

PAS2050 CASE STUDY

Applying PAS2050 to a complex product: Cottage Pie Ready Meal

To support the development and test the robustness of PAS 2050 Defra has funded a series of projects to assess the carbon footprints of several food products over all stages of the food supply chain, from raw materials production through to disposal (see Figure 1).



Figure 1: Stages required in the GHG assessment of a food product

The work presented on the life cycle GHG emissions of a ready meal cottage pie links together the findings from three different Defra-funded projects.¹ The ready meal cottage pie assessed is a complex product with over 20 different ingredients, some of which are present in very small quantities. The main ingredients of the cottage pie are mashed potato and cooked beef, which together make up over 70% of the cottage pie (in mass). Figure 2 shows a flow diagram of the life cycle of this ready meal, grouped in the life cycle steps Raw Materials, Manufacture, Distribution and Retail, Consumer Use and Disposal/Recycling as shown in figure 1.

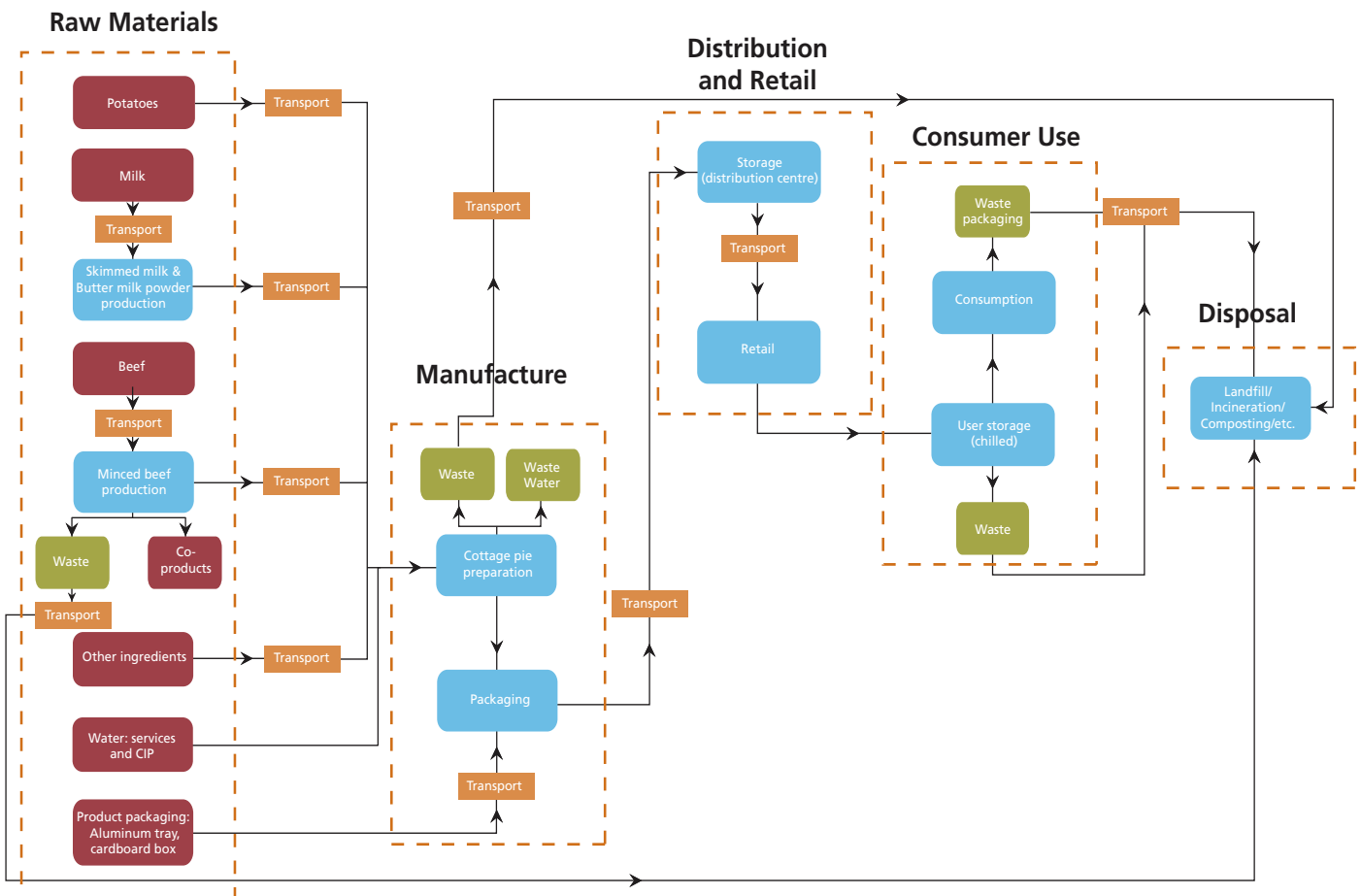


Figure 2: Flow diagram of the life cycle stages of a cottage pie ready meal

¹ ADAS and Campden BRI looked at the impact of the agricultural and manufacturing stages of the cottage pie in FO0404 "Scenario Building to Test the PAS", while researchers from Brunel University studied the contributions of the retail sector to the carbon footprint of the cottage pie in FO0405 "Greenhouse Gas Impacts of Food Retailing". Finally, the impact of consumer use and final disposal of the ready meal was assessed by Campden BRI in FO0406/0409 "Understanding the GHG Impacts of Food Preparation and Consumption in the Home".

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The impact of all life cycle stages on the overall carbon footprint of the ready meal are shown in figure 3. Even though the actual figures may change depending on the assumptions made, general trends are clear: the influence of manufacturing, retail and the consumer use phase are about equally important, while the production of raw materials, including agricultural operations is the “emission hot-spot”, contributing over 60% to the life cycle GHG emissions of the ready meal.

Although final disposal of the cottage pie and of the meal itself (in case it is not eaten) contributes only a small amount to the carbon footprint of the cottage pie, it is important to stress that wasting the product in its entirety results in unnecessary emissions up the supply chain.

Contribution of life cycle stages

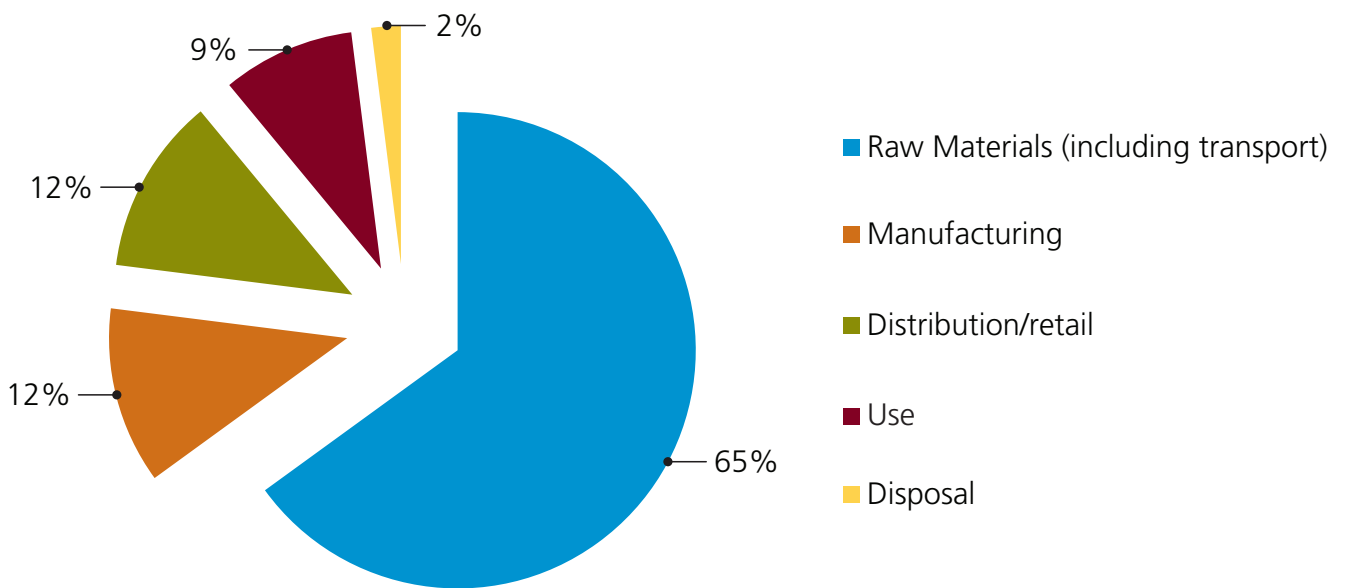


Figure 3: Impact of the life cycle stages on the carbon footprint of a cottage pie ready meal

ADAS have worked together with farmers and growers to assess the impact of the agricultural stage, and Campden BRI have estimated the greenhouse gas emissions associated with the production of other raw materials. In figure 4, the contributions to the GHG emissions of the raw materials are shown.

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Raw materials

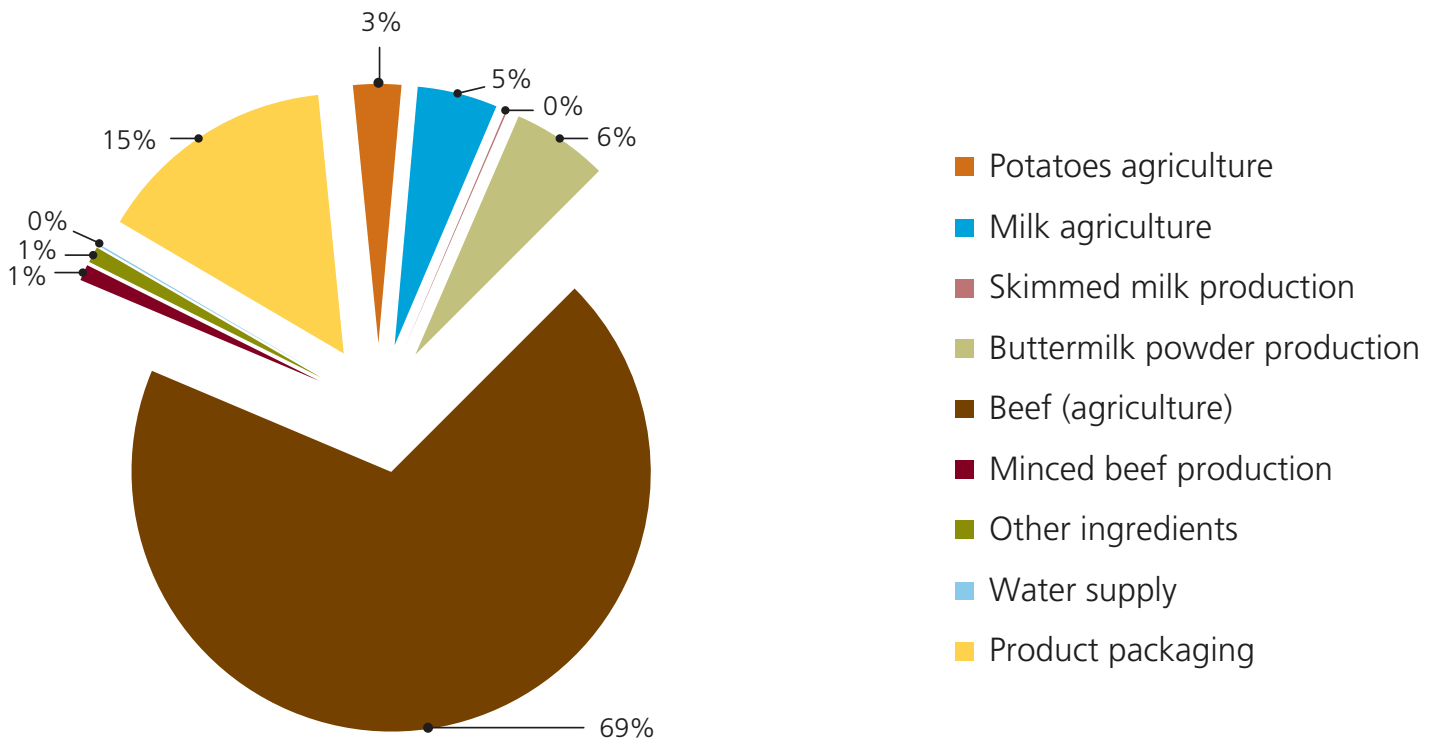


Figure 4: Contribution of the different raw materials to the GHG emissions of this life cycle step

As shown in figure 4, cattle rearing (Beef (agriculture)) makes the biggest impact on the overall carbon footprint of cottage pie raw materials. Cattle manure releases carbon and nitrogen gases which contribute to the carbon footprint. Also, fertilisers used on grass or for the growing of fodder for winter feed release nitrous oxide, which is almost 300 times as damaging as carbon dioxide (global warming potential (GWP) of N_2O : 298 (IPPC 2007)).² The main factor, however, is that ruminants generate methane as they digest their feed.

Interestingly, the method of preparation of the cottage pie has a big impact on the contribution of this life cycle stage to the overall life cycle of the ready meal. Calculations for figure 3 were carried out assuming that a single portion ready meal was heated in an electric fan oven. Figure 5 shows that if a microwave is used instead to reheat the cottage pie, the carbon footprint of this stage drops dramatically, from 9% to 2% of the total GHG emissions. Thus concluding that using the microwave to heat small portions reduces the GHG emissions significantly.

² (IPPC 2007). Climate Change 2007: The Physical Science Basis. Contribution of Working Group I to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change. Solomon, S. et. al.. Chapter 2, Table 2.14.
PAS2050:2008. PAS 2050 – "Specification for the assessment of the life cycle greenhouse gas emissions of goods and services", BSI, 2008.

Consumer Use

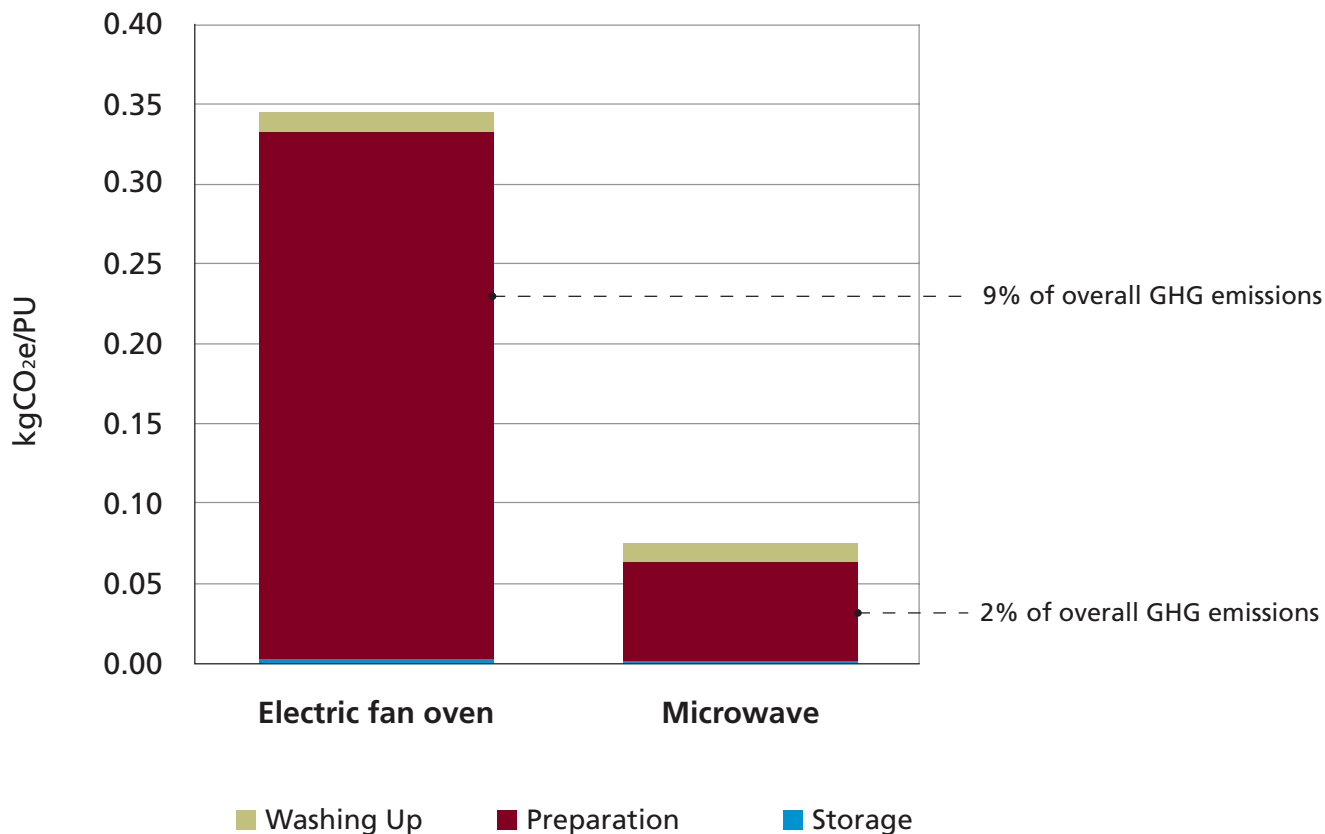


Figure 5: Impact of method of preparation on the carbon footprint of the consumer

The study shows that it is possible to use the PAS2050 method to assess the GHG emissions of a complex food product. Because this is one of the first products assessed in accordance with the new specification, there was not a great deal of secondary data available for the calculations. Hopefully this will change, as the GHG emissions of more products are assessed.

The three Defra funded projects on product carbon footprinting throughout the supply chain are ongoing. Final reports containing more details on the calculations carried out for the lifecycle carbon footprint of the cottage pie ready meal, as well as data on the performance of other food products, will be made publicly available at a later date.

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