APPENDIX (ENGLISH ONLY)

Calculation methodology	
Products for which the climate footprint is calculated	The climate footprint ($kgCO_2e$/kg product) for the below 7 products have been calculated: • Svampebøffen (DK) / Mushroom Patty • Dunsen (DK) / Pea Fritters • Plantebaseret farsbrød (DK) • Falafel Italiano (DK) / Italian Falafels • Rødbedebøffen (DK) / Beetroot Patties • Dild-dellen (DK) / Dill Cakes • Plantefarsen (DK)
Accounting standard and approach	The GHG Protocol's methodology on product life cycle accounting has guided the calculation of the product footprint calculations. The attributional approach to life cycle accounting (following GHG Protocol's prescription) has been used, which means that all processes in the production are considered, and their combined climate impact is attributed to the product in question. The attributional approach only accounts for emissions and removals of greenhouse gases generated during a product's life cycle and <u>not</u> avoided emissions or actions taken to mitigate released emissions.
Functional unit	The functional unit is what is investigated and what all resources and emissions are compared against. These calculations are based on the following functional unit: 1 kg of packaged food product delivered to the store on the Danish market.
Scope and system boundary	The climate footprint of the product from cradle to store has been assessed, which means that all steps of the life cycle have considered from: (1) ingredients, (2) upstream transportation, (3) production, (4) packaging, (5) warehouse, (6) downstream transportation up until the product reaches the stores. Hence, the calculated climate footprints do not consider components outside the system boundary e.g., lighting and refrigeration at the grocery store, transport from grocery store to home, or cooking of product.

	Within the defined system boundary, the calculations most importantly omit: • Capital goods (e.g., manufacture of machinery, trucks, infrastructure) • Waste in production (e.g., food waste from processing)
Included greenhouse gases	The total climate impact is given in CO_2 equivalents and the different GHGs are weighted according to the GWP100 standard.
Inventory version	Version 1.1
Time period	The calculations (version 1) were conducted in 2020 by The Footprint Firm, but updated (version 1.1) in 2021 with following changes: • Product carbon footprint of Plantefarsen (DK) was conducted • Italian Falafels (previously known as Belugaboller) was updated due to the ingredient change • Energy usage in production was updated to include gas used for ovens and increased production capacity from automating shaping of products • Select emission factors (e.g., mushrooms) were updated based on recommendations from Mindful Food Solutions' external validation of version 1 calculations (cf. review from 24th of May 2021) • Emissions of 0,001 $kgCO_2e/kg$ was added to frozen ingredients based on recommendations from Mindful Food Solutions' external validation of version 1.1 calculations (cf. review from 5th of October 2021)

Process step	**Description**	**Calculation methodology**	**Data sources**	**Note**

Ingredients	In this life cycle step, the CO_2e footprint for all the ingredients that go into one of PerfectSeason's 7 products have been calculated. Each product consists of 14-17 different ingredients. As ingredients are often the foremost emission source of food products, every ingredient's CO_2e footprint have been sought accounted for.	Calculation method: Based on the average-data method. Calculation formula: CO_2e from ingredients per product=∑(mass of ingredients (kg) X emission factors for ingredients ($kgCO_2e/kg$))	Activity data: *Mass of ingredients* going into the products has been acquired directly from PerfectSeason following their product recipes. Emission factors: Care has been taken in using quality emission factor from credible life cycle databases, which is why ecoinvent (v. 3.7.1, ReCiPe Midpoint H) primarily has been applied. However, given the variety and specificity of PerfectSeason's ingredients, ecoinvent fall short, and other sources was applied, for example The Big Climate Database from CONCITO and academic research studies. To the extent possible, emission factors that corresponds to the country or region where PerfectSeason source their ingredients from has been applied as the CO_2e-intensiveness of activities can vary greatly across geographies. Next, world average emission factors were applied. For frozen ingredients, an additional 0,001 $kgCO_2e/kg$ was added based on recommendation from Mindful Food Solutions (review dated 5th of October 2021).	In instances where the emission factor for a specific ingredient was not available, for example organic psyllium husks, emission factors for similar ingredients were used as an alternative. In the instance of psyllium husks, another fiber rich crop, sunn hemp, was used. However, this was rarely the case for any of the primary ingredients.
Upstream transportation	In this life cycle step, the CO_2e footprint for upstream transportation was calculated. To do so, the mass and distance travelled for each ingredient (from country of origin to production site in Copenhagen) and the mode of transportation was mapped. PerfectSeason source ingredients from all over the world and so we	Calculation method: Distance-based method, which involves determining the (1) mass, (2) distance, and (3) transportation mode of each shipment, then applying the appropriate mass-distance emission	Activity data: *Mass of ingredients* going into the products has been acquired directly from PerfectSeason following their product recipes. The *transportation distances* and *mode of transportation* (heavy goods vehicle and container ship) are estimated based on the country of origin of the sourced ingredients and the location of PerfectSeason's production site in Copenhagen. Online maps of	Contingent on the transportation route, the calculations include more than one mode of transportation. For all land transport, it is assumed that transport is by a diesel-driven heavy goods

	have calculated the carbon footprint from each ingredient's unique route.	factor for the vehicle used. Calculation formula: CO_2e from upstream transport=∑(mass of ingredients (tonnes) X distance travelled in transport leg (km) X emission factor for transport mode ($kgCO_2e/tkm$))	transportation routes (port to port travel distances) have been used. Emission factors: Emission factors from DEFRA (2020) were collected for each transportation mode given in $kgCO_2e/tkm$.	vehicle with an average laden. When an ingredient is sourced from multiple locations, an average of the CO_2e footprint of transport from each location have been taken.
Production	In this process step, the CO_2e footprint of the production of the 7 products are calculated. PerfectSeason do their own recipes and outsource production to Madsynergi.	Calculation method: Site-specific method, which involves determining the location specific activity data and applying the appropriate emission factor. Calculation formula: CO_2e from production per product=∑(electricity consumed for kg product (kWh) X emission factor for electricity ($(kgCO_2e)/kWh$) + ∑(propane consumed for kg product (kg) X emission factor for electricity ($(kgCO_2e)/kg$)	Activity data: *Electricity consumption* collected from the electricity bill of PerfectSeason's production supplier (Madsynergi) coupled with mass of product produced. *Propane consumption* collected from bill of PerfectSeason's production supplier (Madsynergi) coupled with mass of product produced. Emission factors: Emission factor for Danish electricity collected from IEA (2019), and emission factor from DEFRA (2021) was collected for propane.	Madsynergi is applied as a representative production unit for the entirety of PerfectSeason's production, and data has been collected for an average month's production. The electricity consumption in production has been equally allocated to all products, while the propane consumption for the oven is assumed the same for all products except for Plantefarsen (DK) since it is not heated in the oven. The calculation is limited to only take the CO_2e of energy in production into account, and not other emission sources such as waste.

Packaging	In this process step, the CO_2e that stems from the packaging of the products have been calculated. Next to ingredients, packaging is often an emission hotspot for food products. Therefore, a high level of detail has been sought. A product's amount and type of packing depends on which channel the product is sold through. PerfectSeason sells to B2B (e.g., Aarstiderne), retail (e.g., Coop), and to food services. Thus, the unique packing configurations have been considered for each of the 7 products.	Calculation method: Company-specific method, which involves determining the PerfectSeason's specific use of packaging and applying appropriate emission factors. PerfectSeason use different constellation of packing depending on sales channel, the stated CO_2e footprint is an average of the different constellations. Calculation formula: CO_2e from packaging per product=∑(mass of wrapping (kg) X emission factors for packing (($kgCO_2e$)/kg)	Activity data: The packaging *materials*, *quantities*, and *configurations* were acquired by PerfectSeason. Emission factors: The emission factors for packing materials are primarily sourced from ecoinvent (v. 3.7.1, ReCiPe Midpoint H) except for the emission factor for PerfectSeason's recycled sleeves, which is derived from a DTU study (Hillman et al., Climate Benefits of Material Recycling, 2015).	
Warehouse	In this process step, the CO_2e footprint of the warehousing of PerfectSeason's 7 products are calculated based on the electricity consumption of one of PerfectSeason's main warehousing suppliers.	Calculation method: Site-specific method, which involves determining the location specific activity data (e.g., electricity usage for warehousing) and applying the appropriate emission factor. Calculation formula: CO_2e from warehousing=∑(electricit	Activity data: *Electricity consumption* collected from the electricity bill of PerfectSeason's main warehousing supplier (JN Spedition). To calculate PerfectSeason's share of electricity consumption at JN Spedition's warehouse, the *average space* allocated to PerfectSeason at the warehouse have been used. Emission factor: Emission factor for Danish electricity collected from IEA (2019).	The CO_2e of warehousing is limited to electricity consumption only.

		y consumed for kg product (kWh) X emission factor for electricity ((kg CO2e)/kwh)		
Downstream transportation	Lastly, the CO_2e emissions that stem from transporting the finished products from production site or warehouse to the seller were calculated. To do so, data from PerfectSeason's management system were used to map all transportation routes to get their distance and then applied the emission factors for the vehicles used for transportation.	Calculation method: Distance-based method, which involves determining the (1) mass, (2) distance, and (3) mode of each shipment (here only heavy goods vehicle), then applying the appropriate mass-distance emission factor. Calculation formula: CO_2e from upstream transport=∑(mass of ingredients (tonnes) X distance travelled in transport leg (km) X emission factor for transport mode ($kgCO_2e$/tkm))	Activity data: *Mass of products* was collected by PerfectSeason based on their sales management system. *Distance* travelled was calculated based on the starting and destination locations given by PerfectSeason's sales management system and *mode of transportation* was given by PerfectSeason's two primary distributers JN Spedition and SFT. Emission factors: Emission factors for each transportation mode was taken from DEFRA (2020) and given in $kgCO_2e$/tkm.	

Links for sources

DEFRA (2020): https://www.gov.uk/government/publications/greenhouse-gas-reporting-conversion-factors-2020

DEFRA (2021): https://www.gov.uk/government/publications/greenhouse-gas-reporting-conversion-factors-2021

IEA (2019): https://www.iea.org/data-and-statistics/data-product/emissions-factors-2021

CONCITO's Big Climate Database: https://denstoreklimadatabase.dk/en

Ecoinvent: https://ecoinvent.org/the-ecoinvent-database/