

Barclays Research Highlights: Sustainable & Thematic Investing

## Food Revolution

With a global population forecast to reach 10 billion by 2050, we think there are few more important issues than how to sustainably feed people. From the debate on agribusiness, the carbon footprint of food production, and food waste; to plant-based meat and dairy alternatives – and even insect protein – Barclays research investigates the changes we should expect in the coming years, and the effect on companies and consumers across the food value chain.



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# Winds of change: the next environmental debate

The significant adverse effects of global warming are well documented. Much less well-known is the contribution of the agricultural sector in this process: on some estimates, agriculture is the largest contributor to global gas emissions. In particular, beef consumption — an industry that causes more damage to the environment than cars — is on the rise, and represents a clear challenge to our ability to meet climate target commitments.

## Food for thought and key takeaways

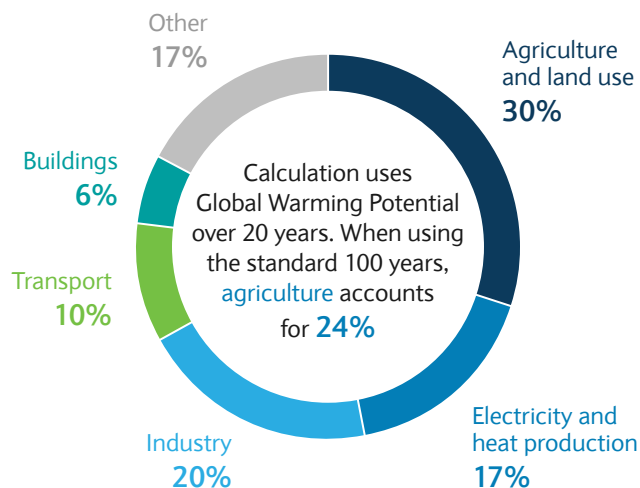
Two of the most important areas that must be improved upon are:

- a) reducing methane produced through feeding technologies, and feed additives, and
- b) increasing carbon capture and storage through land-use/reforestation/pasture management.

Both areas of change would require stricter regulation.

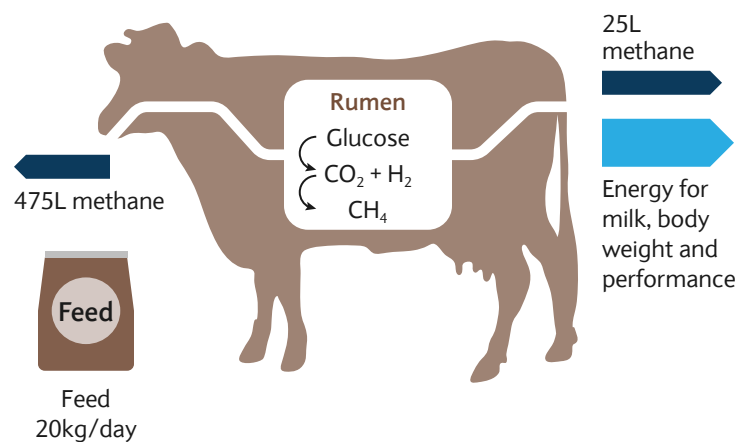
Beef consumption is forecast to increase globally, driven by population growth in emerging markets, though per capita consumption is in decline in the Western world. Consumer behaviour around beef consumption will need to change if the stated climate target commitments are to be met. Steps such as switching from 1kg of beef into 1kg of pork or chicken could reduce the associated emissions by 88%.

## Agriculture and land use is the largest emitter when adjusting for CH<sub>4</sub>'s half-life in the atmosphere



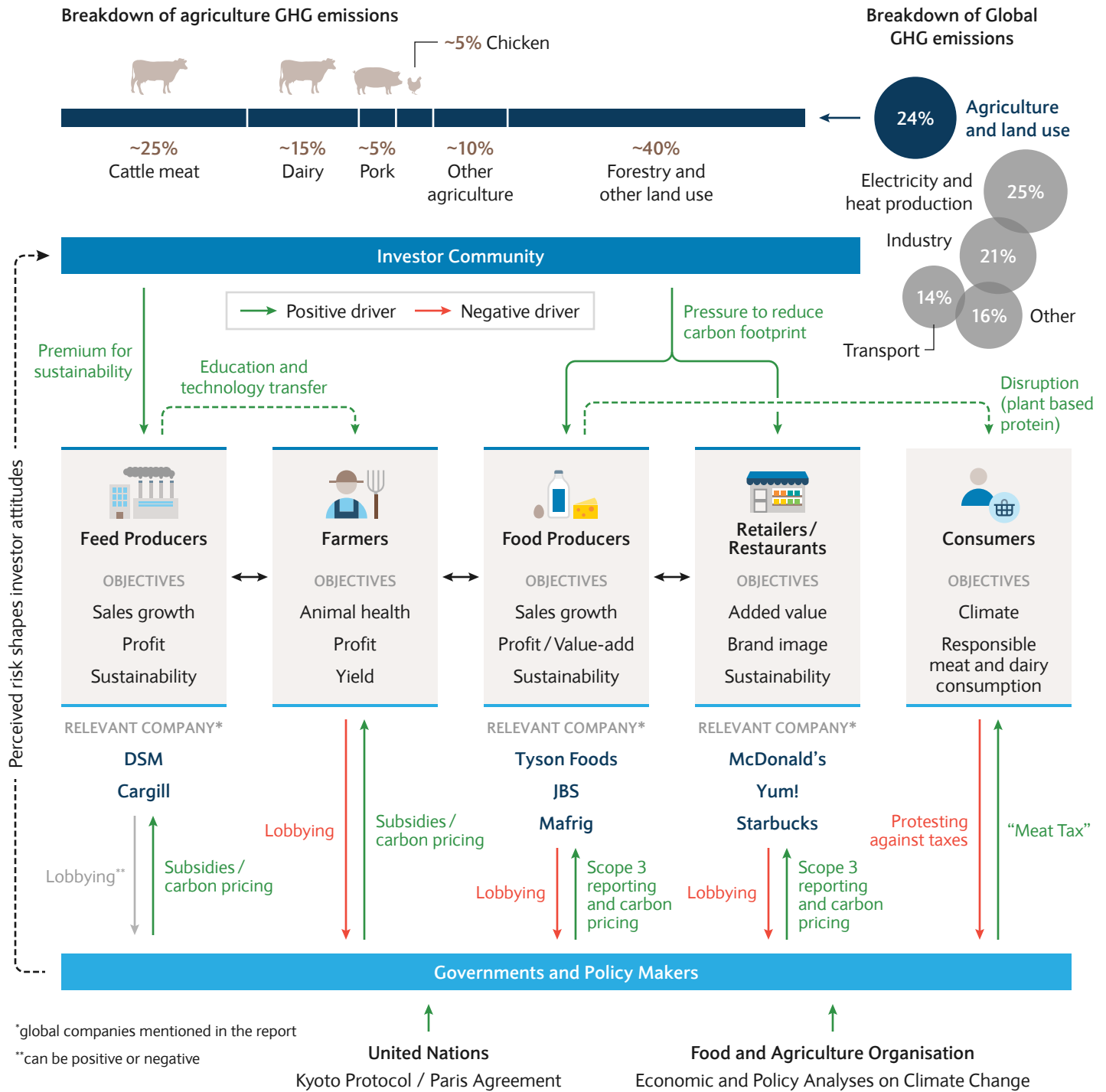
Source: IPCC

## The average cow emits 500 litres of methane every day



Source: DSM, Barclays Research

# Progress towards a 2°C World: Breaking down the Drivers of Agricultural GHG Emissions



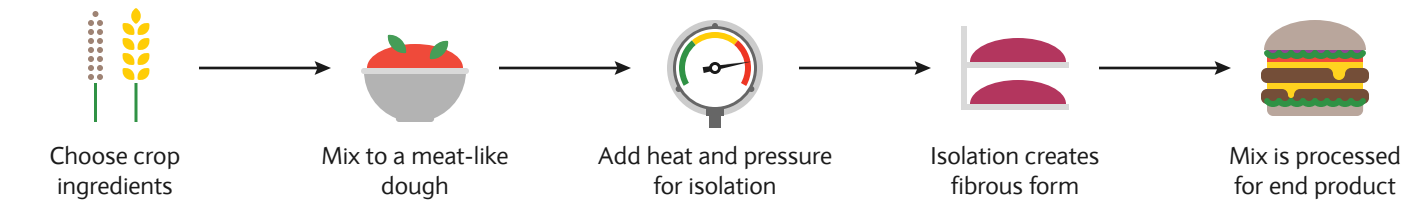
**Reducing GhG emissions in food production is also supported by a steady rise in consumer awareness of the environmental impact their diets are having. Vegans, vegetarians and flexitarians are going mainstream, bringing new challenges to the traditional food industry, and we see plant-based meat and dairy growing at speed in the next decade, helped by emerging technologies...**

# Alternative Protein: I can't believe it's not meat

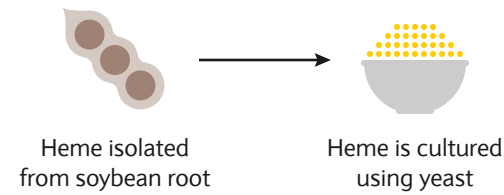
What has been achieved so far in terms of “meatless” ground beef has yielded a positive initial consumer reaction. While still an underdeveloped category, the alternative meat space in our view presents plenty of opportunities; new and incumbent players could grab ~10% of the \$1.4tn global meat market in 10 years. We see three main trends affecting meat consumption across the world: animal welfare concerns, environmental concerns, and health & wellness awareness. Plant- and lab-based meat companies have promoted their products as superior to any existing animal-based option on these fronts: They are healthier for humans, considerate of animal welfare, and can help to slow climate change. However, no one solution fixes all. Animal welfare is clearly addressed by these products, but the picture is less clear when it comes to the claim of being healthier.

## Plant-based meat process and plant-based meat with heme

### Plant-based



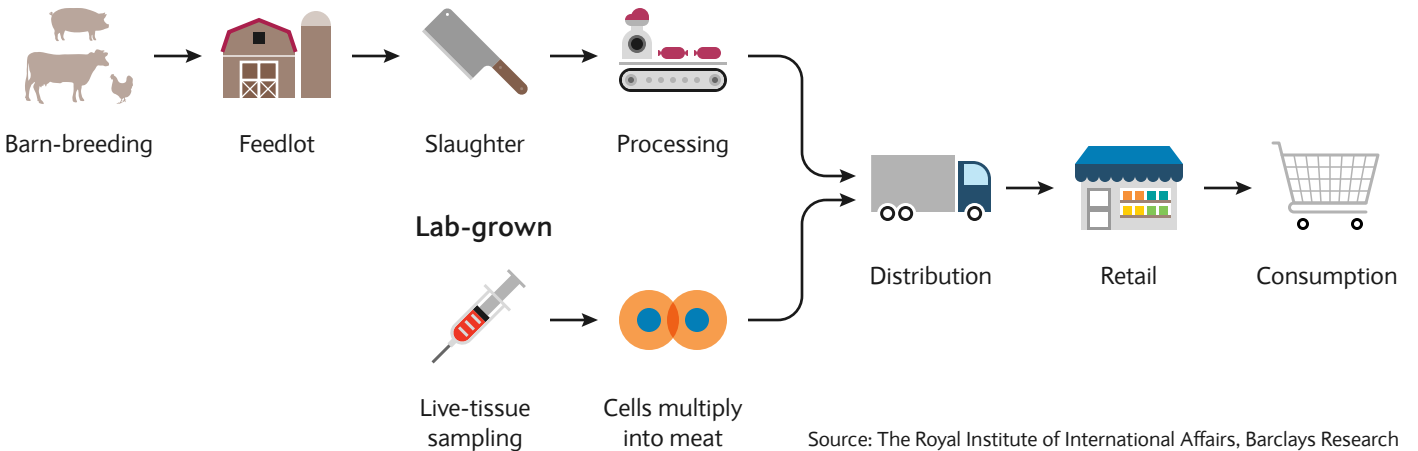
### Plant-based with heme



Source: “Our Meatless Future,” CBIInsights, Barclays Research

## Source of disruption in proteins: now vs. the future

### Traditional



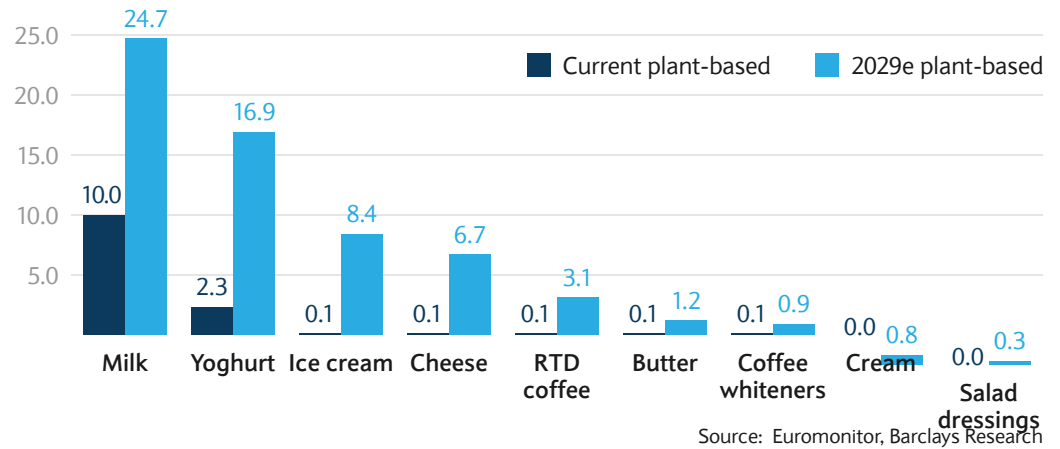
Source: The Royal Institute of International Affairs, Barclays Research

# Alternative Dairy: A thirst for plant-based dairy

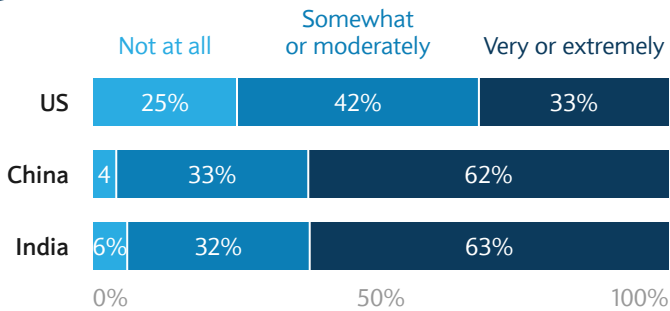
The bulk of the growth in plant-based in the last decade or so has been driven by dairy, mainly yoghurt and milk alternatives in developed markets. The next leg of growth is coming from adjacent categories like ice cream, coffee creamers, and expansion into geographical whitespaces. Interestingly, penetration in markets like France and Italy (recent adopters) is growing twice as fast (c.3 years) as it did in now mature (relatively) markets like the US and Germany (5–7 years). Also, given higher price points and lower input costs, the category is both growth and gross margin accretive.

## We estimate that PB milk will grow by a factor of 2.5x in 10 years, PB yoghurt by 8x, among others

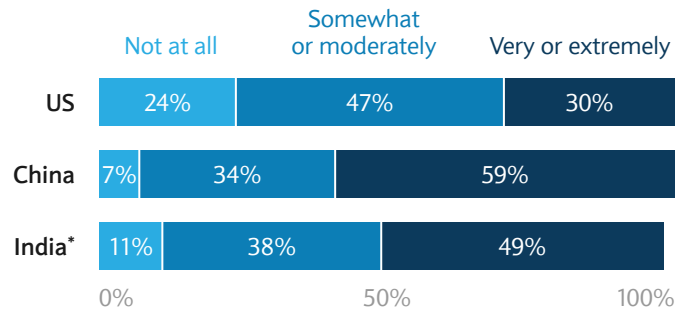
(Retail sales, €bn)



## Americans are less likely to purchase plant-based...



## ... and lab-based meat



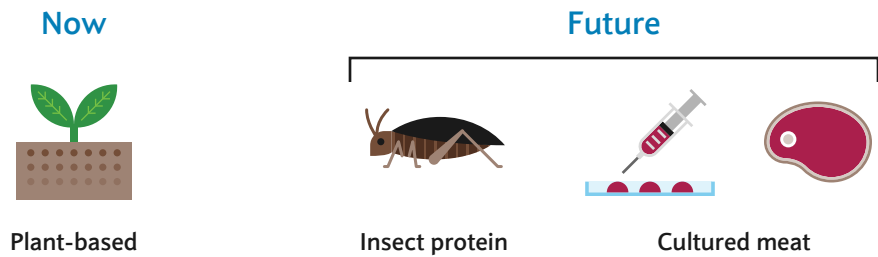
**Plant-based meat and dairy products are experiencing broadening appeal across developed markets, but we also focus on the rise of another sustainable source — insect protein — challenging existing food consumption.**



# Insect Protein: Bitten by the bug

With the global population estimated to increase to 10 billion by 2050, and food production needing to increase by as much as 70% to meet growing demand, serious challenges are posed around the sustainability of our food production systems, particularly in regards to meat. We continue this discussion with another option — insects. We see scope for insects to reduce the environmental burden of our food system as an alternative for both animal feed and food for human consumption. Although there are numerous hurdles to overcome, notably regulation, price and cultural acceptance, we see insects as a viable middle ground for consumers wanting to make their diets more sustainable without going entirely plant-based, as well as offering a more sustainable source of animal feed. The insect protein market could be worth up to \$8bn by 2030 (+24% CAGR) and we see upside if the supply and demand factors continue to develop favourably, similar to what we have seen in the plant-based space.

## Source of disruption in proteins: now vs. the future



## Insect economics — demand and supply factors set to help insects move into the mainstream

Demand	Insect economics	Supply
<p><b>Human consumption</b></p> <ul style="list-style-type: none"><li>• Healthy source of protein, fibre and vitamins</li><li>• Lower environmental impact than other sources of protein</li><li>• Younger cohorts overcoming the 'yuck factor'</li></ul> <p><b>Alternative uses</b></p> <ul style="list-style-type: none"><li>• Aquaculture feed</li><li>• Livestock feed</li><li>• Pet food</li></ul>	<p><b>\$8 bn market by 2030</b></p> <p>+24.4% CAGR 2019 – 30E</p>	<p><b>Regulation</b></p> <ul style="list-style-type: none"><li>• EU – Novel Food</li><li>• US – FDA</li></ul> <p><b>Farming techniques</b></p> <ul style="list-style-type: none"><li>• Ability for vertical farming</li><li>• Move to automation</li></ul> <p><b>Support from industry</b></p> <ul style="list-style-type: none"><li>• Aided by marketing power</li><li>• Beneficial economies of scale</li></ul>

**We don't see changes in the food value chain stopping at production. Socially-conscious consumers are concerned with the challenge of food waste in our current system, which we see as ripe for change.**

# Food Waste: Ripe for change

## The problem with food waste

We currently waste 1.3 billion tonnes of food per year, about one-third of all food produced for human consumption. This represents a loss of around \$1 trillion dollars annually, a figure estimated to hit \$1.5 trillion by 2030. Such massive waste is simply unsustainable in a world far off course from our two-degree climate change limit and one where an expanding population is putting ever-increasing pressure on resources. We think food waste is a greatly overlooked driver of climate change, accounting for as much as 8% of global greenhouse emissions, and an area ripe for transformation. The UN's Sustainable Development Goal 12.3 targets halving food waste by 2030, but without decisive action, the world risks failing to meet this goal. Companies are starting to see food waste as an opportunity, rather than simply a by-product of doing business, and this is particularly true in the developed world where most waste occurs at the consumption stage. We question the current dynamics of the food value chain and see the need for collaboration across key stakeholders, with a clear role for innovation to accelerate change.

## Barclays Sustainable & Thematic Investing — The problem with food waste

**1.3 billion tonnes**  
of food is lost or wasted each year...

...representing over



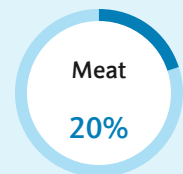
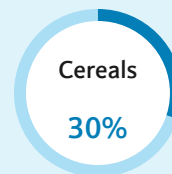
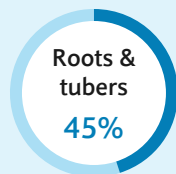
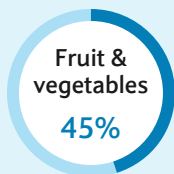
**\$1 trillion**



This is **1/3** of all food produced for human consumption

By 2030, food waste is estimated to hit **2.1 billion tonnes**, worth **\$1.5 trillion**

The commodity groups with the highest proportion of waste are:



Per year, this waste is equivalent to:



**3.7 trillion**  
Apples



**1 billion**  
Bags of potatoes



**3 billion**  
Atlantic salmon



**763 billion**  
Boxes of pasta



**75 million**  
Cows

Waste occurs all along the food value chain:



**Farmers**

Storage  
Cooling facilities  
Harvesting



**Manufacturers**

Storage  
Transport  
Processing



**Food Retailers**

Quality standards  
Packaging  
Stock rotation



**Consumers**

Expiry dates  
Over buying  
Attitude

Earlier stages

Later stages

Drivers of waste

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[Global Food: I Can't Believe It's Not Meat](#), 22 May 2019  
[European Food: A thirst for plant-based dairy](#), 24 May 2019  
[Sustainable & Thematic Investing: Insect Protein: Bitten by the bug](#), 24 June 2019  
[Sustainable & Thematic Investing: Food Waste: Ripe for Change](#), 4 March 2019

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