage, food waste and packaging were based on a previous UK-based LCA¹.

Assumptions:

All customers travel 2km by car to supermarket.

Ready-meal cooked in the microwave.



Home Cooked Meal

Recipes for each meal were found from BBC Good Foods. Each recipe was apportioned to one serving.

Raw ingredients and cooking instructions were based on actual data from the recipe. Estimates for transportation, processing energy usage and packaging were based on a previous UK-based LCA¹.

Assumptions:

All ingredients were bought new for the recipe.

All customers travel 2km by car to supermarket.



Frozen Ready-Meal

Based on Wiltshire Farm Foods similar one serving meal alternatives.

Raw ingredients, cooking instructions and disposal of packaging were based on actual data from the WFF website.

Estimates for transportation and packaging were based on a previous LCA¹. Estimates for the manufacture of frozen ready-meals and energy usage were based on another UK-based LCA².

Assumptions:


Ready-meal cooked in the microwave.

¹ Ximena et al. (2019): Life cycle environmental impacts of ready-made meals considering different cuisines and recipes.

² Schmidt Rivera et al. (2014): Life cycle environmental impacts of convenience food: Comparison of ready and home-made meals.



How are carbon emissions calculated?

- 
- ✎ An LCA/carbon footprint is measured in kilograms of greenhouse gas emissions (GHGs).
 - ✎ Greenhouse gases are those which have a global warming potential (GWP).
 - ✎ The main 3 GHGs are carbon dioxide, methane and nitrous oxide.
 - ✎ Emissions are converted into CO₂e, or carbon dioxide equivalent, a standard unit for measuring carbon footprints.
 - ✎ CO₂e expresses the carbon footprint as a single number with the same global warming potential as the sum of all the different greenhouse gases measured.

Results from emissions calculations



Parsley Box Meals Footprints summary

The beef stew ready-meal option is associated with the highest emissions across its entire life cycle:

- ✎ Emissions from a vegetarian cottage pie are 61.7% lower than a beef stew meal.
- ✎ Emissions from a chicken & leek hotpot are 53.0% lower than a beef stew meal.



1.83
kgCO₂e

Beef Stew



0.86
kgCO₂e

Chicken &
Leek Hotpot



0.70
kgCO₂e

Vegetarian
Cottage Pie

Parsley Box Meals

Footprints broken down by stage

Ingredients used in each ready-meal are the largest source of emissions, contributing:

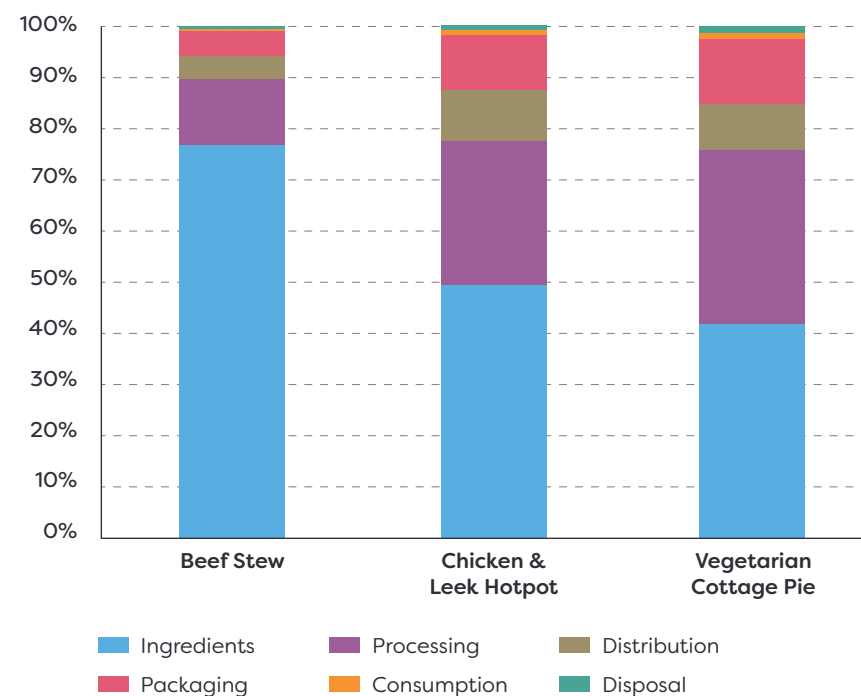
- 76.5% of emissions from a beef stew meal
- 50.0% of emissions from a chicken hotpot meal
- 42.9% of emissions from a vegetarian cottage pie meal

LCA Stage	kgCO ₂ e		
	Beef Stew	Chicken & Leek Hotpot	Vegetarian Cottage Pie
Ingredients	1.40	0.43	0.30
Processing	0.24	0.24	0.24
Distribution	0.08	0.09	0.06
Packaging	0.09	0.09	0.09
Waste	0.01	0.01	0.01
Consumption	0.01	0.01	0.01
Disposal	0.00	0.00	0.00
Total	1.83	0.86	0.70

Emissions from processing (including manufacturing the meal and energy usage at the repackaging warehouse) are the second largest source of emissions, contributing:

- 13.1% of emissions from a beef stew meal
- 27.9% of emissions from a chicken hotpot meal
- 34.3% of emissions from a vegetarian cottage pie

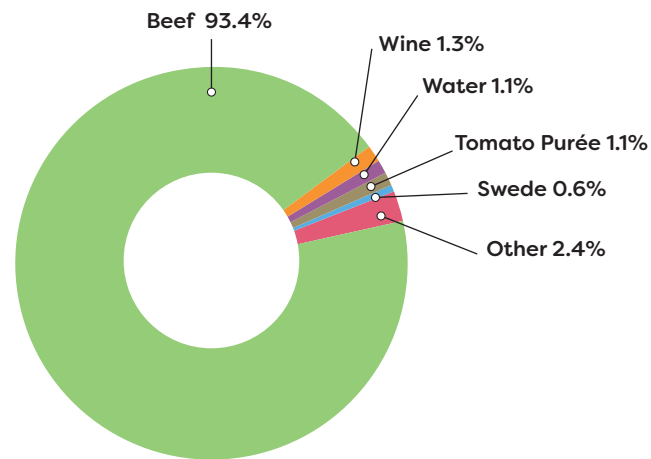
Emissions broken down by percentage



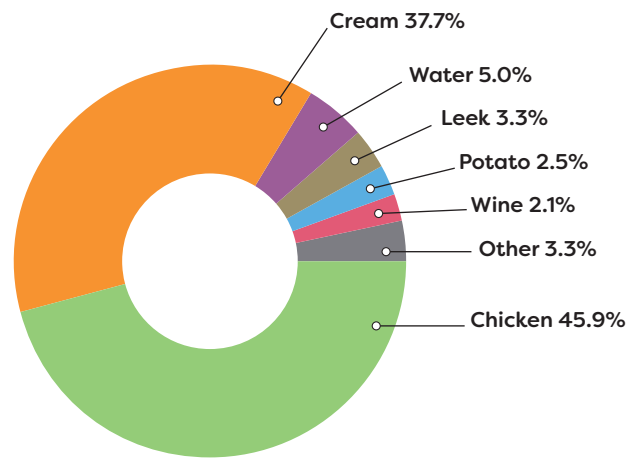
Parsley Box Meals Ingredients

Meat and dairy products are the largest source of emissions for each ready-meal.

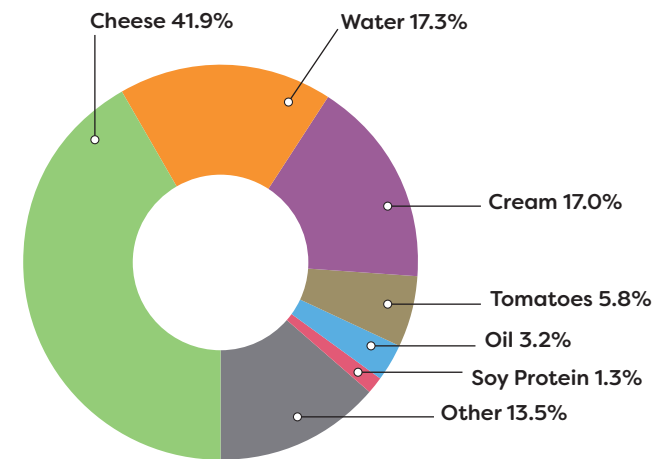
Beef accounts for 93.4% of emissions from all ingredients within a beef stew, whereas soy protein accounts for only 1.3% of emissions from all ingredients within a vegetarian cottage pie.



Beef Stew



Chicken & Leek Hotpot



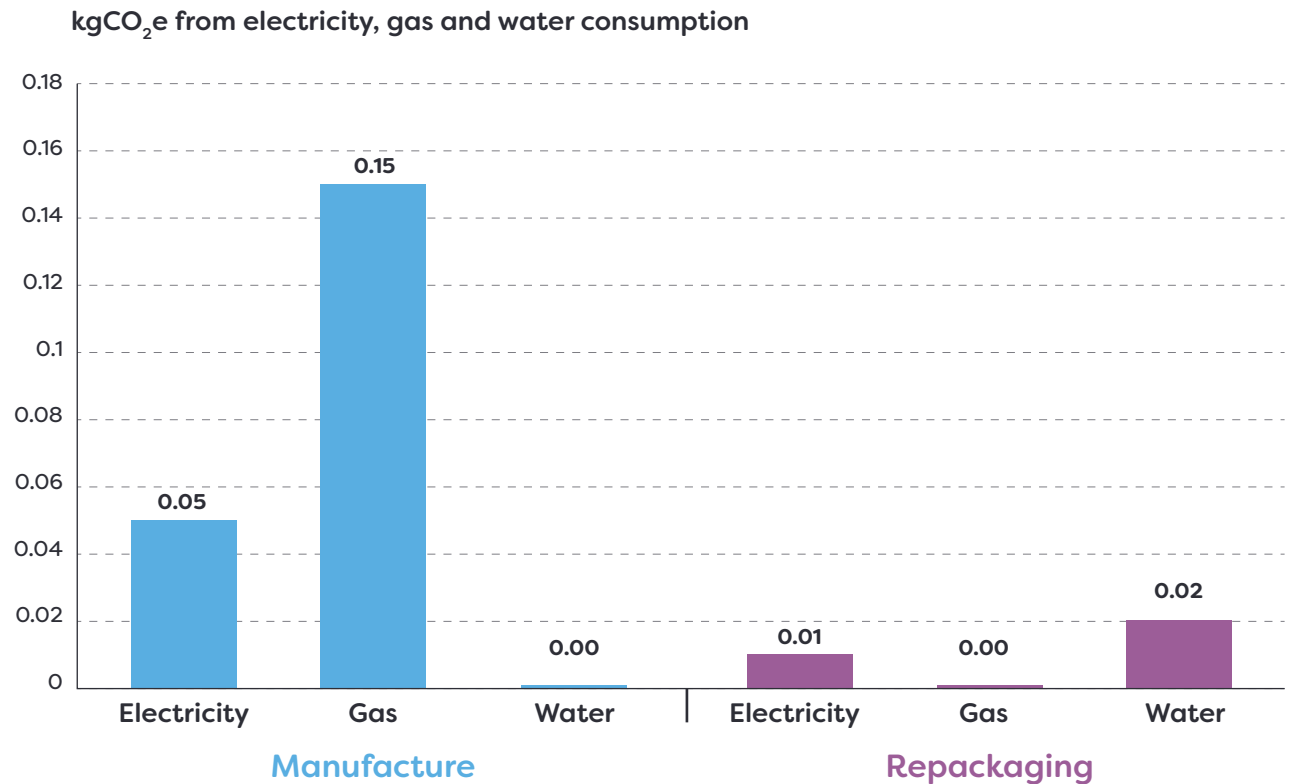
Vegetarian Cottage Pie

Parsley Box Meals Processing

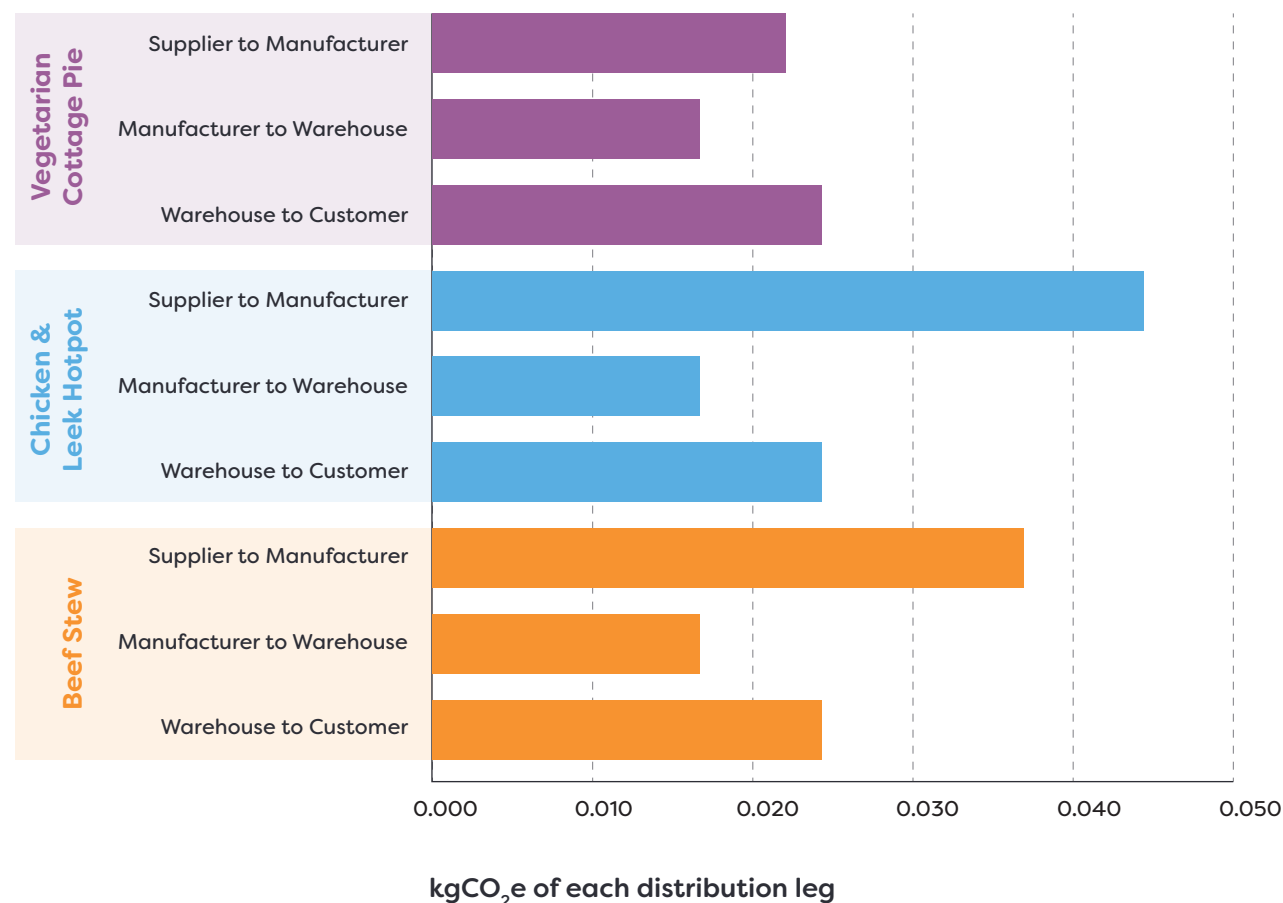
All meals require very similar electricity, gas and water usage to process at both the manufacturer and repackaging warehouse.

Gas usage to manufacture each meal (0.74 kWh) contributes 64.0% of total emissions from processing.

Electricity usage to manufacture each meal (0.17 kWh) contributes 20.0% of total emissions from processing.



Parsley Box Meals Distribution



For both the beef stew and chicken & leek hotpot meals, transport from supplier to manufacturer is the largest source of emissions, contributing:

- ✎ 47.3% of total emissions from distribution for a beef stew meal
- ✎ 51.9% of total emissions from distribution for a chicken & leek hotpot meal

A higher proportion of ingredients within a vegetarian cottage pie are sourced within the UK, requiring shorter road journeys and minimal freight by sea.

Meal Comparisons

Beef Stew

Emissions from a Parsley Box Beef Stew are 24.1% lower than the nearest comparison meal, the supermarket meal alternative.

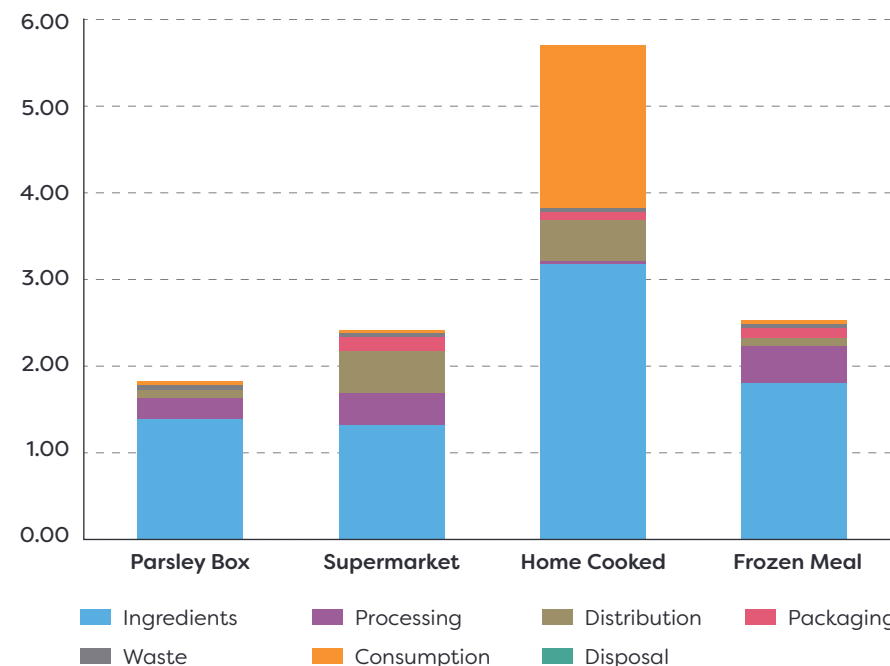
✎ Emissions from a Parsley Box Beef Stew are the lowest across most stages of the LCA (except for processing where emissions are lowest for a home cooked meal, and

ingredients where emissions are lowest for a supermarket ready-meal).

✎ This is because the Parsley Box meal has a higher proportion of meat (beef) within its recipe than the supermarket meal alternative.

	kgCO ₂ e			
	Parsley Box	Supermarket	Home Cooked	Frozen Meal
Ingredients	1.40	1.33	3.18	1.83
Processing	0.24	0.37	0.04	0.42
Distribution	0.08	0.49	0.46	0.09
Packaging	0.09	0.15	0.11	0.11
Waste	0.01	0.05	0.04	0.05
Consumption	0.01	0.01	1.85	0.04
Disposal	0.00	0.00	0.00	0.00
Total	1.83	2.41	5.68	2.54

kgCO₂e by each comparison meal



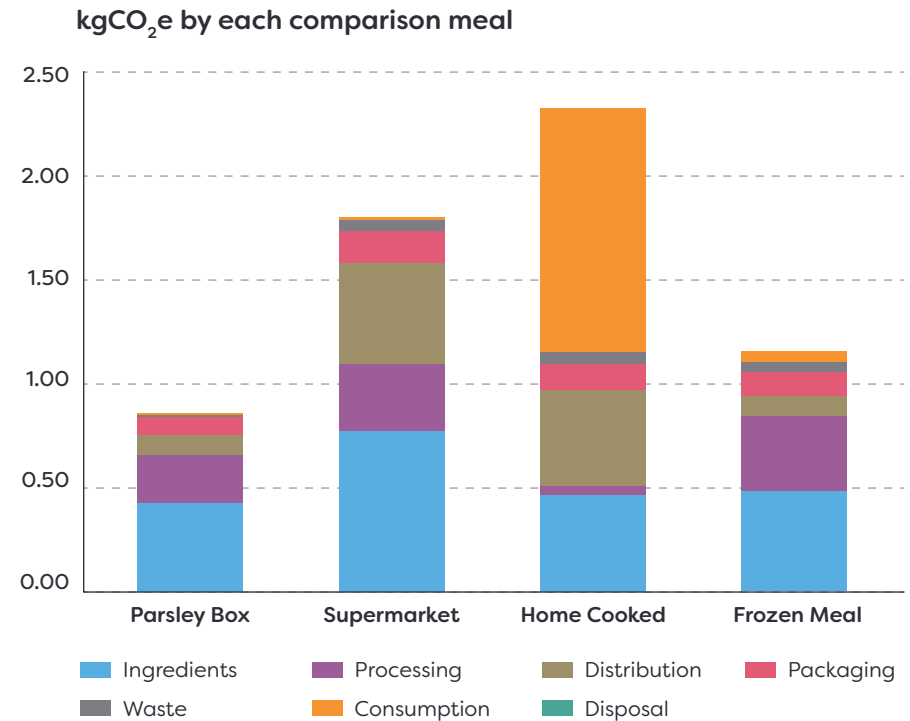
Meal Comparisons

Chicken & Leek Hotpot

Emissions from a Parsley Box Chicken & Leek Hotpot are 25.9% lower than the nearest comparison meal, the Frozen Meal alternative.

✱ Emissions from a Parsley Box Chicken & Leek Hotpot are the lowest across all stages of the LCA (except for processing where emissions are lowest for a home cooked meal).

	kgCO ₂ e			
	Parsley Box	Supermarket	Home Cooked	Frozen Meal
Ingredients	0.43	0.77	0.47	0.48
Processing	0.24	0.32	0.04	0.36
Distribution	0.09	0.50	0.46	0.10
Packaging	0.09	0.15	0.13	0.11
Waste	0.01	0.06	0.06	0.05
Consumption	0.01	0.01	1.17	0.05
Disposal	0.00	0.00	0.00	0.00
Total	0.86	1.81	2.33	1.16



Meal Comparisons

Vegetarian Cottage Pie

Emissions from a Parsley Box Vegetarian Cottage Pie are 38.6% lower than the nearest comparison meal, the Frozen Meal alternative.

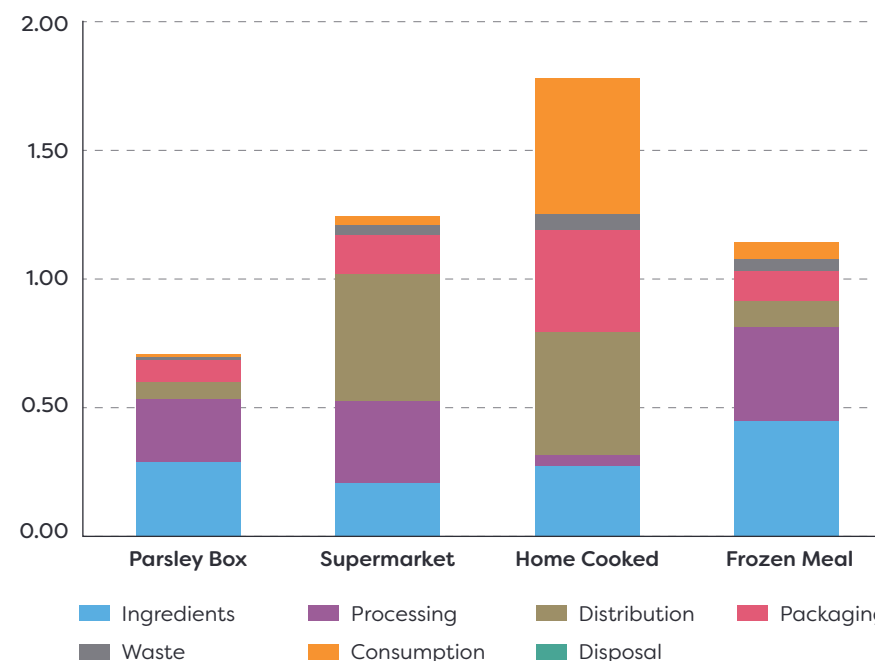
✎ Emissions from a Parsley Box Vegetarian Cottage Pie are the lowest across all stages of the LCA (except for processing where emissions are lowest for a home cooked

meal, and ingredients where emissions are lowest for a supermarket ready-meal).

✎ Again, this is because the Parsley Box meal has a higher proportion of meat (chicken) within its recipe than the supermarket meal alternative.

	kgCO ₂ e			
	Parsley Box	Supermarket	Home Cooked	Frozen Meal
Ingredients	1.40	1.33	3.18	1.83
Processing	0.24	0.37	0.04	0.42
Distribution	0.08	0.49	0.46	0.09
Packaging	0.09	0.15	0.11	0.11
Waste	0.01	0.05	0.04	0.05
Consumption	0.01	0.01	1.85	0.04
Disposal	0.00	0.00	0.00	0.00
Total	1.83	2.41	5.68	2.54

kgCO₂e by each comparison meal



Meal Comparisons Normalised

As each single serve meal have different meal weights, emissions have been normalised so that each meal represents a 270g meal (in line with Parsley Box meal weights).

Cells in **purple** = the normalised meal has a higher kgCO₂e than the equivalent Parsley Box meal.

Cells in **blue** = the normalised meal has a lower kgCO₂e than the equivalent Parsley Box meal.

	Chicken & Leek hotpot kgCO ₂ e			
	Parsley Box	Supermarket	Home Cooked	Frozen Meal
Weight (g)	270	400	412	400
Ingredients	0.43	0.52	0.31	0.33
Processing	0.24	0.21	0.03	0.25
Distribution	0.09	0.34	0.30	0.06
Packaging	0.09	0.10	0.08	0.08
Waste	0.01	0.04	0.04	0.03
Consumption	0.01	0.01	0.77	0.03
Disposal	0.00	0.00	0.00	0.00
Total	0.86	1.22	1.53	0.77

	Beef Stew kgCO ₂ e			
	Parsley Box	Supermarket	Home Cooked	Frozen Meal
Weight (g)	270	380	267	400
Ingredients	1.40	0.95	3.21	1.23
Processing	0.24	0.26	0.05	0.28
Distribution	0.08	0.35	0.46	0.06
Packaging	0.09	0.11	0.11	0.08
Waste	0.01	0.04	0.04	0.03
Consumption	0.01	0.01	1.87	0.03
Disposal	0.00	0.00	0.00	0.00
Total	1.83	1.72	5.74	1.71

	Vegetarian Cottage Pie kgCO ₂ e			
	Parsley Box	Supermarket	Home Cooked	Frozen Meal
Weight (g)	270	300	467	450
Ingredients	0.30	0.19	0.16	0.27
Processing	0.24	0.28	0.03	0.22
Distribution	0.06	0.45	0.28	0.06
Packaging	0.09	0.13	0.23	0.07
Waste	0.01	0.04	0.04	0.03
Consumption	0.01	0.02	0.30	0.03
Disposal	0.00	0.00	0.00	0.00
Total	0.70	1.12	1.03	0.69

Recommendations



Recommendations Ingredients

The largest opportunity to reduce emissions of food will be moving towards a greater share of vegan/vegetarian-based meals:

- 🌱 Plant-based meat alternatives (eg: tofu, quorn) are associated with 94.6% less emissions than beef and 76.2% less emissions than chicken.

The difficulty is that the majority of this decision is up to consumer preference.



Recommendations Distribution

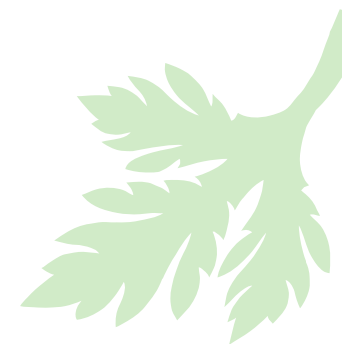


This study found that the vegetarian cottage pie was associated with the lowest emissions from distribution, because a higher proportion of ingredients are sourced within the UK.

🌱 Therefore, switching to locally sourced ingredients will decrease emission from distribution.

However, studies have shown that eating a locally sourced diet only slightly decreases your food's emissions – this is because transport is only a small proportion of total impact in comparison to land use change and farm emissions.

Looking beyond solely emissions, it is still encouraged to prioritise UK, seasonal produce and organic growers to support local communities, ensure transparent supply chains, enhanced biodiversity and animal welfare.



Recommendations Processing

84% of emissions from processing are due to gas and electricity usage at the manufacturer site.

- Switching to LED lights, reviewing the energy-efficiency of equipment and the thermal process requirements for each meal could help significantly reduce emissions from manufacturing each meal.

A switch to 100% renewable electricity could also save 0.06 kgCO₂e for each meal alone, or ~5.3% of the total footprint of each meal.

- Using the GHG Protocol market-based calculation method to work out your carbon footprint focuses on the fuel mix of your electricity supplies. Consequently, if you use renewable energy your emissions for electricity will be net zero!



Recommendations Consumption



Most emissions (up to 50%) from home-cooked meals come from the use of an oven for up to several hours for each recipe.

Previous studies show that consumer choice between heating up a ready-meal in the oven or a microwave makes a significant difference to emissions.

This study assumed that each consumer uses a microwave to heat up the Parsley Box meal. However, if the option to heat the meal in an oven (for up to 25 minutes) is used, emissions from cooking would be 0.36 kgCO₂e compared to 0.009 kgCO₂e:

- ✎ Emissions from a beef stew would increase by 19% (to 2.18 kgCO₂e).
- ✎ Emissions from a chicken & leek hotpot would increase by 41% (to 1.21 kgCO₂e).
- ✎ Emissions from a veggie cottage pie would increase by 50% (to 1.05 kgCO₂e).

Putting in place customer incentives/advice to use the microwave option over the oven, or taking away the option to heat the meal in the oven, should ensure emissions from consumption do not increase.



Parsley Box

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www.parsleybox.com



Our **Parsley Box Promise** means if you're not happy, return your order to us and we will offer you a refund.

