Project Apollo

Looking at the dangers of restricting dairy output in a world short of food

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This report focuses on how food security can be delivered if policy makers can better understand the linkages between nutrition and sustainability especially for dairy.

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Introduction

Recent world events with COVID, inflation and war in Europe, illustrate that we live in an uncertain world and "Black Swan" events come along and destabilise the "norm". What appears right in policy terms can come back to haunt us in the future. Witness the policies surrounding decarbonisation that have contributed to inflation in energy and food prices. Hence good intentions do not always yield good results.

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Therefore, policy makers need to take information from a range of sources and balance their decisions based on wise "counsel" rather than being led by pressure groups with their own agendas. This is important to avoid the law of unintended consequences and creating existential risk.

We now know that food security will be part of our future, along with sustainability, if we are to avoid creating food crises and destabilising society, especially in newly developing parts of the world.

This report builds on previous documents we have recently prepared that show how demand for dairy nutrition is growing around the world. In this report we show that this demand for dairy may not be met and so we could have rising dairy prices and dairy nutrition may not be available to the poorer parts of our society. We see this as representing an inherent risk for our society.

Whilst some policy makers advocate a reduction in dairy in Western economies they may not appreciate the value of dairy nutrition, taking into account sustainability, especially for developing markets.

This report sets out the market pressures that could develop and highlights when dairy is measured using sustainability metrics then it can be part of the solution for sustainable production of nutrients.

Analysis

For the purposes of this analysis on global dairy markets, countries are split into two distinct blocks – net exporters and net importers.

Net exporters	Net importers
EU 27, UK, US, NZ, Australia, Uruguay, Argentina	Brazil, Mexico, China, Other nations

Countries such as Canada, Norway, Switzerland, Turkey, Belarus, Russia, Ukraine, India and Pakistan are excluded from this analysis as they are hardly interacting with other countries in dairy.

The 'in scope' countries listed above produced a total of 558bn kg ECM* in 2021, of which international trade equated to around 74bn kg. Data have partly been supplied by IFCN – the International Farm Comparison Network, based in Kiel, Germany.

*ECM stands for 'energy-corrected-milk' an approach to standardize milk from sources around the globe where protein and fat content of the milk may vary.

Figure 1: Dairy exporters and importers

Net exporters

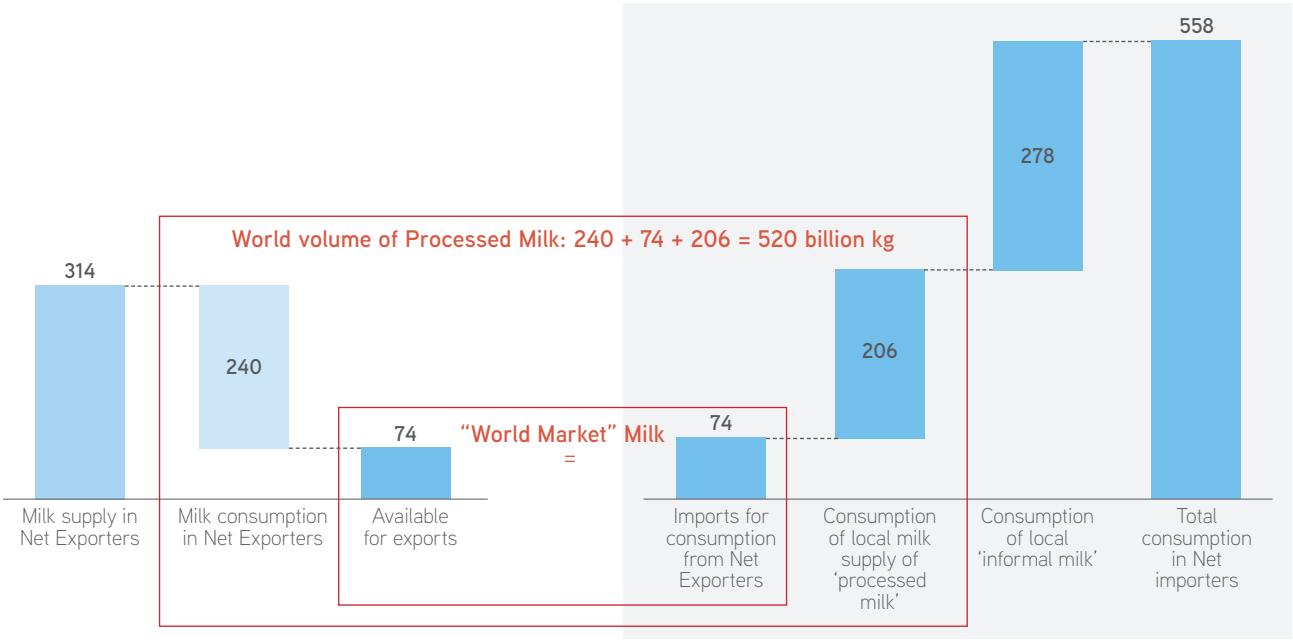
Raw milk supply for processing in factories and domestic demand in main 'dairy exporting countries/regions'*

billion kg ECM, data for 2021

Net importers

Raw milk supply for processing in factories and domestic demand in main 'dairy importing countries/regions'*

billion kg ECM, data for 2021



When we project forward dairy market dynamics to 2030, there are many factors to consider. We must estimate the volume of future net exports, which is a combination of future raw milk supply minus future local consumption. We must take account of factors such as farm margins, dynamics around 'license to operate' issues within markets and labour availability. We must also consider future dairy consumption, based on population growth and per capita consumption – the latter being particularly important given the rise in consumption of plant-based dairy alternatives.

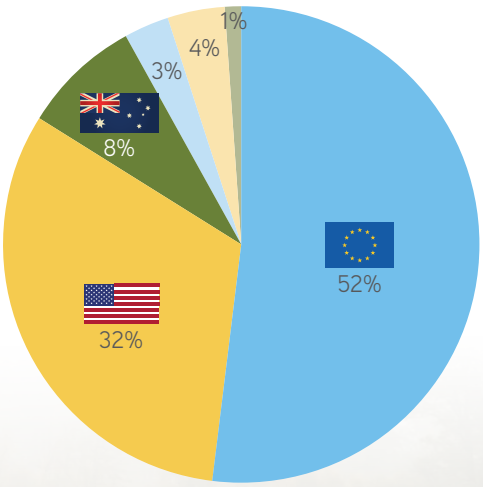
For this analysis we have assumed that drinking milk consumption will reduce by 30 per cent by 2030 in developed markets as we see a rise in plant-based dairy alternatives. We already see around 10 per cent replacement of dairy milk by alternatives in many net exporting markets, so we have assumed that per capita cow milk consumption will be 20kg/person lower LME by 2030. We have assumed, however, that cheese or dairy ingredient consumption will remain stable, mainly as alternatives do not yet perform on taste, structure, or functionality or for affordability reasons. In taking these assumptions, we are more likely to under- than to overestimate the consumption of dairy in exporting countries. Hence, in our later estimate of the growing 'unsatisfied demand' in dairy this is a conservative estimate.

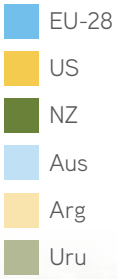
We have based our estimates of population growth on the available 2006-2021 compound annual growth rates and where needed on the lowering trend therein to calculate the population changes from 2022 to 2030. International dairy markets are supplied from net exporting countries as follows:

Figure 2: Net dairy exporting countries 2021

Raw milk supply for processing in factories split by main 'net dairy exporting countries/regions'

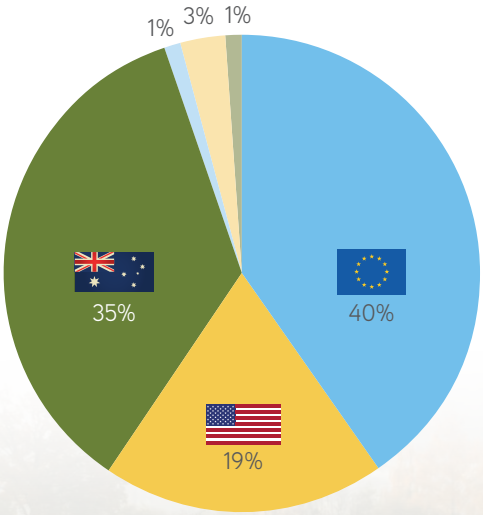
data for 2021, in%





Dairy exports from 'dairy net exporting countries/regions'

data for 2021, in%



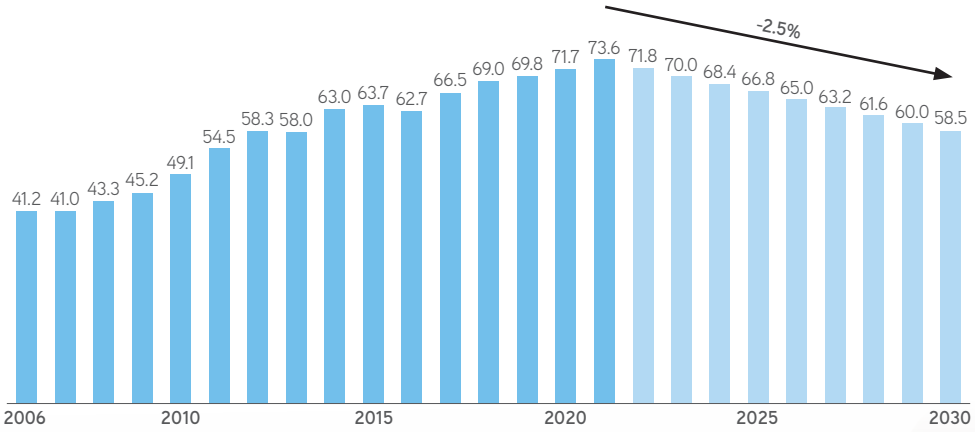
Supply dynamics

Over the next eight years to 2030, the export volume from these net exporting countries is projected to decline, with a compound annual rate of -2.5%. In absolute terms, this means that net dairy exporters are projected to reduce their dairy export volume in liquid milk equivalent (LME) by around 15bn kg/ year by 2030 versus 2020. This projection is based on a bottom-up assessment for all dairy exporting nations taking into account environmental and other considerations, as well as the outlook for domestic consumption.

Figure 3: Projected development of available exports

World net exporters' milk volume available for exports: actuals 2006-2021 and outlook 2022-2030

in billion kg/year

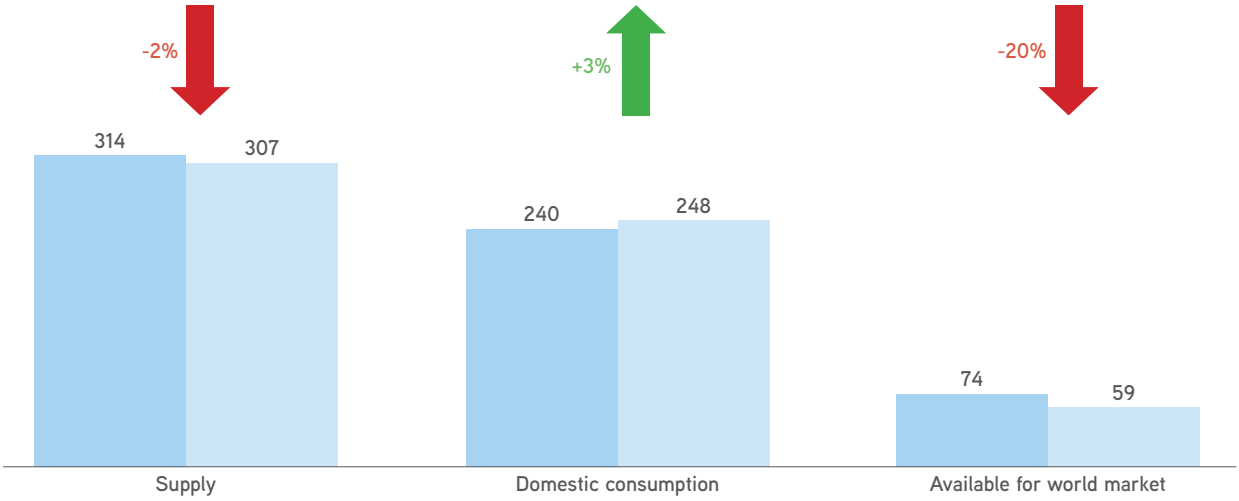


What must be remembered is that small changes in domestic consumption or supply in net exporting nations can have a significant impact on the amount of milk traded internationally. Our analysis suggests that world dairy exporters will see production go down around 2 per cent from 2021 to 2030, whilst domestic consumption will increase by around 3 per cent because of population growth, meaning that global dairy export volumes will go down 20 per cent by 2030.

Figure 4: Raw milk supply for processing

Raw milk supply for processing in factories and domestic demand in main 'net dairy exporting countries/regions'

billion kg ECM, data for 2021 and for 2030

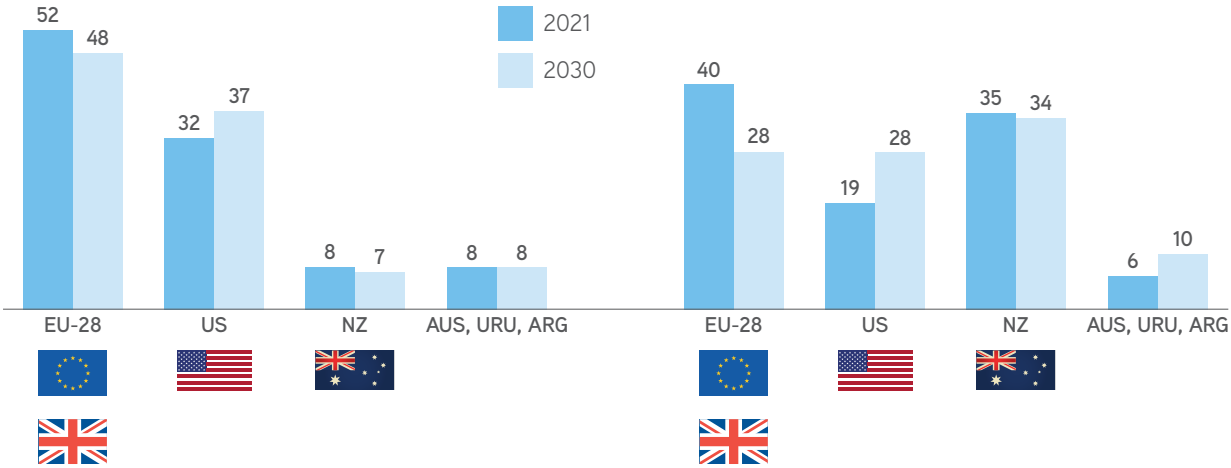


We also anticipate a shift between global net exporters, with the EU losing relevance as a dairy exporting block, NZ remaining relatively almost stable, and the US, Argentina and Uruguay increasing.

Figure 5: Projected evolution of exporters

Raw milk supply for processing in factories split by main 'net dairy exporting countries/regions'

data for 2021 and 2030 in %



Dairy exports from 'net dairy exporting countries/regions'

data for 2021 and 2030 in %

Demand dynamics

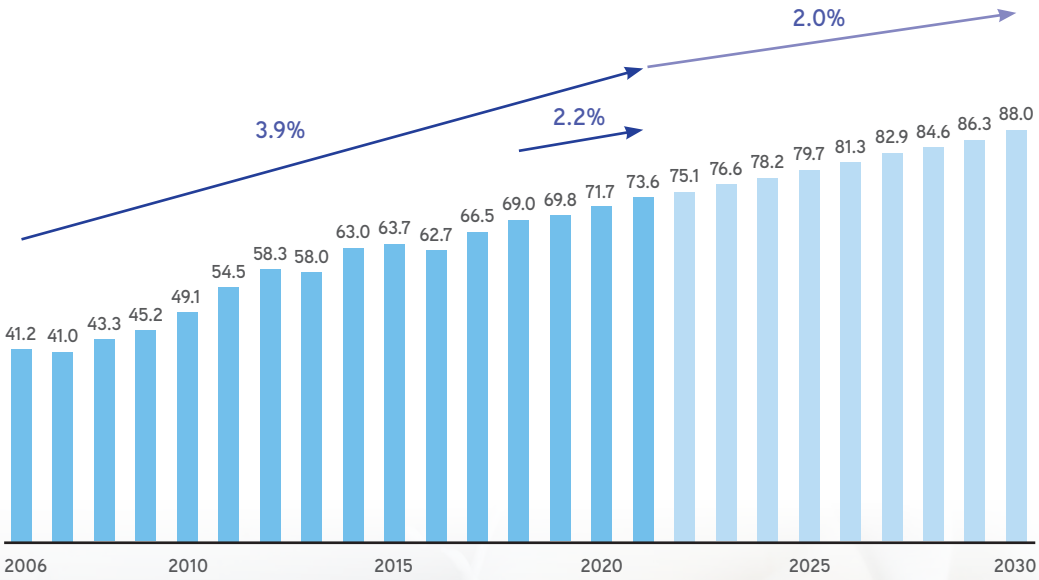
Earlier research showed a net increase compound annual growth rate of 4.4 per cent liquid milk equivalent (LME) in world dairy markets. The two largest regions driving import growth from 2011 to 2019 were the People's Republic of China and Mexico, which together were responsible for 50% of all dairy import growth. Analysis suggests that Brazil also has potential to see demand growth.

Together, China, Mexico and Brazil are responsible for 20 per cent of all world dairy market imports – an import compound annual growth rate (CAGR) of 1.4 per cent from 2021 to 2030 has been calculated.

In recent years, due to insufficient availability and the resultant increase in dairy prices, liquid milk equivalent (LME) export growth has only been 2.2 per cent CAGR (2018-21). In the case of unrestricted supply, an import volume CAGR of 4.4 per cent was, and remains, possible, but at recent higher prices, 2.2 per cent still proved possible. Our analysis assumes a possible volume growth of 2.0 per cent CAGR for dairy imports.

Figure 6: Outlook for demand growth

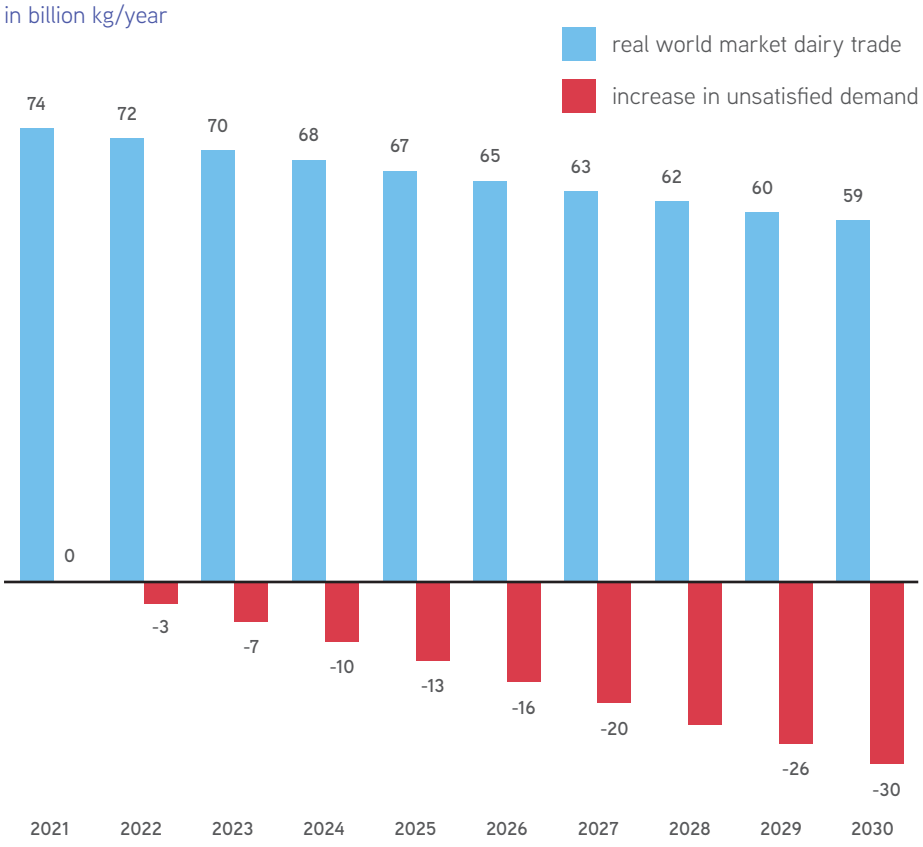
World **net importers volume required for imports**: actuals 2006-2021 and outlook 2022-2030
in billion kg/year



Overall, this analysis shows that restricted dairy availability causes the world market for dairy to contract by 15bn kg/year, creating an additional unsatisfied demand for dairy of 30bn kg/year in net dairy importing countries by 2030 – which is equivalent to about two times the size of the entire UK dairy processing industry's output per year.

Figure 7: Unsatisfied demand volume

World **additional unsatisfied demand volume**: outlook 2022-2030
in billion kg/year



This is mainly a result of environmental restrictions in net exporting nations resulting in a more rapid reduction in supply than the expected reduction in consumption arising from the switch to plant-based alternatives. As stated in the introduction, we are not on track to limit global warming to below 1.5oC, and so action is only likely to increase in this area, particularly in the net exporting nations, potentially limiting dairy supply further.

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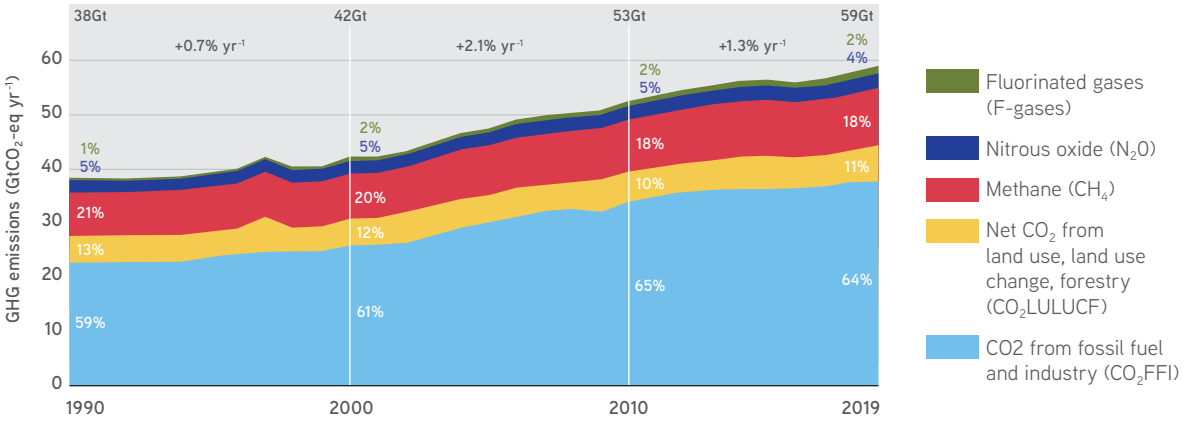
Figure 8: Increasing GHG emissions



Source: IPCC Sixth Assessment Report, April 2022

Our earlier research showed that the increase in dairy prices that results from production restrictions in today's exporting nations leads to a decline of dairy imports in the poorest countries. This decline is not compensated for by an increase of dairy output in these countries, largely because of climatological factors, the lack of availability of capital and of local capabilities.

The result of this is that we already see 'unsatisfied demand' – where consumers are open to buy (imported) dairy but cannot afford to do so.

Import statistics from 2010-2020 linked to economic development parameters by country show this to be ongoing. Our analysis shows that an additional 30 bn kg/year of unsatisfied dairy demand is to be expected given the current outlook for dairy exporters and importers.

Given local constraints to dairy production growth in net importing countries, many of these countries depend on imports for consumption growth. Affordability issues, however, now look to result in an accelerated net consumption decline of dairy in these poorer importing countries. To consumers in countries with a GDP/capita of <US$15,000 access to dairy may be almost denied by 2030. In 2021, these countries were home to over 2.6 billion consumers - about one-third of the world's population.

Increase in dairy prices that results from production restrictions in today's exporting nations leads to a decline of dairy imports in the poorest countries

So, what does this mean?

The war in Ukraine has brought global food security into sharp relief. Ukraine is the breadbasket of Europe, with the International Food Policy Research Unit estimating that Ukrainian exports represent 12 per cent of all the food calories in the world. Many vulnerable countries such as Ethiopia, Yemen, Lebanon and Palestine rely on Russia and Ukraine for food imports, particularly of wheat, corn and sunflower oil. The UN World Food Programme has identified conflict as the main driver of food insecurity in the world, with the instability in exports pushing prices up and often making the countries most vulnerable to the situation in the worst position to secure alternative sources due to the cost.

Ukrainian exports represent 12 per cent of all the food calories in the world

When it comes to dairy, this presents a challenging situation. Of course, working on climate change is and should be a global policy priority. After all, climate change is a global issue and all countries need to act in unison - some earlier, some later depending on their state of economic development. But there is an urgent need for action and Western governments are pushing for progress which, as illustrated in the analysis above, is likely to have an impact on global dairy supply as many of these Western nations are net exporters of dairy.

Every country needs to act on climate change but, for any country to make progress its government must have legitimacy with its respective population. This requires a minimum level of social stability, which is jeopardised by issues with global food security. Yet without action, climate change will also cause issues resulting in social unrest.

Here lies the paradox – commendable and much-needed initiatives to minimise climate change in Western economies put additional pressure on global food security. In combination with ongoing conflict, this is likely to result in high food inflation and poor availability. Any such increase in unsatisfied demand globally is an indicator for an increasing level of 'under-nourishing' the planet's population and thus a likely harbinger of future social unrest. In the most vulnerable countries, this will reduce the legitimacy of their governments and make addressing climate change harder.

Clearly, this situation must be avoided. Any initiative to combat climate change in the West that potentially reduces the West's food output may indirectly backfire through social unrest and a reduced propensity in the rest of the world to combat climate change. This may be because either economic means are lacking due to high food prices in undersupplied markets, or because the willingness of governments in developing economies, or their legitimacy with their population, will reduce in the face of more pressing concerns of food security. The net result would be a cleaner West but globally a worse outcome.

Of course, there are those that argue these circumstances will drive a reduction in food waste, which will benefit climate change whilst also helping to address food security. According to Friends of the Earth, around one third of all food produced globally is wasted, so the potential to address food security by addressing this seems clear. But, although one could expect higher food prices to bring this into sharp focus, this has proved to be a challenging area to address thus far.

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Why is dairy significant in this context?

Dairy has a key role to play in nutrition, particularly in the face of food security challenges globally. At its most basic level, food is fuel and different foods have different nutrient profiles. Whilst in developed economies we have the luxury of choosing food based on taste, texture, meal occasion and convenience, many do not have that choice. Dairy is nutrient dense and provides a cost-effective way to obtain the balance of nutrients needed to survive and thrive.

This seems straightforward in the context of a global food security challenge – dairy has a valuable role to play. But how is it relevant in the context of addressing climate change?

The accepted way of reporting a carbon footprint is to reference the amount of Carbon Dioxide equivalent (CO2e) per unit of 'utility' – whether that be distance travelled in the case of a car, or amount purchased, in the case of food.

But the reality is, unlike some products, the utility value in food is not always transparent. As such, it is a crude and ineffective measure to simply look at carbon footprint per kilogramme of food, as one kilogramme of one food is not the same as one kilogramme of another. What matters most then, is the carbon footprint on a nutrient density basis – or what's the carbon footprint emitted by choosing that foodstuff to get the required daily intake of a broad spectrum of nutrients.

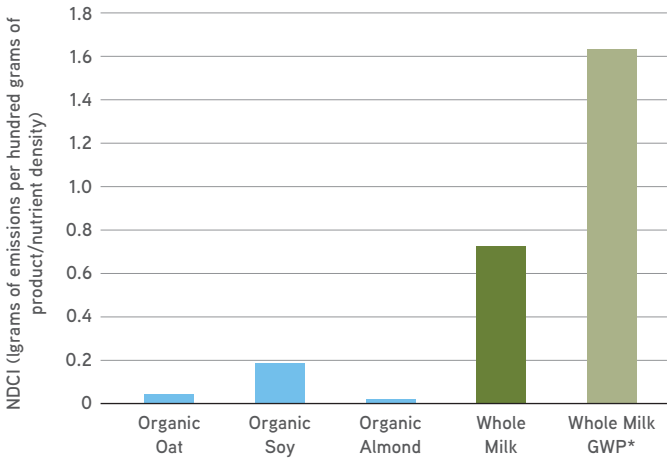
And that is where dairy becomes significant. Dairy has been widely publicised as having a high carbon footprint due to the methane burped by the cows, the carbon footprint of the farm inputs and the energy required in processing and transporting the end products. And, on a carbon footprint/kg of food basis, that analysis is correct.

The real point that has been missed, however, is that the carbon impact of food is not taking account of nutrient value but simply being based on quantity of product. Taking the example above, it has become widely accepted that dairy is bad for the environment. But dairy has a high nutrient density – so relatively small quantities of dairy will fulfill your nutritional needs. As such, the total amount of carbon emitted to meet your nutritional needs may be lower when consuming dairy versus alternatives, even though the carbon footprint per kilogramme is higher, as you need less of it.

We looked at the nutrients dairy provides for a Kg of carbon compared to dairy alternatives. The comparison is based on "pure" milk and dairy alternatives before any fortification or additives and this is shown at Figure 9 below:

Figure 9: Nutrients per unit of carbon

Nutrient density per Unit of CO2 Emissions (NDCI Score) for Milk and Milk Alts, and including GWP*



As we can see then the analysis highlights that dairy yields nearly 4 times as much nutrition as soya even when measured using GWP100 and this increases to 8 times as much if using GWP*. Other alternatives are even poorer in nutritional terms. Policymakers need to recognise this issue when setting targets for changing consumption of dairy.

This is key. The UK dairy industry is leading on decarbonising, with ambitious net zero plans. Dairy is nutrient dense with a rapidly reducing carbon footprint. This makes it a valuable part of the global human diet on an ongoing basis when considered in the wider global context of food security challenges outlined in this report.

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Summary

This analysis paints an interesting picture for dairy in the global context up to 2030. Despite the rise in plant-based dairy alternatives, our analysis suggests that dairy demand will continue to grow. Meanwhile, the world supply for dairy is expected to decline, particularly in the EU and NZ, which will create challenges for the dairy processing sector in those areas as well as adding to the challenges of global food security as prices increase.

This leaves the UK in an interesting position. As a country, we are well placed to produce dairy due to our temperate climate and established, efficient dairy farm and processing base. All other things being equal, we could continue to produce the valuable and much-needed nutrients that dairy provides and supply the growing export opportunity.

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We are also well-placed to adapt to the environmental challenges of climate change whilst continuing to maintain or increase production. Indeed, the UK dairy industry's carbon footprint is already well below that of the global average, with considerable activity being undertaken across the supply chain to drive this down further.

Yet UK policymakers are taking the focus away from efficient food production, with a greater focus on nature conservation and the delivery of other public goods. The dairy industry is also in the spotlight from climate campaigners.

Of course, we must address the biodiversity crisis and decarbonise agriculture – that is not up for debate. But what seems clear is that UK policymakers need to create a framework that achieves this whilst also encouraging and recognising the significant value that comes from producing sustainable, nutrient dense affordable food.

Seeing this analysis should also raise questions in New Zealand and other dairy producing regions about whether the right policies to decarbonise their agriculture are being pursued.

We are in danger of sleepwalking into a global food security challenge which could, in turn, counter the efforts of Western economies to lead on climate change mitigation, undoing any good that has been achieved whilst creating a bigger problem. Global unrest from poor food security could be compounded by further global unrest from a failure to address climate change in a balanced way across the globe.

This cannot be allowed to happen. What's clear is that we need a robust policy framework that allows UK farmers to respond to supply chain challenges such as cost inflation, and the longer-term impacts of decarbonisation, whilst at least maintaining, and ideally increasing, dairy production to avoid food security issues across the globe.

This requires a much more joined up approach to food security and agricultural policy than we've seen to date, ideally co-ordinated between nations.

The challenge is significant, but the opportunities for real progress are also considerable – both on climate change and economically. The question is whether policymakers will be open to take a broad view on these issues and if they'll respond effectively in time.

We are in danger of sleepwalking into a global food security challenge which could, in turn, counter the efforts of Western economies to lead on climate change mitigation

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