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Assessing the Viability of a Livewell and Deforestation Free School Menu in Wales

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Report For

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Preface, recommendations, political opportunities and examples of best practice – WWF Cymru & Size of Wales

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Preface from Size of Wales

One of the key factors driving the global climate and nature emergency is deforestation and habitat loss. The International Panel on Climate Change is clear that without our forests, we will fail to limit global warming to 1.5°C.

Wales needs to play its part by changing what it buys, consumes and invests in, since these choices can drive unethical practices and environmental degradation overseas. Ensuring supply chains are fair, ethical and sustainable is important for a number of reasons, including Wales' obligation to establish itself as a Globally Responsible Nation as defined in the Well-being of Future Generations Act for Wales.

More than 50% of global forest loss and land conversion is attributable to the production of agricultural commodities and forestry products demanded by consumers. Despite increasing initiatives, including certification, corporate commitments and market incentives aimed at halting the loss of forest and habitats, the rate of commodity-driven land use change does not appear to be declining, and the negative impacts on Indigenous Peoples, local communities and nature continue.

Wales' deforestation footprint

Size of Wales, in collaboration with WWF Cymru and RSPB Cymru published a report gathering data on 'Wales and Global Responsibility'.[1] The report, for the first time, provided data on the impact that consumption habits in Wales have on habitats and people overseas. Wales imports significant quantities of agricultural and forest commodities, many of which are driving deforestation and habitat destruction overseas. Whether that is commodities for the production of soymeal for livestock feed in Wales, palm oil used in everyday supermarket items such as bread or even cocoa used in many Welsh treats and desserts.

THE KEY FINDINGS SHOWED THAT:

- An area equivalent to 40% of the size of Wales (823,000 hectares) was required overseas to grow Welsh imports of cocoa, palm, beef, leather, natural rubber, soy, timber, pulp and paper in an average year between 2011-2018.
- 30% of the land used to grow Welsh imports of commodities is in countries categorised as high or very high risk for social and deforestation issues. This means commodity supply chains supplying Wales in these countries risk deforestation, conversion of natural ecosystems and/or social issues, such as child or forced labour or the abuse of Indigenous Peoples' rights.
- Palm is the commodity most likely to come from high or very high-risk countries for deforestation and/or social issues, followed by soy.
- Wales imports 190,000 tonnes of soy a year. Soy is mostly imported into Wales in the form of meal and beans for livestock feed – 80% of total Welsh soy imports. The Welsh poultry industry is estimated to be responsible for consuming 48% of Wales' imported soy feed for livestock, followed by dairy (20%) and sheep (19%).
- Wales imports 51,000 tonnes of palm a year, mostly in the form of palm kernel expeller and oilcake (53% of total), which is an ingredient in livestock feed. A further 27% of imports are palm oil, which is used in many processed foods, such as biscuits, cakes and confectionery, and personal hygiene products (e.g., soap).
- Wales imports 12,000 tonnes of beef a year. Most beef imported into Wales is fresh or chilled (53%). The rest is frozen or in processed meat products such as corned beef. Wales has a higher proportion of its beef land footprint in Brazil compared to the rest of the UK (15% of total versus 12%). This is due to higher levels of corned beef consumption in Wales, which nearly always comes from Brazil. In high and very high-risk countries from which Wales is importing commodities, there are 2,800 species threatened with extinction such as the northern tiger.
- The greenhouse gas emissions (GHG) associated with the conversion of natural ecosystems and changes in land cover for the production of Welsh imports of soy, cocoa, palm and natural rubber total 1.5 million tonnes C02e each year. This is equivalent to 4% of Wales' total estimated domestic and imported goods carbon footprint, or 22% of the GHG emissions from transport in Wales.

1 https://www.wwf.org.uk/walesandglobalresponsibility

It is evident that many of the commodities we import into Wales that are driving deforestation overseas, are food system commodities. **There is a clear role for public policy in Wales, via procurement practices for example, to help ensure that the food we serve on public plates in Wales is deforestation and conversion free. This is important not just from a climate and nature perspective,** but also from an economic and social perspective, particularly in terms of ensuring that supply chains are free from child or forced labour or the abuse of Indigenous Peoples' rights.

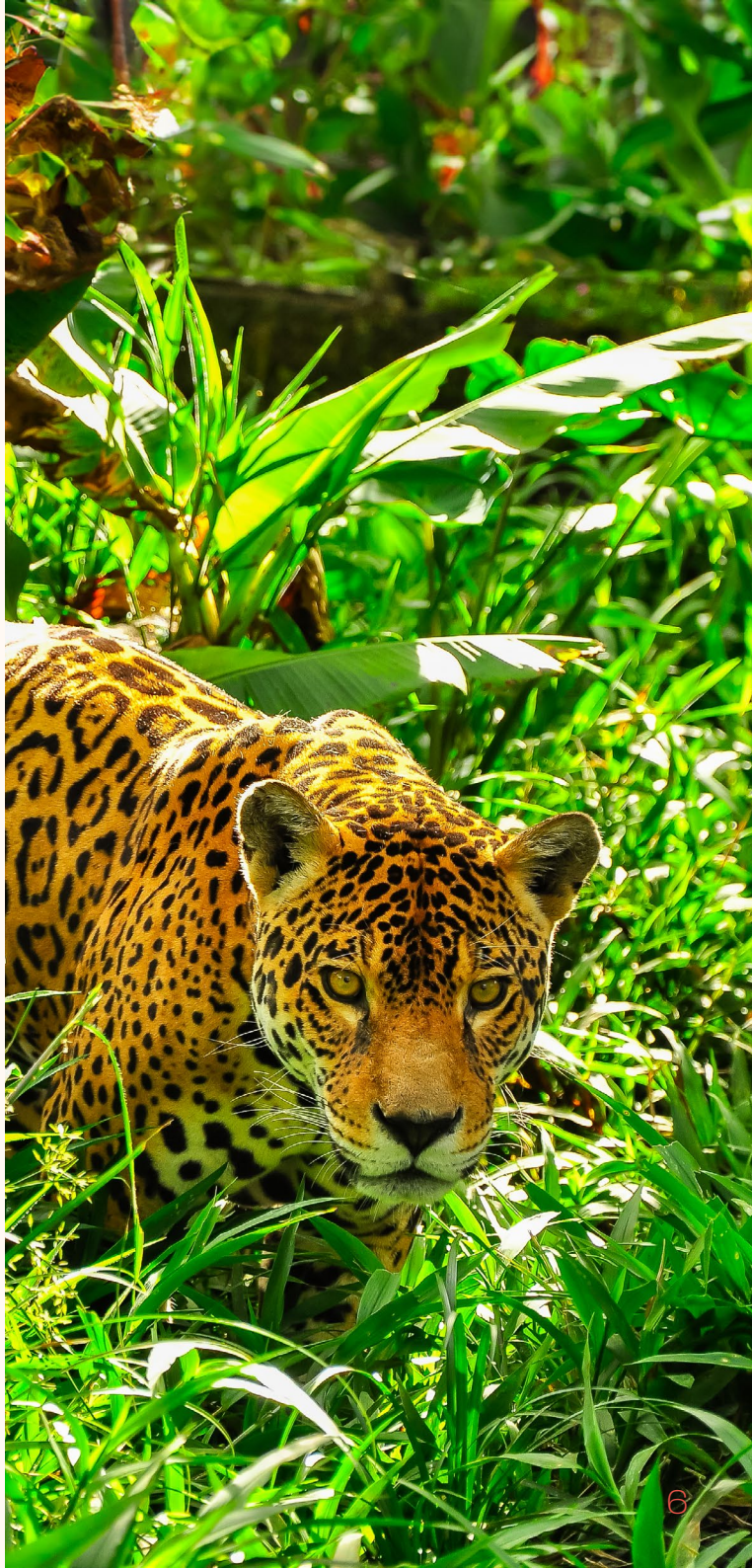
In the Net zero carbon status by 2030 report, it states that between 2021-2022, *'suppliers are sent a strong signal regarding future low carbon requirements and staff are trained.'* We have anecdotal evidence that procurement teams – and those making procurement requests – do not always ask questions on the provenance of goods and services nor do they ask for ethical certifications, including Fairtrade. This is despite the fact that the Welsh Government has in place a Sustainability Risk Assessment for contracts over £20K and that public bodies should be using procurement to contribute to their well-being objectives, including being a globally responsible nation and S6 biodiversity duty.

However, there is emerging good practice across Wales. The new Welsh Public Sector Collaborative Food Group Food Framework, led by Caerphilly Council on behalf of over 16 Councils and public sector bodies for example, which covers schools and civic sites etc. has embedded sustainability and deforestation free criteria within the tender framework for new contracts – this practice should be standardised, Wales-wide, across the public sector.

One way of decarbonising the public sector would be to embed *Deforestation Free (DF) Procurement* criteria across the public sector as standard. Other countries and States are already doing or proposing legislation to this effect. For example, France has a Zero Deforestation strategy for all public sector procurement and the State of New York has passed the Trees Act in both houses and is awaiting sign off from the Governor. This should be a key focus for the statutory guidance of the newly adopted Social Partnership and Public Procurement Act. The globally responsible goal is the most complex for public bodies to comprehend how to apply to its procurement policies and where there is known inconsistency between policy and practice. Embedding DF criteria across public sector procurement would not only enable the practical application of this underrepresented goal, but help public bodies meet their well-being objectives across all seven goals (see table below).

Furthermore, we need a clear commitment and plans to reduce soy and palm demand in agriculture by supporting the development of alternative feed and simultaneously reducing demand for animal products and meat in Welsh diets. This should be achieved by promoting less but better-quality meat, transitioning diets to more plant-based proteins, and reductions in ultra processed foods (UPFs). These actions are not just required to address the overseas footprint of Wales' animal agriculture, but also to address the impacts our current food system has here in Wales. This should be included in the final version of the Sustainable Farming Scheme (SFS) and food strategies across the nation.

Benefits of Deforestation Free Procurement	Related well-being goals
Supporting local, sustainably produced food would enrich communities and support livelihoods / just transition.	• Prosperous • Vibrant culture and thriving Welsh language
Supporting and promoting livelihoods in the Global South and upholding Indigenous Peoples rights through sustainable sourcing and fair trade.	• Globally responsible • More equal • Healthier – Indigenous Peoples have been the guardians of tropical forests for millennia and forests protected by them store more carbon and contain more biodiversity than those unprotected.
Ensuring that procurement decisions in Wales do not directly contribute to forest/habitat loss. Protecting biodiversity means that earth's ecosystems can function healthily and deliver the ecosystem services that support life, e.g. carbon sequestration and climate regulation, purification of air and water, provision of shelter, food and medicine.	• Resilient • Globally responsible • Healthier
Addressing the GHG emissions our consumption generates overseas i.e. not just the GHG production emissions we generate in Wales.	• Resilient • Globally responsible • Healthier
Reducing meat intake and the consumption of ultra processed foods. Increasing intake and variety of nutritious, plant-based foods, such as protein-rich legumes and pulses and promoting new horticultural practices.	• Healthier • Prosperous



Executive Summary

We are currently facing a triple climate, pollution and biodiversity crisis in which the food system is both a major driver and vulnerability. The food system is responsible for 30% of global greenhouse gas (GHG) emissions,[2] and agriculture is the single largest driver of land use change and habitat destruction, causing 70% of biodiversity loss worldwide.[3]

What we do, here in Wales, is having a catastrophic effect on the world's forests and critical habitats. We need to reduce our global impact by sourcing products that do not cause deforestation overseas. This is why Size of Wales and WWF Cymru are calling for Wales to become a Deforestation Free Nation.

At the same time, we are facing a national health crisis, where only a minority of Welsh children currently meet government dietary recommendations.[4] Although diets are partly a product of personal preference, what we eat is also influenced by what is available, and research has shown that healthy and sustainable food is less available and accessible than the alternatives.[5] Public food procurement represents a policy instrument with the potential to transform both food consumption and production by determining: what food is purchased; from whom; and under what production type. In representing a sector worth £84.7 million in Wales,[6] influencing public food procurement could deliver multiple social, economic, and environmental benefits at both national and international scales. To help guide this dietary transition, WWF-UK modelled a diet called Livewell which aims to: meet UK nutritional recommendations and dietary guidelines; minimise GHG emissions and other environmental impacts; and be socially acceptable.

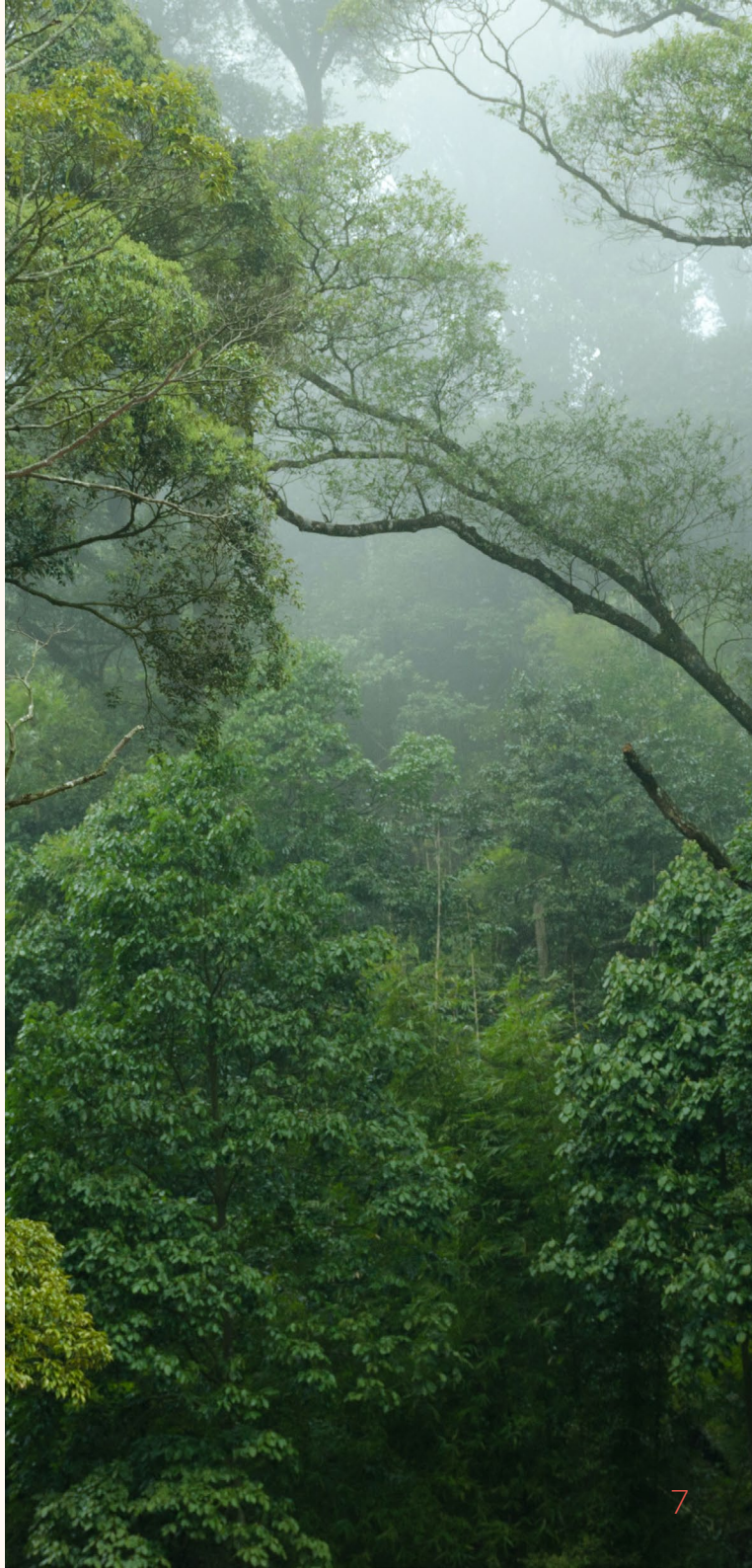
2 IPCC (2022) Climate Change 2022: Mitigation of Climate Change. Available at: https://www.ipcc.ch/report/ar6/wg3/

3 WWF (2020) Living Planet Report 2020 – Bending the curve of biodiversity loss. Almond, R. E. A., Grooten, M. and Petersen, T. (Eds), WWF, Gland, Switzerland. Available at: https://wwfin.awsassets.panda.org/downloads/lpr_2020_full_report.pdf

4 Welsh Government (2019) National Diet and Nutrition Survey: results for years 1 to 9. Available at: https://www.gov.wales/national-diet-and-nutrition-survey-results-years-1-9

5 Goudie, S. and Hughes, I. (2022) The Broken Plate 2022: The State of the Nation's Food System. Available at: https://foodfoundation.org.uk/publication/broken-plate-2022

6 Welsh Government (2022) Minister launches new initiative to encourage more Welsh food onto public sector plates in Wales. Available at: https://www.gov.wales/minister-launches-new-initiative-encourage-more-welsh-food-public-sector-plates-wales



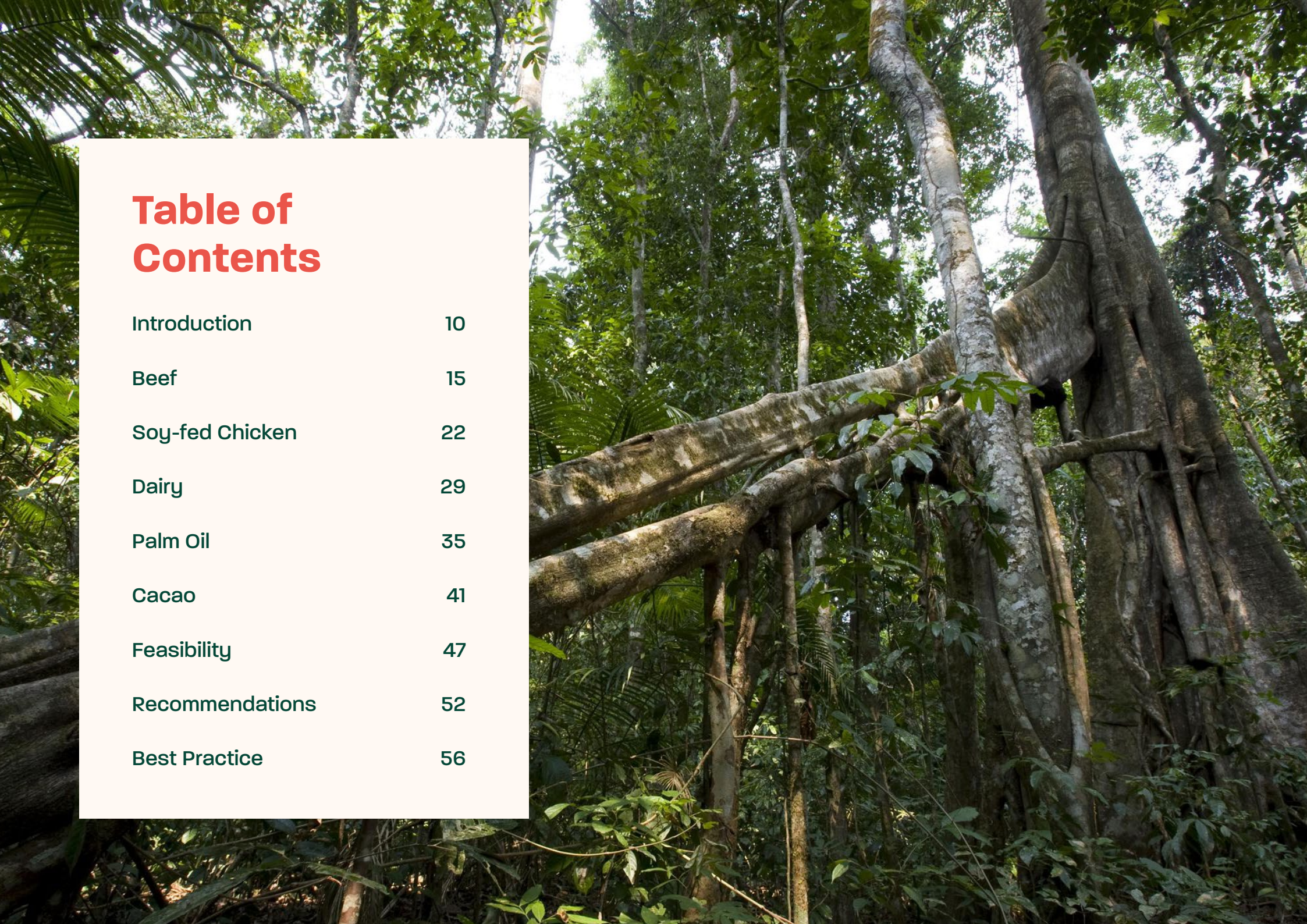
This briefing paper assesses the viability of adapting school meals in Wales so they more closely align with WWF-UK's Livewell diet, and contain ingredients which are deforestation and conversion free, defined by the European union Regulation on deforestation free products (EUDR) as "commodities and products which only contain, or have been fed commodities that were produced on land that has not been deforested after 31st December 2020".[7] Five forest-risk commodities commonly found in school dishes (beef from high deforestation risk areas such as South America, soy-fed chicken, dairy from cows fed on soy/palm, palm oil and cacao) are assessed against potential replacement ingredients according to their: carbon impact; nutritional value; cost; wider social and environmental impact; and impact on tropical deforestation. The four commodities include: beef; soy-fed chicken; palm oil; and cacao. While this analysis points towards a direction of change, the food system is complex, with multiple drivers and feedback loops. This means benefits and disbenefits of certain options and substitutions may involve trade-offs – there is no perfect answer as yet. Nonetheless, this project looked at available evidence and identified key changes that can be adopted now, while acknowledging that the best options may change over time as new evidence emerges and food production practices improve.

One example of this is around consumption of meat, including imported beef from places such as South America which have a high deforestation risk, and soy-fed chicken. Changes to animal welfare, or in relation to production practices, can be beneficial in one respect but might, for example, involve greater land use overall. If meat is to be kept on the menu, this research identifies that the best way to manage trade-offs in relation to beef and soy-fed chicken is therefore almost certainly the pursuit of a 'less and better' approach. This would mean reducing meat content in favour of plant-based proteins such as beans and pulses, but still maintaining some meat as a source of protein, iron and micro-nutrients. The same approach also applies to dairy foods such as milk and cheese, which provide important nutrients particularly for children whose school meal may be their only substantive meal of the day. However, when meat and dairy is used, it should be sourced from Welsh suppliers where animals are reared within healthy ecosystems, favouring natural diets on well-managed farms delivering high welfare**.** This could include organic and/or regenerative production practices where production standards are evidenced. In a school menu context, this might see individual meat and dairy options on the menu unchanged in terms of ingredients (though improved in terms of ingredient sourcing), but with fewer animal-based dishes overall across a bi- or tri-weekly menu cycle, with plant-based meals substituting for the difference. This approach actually expands the range of meals children are exposed to, and they may benefit from eating a greater variety of foods.

For palm oil and cocoa, certified products are strongly recommended as an alternative to uncertified products, to reduce negative environmental and social impacts associated with the production of these commodities, including deforestation risk.

Adapting school menus and other public food procurement programmes in Wales could have wide-ranging and long-lasting benefits such as: supporting nature recovery and preventing biodiversity loss in forested areas; increasing demand for local farming and building a more resilient food system and generating economic benefits; contributing to Net Zero; and improving health and educational attainment. However, some practical considerations should be considered before rollout, and appropriately mitigated against. These include: maintaining the appeal of dishes; overcoming administrative and delivery costs in menu changes; availability and scaling up of local, ethical options; navigating complex and partial data; and responding to a lack of buy-in.

7 FERN (2023) What is the EU Regulation on deforestation-free products? Available at: https://www.fern.org/fileadmin/uploads/fern/Documents/2023/What_is_the_EU_Regulation_on_deforestation_free_products_and_why_should_you_care.pdf



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Introduction

The issue with the current system

We are currently facing triple climate, pollution and biodiversity crises in which the food system is both a major driver and vulnerability. Agriculture has been recognised as the single largest driver of land use change and habitat destruction, causing 70% of global biodiversity loss.[8] In addition, in 2022 the International Panel on Climate Change (IPCC) reported that 30% of global greenhouse gas (GHG) emissions were associated with the food system, including production, transportation, processing and retail.[9]

At the same time, we are facing a national health crisis. In 2020, 61% of adults in Wales were classified as overweight or obese,[10] with over 1 in 5 children in the UK obese by the time they leave primary school.[11] It has been estimated that approximately 80% of children with obesity go on to have obesity as adults,[12] having repercussions for both mental and physical health and costing the Welsh NHS an estimated £86 million annually.[13]

Part of the problem is that healthy, sustainable food is less available and accessible than unhealthy food. In 2022, The Food Foundation found healthy foods to be almost three times more expensive than obesogenic foods (foods tending to cause obesity).[14] As food prices have risen as a result of inflation – with price increases more than double for healthy foods compared to unhealthy foods, vegetable consumption has decreased by 7.5%,[15] with children from the poorest fifth of households consuming less fruit, vegetables and fish than those from the richest fifth.[16] In growing just a quarter of a portion of fruit and vegetables per head of population in Wales, and sourcing 94% of vegetables served in Welsh schools outside of Wales,[17] there is a strong need to encourage more domestic horticulture production, which will in turn, help boost rural economies and reduce reliance on imports from water starved countries.[18] According to the Food Sense Wales report[19], there is an opportunity to expand the Welsh Veg in Schools initiative from eight to 100 growers, to bring in £1.5 million worth of sales per year, equivalent to £12.4 million worth of social, economic and environmental gain. This would up the organic local sales to 10% of the estimated total vegetable purchases for schools and save an estimated 60 tonnes of CO2e annually before factoring in replacement of frozen which has an even higher footprint.

8 WWF (2020) Living Planet Report 2020 – Bending the curve of biodiversity loss. Almond, R. E. A., Grooten, M. and Petersen, T. (Eds), WWF, Gland, Switzerland. Available at: https://wwfin.awsassets.panda.org/downloads/lpr_2020_full_report.pdf
9 IPCC (2022) Climate Change 2022: Mitigation of Climate Change. Available at: https://www.ipcc.ch/report/ar6/wg3/
10 Public Health Wales (2020) Primary Care Obesity Prevention. Available at: https://phw.nhs.wales/services-and-teams/primary-care-division/primary-care-obesity-prevention/#Reports
11 NHS England (2024) National Child Measurement Programme. Available at: https://digital.nhs.uk/services/national-child-measurement-programme
12 Simmonds, M., Llewellyn, A., Owen, C. G., & Woolacott, N. (2016) Predicting adult obesity from childhood obesity: a systematic review and meta-analysis. Obesity reviews : an official journal of the International Association for the Study of Obesity, 17(2), 95–107.
13 See Public Health Wales, 2020.
14 See Goudie and Hughes, 2022.
15 Grocery Gazette (2022), Vegetable consumption falls by 7.5% as consumers grapple with cost-of-living crisis. Available at: https://www.grocerygazette.co.uk/2022/10/05/vegetable-consumption-falls
16 Ipsos (2022), Food insecurity: too much to stomach. Available at: https://www.ipsos.com/en-uk/understanding-society/food-insecurity-too-much-stomach
17 Food Sense Wales (2024) Welsh Veg in Schools. Available at: https://www.foodsensewales.org.uk/app/uploads/2024/07/RWS700x210HR.pdf
18 Food Sense Wales (2023) Courgette Pilot: Agroecological Welsh Veg for Primary Schools in Wales. Available at: https://www.foodsensewales.org.uk/app/uploads/2023/01/CourgetteReport_Eng.pdf
19 Food Sense Wales (2023) Courgette Pilot: Agroecological Welsh Veg for Primary Schools in Wales. Available at: https://www.foodsensewales.org.uk/app/uploads/2023/01/CourgetteReport_Eng.pdf

The opportunity for change

Although diets are partly a product of personal preference, what we eat is also influenced by what is available. For children, choice over food is limited at school, and yet school meals can constitute over 50% of their daily calories.[20] While school food is critical to health, it also influences educational outcomes, with evidence demonstrating that well-nourished children are better able to concentrate, learn and achieve in the classroom.[21] In addition, food preferences formed in childhood are increasingly considered to be an important factor influencing dietary health in later life.[22]

To help guide the transition to more healthy and sustainable diets, WWF-UK has modelled a diet called Livewell which: meets UK nutritional recommendations and dietary guidelines; is socially acceptable by not drastically deviating from the current average diet, and coming at no extra cost; and minimises greenhouse gas emissions and other environmental impacts.[23] Compared to current UK population consumption, Livewell contains a greater proportion of fruit, vegetables, and wholegrains, more plant protein foods (such as beans and lentils), less meat (red, white and processed) and dairy, and fewer products high in fat, salt and sugar. If delivered, it could represent over half of the food emissions reductions needed by 2030 and reduce biodiversity loss by 20%.[24]

As part of the response to the climate and nature crises, Size of Wales and WWF Cymru are advocating for Wales to become a Deforestation Free Nation by reducing consumption of commodities associated with tropical deforestation and replacing them with lower risk alternatives. This is for the purposes of both reducing GHG emissions and protecting and restoring tropical forests and the biodiversity they support, whilst at the same time promoting human rights and the rights of Indigenous Peoples who are the guardians of these critical habitats.

This briefing paper assesses the viability of adapting school meals so they align with WWF-UK's Livewell diet, and contain ingredients which are deforestation and conversion free. Five forest-risk commodities commonly found in school dishes are assessed against potential replacement ingredients according to their: carbon impact; nutritional value; cost; wider social and environmental impact; and direct impact on tropical deforestation. These five commodities are addressed in turn in the following sections.

20 Burgess, J. (2017) Why school meals matter. Better the Future. Available at: https://betterthefuture.org/why-school-meals-matter/
21 Hartgen-Walker, S. and Lally, C. (2023) Child food insecurity and Free School Meals. UK Parliament. Available at: https://post.parliament.uk/research-briefings/post-pn-0704/
22 De Cosmi, V. et al. (2017) Early Taste Experiences and Later Food Choices. Nutrients vol. 9,2 107.
23 Halevy, S. and Trewern, J. (2023) Eating for Net Zero: How diet shift can enable a nature positive net zero transition in the UK. Available at: https://www.wwf.org.uk/sites/default/files/2023-05/Eating_For_Net_Zero_Full_Report.pdf
24 Ibid.

Menu Replacement

This section explores the potential to replace five forest-risk commodities often found in school menu cycles in Wales: beef from places such as South America which have a high deforestation risk; soy-fed chicken; dairy from cows fed on soy/palm; palm oil; and cacao. As shown in Figure 1, these are the top commodities driving deforestation globally. Note that the Figure reports deforestation associated with *all* uses of soy and palm oil (i.e. for a range of products, rather than animal feed specifically), however, around 76% of soy globally is used as animal feed, 37% of which is used solely for chickens.[25] In addition, around 20% of palm is used in animal feed, with the remainder used in consumer products.[26] In Wales, nearly 80% of soy imports and 53% of palm oil imports are fed directly to livestock.[27]

Figure 1: Total forest replacement (million ha) by analysed commodities (2001-2015). *Source: World Resources Institute Global Forest Review (2021)*[28]

With regards to the deforestation impact of consumption in Wales specifically, an area equivalent to 40% of the size of Wales (823,000 hectares) was required overseas to grow Welsh imports of cocoa, palm, beef, leather, natural rubber, soy, timber, pulp and paper in an average year between 2011-2018.[29] In addition, 30% of the land used to grow Welsh imports of commodities is in countries categorised as high or very high risk for social and deforestation issues, with palm being the commodity most likely to have come from these areas, followed by soy, of which 80% is used as livestock feed.[30] In terms of carbon impact, the GHG emissions associated with the conversion of natural ecosystems and changes in land cover for the production of Welsh imports of soy, cocoa, palm and natural rubber (excluding beef), total 1.5 million tonnes CO2e each year. This is equivalent to 4% of Wales' total estimated domestic and imported goods carbon footprint, or 22% of the GHG emissions from transport in Wales.[31]

Each commodity is assessed against replacement options for a given dish, based on their:

- Carbon impact;
- Nutritional value; cost;
- Wider social and environmental impact; and
- Direct impact on tropical deforestation.

25 Carter, N. (2024) The Eco story of the Humble Soybean. Plant Based Data. Available at: https://www.plantbaseddata.org/post/the-eco-story-of-soy#:~:text=1%2076%25%20of%20soy%20globally%20is%20used%20as,the%20most%20soy%29%20is%20used%20for%20animal%20feed.

26 Carter, N. (2024) The Eco story of the Humble Soybean. Plant Based Data. Available at: https://www.plantbaseddata.org/post/the-eco-story-of-soy#:~:text=1%2076%25%20of%20soy%20globally%20is%20used%20as,the%20most%20soy%29%20is%20used%20for%20animal%20feed.

27 https://sizeofwales.org.uk/wp-content/uploads/2022/12/wwf_risky_b_wales.pdf

28 WRI (2021) Global Forest Review. Available at: https://research.wri.org/gfr/global-forest-review

29 Buckland-Jones, S., Cooper-, H., Evans, R., Jennings, S., Munkedal, C. and Rahman-Daultry, K. (2021) Wales and Global Responsibility. Available at: https://www.wwf.org.uk/wales-global-responsibility

30 Ibid.

31 See Buckland et al, 2021.

While this analysis points towards a direction of change for Wales, the food system is complex, with multiple drivers and feedback loops. This makes assessing overall system impact difficult. Throughout this analysis three key features should therefore be recognised:

1. **FIRSTLY, THIS IS AN AREA OF EMERGING EVIDENCE, BOTH AS NEW RESEARCH IS CONDUCTED AND NEW PRACTICES ARE DEVELOPED, IMPROVED, AND DELIVERED AT DIFFERENT SCALES.**

   Of particular relevance to this project is the relatively limited evidence around aspects of organic agriculture. In particular, as this is typically currently practised at small scale, it may not always reflect the potential efficiencies that might be achieved with more widespread adoption, or reflect likely outcomes across a full range of land types and contexts.

   To be more specific, there are several references throughout this report highlighting that some sources suggest organic production can in some instances mean emission increases due to greater land requirements and longer life expectancy of livestock, with some emissions also then displaced abroad to meet current UK demand. The report does caveat this with the fact that producing to better standards (e.g. organic) must also be followed by an eating less meat approach. This leads to the greatest emission reductions overall when matched with diet change.

   Furthermore, the report does not comment on the risks around business as usual production such as the externalised costs on the environment, degraded soils impacting our ability to produce enough food in the future, health impacts and the exposure of farms to input cost volatility, pesticide resistance and the impacts of climate induced extreme weather (which are currently costing farmers in Wales tens of millions of pounds each year). An organic scenario that develops more climate resilient landscapes, to build soil health and ecological diversity feels no less promising in terms of productivity into the short/medium/long term. It is perhaps more robust considering future ecological and climatic uncertainty – we only have to look at the impacts of climate induced extreme weather (droughts, floods) and the impact it's having on livestock and crop losses at this very point in time. Building resilience on-farm is crucial for food security. There is a lack of peer reviewed evidence regarding on farm productivity improving over time following the adoption of agroecological/organic practices, but it would be just as reasonable to assume a higher organic yield baseline by 2050 due to advances in knowledge and technology in agroecological systems with benefits such as natural soil regeneration, healthier plants and crops, improved ecological functioning and reduced costs.

2. SECONDLY, IN AN INTERLINKED GLOBAL FOOD SYSTEM, INDIRECT LAND USE CHANGE IS CHALLENGING TO ACCOUNT FOR AND MANY STUDIES DO NOT ATTEMPT TO DO SO.

Direct land use change is frequently accounted for, as it should be. If land use changes – for example the clearing of forest for agriculture – the carbon impact is significant, and can be directly attributed to the agricultural activity, sector, or nation where it occurs. However, the land footprint of the overall food system is also a critical driver of change. If land use in Wales changes in ways that mean less food is grown on the same area of land, then that food will potentially have to be grown somewhere else. The knock-on impacts of that switch, and where those impacts will be felt, are extremely hard to quantify, but there is a significant risk that, ultimately, this may contribute to an expansion of the global land footprint for agriculture, all other things being equal. This uncertain impact of indirect land use change is seldom modelled at product level, which can mean carbon impacts from some production methods are underestimated. This is not an argument against change, but it is an argument in favour of being cautious. Changes which imply a reduction in the overall land use footprint (such as switching from animal agriculture to crop based agriculture) do not pose this risk.

3. THIRDLY, GLOBAL DEMAND FOR LAND IS INTENSE – FROM FOOD PRODUCTION, TO BIOFUELS, TO BIOMATERIALS, TO ECOSYSTEM SERVICES, TO BIODIVERSITY, TO CARBON SEQUESTRATION.

Land used for food production is not being used for something else, and may represent an 'opportunity cost' for better or worse. Again, the wide range of possible alternative uses for land are typically not considered in most product specific studies.

All of the above is one reason why a key message in relation to food and especially meat consumption may be 'less and better'. Better production methods, in Wales, can provide multiple benefits, and are relatively directly influenced by public policy makers and procurers, private businesses and farms, and citizen choices. However, to maximise gains across the whole food system, shifts towards local production may also need to be accompanied by a shift in overall demand in cases where 'better' local production requires a little more space.

The approach used in this study was focused on a relatively small number of sources in the extensive literature. Poore and Nemecek's study "Reducing food's environmental impacts through producers and consumers" was used as a key data source, alongside the National Food Strategy, WWF-UK's Eating for Net Zero report, and data visualisations by Our World in Data. Further sources were identified through Google and Google Scholar and are listed as endnotes.

Beef

Since 1990, rises in global population and income levels have resulted in increased demand for beef.[32] This has been, and continues to be, highly problematic for our climate and natural environment with beef being the world's most resource – and emissions-intensive food.

To put this into context, the amount of agricultural land used to raise cattle is greater than the land requirement for all other animals and crops combined.[33] A high proportion of land clearance for cattle grazing has been in tropical forests, with exceptional biodiversity and cultural value, as well as being the home to Indigenous Peoples. In the Amazon alone, cattle ranching has been responsible for 80% of deforestation in the last 30 years, with more than 780,000 km^2 of forest clearance contributing to the loss of over 2,000 species.[34,35] In Wales specifically, 12,000 tonnes are imported every year, often from countries in high and very high-risk deforestation areas, with 2,800 species threatened with extinction such as the northern tiger. [36]

Beef production also contributes to climate change, with nearly half of Brazil's carbon emissions associated with deforestation from cattle ranching.[37] This is due to GHGs associated with: the production of feed; land clearing for grazing; management of manure; and crucially, livestock rumination. The release of methane from rumination is particularly impactful given its global warming potential (GWP) is between 28-36 times more powerful than carbon dioxide.[38] This has resulted in the escalation of global beef emissions to be the equivalent to India's annual emissions.[39]

32 Dimbleby, H. (2021) National Food Strategy. Available at: https://www.nationalfoodstrategy.org/

33 Ibid.

34 Skidmore, M. E., Moffette, F., Rausch, L., Christie, M., Munger, J. and Gibbs, H. K. (2020) Cattle ranchers and deforestation in the Brazilian Amazon: Production, location, and policies. Global Environmental Change, 68:102280.

35 WWF (2024) Beef. Available at: https://www.worldwildlife.org/industries/beef#:~:text=With%20the%20global%20population%20expected%20to%20exceed%209,is%20thus%20essential%20to%20improve%20its%20sustainability%20globally.

36 See Buckland et al, 2021.

37 See Skidmore et al, 2020.

38 IEA (2021) Methane and climate change. Available at: https://www.iea.org/reports/methane-tracker-2021/methane-and-climate-change

39 Waite, R. and Zionts, J. (2022) 7 Opportunities to Reduce Emissions from Beef Production. World Resources Institute. Available at: https://www.wri.org/insights/opportunities-reduce-emissions-beef-production

As well as the impacts on nature and climate, current consumption of red and processed meat has been recognised as too high, with processed meat in particular, contributing to increased risks of heart disease, cancer, and diabetes.[40] The National Food Strategy identifies that if everyone ate the amount of meat recommended by the Government's Scientific Advisory Committee on Nutrition, national meat consumption would fall by at least 15%, and red and processed meat by 27%.[41] In accordance with this, WWF's Livewell diet proposes a reduction in animal protein consumption across all land-based meat types, which includes a 69% reduction in meat in replacement for a 50% increase in plant-based proteins such as beans, pulses and lentils.[42]

What are the options?

Table 1 compares the use of imported beef mince in a bolognese to two alternative options: Welsh (organic) beef mince; and lentils, across five key criteria. The colour key for the 5th criteria, Deforestation Risk, is provided below.

KEY FOR DEFORESTATION RISK

	HIGH RISK: May directly cause deforestation through land use change in production.
	MEDIUM RISK: May indirectly cause deforestation by displacing land use from the UK to abroad, in order to meet current demand for the product.
	LOW RISK: Low risk due to strict production methods and ethical certification standards, and / or land could be freed up for other uses.

40 Battaglia Richi, E., Baumer, B., Conrad, B., Darioli, R., Schmid, A. & Keller, U. (2015). Health Risks Associated with Meat Consumption: A Review of Epidemiological Studies. International journal for vitamin and nutrition research. Journal international de vitaminologie et de nutrition, 85(1-2), 70-78. 4

41 See Dimbleby, 2021.

42 See Dimbleby, 2021.

Table 1: Assessing Replacement Options for Beef Mince in a Bolognese

OPTION 1: IMPORTED BEEF MINCE FROM A DEFORESTED AREA SOUTH AMERICA

Carbon Impact	Cost	Nutritional Value[43]	Wider Environmental & Social Impact	Deforestation Risk
99kg CO_2e/kg product, based on international averages from cradle to retail.[44,45] *83% of emissions are from land conversion, feed, and on-farm emissions (methane, fertiliser, manure, machinery), constituting 83% of emissions. The remaining 17% of emissions are from processing, transport, retail, packaging and losses.*[46]	£6.67/kg[47]	✓ High in protein, B vitamins, zinc and iron. ✗ High in calories, saturated fat (7.5g/100g), and cholesterol.	✗ Leading cause of tropical **deforestation,** using 236.2 m^2 per kg product, resulting in widespread loss of stored carbon, habitats, and homes for Indigenous Peoples.[48] ✗ **High water footprint** with an average use of 2,714 litres/kg product.[49] ✗ Contributes to **soil erosion and desertification** through land conversion, overgrazing and using marginal land for growing feed. ✗ Processing beef into meat, and not treating waste properly can cause **air, water and soil pollution.**	

43 Nutrition Calculator. Available at: https://nutritionvalue.org/nutritioncalculator.php

44 This represents the system boundary for the carbon lifecycle analysis. Cradle to farmgate typically includes all upstream processes up to the farmgate, where the animals or products leave the farm, i.e. production of farm inputs and on-farm production activities. Cradle to retail also includes transport of animals and products to processing plants or directly to market, processing into primary products, refrigeration during transport and processing, production of packaging material and transport to the retail distributor.

45 Poore, J. and Nemecek, T. (2019) Reducing food's environmental impacts through producers and consumers. Sustainability, 360 (6392): 987-992.

46 Ritchie, H., Rosado, P. and Roser, M. (2018) Environmental Impacts of Food Production. Our World in Data. Available at: https://ourworldindata.org/environmental-impacts-of-food

47 Price based on frozen beef mince 20% fat content, from a large UK retailer, prices from July 2024.

48 See Skidmore et al, 2020.

49 See Poore & Nemecek, 2019.

Table 1: Assessing Replacement Options for Beef Mince in a Bolognese (Continued)

OPTION 2: WELSH (ORGANIC) BEEF MINCE

Carbon Impact	Cost	Nutritional Value[43]	Wider Environmental & Social Impact	Deforestation Risk
Non-organic Welsh beef is 35.6kg CO2e/kg product, based on cradle to farmgate.[50,51] *British beef can reflect a ~67% emissions reduction due to no direct emissions from land conversion or transport (although this is dependent on production method).* **Data is currently mixed for organic beef.** *In principle on-farm emissions would be expected to reduce from farm manure and fertiliser, and some carbon could be sequestered in grasses and soils depending on production methods, suggesting an emissions reduction.*[52] *However, some sources suggest emissions increases due to greater land requirements and longer life expectancy of cows, with some emissions also then displaced abroad to meet the current UK demand.*[53]	British: £7.83/kg[54] British Organic: £11.00/kg[55]	• See above. • Some research identifies grass-fed beef to be marginally higher in vitamins and minerals and slightly lower in saturated fat.[56]	✓ **Significantly reduced deforestation risk** as Welsh (organic) cows graze on existing pasture in the UK rather than deforested land, and organic cows are required to eat a minimum of 60% forage.[57] ✓ When sustainably managed, beef production can achieve **conservation benefits**, as grazing can maintain the health of grasslands, **improve soil quality** with manure, and preserve wildlife habitat. ✓ **Supports UK farming and community in rural areas.** ✓ Cows are reared under higher welfare with outdoor access and no use of antibiotics. ✗ Can be a less **efficient use of land** as cattle live longer and more land is needed to grow food.[58] This could result in displacement of land use abroad, potentially causing **indirect deforestation** to cater for current UK demand for beef (which can't currently be met by British Organic production).	

50 This figure is for Welsh beef and does not account for Organic practices. It also does not account for emissions from farmgate to retail although these are considered negligible.

51 Welsh Government (2023) New GHG study points to encouraging results for Welsh beef and sheep farms. Available at: https://businesswales.gov.wales/farmingconnect/news-and-events/news/new-ghg-study-points-encouraging-results-welsh-beef-and-sheep-farms

52 van Wagenberg, C. P. A., de Haas, Y., Hogeveen, H., van Krimpen, M. M., Meuwissen, M. P. M., van Middelaar, C. E., & Rodenburg, T. B. (2017). Animal Board Invited Review: Comparing conventional and organic livestock production systems on different aspects of sustainability. Animal : an international journal of animal bioscience, 11(10), 1839–1851.

53 Food Revolution Network (2021) Is Grass-Fed Beef Good for Your Health & the Planet? Available at: https://foodrevolution.org/blog/grass-fed-beef-2021-update/

54 Price based on UK Red Tractor beef mince, from a Welsh school food supplier, prices from July 2024.

55 Price based on UK Organic beef mince, 5% fat content, from a large UK retailer, prices from July 2024.

56 See Food Revolution Network, 2021.

57 Soil Association (2024a) Better for animals. Available at: https://www.soilassociation.org/take-action/organic-living/why-organic/better-for-animals/#cows

58 Ibid.

Table 1: Assessing Replacement Options for Beef Mince in a Bolognese (Continued)

OPTION 3: LENTILS

Carbon Impact	Cost	Nutritional Value[43]	Wider Environmental & Social Impact	Deforestation Risk
0.8kg CO2e/kg product, based on international averages from cradle to retail.[59] *Very low in emissions as production involves no land use change, animal feed, or processing. On-farm emissions are also much lower with no manure management, methane from rumination, and reduced use of fertiliser. Without a strong local supply of lentils in Wales at current, some emissions would be produced from transportation, although this is considered to be negligible.*[60]	£1.77/kg[61]	*Compared to beef on a gram for gram substitution basis:*[62] ✓ 50% lower in calories, 93% lower fat, and zero cholesterol. ✓ 11% more fibre. ✗ 65% less protein (a 50g portion contains 60% of school lunch requirement). ✗ Less Zinc and B vitamins (a 50g portion contains 25% of school lunch requirement).	✓ **Zero deforestation risk with potential net positive effect on land use.** Only uses 7.46 m2 of land per kg product, freeing up land for nature restoration / carbon sequestration.[63] ✓ **Climate resilient crop** through its genetic diversity, supporting long-term food security.[64] ✓ **Crop fixes nitrogen** into soils, improving soil health, decreasing fertiliser demand and reducing water pollution. ✓ **Can provide forage for pollinators and could reduce pests & disease** in cropping systems.[65] ✓ Low **water footprint**, using 397 litres/kg product), which although high compared to other legumes, is much lower than beef.[66] ✗ **Majority currently imported** from Turkey, Canada and the EU where some production has been associated with poor working conditions and child labour.[67]	

59 See Poore and Nemecek, 2019.

60 Ritchie, H. (2020) You want to reduce the carbon footprint of your food? Focus on what you eat, not whether your food is local. Our World in Data. Available at: https://ourworldindata.org/food-choice-vs-eating-local#article-citation

61 Price based on Red Split Lentils (Triple Lion), from a Welsh school food supplier, prices from July 2024.

62 The analysis here provides a comparison of the nutritional value of lentils on a gram for gram substitution basis with beef. However, this would not necessarily be made in the case of a Bolognese, as other vegetables or high-protein foods may be combined with lentils to help balance flavour and nutritional diversity.

63 See Poore and Nemecek, 2019.

64 FAO (2016) Pulses are praised for their health, environmental and economic benefits. How can their full potential be tapped? Global Forum on Food Security & Nutrition. Available at: https://www.iucn.nl/app/uploads/2022/10/Factsheet-Lentils_IUCN-NL-2022_Guide-for-value-chain-management-in-the-protein-transition.pdf

65 Rodriguez, C., Mårtensson, L. D., Zachrison, M. and Carlsson, G. (2021). Sustainability of diversified organic cropping systems—challenges identified by farmer interviews and multi-criteria assessments. Frontiers in Agronomy: 75.

66 IUCN (2022/23) Sustainable plant-based worldwide: Guide for value chain management in the protein transition. Available at: https://www.iucn.nl/app/uploads/2022/10/Factsheet-Lentils_IUCN-NL-2022_Guide-for-value-chain-management-in-the-protein-transition.pdf

67 See IUCN, 2022/23.

What are the key conclusions?

1. CARBON

Beef has the highest carbon footprint of all food types analysed, which is largely driven by the methane produced from rumination which accounts for 50% of the overall emissions footprint.[68] This data is based on an average of international production, in practice, emissions may vary significantly by country of origin (e.g. Irish beef vs Brazilian beef). *British beef* is estimated to be around two thirds lower in emissions compared to international imported beef due to no direct land use change being implicated in production and reduced long-haul transport to market. *Organic beef* produced in the UK could result in lower emissions still, due to potential emissions reductions from manure management and fertiliser use, combined with carbon sequestration from grasses and soil. However, because of a potential reduction in productivity and output/input under organic production, the net outcome on emissions is unclear from current data available. This is largely due to differences in production methods and carbon measurement, not to mention emissions displaced abroad to meet the current UK demand for beef, whether organic or otherwise (which are rarely accounted for in current studies). *Regeneratively farmed grass-fed* beef is also considered to be lower in emissions, because the maintenance of healthy grasslands and soils sequesters carbon and cows are fed on grass not imported feed. In addition, rotational grazing practices reduce the need for artificial fertiliser, and let the land rest in between cycles to facilitate foliage growth, in turn capturing carbon. While hard evidence supporting regenerative agriculture is limited, experts such as Henry Dimbleby are in strong support.[69] Putting beef aside, lentils are far lower in emissions than any form of beef due to the far lower land requirements and farm inputs.

2. COST

International beef can be relatively cheap, particularly when processed. *British beef* is marginally more expensive, but *British organic beef* can be significantly more expensive currently because of the higher production costs. In comparison, lentils are far cheaper than both beef options.

3. NUTRITION

Beef is high in protein, B vitamins, zinc and iron, although also high in calories, saturated fat and cholesterol. In comparison, lentils provide a rich source of vitamins, minerals, protein and amino acids, while having less fat and cholesterol. However, lentils contain less protein, zinc and vitamin B, representing important nutrients for children's growth and development. Therefore, if beef is replaced with lentils, it is recommended that: a higher quantity of lentils is used (compared to a gram for gram replacement); lentils are combined with better (British, organic) beef; or blended with vegetables or other high protein foods, benefitting both nutritional diversity and flavour profile. Despite this, in a school context, dishes can be adapted over the course of a bi/tri-weekly menu cycle, meaning the benefits of eating a greater variety of foods is likely to outweigh the potential protein reduction. This is particularly applicable in the context of observational studies which have consistently reported that the average protein intake in children in Western Europe and the United States is 2-3 times higher than the recommended dietary intake.[70]

68 Ritchie, H. (2020) The carbon footprint of foods: are differences explained by the impacts of methane? Our World in Data. Available at: https://ourworldindata.org/carbon-footprint-food-methane
69 See Dimbleby, 2021.
70 Garcia-Iborra, Maria et al. (2023) Optimal Protein Intake in Healthy Children and Adolescents: Evaluating Current Evidence. Nutrients vol. 15,7 1683.

4. WIDER SOCIAL AND ENVIRONMENTAL IMPACT

In being highly land- and resource-intensive, beef sourced from deforestation-risk areas such as South America, has resulted in widespread biodiversity loss, soil erosion and desertification. *British beef* has a reduced risk of deforestation and associated knock-on impacts including human rights abuses, while *British organic beef* is likely to be lower in soil, water and air pollution, while also being higher welfare. Lentils are better than any form of beef production for the environment given they are less land- and resource-intensive. They also have a net benefit on soil health and farm resilience through fixing nitrogen into soil. Although lentils are mostly imported, with some reports of poor working conditions in origin countries, they can be grown in the UK and public procurement could boost the market for UK-grown. An example from Scotland includes Bridging the Gap's 'Give Peas a Chance' pilot in Aberdeen, which aims to open up a new route to market for peas by introducing locally-grown organic peas into schools over the course of 12 months.[71]

5. DIRECT DEFORESTATION RISK

Beef is the number one cause of tropical deforestation globally. *British beef* has a reduced deforestation risk given cows graze on UK grassland, and *British organic beef* is better as cows are fed on pasture and 100% organic feed under organic standards, dramatically reducing the demand for forest-risk soy. However, there is a risk of indirect deforestation, as British production is unable to cater to the current demand for beef due to lower productivity. This could mean that land use for beef is displaced abroad, resulting in further deforestation. In comparison, lentils have zero deforestation risk and can present a net benefit by freeing up land for other purposes.

Overall...

If beef is retained on school menus, a less and better approach is recommended for beef dishes over a menu cycle. This involves:

1. Reducing beef content in dishes in replacement for plant-based proteins such as lentils; and
2. Where beef is used, sourcing from Welsh suppliers where animals are reared within healthy ecosystems, favouring more natural diets from sustainable sources, and in well-managed farms that deliver high standards of animal welfare. This could include organic or regeneratively farmed grass-fed beef.

71 Sustain (2024) Aberdeen City Gives Peas a Chance. Available at: https://www.sustainweb.org/news/apr24-aberdeen-give-peas-a-chance-bridging-gap-school-food/

Soy-fed Chicken

The soybean is a protein-rich legume which is grown predominantly as animal feed in Brazil, the US and Argentina. At a global scale, 76% of soy is used as animal feed, with 37% grown solely for chicken.[72] As demand for chicken has markedly increased – with the average UK consumer eating more poultry than beef, lamb and pork combined[73,74] the area sown with soybean has more than doubled globally. This has made soy the second leading cause of global deforestation,[75] with approximately 850,000ha used for soy imports to feed British livestock alone, reflecting an area nearly the size of Wales.[76]

In Wales, 190,000 tonnes of soy are imported every year. 80% of imported soy is in the form of soymeal and soybeans for livestock feed, of which nearly half is used for the Welsh poultry industry.[77] As well as representing a leading cause of deforestation and habitat loss, growing soy is also a driver of soil degradation and nitrogen pollution as a result of pesticide and fertiliser use in production.[78] In addition, the clearance of forests for soy plantations has devastated Indigenous communities such as the Guarani People in southern Brazil. The conversion of their land into monocultures has impacted their way of life, being deeply rooted in agroecological practices that consider the forest inseparable to their culture. The use of pesticides has also severely affected health and contaminated local rivers and crops, threatening food security. The profound socio-environmental impacts have led to intense land conflicts and legal disputes as communities fight to return to their territories and receive reparations for the damage suffered.[79]

72 Fraanje, W. & Garnett, T. (2020). Soy: food, feed, and land use change. (Foodsource: Building Blocks). Food Climate Research Network, University of Oxford. Available at: https://tabledebates.org/building-blocks/soy-food-feed-and-land-use-change

73 See Fraanje and Garnett, 2020.

74 Department for Environment, Food & Rural Affairs. (2018) Food statistics pocketbook. Updated 2023. Available at: https://www.gov.uk/government/statistics/food-statistics-pocketbook

75 Ritchie, H. (2021) Drivers of Deforestation. Our World In Data. Available at: https://ourworldindata.org/drivers-of-deforestation#is-our-appetite-for-soy-driving-deforestation-in-the-amazon

76 See Buckland et al, 2021.

77 Ibid.

78 WWF (2024) Soy. Available at: https://www.worldwildlife.org/industries/soy

79 Size of Wales (2024) Saving the Future: A report into Wales' public pension exposure to global deforestation. Available at: https://sizeofwales.org.uk/wp-content/uploads/2024/05/Saving-for-the-future-Size-of-Wales-public-pension-report.pdf

Current consumption of chicken with a reliance on soy-based feed is unsustainable for our natural environments and climate. In addition, the shift to intensive production methods has meant that chicken meat today has over twice the amount of fat of chickens consumed in 1970, with fewer essential nutrients, including 69% less iron than in 1940 and 5 times less Omega 3.[80] As a result, the Livewell diet recommends a significant reduction of poultry consumption, through a 69% reduction across all meat types, including red, white and processed.[81]

What are the options?

Table 2 compares the use of soy-fed chicken in a chicken korma, to: British (organic) chicken; and chickpeas, across five key criteria. The colour key for the fifth criteria, Deforestation Risk, is provided below.

KEY FOR DEFORESTATION RISK

	HIGH RISK: May directly cause deforestation through land use change in production.
	MEDIUM RISK: May indirectly cause deforestation by displacing land use from the UK to abroad, in order to meet current demand for the product.
	LOW RISK: Low risk due to strict production methods and ethical certification standards, and / or land could be freed up for other uses.

80 Eating Better (2020) We need to talk about chicken. Available at: https://eating-better.org/news-and-reports/reports/we-need-to-talk-about-chicken/
81 See Halevy and Trewern, 2023.

Table 2: Assessing Replacement Options for Soy-fed Chicken in a Korma

OPTION 1: INTERNATIONAL CHICKEN FED ON UNCERTIFIED SOY

Carbon Impact	Cost	Nutritional Value[82]	Wider Environmental & Social Impact	Deforestation Risk
9.9kg CO_2e/kg product of *poultry,* based on international averages from cradle to retail.[83] *A third of emissions from land conversion, a third from feed and on-farm emissions (fertiliser, machinery, manure), and a third from processing, transport, retail, packaging and losses.*[84] Other data identifies **5.4kg CO_2e/kg product of *chicken,*** based on international averages from cradle to retail.[85] *The difference compared to the above figure could reflect the omission of other poultry types (turkey, duck, etc) identified in the above.*	£8.75/kg[86]	✓ Low in calories. ✓ Lower in fat compared to other meat. ✓ High in protein, B vitamins and phosphorus. ✗ Moderately high in cholesterol.	✗ Most soy is grown in South America where it carries a high risk of **deforestation and risk of abuse of Indigenous Peoples' rights.** ✗ Growing crops for animals is a driver of **pesticide and fertiliser use, causing soil degradation and water pollution**. ✗ **Ammonia** produced from poultry manure contaminates soil and watercourses, toxifying plant life and biodiversity. Runoff can lead to eutrophication,[87] with 48.7g of eutrophying emissions produced per kg meat.[88] ✗ **High water footprint,** using 660 litres/ kg product.[89] ✗ 81% of chickens are produced intensively, likely with **low welfare** i.e. confined indoors and in battery cages.[90] Chickens can also be given antibiotics, contributing to antimicrobial resistance.	

82 Nutrition Calculator. Available at: https://nutritionvalue.org/nutritioncalculator.php

83 See Poore and Nemecek, 2019.

84 See Ritchie et al, 2018.

85 MacLeod, M., Gerber, P., Mottet, A., Tempio, G., Falcucci, A., Opio, C., Vellinga, T., Henderson, B. & Steinfeld, H. (2013). Greenhouse gas emissions from pig and chicken supply chains – A global life cycle assessment. Food and Agriculture Organization of the United Nations (FAO), Rome.

86 Price based on frozen diced chicken breast sourced from Thailand and Brazil, by a large UK retailer, prices from July 2024.

87 Eutrophication is a process in which a water body becomes overly enriched with nutrients (primarily via agricultural runoff), leading to excessive growth of plant life such as algae and plankton. Water blooms and high concentrations of algae develop on the surface, preventing the light penetration and oxygen absorption necessary for underwater life, resulting in degradation of aquatic ecosystems.

88 See Poore & Nemecek, 2018.

89 See Poore & Nemecek, 2018.

90 See Dimbleby, 2021.

Table 2: Assessing Replacement Options for Soy-fed Chicken in a Korma

OPTION 2: BRITISH (ORGANIC) CHICKEN FED ON CERTIFIED SOY

Carbon Impact	Cost	Nutritional Value[82]	Wider Environmental & Social Impact	Deforestation Risk
Non-organic British *poultry* is: 4.5kg CO_2e/kg based from cradle to farmgate.[91,92] *British poultry has less emissions compared to international poultry due to no direct emissions from land conversion or transport (although this is dependent on production method). This does not however account for emissions due to land use change overseas to compensate for shortfalls in home production, as well as emissions from farmgate to retail.* **Organic British poultry is 5.1kg CO_2e/kg** product, based on British averages from cradle to farmgate.[93,94] *Data is currently mixed for organic chicken, although figures can come out marginally higher than a conventional system (as shown through the figures above). Despite reduced emissions from energy and fertiliser, organic chicken can sometimes have a higher localised footprint due to the potential for higher mortality rates (e.g. due to natural predation, disease, weather extremes, non-prophelactic use of antibiotics), longer rearing times, less efficient feed conversion rates and greater land requirement, meaning less output for more input.*[95] In a 'business as usual' scenario, t*his could also result in some emissions being displaced abroad to meet the current UK demand.*	British: £10.35/kg[96] British organic: £21.00/kg[97]	• See above. • Largely indifferent in nutritional value to regular chicken.	✓ **Partly reduced risk of deforestation as British chickens forage** on UK land, although organic chickens present a significantly reduced risk of deforestation, as they forage on organic pasture and certified feed.[98] Although soy certifications vary, most have zero-deforestation criteria. ✓ Organic chickens are **higher welfare** as they must have outdoor access and be raised with no antibiotics. ✓ Organic farms use no pesticides, resulting in **more biodiversity** and **healthier soils,** contributing to more **pollinators and improved habitats**.[99] These factors can support on-farm resilience and long term yields. ✗ Organic chicken can require 65-200% more land as a result of lower yields.[100] This can result in displacement of land abroad to cater to current demand for chicken, which could contribute to **indirect deforestation**. ✗ **Eutrophication** can sometimes be worse on less intensive farms if manure is less contained e.g. on a small scale with far fewer birds and within systems oriented towards nutrient cycling, although this is highly dependent on the number and distribution of chickens, and manure/land management strategies used.[101] Actual eutrophication harms are being overwhelmingly driven by intensive production at scale, not organic.	

91 This figure is based on poultry farms in England and Wales, and does not account for emissions from farmgate to retail.
92 Smith, L.G., Kirk, G.J.D., Jones, P.J. et al. (2019) The greenhouse gas impacts of converting food production in England and Wales to organic methods. Nat Commun 10, 4641
93 This figure is based on poultry farms in England and Wales, and does not account for emissions from farmgate to retail.
94 Smith, L.G., Kirk, G.J.D., Jones, P.J. et al. (2019) The greenhouse gas impacts of converting food production in England and Wales to organic methods. Nat Commun 10, 4641
95 Ibid.
96 Price based on UK Red Tractor chicken breast via Green Gourmet, by a Welsh school food supplier, prices from July 2024.
97 Price based on UK Free Range organic chicken breast (Class A), by a large UK retailer, prices from July 2024.
98 See Soil Association, 2024a.
99 Soil Association (2024b) Organic Eggs. Available at: https://www.soilassociation.org/take-action/organic-living/what-is-organic/organic-eggs/
100 See Smith et al, 2019.
101 Zoli, M. et al. (2023) Soil Organic Matter and Nutrient Levels in Outdoor Runs in Organic Laying Farms. Animals : an open access journal from MDPI vol. 13,3 401.

Table 2: Assessing Replacement Options for Soy-fed Chicken in a Korma

OPTION 3: CHICKPEAS

Carbon Impact	Cost	Nutritional Value[82]	Wider Environmental & Social Impact	Deforestation Risk
0.98kg CO_2e/kg product, based on international averages from cradle to retail.[102] *Very low in emissions as production involves no land use change, animal feed, or processing. On-farm emissions are also much lower with no manure management, methane from rumination, and reduced use of fertiliser.*	£1.77/kg[103]	*Compared to chicken on a gram for gram basis:*[104] ✓ Also low in calories and fat. ✓ No cholesterol. ✓ 50% higher in minerals -manganese, iron, zinc. ✓ 12% more fibre. ✗ 66% less protein (45g contains 54% of school lunch requirement). ✗ 25% less B vitamins.	✓ **Zero deforestation risk and land efficient crop** using 7.46 m^2 per kg product, which can free up land for nature restoration / carbon sequestration.[105] ✓ **Climate resilient crop** through its genetic diversity, supporting long-term food security.[106] ✓ **Fixes nitrogen** into soils, improving soil health, reducing fertiliser demand and pollution. ✓ **Provide forage for pollinators and could reduce pests & disease** in cropping systems.[107] ✓ Low **water footprint** of 397 litres/kg product, which although high compared to other legumes, is much lower than chicken.[108] ✗ **Majority imported** from India, Australia and Turkey where some production has been associated with forced labour and gender inequality.[109]	

102 See Poore and Nemecek, 2019.

103 Price based on Red Split Triple Lion Lentils, from a Welsh school food supplier, prices from July 2024 (no chickpea price available, but expected to be similar to lentils).

104 The analysis here provides a comparison of the nutritional value of chickpeas on a gram for gram substitution basis with chicken. However, this would not necessarily be made in the case of a korma, as other vegetables may be combined with chickpeas to help balance the flavour and nutritional diversity.

105 See Poore and Nemecek, 2019.

106 FAO (2016) Pulses are praised for their health, environmental and economic benefits. How can their full potential be tapped? Global Forum on Food Security & Nutrition. Available at: https://www.iucn.nl/app/uploads/2022/10/Factsheet-Lentils_IUCN-NL-2022_Guide-for-value-chain-management-in-the-protein-transition.pdf

107 See Rodriguez et al, 2021.

108 See IUCN, 2022/23.

109 See IUCN, 2022/23.

What are the key conclusions?

1. CARBON:

For meat, chicken is a relatively low-carbon protein, being far less carbon-intensive than red meat because chickens are monogastric, meaning that fermentation is minimal and enteric emissions are low. British chicken is generally considered better than imported chicken from a carbon perspective, without accounting for emissions due to land use change overseas to compensate for shortfalls in home production. For organic chicken, the picture for carbon is mixed due to production method and the nature of carbon measurement (e.g. inclusion of soil carbon). However, organic chicken is generally considered to generate higher emissions due to longer rearing times, higher mortality rates, and poorer feed conversion ratios, leading to more land and feed required per tonne of product. In addition, because lower livestock yields are currently unable to cater to current levels of demand, emissions can be displaced from increased production and associated land conversion abroad. Chickpeas are much lower in emissions compared to both chicken options due to the reduced land requirements and farm inputs.

2. COST:

International chicken can be a relatively cheap meat. *British chicken* is marginally more expensive, but *British organic chicken* can be significantly more expensive because of higher production costs. In comparison, chickpeas are much cheaper than both chicken options.

3. NUTRITION:

Chicken and chickpeas have a similar nutritional profile. Both provide rich sources of vitamins, minerals, protein and amino acids which are low in fat and calories. A key difference is that chickpeas have lower protein content. As a result, if chicken is replaced with chickpeas, it is suggested that: a higher quantity of chickpeas is used; chickpeas are combined with better (British organic) chicken; or blended with other high protein foods such as broccoli, sweetcorn or spinach, benefitting both flavour profile and nutritional diversity. Despite this, in a school context, dishes can be adapted over the course of a bi/tri-weekly menu cycle, meaning the benefits of eating a greater variety of foods is likely to outweigh the potential protein reduction. This is particularly applicable in the context of observational studies which have consistently reported that the average protein intake in children in Western Europe and the United States is 2-3 times higher than the recommended dietary intakes.[110]

110 Garcia-Iborra, Maria et al. (2023) Optimal Protein Intake in Healthy Children and Adolescents: Evaluating Current Evidence. Nutrients vol. 15,7 1683.

4. WIDER SOCIAL AND ENVIRONMENTAL IMPACT:

Most chicken sold globally is produced intensively in indoor units or confined spaces, which: have low/no consideration for welfare; and produce large volumes of ammonia which contaminate soil and watercourses. In addition, most chicken is fed on soy grown in South America, which carries a high risk of deforestation as well as pesticide and fertiliser use and has high social impacts, including abuse of Indigenous Peoples' rights such as the Guarani People from the Atlantic forest in Brazil. *British chicken* has more stringent welfare, although there has been a steady increase in the scale and number of broiler enterprises,[111] most chickens are still fed on soy sourced from abroad,[112] and the industry remains a major polluter of rivers such as the Wye. *British organic chicken* represents a better option from a welfare perspective and in relation to several environmental metrics, and is less likely to be directly associated with deforestation as organic chickens forage on organic pasture and certified feed. Certification could include soy certified by schemes such as the Round Table on Responsible Soy (RTRS) and ProTerra, which aim to decouple soy production from deforestation.[113] While certified soy feed represents a step in the right direction, there are emerging opportunities to replace soy-based feed with alternative protein sources such as insects, food waste, and farm by-products.[114]

In comparison, chickpeas are better than both chicken options for the natural environment given they are far less land- and resource-intensive, and can actually have a net benefit on soil health and farm resilience through fixing nitrogen and freeing up land for other purposes. Although chickpeas are mostly imported, with some reports of poor working conditions in origin countries, they can be grown in the UK and public procurement could boost the market for UK-grown.

5. DEFORESTATION RISK:

Nearly all chickens are fed on soy grown in South America, which is the second largest driver of deforestation behind beef. While *British chickens* present a deforestation risk as they consume soy-based feed, *British organic chickens* have a reduced risk as they eat grass as well as feed, and where feed is used, it is certified responsible. For any form of British chicken, there remains a risk of indirect deforestation as production is unable to cater to current demand due to the reduced production efficiencies. This could mean that land use for chicken is displaced abroad, which could result in fuelling tropical deforestation. In comparison, chickpeas will reduce net land demand relative to chicken, and thus pose no global deforestation risk and can present a net benefit by freeing up land for other purposes.

Overall....

A less and better approach is recommended for chicken dishes over a menu cycle. This involves:

1. Reducing chicken content with replacement by plant-based proteins such as chickpeas; and
2. Where chicken is used, sourcing it from Welsh animals reared within healthy ecosystems, favouring diets from certified soy and other plant-based sources, and in well-managed farms that deliver high standards of animal welfare e.g. organic, regeneratively farmed.

111 Williams, C. (2020) Part 2: Greenhouse gas emissions & environmental impacts of the poultry industry. Welsh Government. Available at: https://businesswales.gov.wales/farmingconnect/news-and-events/technical-articles/part-2-greenhouse-gas-emissions-environmental-impacts-poultry-industry#:~:text=The%20vast%20majority%20of%20poultry%20in%20the%20UK,in%20the%20manure%20performing%20methanogenesis%20and%20nitrification%2Fdenitrification%20respectively.

112 Landworkers Alliance. (nd) Soy No More! Land workers Alliance. Available at: https://landworkersalliance.org.uk/campaigns-advocacy__trashed/soy-no-more/

113 FCRN (2020) Soy: food, feed, and land use change. Available at: https://tabledebates.org/building-blocks/soy-food-feed-and-land-use-change#SOYBB4.3

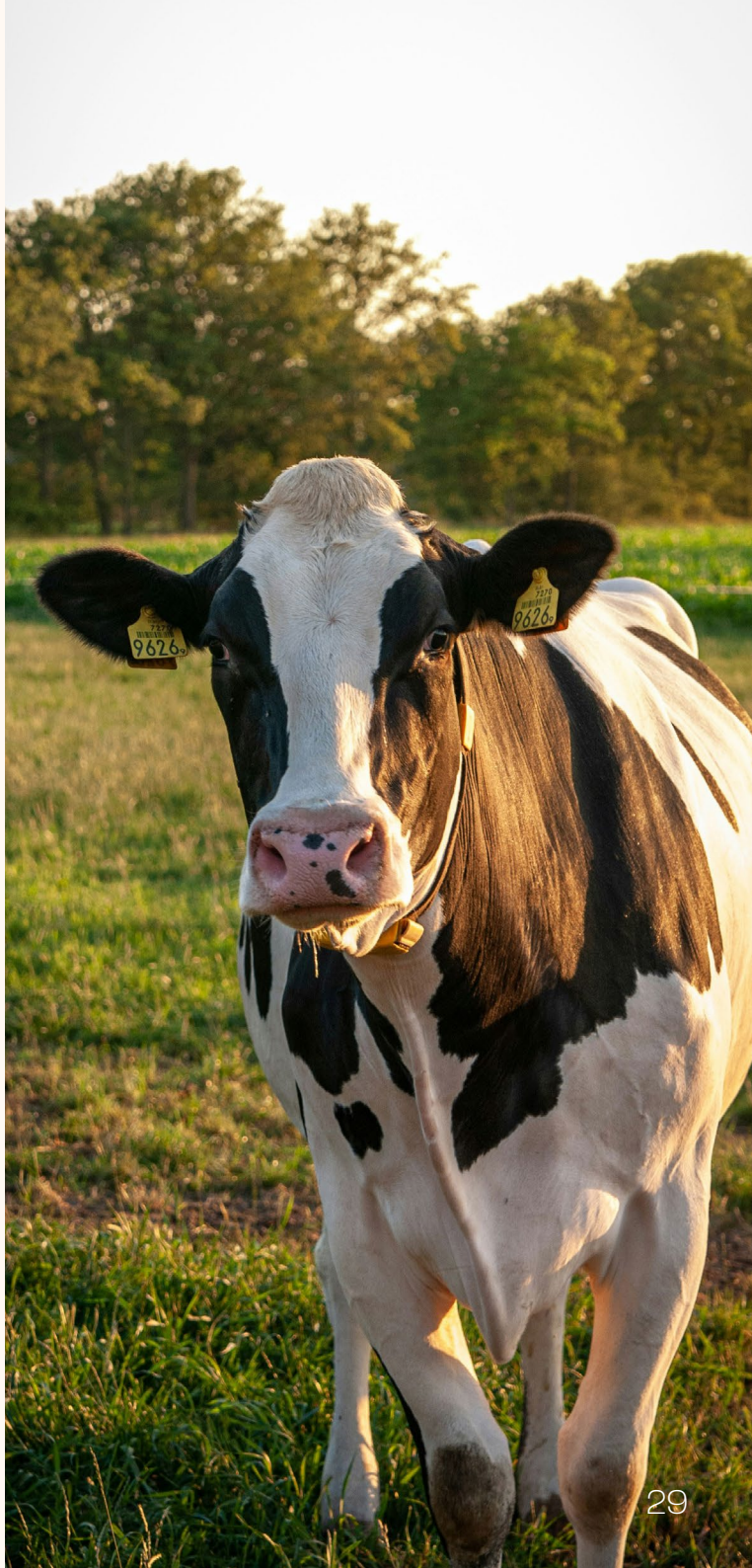
114 See Landworkers Alliance (nd)

Dairy

Dairy is a valuable source of protein, calcium and other vitamins and minerals considered particularly important for young children. As of 2019, milk and other dairy products accounted for 14% of the global agricultural trade, with world milk production projected to increase around 1.7% annually over the next decade.[115] With 1.9 billion litres of milk produced annually in Wales, dairy is an important economic sector supporting over 2,300 farmers, which is also culturally significant as a farming sector.[116]

Although dairy products are important from a nutritional and economic perspective, dairy production in its current form has a considerable environmental impact. Dairy cows are fed a diet that varies by region and farm, however most feed mixes include soy in the form of soybean meal or palm oil.[117,118] Both products are predominantly sourced from forested areas in the Amazon, with land clearance for crops contributing to deforestation, biodiversity loss, carbon release, and the displacement of Indigenous communities. In Wales, around 80% of soy imported is used as feed for livestock, of which 20% is used for the dairy industry specifically.[119] The farming of dairy cows also contributes to GHG emissions through manure management, rumination, feed production and on-farm processing. At a local level, dairy farming results in slurry runoff, representing a leading cause of water pollution, while also degrading soil fertility and structure, and releasing air pollutants through ammonia.[120]

While dairy intake is important for human health, particularly in young children, the Livewell diet recommends a 25% reduction in dairy and 67% reduction in cheese in order to improve both environmental and human health.[121]



115 https://openknowledge.fao.org/server/api/core/bitstreams/beee9189-d92d-4a0d-86af-a1e3328c33d1/content?

116 Welsh Assembly Government (2018) Strategic Action Plan for the Welsh Dairy Industry. Available at: https://www.gov.wales/sites/default/files/publications/2018-05/dairy-industry-strategic-action-plan.pdf#:~:text=2%20In%20Wales%2C%20we%20have%20about%202%2C300%20dairy,the%20milk%20produced%20is%20currently%20processed%20in%20Wales.

117 Carter, N. (2023) Plant Based Data. The Eco Story of the Humble Soybean Exploring Soy's Environmental Impacts and Solutions. Available at: https://www.plantbaseddata.org/post/the-eco-story-of-soy

118 Rainforest Action Network (2024) Feeding Deforestation: How millions of tons of palm oil are hidden in animal feed. Available at: https://www.ran.org/the-understory/palm-oil-hidden-in-animal-feed/

119 See Buckland et al, 2021.

120 Horton, H. (2024) Most UK dairy farms ignoring pollution rules as manure spews into rivers. Available at: https://www.theguardian.com/environment/2024/apr/19/most-uk-dairy-farms-ignoring-pollution-rules-as-manure-spews-into-rivers

121 See Halevy and Tewern, 2023.

What are the options?

Table 3 compares the use of dairy milk in a macaroni cheese, from a cow fed on soy / palm oil, to an organic / grass-fed cow, across five criteria. The colour key for the fifth criteria, Deforestation Risk, is below.

KEY FOR DEFORESTATION RISK

	HIGH RISK: May directly cause deforestation through land use change in production.
	MEDIUM RISK: May indirectly cause deforestation by displacing land use from the UK to abroad, in order to meet current demand for the product.
	LOW RISK: Low risk due to strict production methods and ethical certification standards, and / or land could be freed up for other uses.

This assessment considers only milk used as a direct ingredient. However, cheese is also a key dairy ingredient in a dish like macaroni cheese and would be expected to have a larger environmental impact. This is because of the significantly higher milk requirement per unit of final product (around 10 litres of milk produce 1kg of cheese), and more energy-intensive processes involved in cheese production relative to milk, such as curdling and refrigeration.[122] This means that the carbon footprint of cheese is around 8 times higher than milk, and the land use and water footprint is around 10 times higher.[123] From a nutritional perspective, cheese also contains saturated fat and salt. While cheese is not formally assessed, a 'less and better' approach is likely to apply to it, in common with other ingredients considered in this analysis. In the case of a dish like macaroni cheese, this might involve the whole dish appearing less frequently on the menu cycle. Cheese may however offer benefits as a substitute or additional ingredient in dishes where meat is currently the key protein source.

122 See Ritchie, 2020.
123 See Poore & Nemecek, 2019.

Table 3: Assessing Replacement Options for Milk in a Macaroni Cheese

OPTION 1: MILK FROM A COW FED ON SOY / PALM OIL

Carbon Impact	Cost	Nutritional Value[124]	Wider Environmental & Social Impact	Deforestation Risk
3.15kg CO_2e/kg milk, based on international averages from cradle to retail. *~70% emissions are from on-farm emissions (predominantly methane and manure management), ~20% from land conversion and feed, and the remaining 10% from processing, transport, retail, and packaging.*[125] It should be noted that current consumption of milk in Wales is largely domestic / UK-based, therefore the non-organic Option 2 (below) is likely to be closer to the status quo already. [126]	British: £0.64/litre[127]	✓ High in protein, calcium, B vitamins, riboflavin and phosphorus.	✗ Contributes to **deforestation** through land clearance for soy and palm used in feed, resulting in widespread loss of stored carbon, habitats, and homes of Indigenous communities.[128] ✗ **High water footprint** with an average use of 628.2 litres of freshwater per litre of milk (used to grow feed, water cows, manage manure).[129] ✗ Contributes to **soil erosion and desertification** through conversion of land to grow feed crops. ✗ Contributes to **water pollution** and **eutrophication** (10.65g per litre of milk) through manure runoff.[130] ✗ Release of **ammonia contributes to air pollution**, damaging downstream habitats and air quality. ✗ In intensive dairy farms, **cows can be: confined indoors; suffer health problems** such as lameness and malnourishment due to higher milk yields; and distressed by early separation from calves.[131]	

124 Nutrition Calculator. Available at: https://nutritionvalue.org/nutritioncalculator.php
125 Ritchie, H., Rosado, P. and Roser, M. (2018) Environmental Impacts of Food Production. Our World in Data. Available at: https://ourworldindata.org/environmental-impacts-of-food
126 Poore, J. and Nemecek, T. (2019) Reducing food's environmental impacts through producers and consumers. Sustainability, 360 (6392): 987-992.
127 This figure is based on semi-skimmed milk sourced from a British dairy farm, from a large UK retailer, prices as of August 2024.
128 WWF (2024) Dairy. Available at: https://www.worldwildlife.org/industries/dairy
129 See Poore & Nemecek, 2019.
130 Ritchie, H. (2022) Dairy vs. plant-based milk: what are the environmental impacts? Our World in Data. Available at: https://ourworldindata.org/environmental-impact-milks
131 Compassion in world farming (2024) Dairy Cows. Available at: https://www.ciwf.org.uk/farm-animals/cows/dairy-cows/?gad_source=1

Table 3: Assessing Replacement Options for Milk in a Macaroni Cheese

OPTION 2: MILK FROM A WELSH ORGANIC COW FED ON GRASS

Carbon Impact	Cost	Nutritional Value[124]	Wider Environmental & Social Impact	Deforestation Risk
Non-organic British dairy is 1.33 CO_2e/kg milk, based on UK averages from cradle to farmgate.[132,133] *Data is currently mixed for **organic** dairy farming, and largely depends on feed composition, use and origin, and production efficiency. Generally, emissions from feed are expected to reduce and carbon stored in soil increases. However, because of lower macronutrient densities and digestibility of feeds in grass-fed systems, cows grow slower and are slaughtered older, which can contribute to higher lifetime methane emissions.[134,135] As a result, reduced use of inputs per tonne of milk under organic management can be offset by lower milk yields and lower feed conversion ratios.[136,137]* The greater land requirement and longer life expectancy of organic cows may also displace some emissions (from feed and farming) abroad to meet the current UK demand for milk.	Welsh: £0.75/litre[138] Welsh Organic: £1.00/litre[139]	• See above. • Some research identifies organic milk to be marginally higher in vitamin E, iron and fatty acids (omega-3s).[140]	✓ **Reduced deforestation risk** as organic cows graze on existing pasture in Wales rather than feed mixes.[141] ✓ When sustainably managed, organic dairy production can achieve **conservation benefits**, as grazing can maintain the health of grasslands and preserve wildlife habitats. Some dairy cows are being used in rewilding projects to create pastured woodland. ✓ Regeneratively farmed grass-fed cows can **improve soil health and fertility** through manure, supporting farm business resilience and food security. ✓ **Supports Welsh farming and rural economies**. ✓ Cows are reared under **higher welfare** with outdoor access and no use of antibiotics. ✗ Can be a less **efficient use of land** as cows live longer and more grassland is needed for grazing.[142] This could result in displacement of land use abroad, potentially causing **indirect deforestation** to cater for current Welsh demand for dairy (which can't currently be met by organic production).	

132 This figure is for UK dairy and does not account for organic practices. It also does not account for emissions from farmgate to retail (although these are considered relatively low).

133 AHDB (2022) UK average greenhouse gas emissions per unit product, Agrecalc farms 2018-2022. Available at: https://ahdb.org.uk/knowledge-library/greenhouse-gas-emissions-agriculture

134 Clark, M. and Tilman, D. (2017) Comparative analysis of environmental impacts of agricultural production systems, agricultural input efficiency, and food choice. Environ. Res. Lett. 12.

135 O'Connor, I. Ellens, J. and Klarmann, M. (nd) Organic Production, Climate and the Environment. Eaternity. Available at: https://eaternity.org/assets/smart-chefs/170927-Eaternity-fact_sheet_booklet.pdf

136 Bronts, S. Gerbens-Leenes, P.W. and Guzman-Luna, P. (2023) The water, land and carbon footprint of conventional and organic dairy systems in the Netherlands and Spain. A case study into the consequences of ecological indicator selection and methodological choices. Energy Nexus, 11:100317.

137 Hirsiger, E., O'Connor, I. & Ellens, J. (2016). Meta-Analysis: A review on the differences in environmental impacts of organic and conventional farming-systems. Work Package B of the Organic FootPrint project. Eaternity, Zürich.

138 This figure is based on semi-skimmed milk sourced from a Welsh dairy, from a Welsh school food supplier, prices as of August 2024.

139 This figure is based on semi-skimmed milk sourced from an organic grass-fed Welsh dairy, direct to consumer, prices as of August 2024.

140 Healthline (2021) Organic vs. Regular Milk: What's the Difference? Accessed via: https://www.healthline.com/nutrition/organic-milk#nutrition

141 Soil Association (2024) Better for animals. Available at: https://www.soilassociation.org/take-action/organic-living/why-organic/better-for-animals/#cows

142 Ibid.

What are the key conclusions?

1. CARBON:

The dairy industry is a significant contributor to GHG emissions, predominantly through manure management, rumination, feed production, and on-farm processing. This assessment considers only milk as a direct ingredient, although cheese is also a key ingredient in a dish like macaroni cheese and would be expected to have an even larger carbon impact. Milk produced in Wales is lower in emissions than milk sourced from abroad due to reduced transportation and processing, and a lower reliance on imported feed. With most milk consumed in Wales already produced in the UK, milk produced from grass-fed / organic cows can result in lower emissions still, due to further reductions in imported feed, combined with carbon sequestration from grasses and soil. However, these potential reductions are typically offset by lower milk yields and higher lifetime methane emissions, meaning the net outcome on GHG emissions can be higher. As a result, a less and better approach is advised, where consumption is reduced, and matched with substitution of plant-based alternatives. There may also be other options to reduce emissions from dairy cows, such as exploring feed additives to minimise methane production, or practising silvopasture, though the scale and pace at which these could be implemented is perhaps limited at current.[143]

2. COST:

Milk is a relatively cheap product, with milk from organic / grass-fed cows being around a third more expensive because of higher production costs. The cost premium for switching to organic / grass-fed dairy could be offset by reducing the quantity of dairy used across a menu, and replacing this with other plant-based whole foods, which can be relatively cheap.

3. NUTRITION:

Milk is highly nutritious, being high in protein and containing all nine essential amino acids. It is also high in calcium, B vitamins, phosphorus, and riboflavin, providing important nutrients for children to grow and build strong bones. The nutritional profile of milk produced from organic / grass fed cows is considered to be similar to milk produced from soy / palm fed cows, though some research finds it marginally higher in vitamin E, iron and polyunsaturated fatty acids (omega-3s). Because milk is so rich in vitamins and minerals, it should retain a key role in children's diets. However, its environmental impact could potentially be reduced through: sourcing from organic / grass-fed cows, or cows reared under more sustainable production practices; and reducing the number of dishes (or quantity) with milk across a menu cycle. With regards to other forms of dairy, notably cheese, the Livewell diet recommends a significant reduction in consumption (by 67%), given its high saturated fat and salt content.[144] Given that cheese may become a potential supplement or alternative to meat dishes, reducing the number and / or the rotational frequency of meals on a menu where cheese is the primary ingredient (such as macaroni cheese), rather than a secondary ingredient (such as a cheese topping on a pasta), will be an important consideration.

143 WWF (2022) Farm-level Interventions to Reduce Agricultural Greenhouse Gas Emissions. Available at: https://www.wwf.org.uk/sites/default/files/2022-01/Farm-level%20interventions%20to%20reduce%20GHG%20emissions_Final%20Report_updated.pdf

144 See Halevy and Tewern, 2023.

4. WIDER SOCIAL AND ENVIRONMENTAL PERSPECTIVE:

The production of feed for dairy cows reared both in the UK and abroad, has resulted in extensive land clearance for feed crops. In addition, the production of milk has a high water footprint, and through the release of ammonia, has contributed to water and air pollution. Intensive dairy farms can also have lower welfare standards, where cows are confined indoors and vulnerable to health problems such as lameness and malnourishment (although this is less apparent in the UK – where most milk consumed in Wales is already sourced from – due to animal welfare regulations). Organic / grass-fed dairy farming represents a much better alternative from a wider social and environmental perspective. When sustainably managed, organic / grass-fed dairy production can achieve conservation benefits, and improve soil health and fertility, as healthy grasslands are maintained while cow manure acts as a natural fertiliser. In addition, organic cows are consistently reared under higher welfare as they are fed on a natural diet, have access to pasture, live longer, and are not subjected to antibiotics or hormone treatments.

5. DEFORESTATION RISK:

Most milk sold in Wales is produced in the UK, from dairy cows fed on a mix of grass, concentrate feeds like grains and soybean meal, and by-products which can include palm oil. The use of soy and palm oil in feed therefore makes the dairy industry a key contributor to deforestation through production of feed crops. In 2019, it was estimated that around 1 billion ha of land is used to grow feed for dairy cows, with the global dairy herd consuming 2.5 billion tons of dry matter feed annually.[145] However, a growing number of dairy farms in Wales are now feeding their cows solely on grass, or a grass mixture which excludes forest-risk commodities such as soybean and palm oil, and is instead based on grass, organic forage, and non-GMO feed. There are even some farmers trialling innovative feed types such as insect protein, microbial protein, grain legumes, and organic waste. While these cows reduce the risk of direct deforestation, there remains a risk of indirect deforestation as Welsh organic / grass-fed dairy production is unable to cater to the current demand for dairy due to lower productivity (like other organic commodities discussed in this report). Hence, if dairy consumption is not reduced, this could mean that land use for growing feed crops for non-organic / grass-fed cows is displaced abroad, resulting in further deforestation.

Overall....

A less and better approach is recommended for dairy use over a menu cycle. This involves:

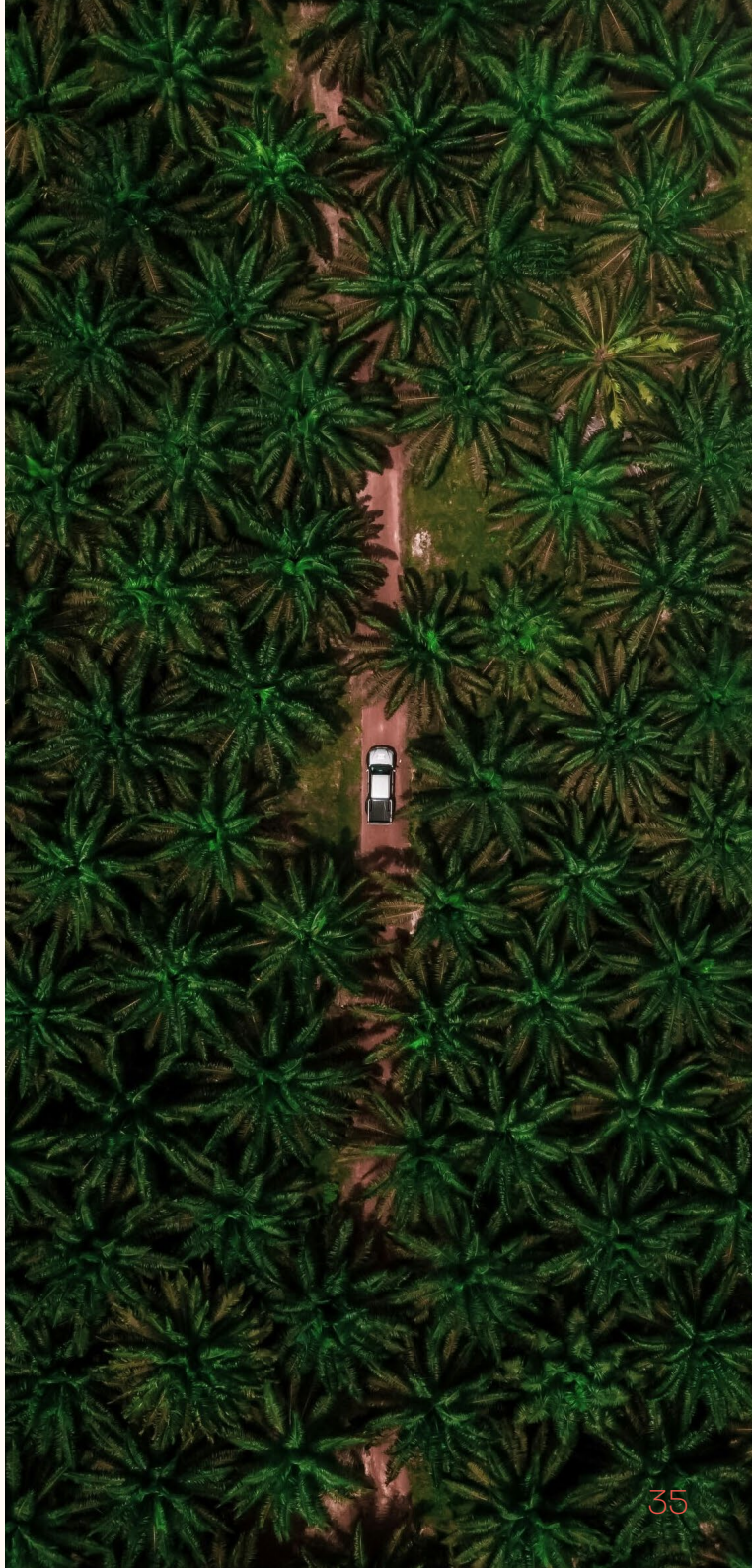
1. Sourcing dairy from Welsh suppliers where cows are organic / grass-fed within healthy ecosystems and high standards of welfare; and
2. Reducing the overall quantity of dairy used across a menu, in replacement for plant-based foods such as vegetables, fruit, pulses, nuts and wholegrains. Due to the higher environmental impact and lower nutritional value of cheese, it is recommended that substituting cheese over milk is prioritised, particularly in dishes where both forms of dairy are used (such as a macaroni cheese). Reducing the number of meals on a menu where cheese is a primary ingredient, is particularly important in light of the role cheese may play elsewhere in a menu as an alternative ingredient to supplement meat-free dishes. Meals and menu cycles should therefore be reformulated through a holistic approach with a view to achieve a reduction of animal-based ingredients, overall.

145 See Dairy Declaration, 2019.

Palm Oil

Palm oil is an edible vegetable oil that comes from the fruit of oil palm trees. It can be found in nearly 50% of packaged products in UK supermarkets, with 68% used in foods such as margarine, chocolate, bread and cooking oils, 27% in consumer products such as soaps, detergents and cosmetics, and 5% in bioenergy.[146,147] Wales imports 51,000 tonnes of palm a year, mostly in the form of palm kernel expeller and oilcake (53% of total), which is an ingredient in livestock feed.[148] A further 27% of imports are palm oil, which is used in processed foods such as biscuits, cakes and confectionery, and personal hygiene products.[149]

With 30 million ha of land devoted to oil palm plantations globally, palm oil has historically been, and continues to be, a major driver of deforestation.[150] Production is centred in tropical countries containing some of the world's most biodiverse forests, with 45% of the land area covered by new oil palm plantations on formerly forested land -a much higher share than for other oilseed crops such as soybean (8%).[151] This makes palm Wales' most likely forest-risk commodity to come from high or very high-risk countries for deforestation and social issues.[152,153] Oil palm plantations have therefore led to the destruction of areas with high ecological and cultural value, resulting in the decline of endangered species such as the orangutan, Sumatran rhino and pygmy elephant. It has been estimated that oil palm expansion could affect 54% of all threatened mammals and 64% of all threatened birds globally.[154] In addition, the loss of carbon-rich forests and peat soils contributes to climate change through significant release of greenhouse gas emissions and destruction of valuable carbon sinks. As well as its carbon and biodiversity impact, oil palm cultivation and palm oil production have been linked to human rights abuses, including exploitative working conditions and the undermining of Indigenous land rights.[155]



146 WWF (n.d.) 8 Things to Know About Palm Oil. Available at: https://www.wwf.org.uk/updates/8-things-know-about-palm-oil

147 Our World in Data (2021) Palm Oil. Available at: https://ourworldindata.org/palm-oil#:~:text=Palm%20oil%20is%20very%20versatile%20and%20is%20used,used%20as%20biofuels%20for%20transport%2C%20electricity%2C%20or%20heat.

148 See Buckland et al, 2021.

149 Ibid.

150 See WWF (n.d.)

151 See Buckland et al, 2021.

152 See Buckland et al, 2021.

153 Vijay, .V, Pimm, S.L, Jenkins, C.N., and Smith S.J. (2016) The Impacts of Oil Palm on Recent Deforestation and Biodiversity Loss. PLOS ONE 11(7): e0159668.

154 IUCN Issues Brief (June 2018), Palm Oil and Biodiversity. Available at: https://www.iucn.org/resources/issues-brief/palm-oil-and-biodiversity

155 Human Rights Watch (2019) "When We Lost the Forest, We Lost Everything": Oil Palm Plantations and Rights Violations in Indonesia. Available at: https://www.hrw.org/report/2019/09/23/when-we-lost-forest-we-lost-everything/oil-palm-plantations-and-rights-violations

Progress has been made minimising harm to nature and people from palm oil production; in 2019, 70% of total palm oil imports to the UK were regarded as sustainable, minimising harm to nature and people where certification schemes are transparent and adhered to.[156] Globally, in response to concerns about the destruction of tropical forests for palm oil production, a coalition of organisations including palm oil producers, traders, consumer goods manufacturers, NGOs and retailers founded the Roundtable on Sustainable Palm Oil (RSPO) in 2004. RSPO-certified palm oil must meet traceability and verification standards set out by the RSPO, with the aim of reducing the negative impacts of palm oil production on human rights and the environment.

What are the options?

Table 4 compares the use of uncertified palm oil with certified palm oil in ready-made tortillas across five key criteria. The key for the fifth criteria, Deforestation Risk, is provided below.

KEY FOR DEFORESTATION RISK

	HIGH RISK: May directly cause deforestation through land use change in production.
	MEDIUM RISK: May indirectly cause deforestation by displacing land use from the UK to abroad, in order to meet current demand for the product.
	LOW RISK: Low risk due to strict production methods and ethical certification standards, and / or land could be freed up for other uses.

156 See WWF (n.d.).

Table 4 Assessing Replacement Options for Uncertified Palm Oil in a Tortilla

OPTION 1: UNCERTIFIED PALM OIL

Carbon Impact	Cost	Nutritional Value	Wider Environmental & Social Impact	Deforestation Risk
5.34 (3.34-8.16) kg CO_2e/kg product[157] Other data suggests palm oil is associated with **6-8kg CO_2e/kg** emissions,[158,159] though it is not explicitly specified that this is 'uncertified'. *Emissions are primarily from land use change (around 30%), carbon release from peat soils, and the treatment of mill effluents. Although new biomass grown (in the form of oil palm trees) will sequester carbon, it will do so at a total amount that is much lower than a native forest, and total biomass will be significantly less than native forest biomass.*	N/A[160]	✗ Higher levels of saturated fats than most vegetable oils[161] (e.g. rapeseed, sunflower oil).[162] ✗ Often contained in ultra-processed foods, which typically have lower nutritional value.	✓ An attractive **source of income and employment** for farmers and key to economic development in Malaysia / Indonesia.[163] ✓ Palm oil is one of the most efficient vegetable oils to produce from a land use perspective.[164] ✗ Significant driver of tropical **deforestation**, representing a significant reduction in carbon sequestration and increase in biodiversity loss in species-rich areas.[165] ✗ Driver of **peatland conversion**[166] Peatland is the largest natural terrestrial carbon store and a key habitat for wildlife. Damaged peatlands are a major source of greenhouse gas emissions. ✗ **Air, soil and water pollution** may occur during clearing, plantation establishment and mill operation.[167] ✗ Clearance of forests to establish plantations and planting palms on steep slopes may result in **soil erosion,** increased flooding and silt deposits in rivers and ports.[168] ✗ Plantations have been associated with **exploitation of workers**, **violations of land use rights of Indigenous Peoples, and child labour.**[169,170]	

157 Schmidt, J. and De Rosa, M. (2020) Certified palm oil reduces greenhouse gas emissions compared to non-certified. Journal of Cleaner Production. 277, 124045

158 See Poore and Nemecek, 2019.

159 Patel et al. (2022) Measuring and Mitigating GHGs: Palm Oil. The Markets Institute at WWF. Available at: https://files.worldwildlife.org/wwfcmsprod/files/Publication/file/1l7ynjrq3a_MOBERG_GHG_Brief_PALM_OIL_08_22_v3.pdf

160 Prices for tortillas containing uncertified palm oil were not readily available, given that most tortilla/bread products identified already contain certified palm oil. While reflecting a step in the right direction, a significant majority of the sample products procured under Welsh procurement contracts and identified as containing palm oil contained palm oil certified as RSPO Mass Balance (MB). MB is a mix of certified and conventional (uncertified) palm oil and therefore not consistent with a deforestation free approach. This is the same position held by the French Government in its zero deforestation strategy: https://www.atibt.org/files/upload/news/Guide_politique_achat_public_zero_deforestation_18nov2020.pdf. The more robust options are RSPO Certified (i.e. Segregated and Identity Preserved), which can be traced along the supply chain from farm to fork.

161 https://www.sciencedirect.com/science/article/pii/S0022316622087958

162 Oil, Palm Nutrition Facts and Analysis. Available at: https://www.nutritionvalue.org/Oil%2C_palm_nutritional_value.html?size=100+g

163 European Parliament (2020) Palm oil: Economic and environmental impacts. Available at: https://www.europarl.europa.eu/RegData/etudes/ATAG/2020/659335/EPRS_ATA(2020)659335_EN.pdf

164 WWF (n.d) Which Everyday Products Contain Palm Oil? Available at: https://www.worldwildlife.org/pages/which-everyday-products-contain-palm-oil#:~:text=Palm%20oil%20is%20by%20far%20the%20most%20efficient,and%20the%20communities%20where%20it%20is%20commonly%20grown.

165 See IUCN, 2018.

166 Miettinen, J. et al. (2016) Land cover distribution in the peatlands of Peninsular Malaysia, Sumatra and Borneo in 2015 with changes since 1990. Global Ecology and Conservation. 6 (67-78)

167 WWF (n.d.) What is Palm Oil? Facts About the Palm Oil Industry. Available at: https://www.worldwildlife.org/industries/palm-oil

168 Ibid.

169 University of Warwick (2021) Strengthening Indigenous Land Rights in the Face of Rapid Oil Palm Expansion in Kalimantan, Indonesia. Available at: https://warwick.ac.uk/fac/arts/schoolforcross-facultystudies/gsd/engagement/studentresearch/policiesandbriefings/2020-21/naomi_-_policy_brief.pdf

170 WWF (n.d.) What is Palm Oil? Facts About the Palm Oil Industry. Available at: https://www.worldwildlife.org/industries/palm-oil

Table 4 Assessing Replacement Options for Uncertified Palm Oil in a Tortilla (continued)

OPTION 2: CERTIFIED PALM OIL (RSPO)

Carbon Impact	Cost	Nutritional Value	Wider Environmental & Social Impact	Deforestation Risk
3.41 (2.61-4.48) kg CO2 eq./kg[171] *Certified production is associated with reduced emissions due to higher yields (less land per unit of product), less oil palm cultivated on peat soil, and a higher share of palm oil mill effluents treated with biogas capture technologies.*	£1.43/ kg[172]	• There is no known difference in nutritional value between uncertified and certified palm oil.	✓ RSPO production standards set best practices for producing and sourcing palm oil.[173] When palm oil is produced in adherence to RSPO standards, growers help to **protect the environment, minimise environmental and human rights impacts** associated with oil palm cultivation, and support local communities who depend on the crop for their livelihoods. However it must be noted that weaknesses can be found in industry led certification schemes where environmental and human rights abuses can be found in supply chains.	

171 See Schmidt and De Rosa, 2020.
172 Price based frozen plain wheat flour tortillas, by a Welsh school food supplier, prices from July 2024.
173 See WWF (n.d.) 8 Things to Know About Palm Oil.

What are the key conclusions?

1. CARBON:

Certified palm oil is estimated to be 35% lower in emissions than uncertified palm oil. This is primarily due to: reduced land use change-related emissions per unit of product; reduced oil palm cultivated on peat soil; and a higher share of palm oil mill effluents treated with biogas capture.[174]

2. COST:

Prices for tortillas containing uncertified palm oil were not readily available, given that most tortilla/bread products identified already contain certified palm oil. While reflecting a step in the right direction, a significant majority of the sample products procured under Welsh procurement contracts and identified as containing palm oil contained palm oil certified as RSPO Mass Balance. Mass Balance is a mix of certified and conventional (uncertified) palm oil and therefore not consistent with a deforestation free approach. The more robust options are RSPO Certified (i.e. Segregated and Identity Preserved), which can be traced along the supply chain from farm to fork.[175]

3. NUTRITION:

There is no known difference in nutritional value between certified and uncertified palm oil. However, from a nutritional point of view, both certified and uncertified palm oil are typically associated with **ultra-processed foods (UPFs)**. Although no standard definition exists, this category includes foods containing additives that are foreign to a domestic kitchen, such as artificial colours and flavours or stabilisers, and substances extracted from foods, such as fats, starches, added sugars, and hydrogenated fats. Typical examples include crisps, sweetened breakfast cereals, breads, biscuits and packaged soups.[176] Recent research shows that UPFs are directly linked to 32 harmful effects to health, including a higher risk of heart disease, obesity, cancer, type 2 diabetes, adverse mental health and early death.[177] In the UK, UPFs constitute 67% of daily energy intake for under 14-year-olds, with some children who are poorer or from disadvantaged areas consuming as much as 80% UPFs in their diet.[178] In schools, a 2022 study found that 64% of UK pupils' total school-provided lunch calories to be from ultra-processed foods.[179] Hence, there is widespread evidence that eating more minimally-processed plant foods and fewer products high in fat, salt and sugar is healthier,[180,181] and given the devastating impacts on nature from these industrial production practices, Livewell encourages change towards a healthy, sustainable diet which favours natural whole food.[182] In the context of a school menu, that might mean options prepared from more whole food ingredients and the elimination of UPFs on a menu.

174 See Schmidt and De Rosa (2020)
175 RSPO (2015) Statement on RSPO Supply Chain Models. Available at: https://rspo.org/statement-on-rspo-supply-chain-models/
176 See Dimbleby, 2021.
177 Lane, M. M. et al (2024) Ultra-processed food exposure and adverse health outcomes: umbrella review of epidemiological meta-analyses. BMJ, 384.
178 Gregory, A. (2024) Ultra-processed food linked to 32 harmful effects to health, review finds. The Guardian. Available at: https://www.theguardian.com/society/2024/feb/28/ultra-processed-food-32-harmful-effects-health-review
179 Parnham, J. C. et al. (2022). The ultra-processed food content of school meals and packed lunches in the United Kingdom. Nutrients, Vol 14, 2961.
180 Crimarco, A. et al. (2022) Ultra-processed Foods, Weight Gain, and Co-morbidity Risk. In: Current Obesity Reports. Etiology of Obesity.
181 Rauber F. et al. (2018) Ultra-processed food consumption and chronic non-communicable diseases-related dietary nutrient profile in the UK (2008-2014). Available at: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5986467/pdf/nutrients-10-00587.pdf
182 See Halevy and Trewern, 2023.

4. WIDER SOCIAL AND ENVIRONMENTAL PERSPECTIVE:

RSPO-certified palm oil provides a better alternative to uncertified palm oil from both an environmental and social perspective. RSPO-certified palm oil reduces the risk of deforestation within supply chains relative to uncertified palm oil, due to the standards set out by the RSPO for supply chain traceability. RSPO standards also stipulate best practices for minimising wider negative environmental and social impacts associated with palm oil cultivation. Despite this, it is worth noting that the Environmental Investigation Agency (and other organisations) have accused the RSPO of greenwashing, with standards falling short of ensuring supply chains do not result in forest clearance.[183] This has included practices such as certifying companies who 'compensate' for forest loss by conserving an equivalent area elsewhere or simply paying out. As a result, public sector bodies procuring food are encouraged to use the RSPO certification as a guiding standard, however at a broader level, it is recommended that the UK urgently implements has due diligence legislation on forest risk commodities, rather than relying on industry-led voluntary standards and certification processes that can have violations in the supply chain. The UK Government has yet to introduce the secondary legislation to operationalise the forest risk commodities regulations included in the Environment Act (2021).

In addition to the direct deforestation impact, the rise in UPFs has been accompanied and enabled by the rise in industrial, input-intensive production practices, as well as standardised commodity monoculture ingredients produced at scale.[184] These systems are associated with devastating impacts on nature.[185] Reducing or even eliminating ultra-processed foods, including those that contain palm oil, would therefore be a step better.

5. DEFORESTATION RISK:

Oil palm cultivation is a significant direct driver of deforestation in tropical forests, and is the primary cause of deforestation in Indonesia and Malaysia. Although palm oil is more land efficient, many other oils can be grown on previously cultivated land in Europe, whereas palm oil can only be grown in tropical regions. Given the demand for UPFs requires the versatility of palm oil compared to other oils, reducing UPF consumption should be the first step for the benefit of both human and environmental health. Where it is difficult to avoid the use of palm oil, or making the product from scratch is impractical for schools, such as margarine, suppliers should use products which contain RSPO certified palm oil from fully traceable sources.[186]

Overall....

Replacing uncertified palm oil for certified palm oil (Identify Preserved or Segregated, rather than Mass Balance or RSPO credits (previously Book and Claim), is a worthwhile swap and a step in the right direction from an environmental and social point of view.

While this comparison is situated in the context of tortillas, palm oil is found in a range of dishes in a school menu, therefore uncertified palm oil could be swapped out across an entire school menu, and with relative ease given the taste indifference between certified and uncertified palm oil.

However, reducing or even eliminating ultra-processed foods, including those that contain palm oil, would be a step better where possible.

183 Environmental Investigation Agency (nd) Palm oil produced through the destruction of forestland is still being sold around the world with the blessing of the Roundtable on Sustainable Palm Oil (RSPO). Available at: https://eia-international.org/news/will-palm-oil-watchdog-rid-itself-of-deforestation-or-continue-to-pretend-its-products-are-sustainable/

184 Anastasiou, K. et al. (2022) A conceptual framework for understanding the environmental impacts of ultra-processed foods and implications for sustainable food systems. In: Journal of Cleaner Production, vol. 368. Available at: https://www.sciencedirect.com/science/article/abs/pii/S0959652622027445?dgcid=author

185 Soil Association. (2021) Ultra-Processed Planet. The impact of ultra-processed diets on climate, nature and health (and what to do about it). Available at: https://www.soilassociation.org/media/23032/ultra-processed-planet-final.pdf

186 WWF (n.d.) What is Palm Oil? Facts About the Palm Oil Industry. Available at: https://www.worldwildlife.org/industries/palm-oil

Cacao

Cacao is a tropical evergreen tree grown for its edible seeds, cocoa beans.[187] These beans are processed into cocoa powder, cocoa butter, and chocolate, with the UK consuming an average of nearly 4kg per person in 2021.[188] In Wales alone, 15,000 tonnes are imported each year, of which 38% is in the form of chocolate, and 31% as raw cocoa beans.[189]

Native to tropical forests, cacao is grown commercially in West Africa, Central and South America, and Malaysia, with Côte d'Ivoire and Ghana being the world's two leading cacao producers. In being a land-intensive crop, the average land required to produce enough cocoa for Wales alone (representing 5% of the UK total cocoa imports), is 48,200ha per year, being the equivalent to an area the size of Wrexham county.[190] Subsequently, in nearly every country where it is produced, being mostly from West Africa in the case of Welsh imports, cacao cultivation has been a leading cause of deforestation. For example, Côte d'Ivoire lost 94% of its forest cover from 1990 to 2015, and at least a third of that was due to cacao farming, with a similar picture in Ghana.[191] The replacement of native tropical forest with cacao monocultures is associated with significant loss of biodiversity and increased pollution.[192]

As well as its environmental impacts, cacao production also comes at a severe human cost. Many of the 5-6 million smallholder farmers growing cacao are not paid a living wage and live in extreme poverty, making the industry prone to forced or child labour, human trafficking, and illegal logging.[193] Pressures on cacao farmers are likely to increase as heatwaves and droughts increase in frequency and duration in the coming decades, detrimentally impacting cocoa yields and thereby potentially exacerbating social issues associated with cacao farming.

187 In this report, references to "cacao" refer to the crop as cultivated on plantations, and "cocoa" refers to products derived from the beans of this crop.

188 FAO (2023) Per capita consumption of cocoa beans. Available at: https://ourworldindata.org/grapher/chocolate-consumption-per-person

189 See Buckland et al, 2021.

190 See Buckland et al, 2021.

191 National Wildlife Federation (2024) Cocoa and Deforestation. Available at: https://international.nwf.org/cocoa-and-deforestation/

192 Kalischek, N., Lang, N., Renier, C. et al. (2023) Cocoa plantations are associated with deforestation in Côte d'Ivoire and Ghana. Nat Food 4, 384–393.

193 WWF (2024) Changing the cocoa industry to protect people and our forests. Available at: https://wwf.panda.org/discover/our_focus/forests_practice/cocoa/#:~:text=This%20has%20a%20knock%2Don,farmers%20to%20use%20more%20pesticides

What are the options?

Table 5 compares the use of uncertified cocoa powder with certified cocoa powder in a chocolate cake across five key criteria. The key for the fifth criteria, Deforestation Risk, is provided below.

KEY FOR DEFORESTATION RISK

	HIGH RISK: May directly cause deforestation through land use change in production.
	MEDIUM RISK: May indirectly cause deforestation by displacing land use from the UK to abroad, in order to meet current demand for the product.
	LOW RISK: Low risk due to strict production methods and ethical certification standards, and / or land could be freed up for other uses.

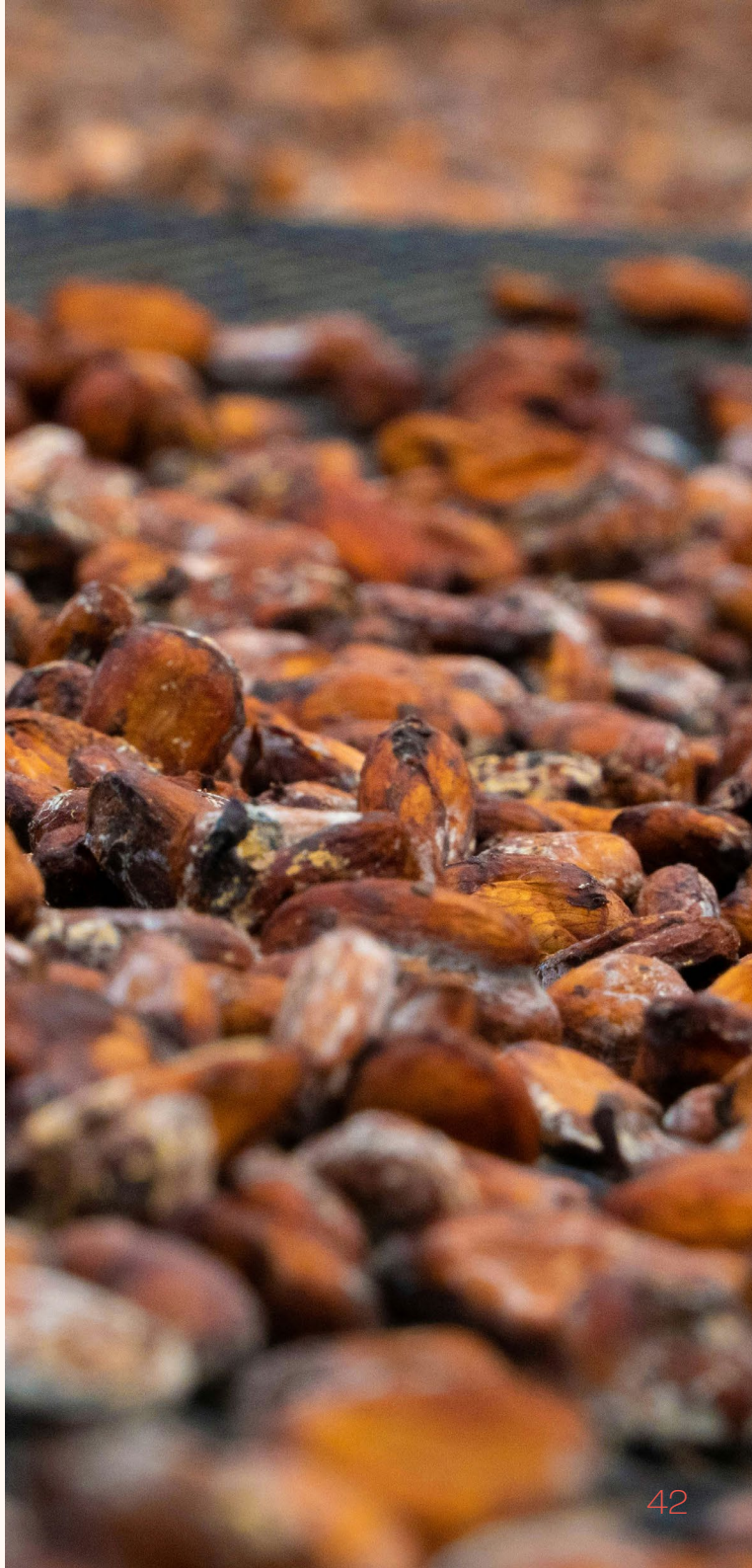


Table 5: Replacement Options for Cacao in a Chocolate Cake

OPTION 1: UNCERTIFIED COCOA POWDER

Carbon Impact	Cost	Nutritional Value	Wider Environmental & Social Impact	Deforestation Risk
Range from 1.47kg CO_2e/kg[194] to 9.22 kg CO_2e/kg.[195] *There is a wide range of carbon emission figures due to diverse farming practices employed and less comprehensive data on emissions compared to other deforestation-risk commodities.*	£8.86-£15.09/kg[196]	✓ Raw (unsweetened) cocoa powder contains antioxidants, flavanols and minerals such as zinc and iron.[197, 198] ✗ Often in products high in sugar and fat.	✗ Key driver of tropical **deforestation** in the countries where it is produced. It is estimated that 70% of illegal deforestation in the Cote d'Ivoire is related to cocoa farming.[199] Deforestation can lead to habitat loss, driving **biodiversity decline.** ✗ Monoculture cacao farming has become increasingly dependent on **agrichemical usage**,[200] with knock-on impacts on water and soil pollution and on human health.[201, 202] ✗ Many cacao farmers are not paid a living wage and live in **extreme poverty**. ✗ Links to forced and **child labour and trafficking** to meet demand for labour.[203]	

194 Vervuurt, W. et al. (2022) Modelling greenhouse gas emissions of cacao production in the Republic of Côte d'Ivoire. Agroforest Syst 96, 417–434.

195 Ortiz-Rodriguez, O. O. et al. (2016) Carbon footprint of the Colombian cocoa production. Eng Agric, 36:260–270.

196 Prices based Freshers Fat Reduced Cocoa Powder and Blanxart Cacao Puro Cocoa Powder, respectively, from catering suppliers based in England, prices from July 2024.

197 Deepak, L. and Bhatt, M. D. (2022) Should I add cocoa powder to my diet? Harvard Health Publishing. Available at: https://www.health.harvard.edu/mens-health/should-i-add-cocoa-powder-to-my-diet

198 Katz, D. L. et al. (2011) "Cocoa and chocolate in human health and disease." Antioxidants & redox signaling vol. 15,10: 2779-811. doi:10.1089/ars.2010.3697

199 WWF (2017) Bittersweet: chocolate's impact on the environment. Available at: https://www.worldwildlife.org/magazine/issues/spring-2017/articles/bittersweet-chocolate-s-impact-on-the-environment#:~:text=Cocoa%20farmers%20usually%20clear%20tropical,is%20related%20to%20cocoa%20farming.

200 Alternative farming practices, such as agroforestry and organic farming, bring several wider environmental benefits to cacao farming, including reduced pollution from agrochemical use. However, these practices may result in reduced cocoa bean yields compared to conventional monocropping systems, and therefore have the potential to drive increased deforestation, and/or the displacement of deforestation and conversion to other regions. (Niether et al. (2020); Schneider et al. (2016)

201 See WWF, 2024.

202 Burns (2022) Climate and cocoa: why an anti-modern slavery movement is talking about the environment. Available at: https://www.freedomunited.org/climate-and-cocoa/?utm_source=google&utm_medium=cpc&utm_campaign=%28ROI%29%20DSA&utm_id=1080780403&utm_content=53843782518&utm_term=&gad_source=1&gclid=CjwKCAjwm_SzBhAsEiwAXE2CvxB4asRFBsoQOPrG58-bDbYhLGnZXP7VyM6FUXOIMTpoqsvAUU9brBoC37wQAvD_BwE

203 See Burns, 2022.

Table 5: Replacement Options for Cacao in a Chocolate Cake (continued)

OPTION 2: CERTIFIED COCOA POWDER (E.G. FAIRTRADE, RAINFOREST ALLIANCE)

Carbon Impact	Cost	Nutritional Value	Wider Environmental & Social Impact	Deforestation Risk
2.29kg CO_2e/kg[204] where "good agricultural practices" are adopted. *"Good agricultural practices" include zero deforestation, higher use of inputs, higher yields and more shade. This is used here as a proxy for sustainability certification schemes due to the lack of data on cacao cultivation emissions, however, there is uncertainty about how directly 'good' practices in this sense might apply to all cacao in all certification schemes. This data should not be seen as a direct proxy for Fairtrade, Rainforest Alliance, or other certifications.*	£9.95-£14.2/kg[205]	• There is no known difference in nutritional value between uncertified and certified cocoa powder.	✓ Fairtrade: farmers are paid a Fairtrade **Minimum Price** for their goods. Farmers also receive a **Fairtrade Premium** to invest in projects of their choice. Fairtrade Standards cover key areas for **environmental protection**, including energy and emissions reduction, zero deforestation criteria, soil and water quality, and biodiversity protection. ✓ Rainforest Alliance has a strong focus on **deforestation free** products and **good agricultural practices**, whilst also working to improve **trading conditions** for farmers.	

204 See Vervuurt et al, 2022.
205 Prices based on Nurifi Organic Cacao Powder from a UK supplier, and Cadburys Bournville Cocoa Powder from a large supplier in Wales, respectively, prices from July 2024.

What are the key conclusions?

1. CARBON:

Although there is not yet strong evidence comparing the carbon emissions of uncertified and certified cocoa products, the fact tropical deforestation is the most significant contributor of emissions in cacao cultivation[206] suggests that certifications which promote deforestation free cacao are likely to have an emissions reduction benefit. It is worth noting that choices on agricultural practices for cacao can have a significant differential carbon impact, which may not all be reflected in whether a product is or is not certified.

2. COST:

There does not appear to be a significant difference in price between uncertified and certified cocoa, although prices do vary for cocoa powder products.

3. NUTRITION:

There is no known difference in nutritional value between uncertified and certified cocoa powder. However, although replacing uncertified cocoa for certified cocoa marks a step in the right direction from an environmental and social perspective, reducing the use of cocoa-containing products in school meals is even more favourable where possible. Although raw cacao contains antioxidants and some protein and vitamins, in school meals, cocoa is generally used in the form of products such as chocolate, which are high in sugar, fat and caffeine. Even if raw cacao is used in cooking, it is typically combined with other ingredients such as sugar and butter because of its bitter taste. The Livewell diet recommends replacing products high in fat, salt and sugar (such as savoury snacks, desserts and sugary drinks) with more nutritious foods including fruit, vegetables and wholegrains, which would improve health outcomes and ensure we are using scarce natural resources to only produce nutritious foods.[207]

Moreover, products such as chocolate cakes are typically produced en masse at schools using ultra-processed cake mixes, which can have a significantly worse nutritional profile than using raw cacao in cooking (see discussion of UPFs under the palm oil section). Instead, shifting to a system where cocoa-based desserts are made from scratch in schools with raw ingredients such as raw cacao, would represent a healthier alternative.

206 See Vurvuurt et al, 2022.
207 See Halevy and Trewern, 2023.

4. WIDER SOCIAL AND ENVIRONMENTAL PERSPECTIVE:

Certified cocoa is preferable to uncertified cocoa from a social and environmental perspective. For example, Fairtrade-certified cacao growers receive a guaranteed minimum price for their product, reducing levels of exploitation and extreme poverty associated with cacao farming.

5. DEFORESTATION RISK:

Cacao farming is a direct driver of deforestation globally, and particularly in West Africa, with demand for cocoa products continuing to increase rapidly. Certifications such as Fairtrade set standards for increased traceability and transparency within cocoa supply chains, to reduce deforestation associated with cacao farming.

Overall....

Certified cocoa powder provides a better alternative to uncertified cocoa powder from both an environmental and social perspective.

While this comparison is situated in the context of a chocolate cake, cocoa is used in a range of puddings in schools, therefore uncertified cocoa could be swapped out across an entire school menu – and with relative ease like palm oil, given the taste indifference and lack of significant price difference between certified and uncertified. As a next step, reducing or even eliminating ultra-processed foods and cocoa-containing foods with high levels of fat and sugar and replacing with more nutritious foods including fruit and yoghurt, would improve health outcomes and ensure we are using scarce natural resources to only produce nutritious foods, and would help improve nutritional and educational outcomes in pupils.

Feasibility of a Livewell & Deforestation Free School Menu

This section explores the feasibility of rolling out a Livewell and deforestation free school menu in Wales through identifying some key opportunities and barriers. These have been split into environmental, socio-economic and political categories.

Opportunities: Environmental

1. **Reduce tropical deforestation rates and support nature recovery**

   WWF-UK estimates that adopting Livewell recommendations could deliver a 20% reduction in biodiversity loss compared to the current average diet.[208] In addition, the Climate Change Committee's Sixth Carbon Budget analysis identified that dietary shift could release 3 million ha of land from agriculture by 2035,[209] providing opportunities to sequester carbon and restore nature, through for example, reducing: terrestrial acidification (57% reduction estimated); freshwater eutrophication (45% reduction); and marine eutrophication (47% reduction).[210] For Wales specifically, 1.5 million tonnes CO_2e are associated with the conversion of land for the production of Welsh imports of soy, cocoa, palm and natural rubber, therefore switching sourcing to better alternatives could help reduce Wales' carbon footprint.[211]

2. **Contribute to Net Zero.**

   The food system has a key role to play in achieving Net Zero. WWF-UK estimates that adopting Livewell recommendations could deliver a 36% reduction in emissions in the UK.[212] This is based on a comparison of the Livewell diet, estimated to be 3.12 $kgCO_2e$ per person per day, to the current average diet of 4.84 $kgCO_2e$ per person per day. This could in turn, deliver over half of the food emissions reductions needed by 2030. Notably, 69% of this is the result of reductions in meat and dairy consumption, therefore the extent to emissions reduction from a Livewell / deforestation free diet will be dependent on the type of swaps that are made, and in particular, the weighting of meat and dairy swaps.

3. **Support a transition to nature-friendly farming practices and a more resilient food system.**

   The principles of Livewell, as well as organic and certified products, include objectives to move towards more sustainable agricultural practices. For example, reduced consumption of ultra processed foods and increased diversity of plant-based foods in the diet is expected to enable a transition to regenerative agriculture (also associated with organic practices). This adopts approaches such as: greater agrobiodiversity; less input-intensive monoculture systems; prioritised food production for direct human consumption; and reduction of artificial fertilisers. By restoring the systems that food production depends on, including healthy soils, clean rivers, functioning ecosystems and a stable climate, a Livewell / deforestation free diet could help build a more resilient food system.

208 Ibid.

209 Climate Change Committee (2020) The Sixth Carbon Budget. Agriculture and land use, land use change and forestry. Available at: https://www.theccc.org.uk/wp-content/uploads/2020/12/Sector-summary-Agriculture-land-use-land-use-change-forestry.pdf

210 See Halevy and Trewern, 2023.

211 See Buckland et al, 2021.

212 See Halevy and Trewern, 2023.

Opportunities: Socio-economic

1. **Improve children's physical and mental health.**

   The Livewell diet, while meeting UK nutritional recommendations and dietary guidelines, proposes a greater proportion of fruit, vegetables, wholegrain cereals, plant protein foods and whole foods, as well as reduced intake of products high in fat, salt and sugar. This dietary shift is associated with reduced risks of malnutrition and obesity, improved dental health, and better mental health and wellbeing.[213] Although not every child eats a school meal all primary school children in Wales can now access Universal Primary Free School Meals.[214] This represents an opportunity particularly for those currently on packed school lunches, with repeated surveys of primary schools suggesting less than 2% of packed lunches meet nutritional standards.[215]

2. **Increase demand for local food, supporting Welsh farmers and rural economies.**

   The Livewell diet is associated with more whole foods and less ultra-processed foods. These are more likely to be available locally to schools in Wales and therefore may increase demand for local products, in turn, supporting Welsh agriculture. There is an opportunity to build this into the final version of the Sustainable Farming Scheme to ensure that regenerative farming practices are supported, increasing home grown feed and diversifying agriculture to increase horticulture production, including beans and legumes.

3. **Improve children's educational attainment.**

   Studies have identified a link between improved nutrition with: increased academic performance; advanced social and emotional competencies; and better behaviour.[216],[217] This is a result of healthy foods being associated with improved capacity for learning, concentration, reasoning, memory, and self-control in children and adolescents.[218]

4. **Improve livelihoods of growers internationally.**

   The sourcing of forest-risk commodities through certified deforestation free sources such as Fairtrade, RSPO and Rainforest Alliance, has the potential to improve incomes and livelihoods of growers and farmers in the Global South. Furthermore, including ethical certifications in Wales' procurement practices will also reduce the risk of human rights abuses in its supply chains, including abuses of Indigenous Peoples' rights, child and forced labour and trafficking. As Wales is already a Fairtrade Nation, Wales has an opportunity to build on this commitment and promote deforestation free practices across the nation.

5. **Reduce costs for schools through cheaper ingredients.**

   Many plant-based ingredients could provide financial savings for schools, given they are cheaper in cost. This could also apply for dishes where a meat/plant-based blend is considered most appropriate.

213 See Halevy and Trewern, 2023.

214 Welsh Government (2022) Universal Free School Meals Roll-out to Commence in September. Available at: https://www.gov.wales/universal-primary-free-school-meals-upfsm&sa=D&source=docs&ust=1727831850550493&usg=AOvVaw2XRe1rRKkjt_eZA09wL1DX

215 Evans, C. E. L. et al. (2020). A repeated cross-sectional survey assessing changes in diet and nutrient quality of English primary school children's packed lunches between 2006 and 2016. British Medical Journal, 10. British Medical Journal Publishing Group

216 Brooks, F. (2014) The link between pupil health and wellbeing and attainment. Public Health England. Available at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/370686/HT_briefing_layoutvFINALvii.pdf

217 Levy, L. (2013) School Food and Attainment: Review of the literature. Public Health England. Available at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/245113/School_food_and_attainment_-_review_of_literature.pdf

218 See Hartgen-Walker and Lally, 2023.

Opportunities: Political

1. **Rolling out a Livewell/DF school menu would help Wales meet its net-zero and biodiversity targets, as well as support local economies and help to realise Wales' commitment to be a globally responsible and more resilient nation. This could include:**
    a. Amending the Social Partnership and Public Procurement Act to include mandatory deforestation and exploitation-free supply chain standards in the Statutory Guidance. This is in line with the Future Generations Commissioner's recommendation outlined in their 5 year report which states that the *"public sector must become deforestation-free by 2028, ensuring supply chains do not contribute to global deforestation, habitat loss or human rights violations, including child labour and the abuse of Indigenous Peoples' rights."*
    b. Ensuring universal primary free school meals (UPFSM) do not contribute to deforestation, habitat conversion and social impacts overseas would enable the Welsh Government, and Wales as a whole, to respond to genuine public concerns around consumption-driven deforestation.
    c. Supporting farmers, through the Sustainable Farming Scheme, to move away from forest-risk soy and palm-based feeds in favour of more sustainable alternatives, such as UK grown legumes and grass fed systems, would help build local food resilience and protect Welsh food supply from global shocks and disruptions, e.g. pandemics, drought, war etc.

2. **Opportunity to align with both the EU Regulation on Deforestation-free products (EUDR) and the UK Environment Act 2021, which includes forthcoming secondary legislation on due diligence for forest-risk commodities.**

Barriers and Risks: Environmental

1. **Complex and partial data – risking confusion and controversy.**

   While there is robust data for the differences between animal- and plant-based protein, the data is more complex and partial for different types of animal-protein based on their production practice, such as local and organic, versus international, as well as variation in outcomes due to more specific production choices and local environmental context. As identified in the sections on beef and soy-fed chicken, there is also uncertainty around indirect land use change that might occur when the land footprint of one component of the food system increases. This can make it difficult to draw solid conclusions on what type of meat is better, and therefore could cause some confusion and/or potential controversy among procurers and suppliers. However, a proportionate 'less and better' approach should offer a no regrets strategy in relation to meat. Similarly, the shift to certified ingredients for palm oil and cacao should also be no regrets. In both cases, improved practices and evidence may provide additional clarity on further steps for the future.

2. **Differences in ethical certifications are unclear.**

   There are several certification schemes that can help reduce deforestation risk, each with differing focuses and levels of stringency. Without clear guidance and training this creates a complex picture. What is needed is UK-wide legislation providing stringent due diligence criteria that businesses must uphold to ensure their supply chains are deforestation free, following in the footsteps of the EU Deforestation Regulation (EUDR). The Welsh Government should call on the UK Government to urgently introduce the secondary legislation to implement the forest risk regulation included in the Environment Act (2021).

3. **Lack of transparency over certification in UPFs.**

   Whilst the aim is to reduce consumption of UPFs, for certain packaged foods, it can be difficult to identify whether forest-risk ingredients, such as palm oil and cocoa, are certified or not. This is due to various factors, including numerous chemical names for palm oil derivatives and a lack of information on packaging, such as certification logos. Regulations around packaging and ingredient lists should be tightened to ensure transparency for all end consumers, including public procurers.

Barriers and Risks: Socio-economic

1. **Reduced appeal of school meals risking lower take up.**

   The Livewell / deforestation-free menu suggests a 50% increase in pulses, which some children may not be familiar with. This could reduce the appeal of school meals and potentially risk lower take up. However, at the same time, it may help build more diverse eating habits for the long term and create a shift towards a different food culture for the future. To facilitate behaviour change around the uptake of healthier school meals, pupils and the wider school community should be involved in the design process and given plentiful opportunities to prepare, cook, share and enjoy a wide variety of nutritious foods.

2. **Increased costs.**

   Although the Livewell diet has been developed based on no increases in cost, and most of the replacement options presented in this paper have not represented a cost premium on an ingredient level, there may be costs in: administration time of changing menus / suppliers and aligning menus with food school standards; training kitchen staff how to cook with alternative ingredients such as pulses (which could add a time cost as preparation of foods from raw ingredients could potentially take longer); investment required in local supply chains to scale up production; and providing food education in schools to aid acceptability of new dishes. Despite this, some costs and savings may be traded off, such as paying more for organic but less for plant-based options.

3. **Resistance to change and lack of buy-in towards a healthier, more sustainable menu.**

   While some schools may be willing to change their menu cycles, some schools may be less inclined or able to do so. Successful change will rely on both institutional and individual behavioural choices, and requires capacity, opportunity, and motivation all in place. Research has identified how the priorities of school headteachers can be the most impactful in the context of rolling out free school meals, suggesting that senior buy-in could be particularly influential for adoption, as well as the support of parents, catering teams, teachers, and pupils.[219]

4. **Current lack of supply chain transparency and school food monitoring.**

   Transparent food supply chains and strict monitoring of school food provision will be important elements to successfully implementing, maintaining, and regulating the rollout of Livewell / deforestation free menus.

219 Dimbleby, H. et al. (2013). The School Food Plan. Department for Education.

Recommendations for rolling out a Livewell & Deforestation Free School Menu

Welsh Government and Public bodies

1. Design an overarching food strategy.

There is an urgent need for the Welsh Government to introduce a national food resilience vision and plan for Wales. This must include measures to enable a socially just and ecologically resilient 'local' food system with a coherent food resilience vision and plan to underpin that change. This vision and plan must act across Welsh Government departments to deliver for the environment, health, economy and society and be supported by the mechanisms and budget needed to provide it. It should drive and reward local, sustainable Farm to Fork supply chains and prioritise only ethically sourced products from overseas to support livelihoods at both home and abroad, and reduce the risk of deforestation, habitat conversion and social impacts associated with imports of forest-risk commodities.

2. Update the Healthy Eating in Schools (Wales) Measure 2009.

To incorporate social and environmental sustainability criteria, including a definition of and restrictions on ultra processed foods (UPFs) served in school meals.

In 2025, the Welsh Government reviewed the Healthy Eating in Schools (Nutritional Standards and Requirements) Regulations 2013, to strengthen the food standards and support access to healthier, balanced choices for learners, but without changes in primary legislation, there has been no impetus to incorporate social and environmental sustainability as part of the regulation update.

Health is more than just nutrition, it is heavily dependent on the ability of nature to provide us with healthy, nutritious food. The Welsh Government should seek to update this measure to reflect the urgency of the times we are living in. The global social and environmental impacts of public food provision have to be considered as part of a healthy school food approach.

3. **Set sustainable food targets.** Targets should be set to:
    a. Increase the availability of climate/nature friendly and ethical, locally sourced food in school meals, including a greater variety of plant proteins, such as lentils, peas and beans. In bridging the gap to the Livewell diet, a good start would be to significantly increase the percentage of organically produced Welsh fruit and vegetables to ensure that 75% of Eatwell's recommended fruit and vegetable consumption is produced sustainably in Wales, for Wales, by 2030.
    b. Reduce consumption of unsustainable animal products in favour of a 'less, but better' model of consumption, which promotes sourcing meat and dairy from organic, pasture fed and regenerative agriculture.
    c. Restrict the amount of UPFs served in school meals. UPFs not only cause damage to biodiverse ecosystems, e.g. through the production of ingredients such as palm oil and cheap, processed meats, but they are also linked to poorer health outcomes, such as type 2 diabetes, obesity, heart disease and poor mental health.[220] With UPFs making up 61% of energy intake from school meals for primary school children in the UK, we are effectively investing in a future of ill health for children in Wales.[221] Measures to reduce consumption of UPFs should be supported by Welsh Government regulation e.g. taxation, advertising restrictions[222] and nutritional standards.
    d. Increase the use of Fairtrade certified products and ingredients in food procured by public bodies. This should include ensuring that all cacao and coffee purchased is Fairtrade, thereby promoting zero deforestation and improving the livelihoods of rural farmers in the Global South.

4. **Introduce a requirement for supply chains to be free from deforestation, conversion and social exploitation** in the statutory guidance of the **Social Partnership and Procurement Act**, as part of the transition to utilising locally produced and sustainable goods and promoting global responsibility.

5. **Embed mandatory Livewell / Deforestation Free criteria** into public sector food procurement contracts, so suppliers have a contractual responsibility to meet these criteria. This would not only support children's health e.g. by reducing UPF and increasing plant proteins/vegetable consumption, and make meals more climate friendly, but it would also encourage wider behaviour change in business practices.[223]

6. **Support the local food system.**

    To facilitate a dietary shift we need a resilient, local food system that can deliver nutritious, climate and nature friendly food, with ample opportunities for small-scale farmers/businesses to access public sector procurement contracts. For example, as part of the WPSCFG Food Framework, contracts were split into smaller lots to encourage participation from smaller, Welsh-based suppliers.

    Promoting local, sustainable supply chains would not only support Wales' rural and farming communities who are integral to Welsh food provision, increasing food security and resilience, but it would also help sustain Welsh culture and language.

220 https://www.bmj.com/content/384/bmj-2023-077310
221 https://pmc.ncbi.nlm.nih.gov/articles/PMC9318725/
222 See Cardiff Council's decision to restrict harmful ads on council-owned sites, including ads that promote food and drink high in fat, salt and/or sugar (HFSS): https://adfreecities.org.uk/2024/12/cardiff-council-restrict-harmful-ads/
223 An example of good practice is the Welsh Public Sector Collaborative Food Group (WPSCFG) Food Framework, led by Caerphilly County Borough Council, which includes mandatory DF criteria: https://sizeofwales.org.uk/wp-content/uploads/2025/06/Size-of-Wales-CCBC-Case-Study_Long-Version-Final.pdf

To help achieve these targets Welsh Government should:

a. Support further roll out of the Welsh Veg in Schools programme (coordinated by Food Sense Wales) to all local authorities in Wales, to enable more schools across Wales to procure organically produced Welsh vegetables. This includes providing local training and educational programmes for agroecological growing and food diversification.

b. Continue to support the roll out of partnerships between local government and civil society (e.g. Sustainable Food Partnerships).

c. Support more local, ethical produce through the Sustainable Farming Scheme through, for example, providing incentives in the collaborative layer of the scheme to ensure organic vegetable growers can aggregate their supply to help meet the demand of a local authority.

d. Ensure the Sustainable Farming Scheme supports Welsh farmers to eliminate imported livestock feed such as soy and palm that is linked to deforestation and habitat conversion overseas.

e. Provide support to retailers and businesses in the Food and Drink Industry to reduce their deforestation footprint using Size of Wales' Deforestation Free Business toolkit as part of their work to reduce scope 3 emissions.

f. Including consumption emissions for imported deforestation in carbon calculations and target setting to help Wales transition to net zero.

And in partnership with local authorities:

g. Enable better community access to / opportunities to purchase land, support community projects on local land (e.g. allotments, community gardens/farms/orchards, communal fruit harvesting, forest gardening, garden sharing) to help stimulate demand for local food and build resilient supply routes e.g. Community hubs.

h. Work with suppliers to influence sustainable behaviour change and delivery of climate and nature friendly food, e.g., through the Social Partnerships and Public Procurement Bill and the Economic Contract agreement.

Educational settings

1. **Food education should be embedded in both primary and secondary school curriculums,** so children can learn from a young age about healthy, climate and nature friendly foods, including plentiful opportunities to taste, grow, prepare and cook food, helping them to establish healthy food behaviours for life.[224] This should also involve the wider school community, including parents and carers. Children should also be taught about the human and environmental cost of ultra-processed foods (UPFs) and the tactics used by companies to appeal to children.[225]

2. **Engaging and appealing descriptions of meals should be used to encourage positive choices at school meal times.[226]**

3. **Work should be done to engage pupils in menu redesign and recipe reformulation to improve take up and facilitate sustainable behaviour change.** An example of good practice is Size of Wales' Deforestation Free Communities campaign, which brings together schools, councils, farms and catering suppliers to raise awareness about forest-risk commodities – their impacts and solutions – and make school meals more nature-friendly, one meal at a time.

4. **Training for food system actors, such as catering staff and public health practitioners, should include learning on both nutrition and food systems and associated impacts/solutions.**

224 See the School Food Hour in examples of best practice, overleaf.
225 The Fuel Us Don't Fool Us campaign from youth activist movement Bite Back aims to raise awareness of the advertising tactics used by leading food and drink manufacturers to appeal to children, and to demand action from these companies.
226 See ProVeg's School Plates guide for information on framing and behaviour change in relation to school meal uptake.

Best Practice

SCHOOL FOOD HOUR – PUTTING HEALTHY FOOD AND FOOD EDUCATION INTO EVERY SCHOOL DAY

The School Food Hour pilot is led by Cardiff Council in collaboration with Food Sense Wales and Cardiff & Vale University Health Board. This pilot provides children in primary schools in Cardiff with the opportunity to spend at least one hour each school day learning about food, including food production from farm to fork, and preparing, eating and sharing nutritious food. Its aim is to help create a nation of good food citizens by nurturing well-informed, empowered and inspired future generations who are motivated to make choices that positively impact their health, the environment, and their local communities.

HEALTHY, CLIMATE FRIENDLY SCHOOL MEALS IN FRANCE

France's National Food Programme, aligned with its Climate and Resilience law and Zero Deforestation Strategy, means that school meal programmes are designed to be holistic, not only meeting the nutritional needs of children, but helping them to develop global awareness in relation to food and learn about culinary traditions, nutrition and environmental protection, such as reducing food waste. You can read more in this case study.

COMMUNITIES TAKING ACTION ON DEFORESTATION-RISK INGREDIENTS, DEFORESTATION FREE COMMUNITIES

The Deforestation Free Communities (DFC) campaign from Size of Wales works with schools, farms, public bodies, businesses and communities to help them learn about and take action on imported deforestation in our supply chains. The campaign began with a 2-year pilot (2022-2024) which aimed to establish Wales' first Deforestation Free Community in Monmouthshire, as well as two Wales-wide networks for schools and farming. The pilot achieved various outcomes, including the reformulation of a high-risk dish and inclusion on the school menu, and Monmouthshire County Council voting unanimously to become Wales' first Deforestation Free Champion Council. Size of Wales continues to work with more schools and councils through their DFC campaign to help them take action to reduce their tropical forest footprint overseas. See their final evaluation report for shared learning.

DEFORESTATION FREE CRITERIA EMBEDDED WITHIN PUBLIC SECTOR FOOD CONTRACTS

Working with Size of Wales, the Welsh Public Sector Collaborative Food Group, led by Caerphilly County Borough Council, took the step of embedding mandatory deforestation free criteria within the new food framework, which means that the suppliers bidding for the contracts had to be able to meet these criteria. The framework, valued at an estimated £228 million over 4 years, includes 20 public sector bodies, each with designated geographical zones, and 19 Welsh suppliers. The next step in this journey is training on forest-risk commodities and measures to reduce risk for all the suppliers and public bodies included in the framework.

BRINGING FUTURE GENERATIONS THINKING INTO SCHOOL FOOD, CARMARTHENSHIRE

The Future Generations Menu pilot campaign from Carmarthenshire County Council is an initiative focused on redesigning primary school lunch menus, with an emphasis on local produce to promote health, wellbeing, sustainability, social value and education. The pilot aligns public sector catering with national and local policies to create long-term positive impacts in the key areas of environmental sustainability, rural economic growth and net-zero targets. Three Carmarthenshire primary schools will take part in the pilot and a series of workshops involving the whole school community means that everyone is involved in the process. Read more about their approach here.

Size of Wales

Size of Wales is a charity registered in England and Wales numbered 1143178.

WWF Cymru

WWF-UK is a registered charity in England and Wales 1081247 and in Scotland SC039593 and a company limited by guarantee registered in England and Wales 4016725.