TRansition paths to sUstainable legume based systems in Europe

Background information and data for the TRUE press release "Plant protein can contribute to fight hunger and global warming" from 13.10.2017

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In terms of plant protein, Europe is reliant on imports of soya bean from South America amounting to a staggering 37 million tonnes per year, almost all of this being used for animal feed (Murphy-Bokern et al.,2017). In contrast, the area of legume crops grown in Europe has decreased by approx. 62% over the past 50 years in direct contrast to livestock production which has increased from 17 to 40 million tonnes (Helming et al., 2014). This reflects a change in our eating habits where we now consume significantly more meat at the expense of plant protein. As an example, the consumption of meat in Europe (in terms of kcal per person per day) has increased since the early 1960s by approximately 76% (Da Silva et al., 2009).

The European Research Project TRUE (Transition paths to sustainable legume based systems in Europe) is aimed at addressing this imbalance in protein production by persuading growers, producers and consumers of the significant environmental, economic and nutritional benefits of legume crops. Initial results from this study by Trinity College Dublin students Shauna Maguire and Conor O'Brien, under the supervision of Prof. Mike Williams, score dietary protein sources in terms of both their environmental cost of production (greenhouse gas emissions, groundwater pollution and land requirement) and their nutrient content. In all cases plant protein sources (legumes) show the highest nutrient density and the lowest environmental production costs.

Applying these environmental and nutritional indices to a range of diet scenarios, Shauna Maguire has calculated the benefits that occur in terms of reduced greenhouse gas emissions and increased nutrient densities where the proportion of animal protein consumed is reduced. Such quantitative estimates of sustainable agriculture will hopefully allow a more informed choice for the consumer when considering the main protein component of their diet.

References:

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Murphy-Bokern, D., Peeters, A. and Westhoek, H. (2017). The role of legumes in bringing protein to the table. In: Legumes in Cropping Systems (eds. D.Murphy-Bokern, F.L. Stoddard and C.A. Watson). CABI publishers, UK. pp 18-36.

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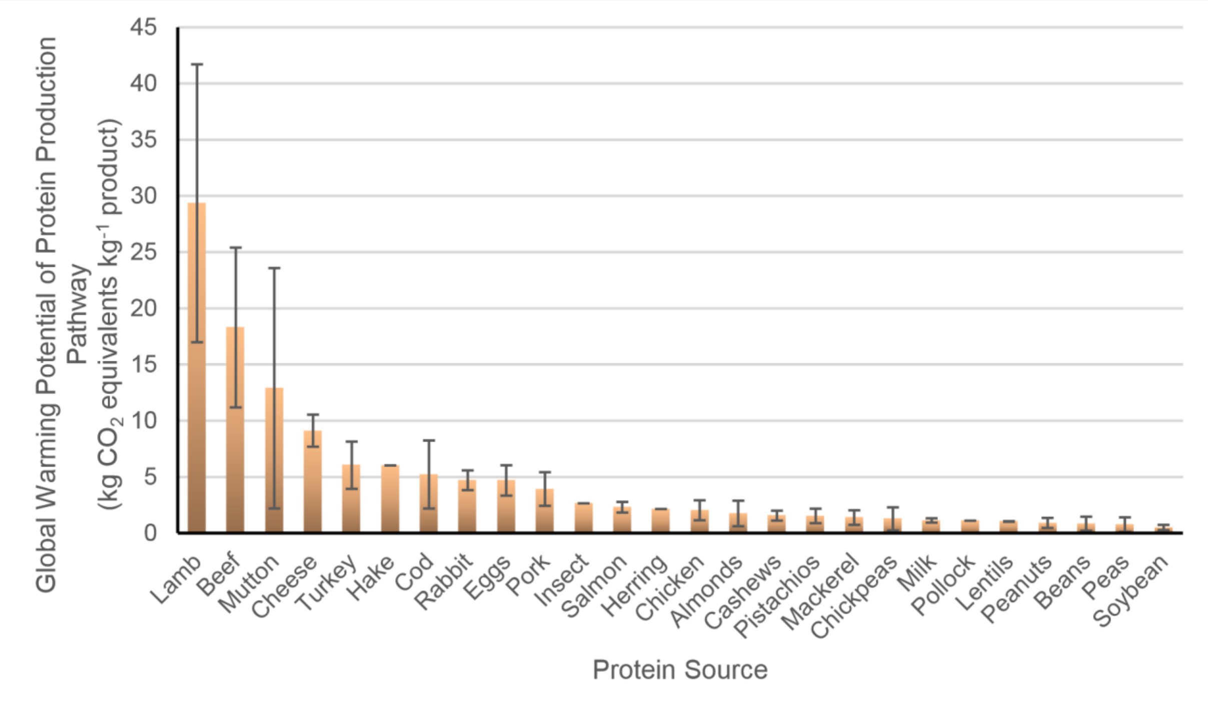

Figure 1: The Global Warming Potential of protein production pathways in terms of greenhouse gases emitted to the atmosphere. Data for farm to farm-gate production pathways collated from 123 peer-reviewed life cycle analyses.

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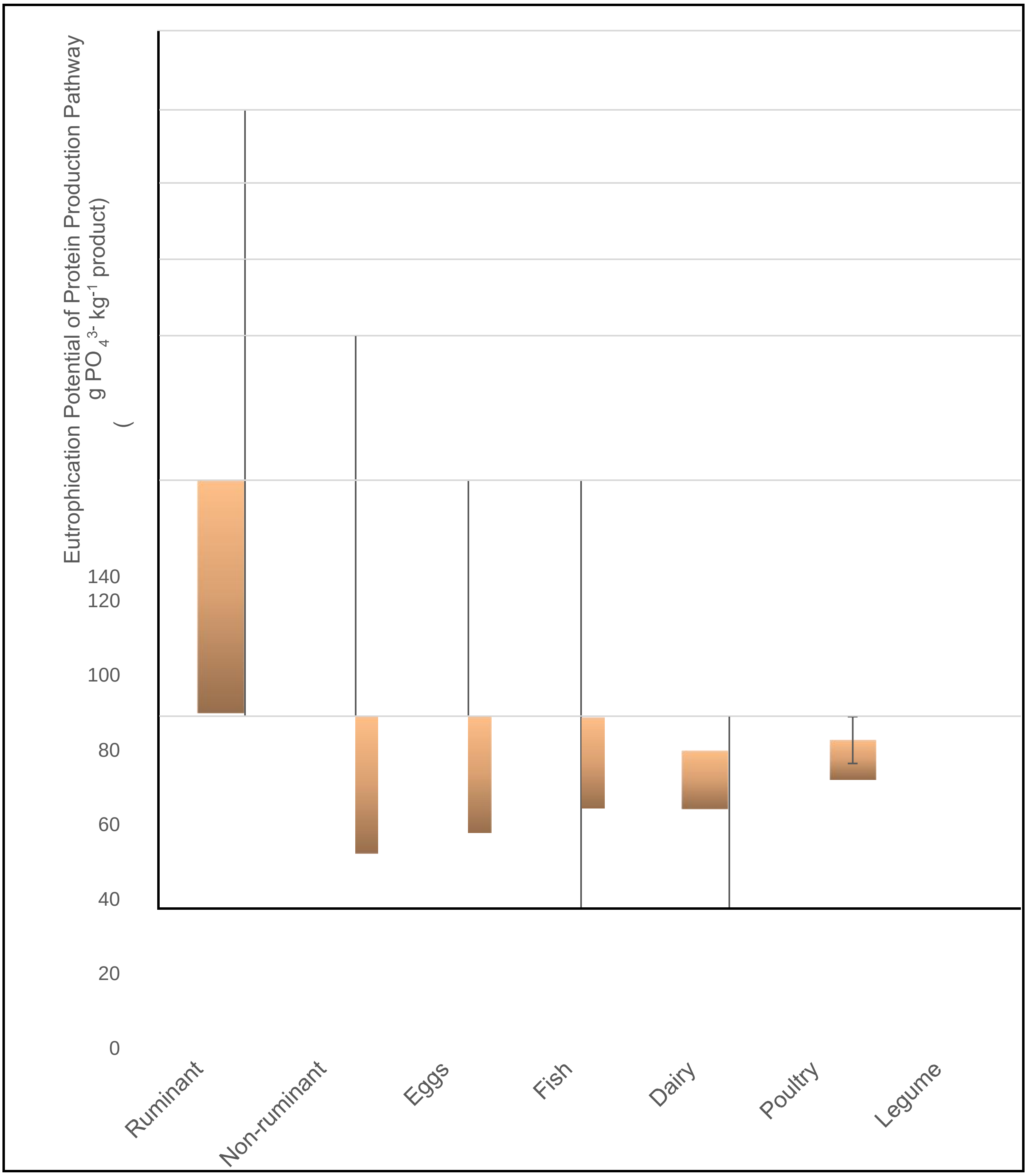

Figure 2: The Eutrophication Potential of protein production pathways in terms of nutrients released to groundwater. Data for farm to farm-gate production pathways collated from 123 peer-reviewed life cycle analyses.

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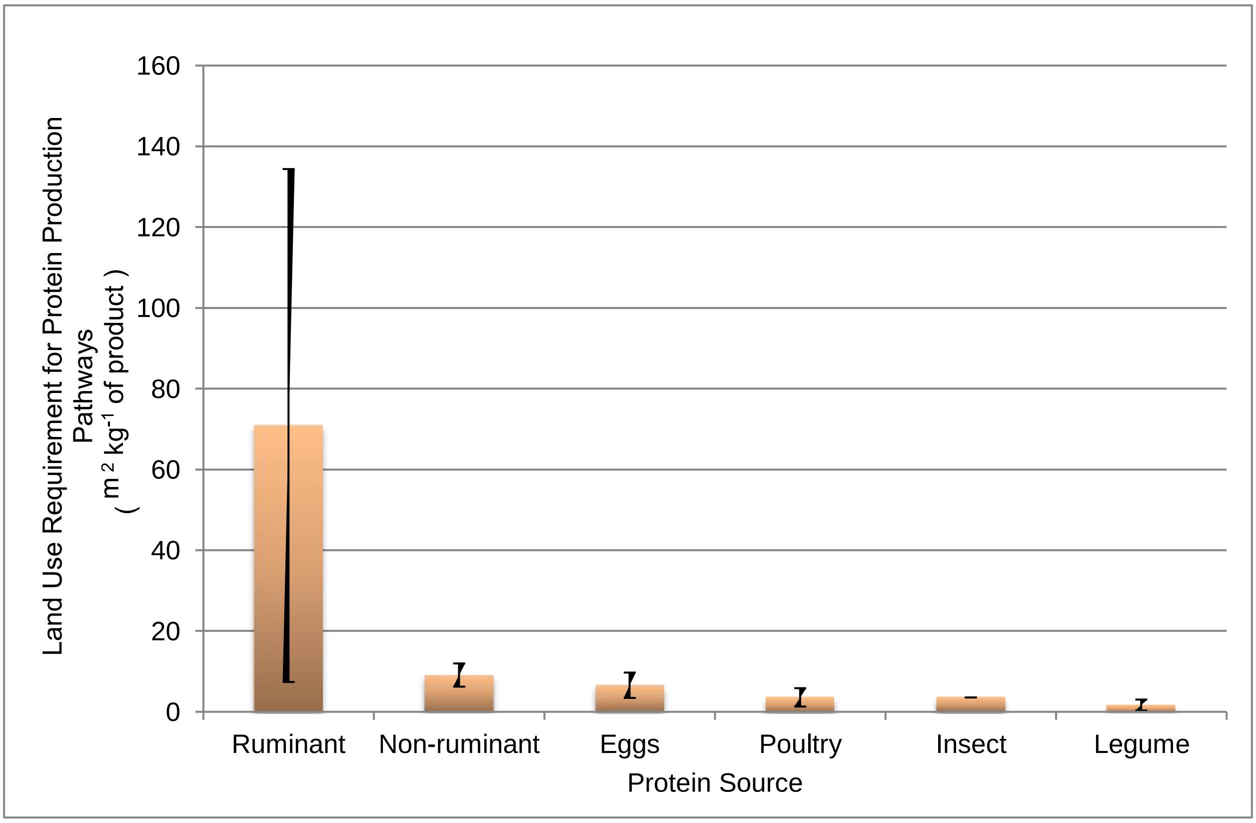

Figure 3: The Land-Use Potential of protein production pathways in terms of land area utilized. Data for farm to farm-gate production pathways collated from 123 peer-reviewed life cycle analyses.

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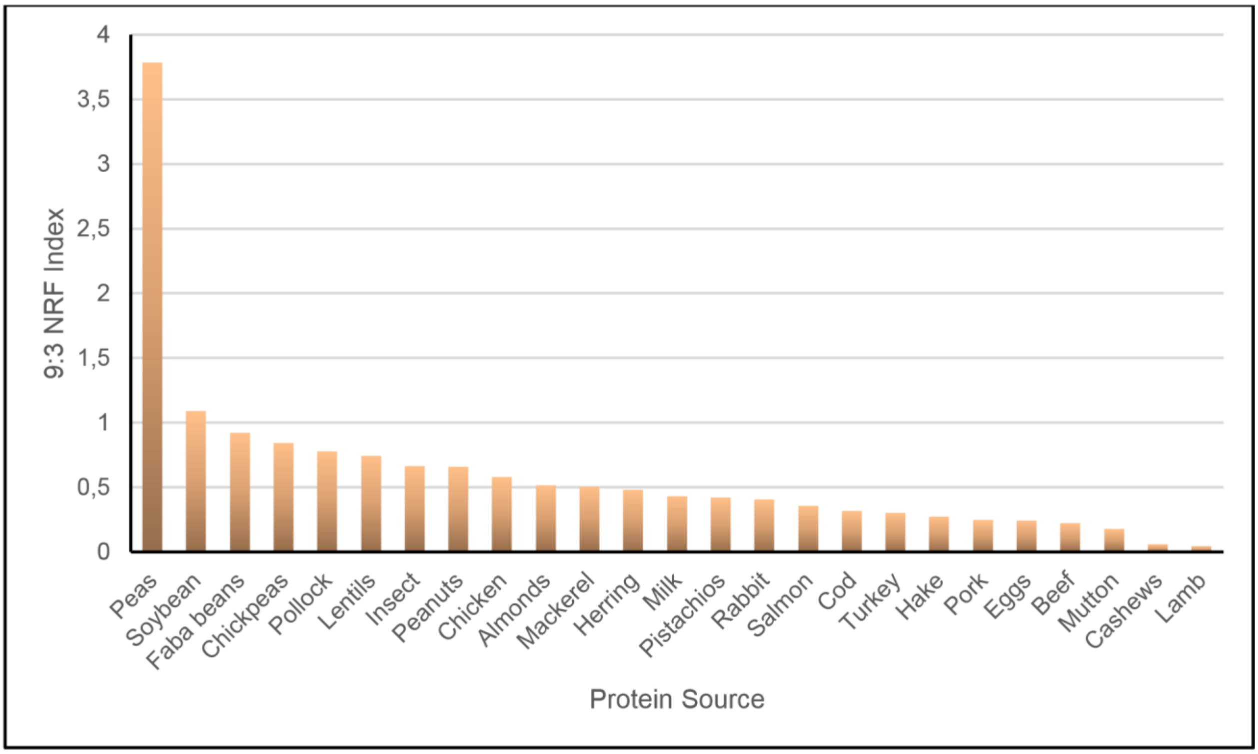

Figure 4: The 9:3 Nutrient Rich Food Index score (Drewnowski, 2009) for a variety of dietary protein sources. Nutrient values obtained from the United States Department of Agriculture Food Database. NRF scores were calculated per 100g of food product where the NRF is the unweighted sum of the percentage recommended daily value (DV) for 9 nutrients to encourage (protein, fiber, vitamins A,C and E, calcium, iron, magnesium and potassium) minus the percentage recommended daily value for 3 nutrients to limit (sugars, salt and total fat). DV scores were capped at 100% of recommended values to prevent skewed data resulting from foods containing a high amount of one particular nutrient. Final values were expressed per 100 kcal.

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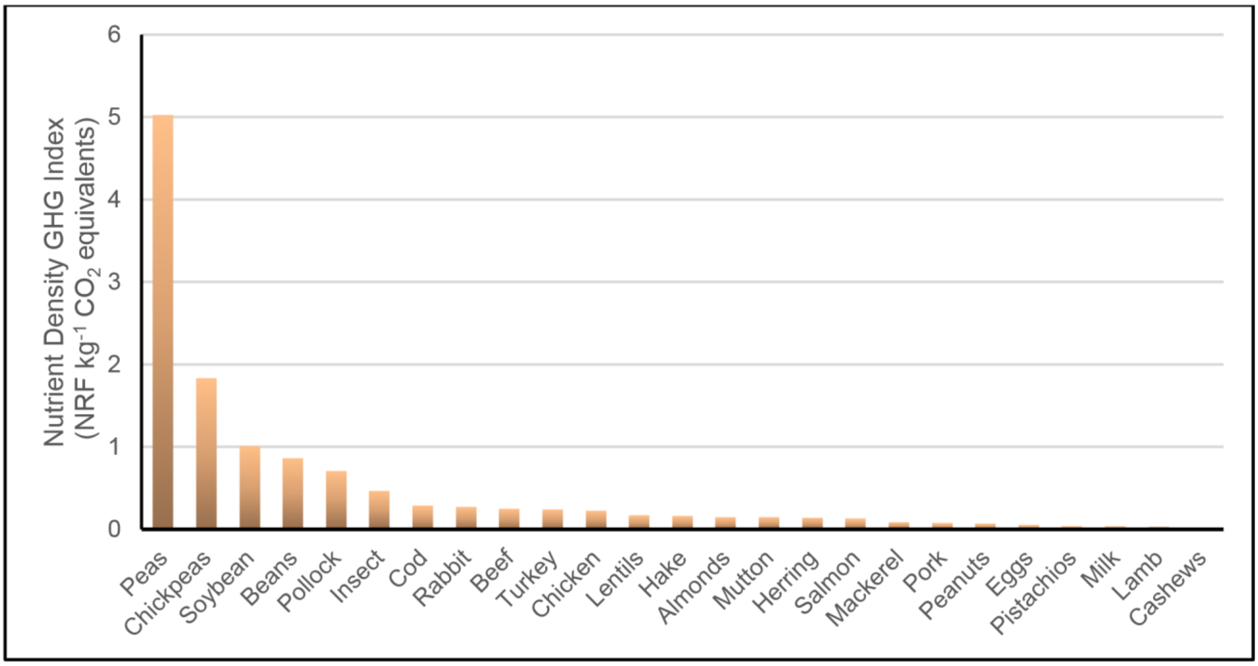

Figure 5: The Nutrient Density GHG Index for a range of protein production pathways. The NDGHG Index relates the nutrient rich food index (NRF) of a protein source with the global warming potential of that protein source's production pathway. In this case data from Figures 1 and 4 were combined to produce the NDGHG values illustrated above.

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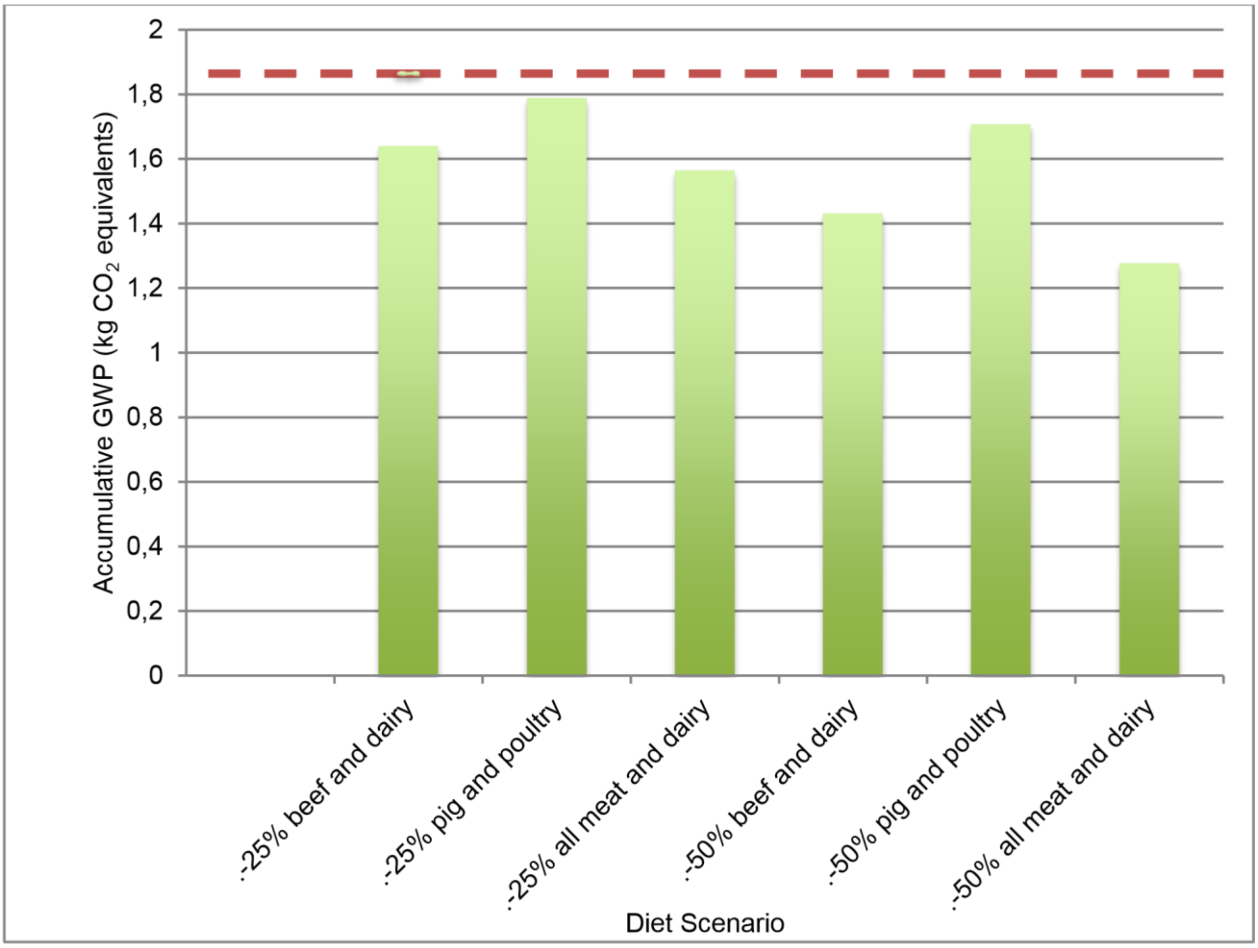

Figure 6: Change in the accumulative Global Warming Potential of a model European diet when the proportion of meat and dairy protein is reduced. Red line represents the control value. Diet scenario data is taken from Westhoek et al., (2015).

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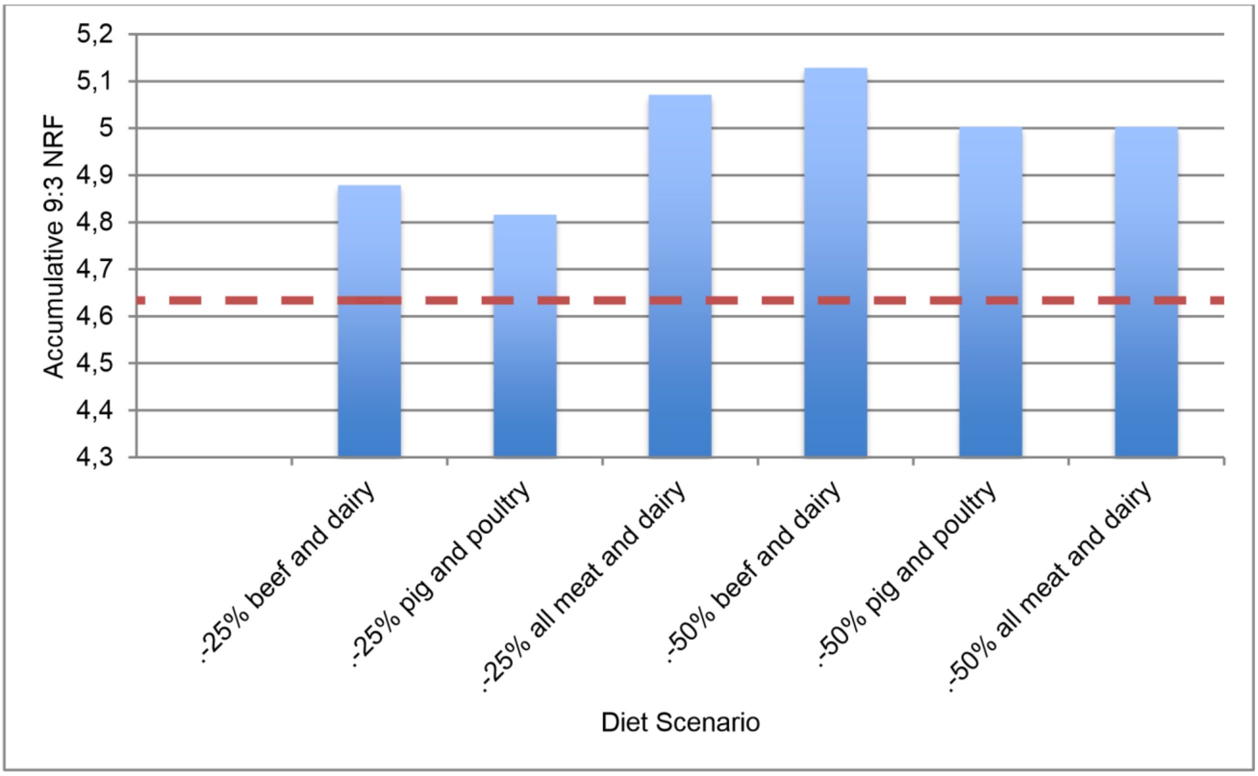

Figure 7: Change in the accumulative 9:3 Nutrient Rich Food Index of a model European diet when the proportion of meat and dairy protein is reduced. Red line represents the control value. Diet scenario data is taken from Westhoek et al., (2015).

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