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Tejarah Talks

REAL  
CONVERSATIONS  
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IMPACT



AGRIFOOD  
CULTIVATING  
OPPORTUNITY

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REGENERATIVE  
AGRICULTURE

DIGITAL  
AGRICULTURE

CONSUMER  
BEHAVIOUR

RECONNECTING  
PEOPLE WITH  
FOOD

SLOW  
FOOD  
MOVEMENT

FOOD PRICES  
& INFLATION

POLICIES  
& LAWS

BIODIVERSITY  
LOSS

CHEAPER FOOD  
PARADIGM

FOOD SECURITY

TEJARAH  
TALKING

About Tejarah Talks

# INSPIRE EDUCATE ENTERTAIN

Tejarah Talks is organized by Oman Business Forum in association with the Ministry of Commerce, Industry & Investment Promotion. With a firm focus on Oman's current and future business, export and investment environment, Tejarah Talks is a series of informal, interactive evening discussions that brings together some of Oman's most inspirational and innovative thinkers and doers to share their stories, insights and ideas with an enthusiastic crowd. It is a platform for positive interaction.



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## SESSION PANEL



**Panelist Dr. Masoud Al Azri**  
Director General, Marketing, Agriculture & Fisheries  
Ministry of Agriculture, Fisheries Wealth & Water Resources



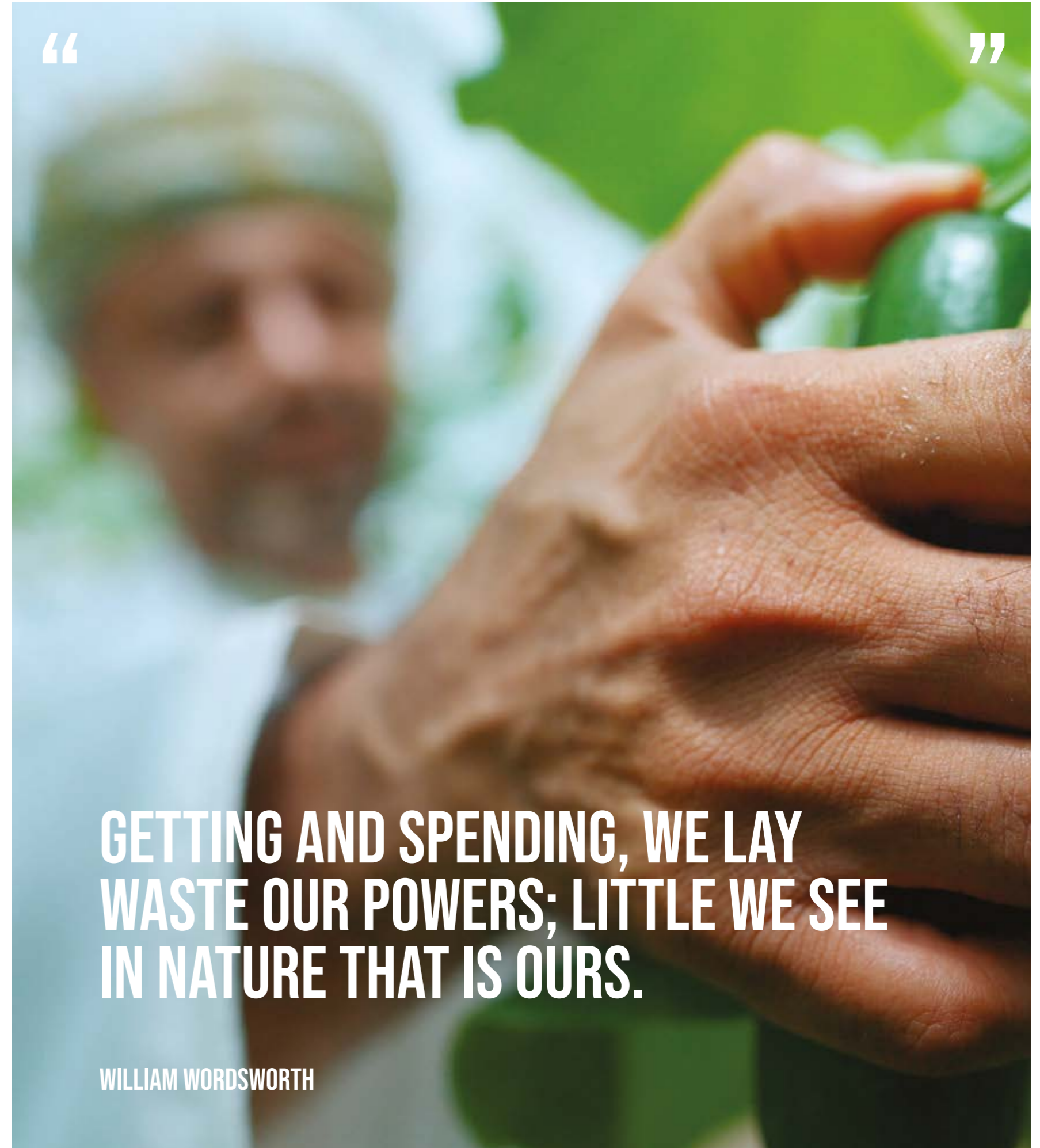
**Panelist Sayyid Fahar Al Said**  
Co-founder & CTO  
YUZU Agriculture



**Panelist Moza Al Kharusi**  
Head, Research Facilities, OAPGRC  
Ministry of Higher Education, Research & Innovation



**Moderator Jamal Al Asmi**  
Executive Producer  
RealityCG



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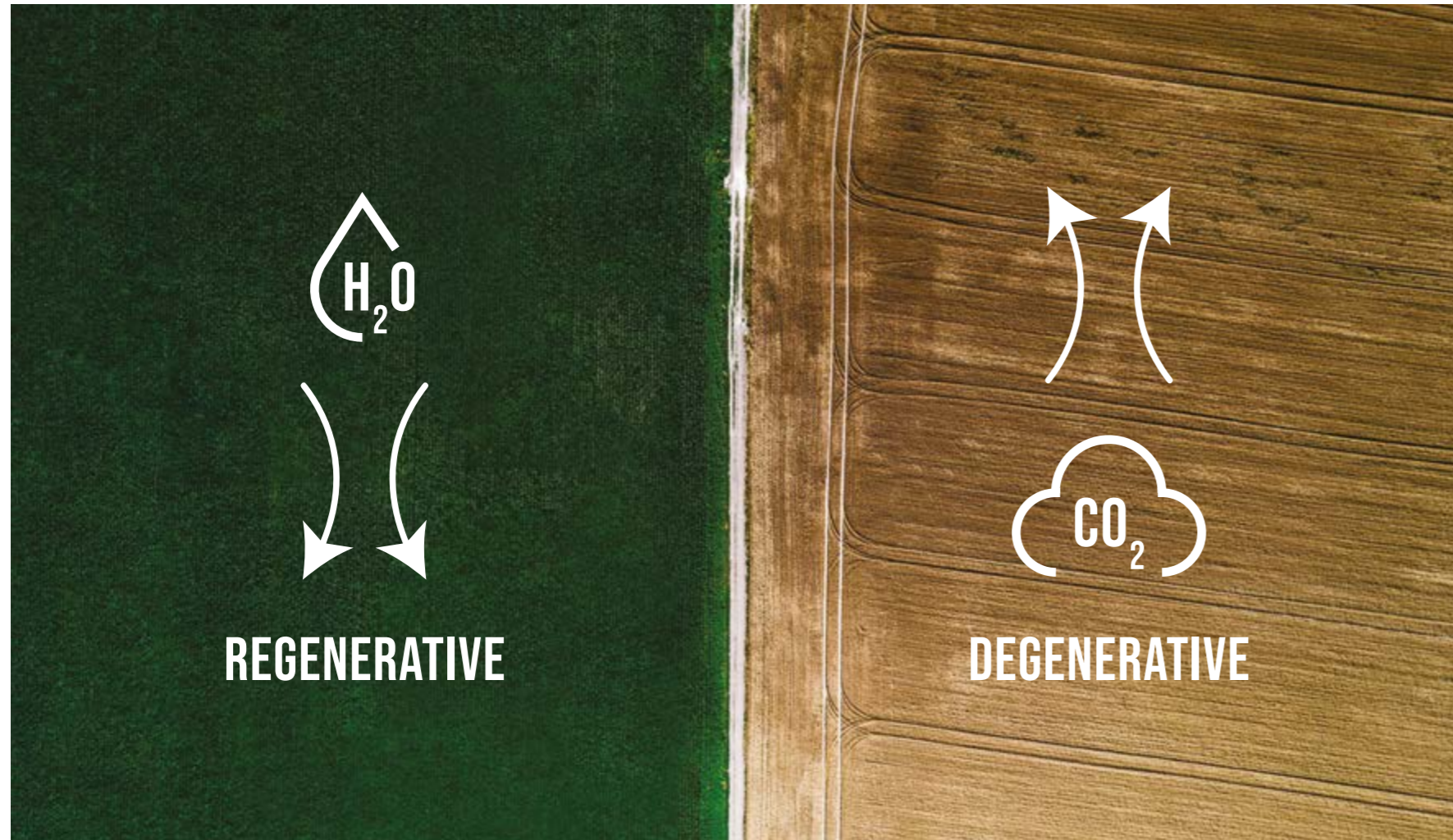
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# GETTING AND SPENDING, WE LAY WASTE OUR POWERS; LITTLE WE SEE IN NATURE THAT IS OURS.

WILLIAM WORDSWORTH

Talking Point 1

# REGENERATIVE AGRICULTURE



Regenerative agriculture is a system of farming principles and practices that increases biodiversity, enriches soils, improves watersheds and enhances ecosystem services. It aims to capture carbon in the soil and aboveground biomass, reversing current global trends of atmospheric accumulation and climate change. At the same time, it offers increased yields, resilience to climate instability and higher health and vitality for farming communities.<sup>1</sup>

If degenerative means: “continuous, often irreversible deterioration of cells, organisms and ecosystems” or lowering of effective power, vitality or essential quality to an enfeebled and worsened kind or state, then degenerative agriculture is agriculture that is doing just that.

If regenerative means: renewal, restoration and growth of cells, organisms and ecosystems or renewal or restoration of a body, bodily part or biological system - as in a forest - after injury or as a normal process, then regenerative agriculture is agriculture that is doing just that.

From there we begin to acknowledge that something is causing either degeneration or regeneration which allows us to get some perspective on how we can change from degenerative agriculture - viewed by the mainstream as normal - to regenerative agriculture.

Footnotes

- 1 Terra Genesis International, Cultivating Transformation
- 2 BCG, WBCSD & OP2B, Cultivating Farmer Prosperity: Investing in Regenerative Agriculture
- 3 BCG, The Potential of Regenerative Agriculture in Denmark

## Climate Smart Practices

Today, regenerative agriculture is emerging as a transformative approach to sustainable farming, offering both economic and environmental benefits. This method focuses on improving soil health, promoting biodiversity and reducing chemical inputs, resulting in more resilient farms and healthier ecosystems. According to a recent report from the Boston Consulting Group (BCG), the World Business Council for Sustainable Development (WBCSD) and One Planet Business for Biodiversity (OP2B), US farmers could see a 15 - 25% return on investment after transitioning to regenerative practices. However, this shift often takes three to five years to fully realize its financial benefits, as the initial transition period may lead to profitability losses of up to US\$40 per acre due to lower yields and higher upfront costs.<sup>2</sup>



**US farmers could see a 15 - 25% return on investment after transitioning to regenerative practices.**



## Danish Experience

Globally, the advantages of regenerative agriculture extend beyond the US. In Denmark, for example, analysis suggests widespread implementation of regenerative agriculture could have an abatement potential of about 4 megatons of CO2e per year by 2035 - roughly 10% of Denmark’s total 2022 greenhouse gas (GHG) emissions.<sup>3</sup> Regenerative techniques, such as cover cropping and no-till farming, not only lower emissions but also improve soil health, reduce water usage and increase crop resilience to extreme weather. Danish farmers adopting these methods are likely to experience higher and more reliable yields, ultimately improving long-term profitability.

It is not just Danish farmers that can profit from the transition to regenerative agriculture - the country’s entire downstream food system - including its food producers, distributors, retailers and consumers can also benefit. And because Danish farmers have to take on most of the financial risk involved, it is important downstream players support farmers in the effort.

## Talking Point 1 - Regenerative Agriculture

### Downstream Support

The key to the business case for downstream players lies in a combination of financial, socio-ecological and reputational incentives. Indeed, financial and socio-ecological pressures are closely connected. For example, consider the impact of extreme weather on food prices. In 2018, Danish crop yields dropped by up to 23%, not only threatening farmer profits but also putting pressure on food companies, which faced increases in rye and barley prices of up to 28% year-over-year for the fourth quarter. The result - profit margins declined for the food-related businesses while prices increased for consumers. Such drops in yields also threaten business-continuity and overall production capacity.

**-23%**

**IN 2018 DANISH CROP YIELDS DROPPED BY 23% DUE TO IMPACT OF EXTREME WEATHER.**

**No-till farming can increase profits by US\$106 per hectare through a combination of cost savings and increased yields.**

### 60% Profit

In 2022, German agriculture was responsible for about 53 million tons of carbon dioxide equivalents - 7.1% of the country's GHG emissions. Main sources were emissions of methane from animal husbandry and nitrous oxide from agricultural soils.<sup>4</sup> This makes the transition to regenerative practices crucial. German farmers have already seen financial benefits from regenerative techniques - for example, no-till farming can increase profits by US\$106 per hectare through a combination of cost savings and increased yields. Over time, regenerative agriculture is expected to boost farming profits by up to 60%, while also delivering annual socio-ecological benefits worth US\$9.3 billion through improved water quality, reduced emissions and enhanced biodiversity.<sup>5</sup>

Despite these promising outcomes, many farmers worldwide face challenges during the transition period. Decreased yields and the need for specialized equipment make the shift financially risky in the short-term. However, with the right support mechanisms - such as subsidies, sustainable leases and improved insurance terms - risks can be mitigated. Both Denmark and Germany provide valuable examples of how regenerative agriculture can be supported through government initiatives and private sector involvement, helping farmers embrace these practices without shouldering the full financial burden alone.

The global environmental, health and socioeconomic costs associated with the current food and land use system total nearly US\$12 trillion per year. Regenerative farming practices can help mitigate that damage while restoring ecosystem health. With the increasing frequency of extreme weather events such as cyclones, flooding, droughts and extreme heat combined with the immense loss of biodiversity due to agriculture over the past several decades, regenerative farming practices can be a powerful tool for farmers to adapt to a changing climate and increase profitability by doing so - for legacy and novice farmers alike.



#### Footnotes

- 4 Institute of Climate-Smart Agriculture, Emissions of greenhouse gases from agriculture  
5 BCG, The Case for Regenerative Agriculture in Germany & Beyond  
6 Regenagri, Report highlights exceptional growth in regenerative agriculture  
7 Ibid

- 8 Ibid  
9 Ibid  
10 BCG, Making Regenerative Agriculture Profitable for US Farmers



### Regenerative Agriculture: What's Involved?

The foundation of regenerative agriculture lies in rebuilding soil health and biodiversity. This involves practices such as:

- **Cover cropping:** planting crops that cover the soil, preventing erosion and improving nutrient cycles.
- **No-till farming:** reducing soil disturbance to retain organic matter and promote healthier soil biomes.
- **Agroforestry:** integrating trees into agricultural systems to enhance biodiversity and carbon sequestration.
- **Holistic grazing:** rotational grazing practices that mimic natural ecosystems, reducing overgrazing and restoring soil fertility.

These principles not only promote environmental health but also lead to more productive, resilient farming systems that can adapt to changing climates and resource constraints.

### Regenagri: Growth & Certification

In 2023, the global adoption of regenerative agriculture reached unprecedented levels. Regenagri, a leading certification body, reported total land area under its certification increased from 487,000 hectares in 2022 to over 1.46 million hectares in 2023, marking a 200% growth. This program now supports over 230,000 farms worldwide and has become an industry standard, particularly in the textiles and food supply sectors.<sup>6</sup> Regenagri aims to double its impact in 2024 by expanding its program to cover 2 million hectares of land, supporting 500,000 farms globally.<sup>7</sup>



**Regenagri, a leading certification body reported total land area under its certification increased from 487,000 hectares in 2022 to over 1.46 million hectares in 2023.**

- **Carbon Sequestration:** regenerative agriculture has helped sequester approximately 5 million tonnes of carbon annually with farms such as coffee plantations reducing their carbon footprint by 5.34 tonnes of CO<sub>2</sub> per hectare.<sup>8</sup>
- **Water Efficiency:** In Brazil, regenerative farms managed to reduce water use by 95,410 liters per hectare, showcasing the potential to address water scarcity, a major challenge in modern agriculture.<sup>9</sup>
- **Fewer Chemicals & Higher Profits:** According to BCG analysis of wheat farmers in the state of Kansas shows that over time, regenerative agriculture can increase their profitability by up to 120%. Thanks to regenerative agriculture, some farmers have decreased fertilizer use by 50% and pesticides by up to 75%.<sup>10</sup> Globally, regenerative agriculture is proving to be a cost-effective solution for both smallholder and large-scale farmers. Despite the upfront costs of transitioning, the long-term benefits, including healthier soils and reduced reliance on costly synthetic inputs, have made the practice economically attractive.
- **Challenges:** While regenerative agriculture offers immense benefits, there are challenges that restrict its widespread adoption:
  - Initial costs: Transitioning from conventional to regenerative agriculture can be costly, with farmers needing financial assistance and technical training.
  - Knowledge gaps: Many farmers lack the knowledge or access to best practices in regenerative farming, highlighting the need for education and capacity-building programs.
  - Risk management: Despite long-term benefits, the short-term risks, such as reduced yields during the transition period, remain a barrier for many farmers.

Talking Point 2

# DIGITAL GROWTH

Digital agriculture is at the heart of the global transformation in farming practices, driven by the need to address escalating challenges such as climate change, rising production costs and labour shortages. As the world strives to meet the growing demand for food while managing limited resources, digital agriculture offers innovative, tech-driven solutions that could revolutionize traditional farming systems. Leveraging cutting-edge technologies like IoT, AI, drones and precision farming tools, this approach is reshaping how food is produced, improving efficiency and enhancing sustainability.



Footnotes

- 11 S&S Insider, Smart Agriculture Market
- 12 Blafar Azizi, Application of Artificial Intelligence (AI) In-Farm



## IoT & Smart Sensors

IoT devices and sensors are embedded across farms to monitor critical factors such as soil moisture, temperature and nutrient levels. These sensors provide real-time data farmers can use to make informed decisions about irrigation, fertilization and pest control. For example, IoT technology enables the precise application of water and fertilizers, ensuring crops receive exactly what they need, when they need it. This helps conserve water, reduce input costs and boost crop productivity. The global smart agriculture market is expected to grow from US\$20 billion in 2022 to US\$55 billion by 2030, driven by the widespread adoption of IoT technologies.<sup>11</sup>

## AI

AI plays an important role in digital agriculture by analyzing large datasets - such as weather patterns, historical crop data and soil conditions - to generate actionable insights. AI tools can predict the best planting times, recommend optimal irrigation schedules and help mitigate risks associated with climate variability, pests and diseases. By integrating predictive analytics, AI enables farmers to make data-informed decisions that reduce waste, increase yields and optimize resource use. It is estimated the use of AI can increase crop yields by 20% to 30% and help reduce water consumption by 25%.<sup>12</sup>

## Reap the AI Harvest

Lowering costs and increasing yields are of obvious importance to farmers and agricultural companies worldwide. Improved productivity in fields means more profit for farmers, a more robust supply chain and lower prices for consumers. More sustainable practices mean less degradation of natural resources and prevention of ecological damage to the planet. Using AI to optimize crop and animal management which can help weed out diseased animals or plants, will increase profits and protect the environment.



**The global smart agriculture market is expected to grow from US\$20 billion in 2022 to US\$55 billion by 2030.**

## Talking Point 2 - Digital Agriculture

### Precision Agriculture

Precision agriculture uses data-driven technologies to tailor farming practices based on the specific needs of individual crops and fields. Drones, satellite imagery and GPS systems help farmers map their fields and monitor crops in real time. This allows for targeted interventions, such as variable-rate fertilization which applies nutrients only where they are needed most. Research suggests technology should play a greater role in making farming more sustainable, without sacrificing productivity or farmer incomes and with precision agriculture playing a large part of the solution.<sup>13</sup>

The World Economic Forum estimates that if 15% - 25% of farms adopted precision agriculture, global yield could be increased by 10% - 15% by 2030, while GHG emissions and water use could be reduced by 10% and 20%, respectively.<sup>14</sup> While these are small steps on a global scale, food systems are currently responsible for up to 33% of global GHG emissions and 70% of biodiversity loss.<sup>15</sup> Smart agriculture could kickstart the digital transformation of the entire food industry.

**AGRICULTURAL ROBOTS USE LESS THAN 90% OF WATER FOR OVER 20X THE AMOUNT OF CROP PER ACRE.**

### Robots Dig In

Robotics and automation technologies are being increasingly adopted to streamline labour-intensive farming tasks such as planting, weeding and harvesting. Autonomous tractors, robotic harvesters and automated irrigation systems allow farmers to manage larger areas of land more efficiently while reducing the need for human labour. These technologies not only increase operational efficiency but also ensure greater consistency in farming practices, reducing human error and optimizing productivity.

Agricultural robots are revolutionizing the world of farming in unprecedented ways. These versatile machines can operate in a diverse range of environments, from the cozy confines of indoor greenhouses to expansive outdoor fields, adapting seamlessly to various crop types. The increasing adoption of robotics in agriculture is a testament to the transformative power of technology in addressing pressing global challenges.

These technological marvels are playing a significant role in achieving SDG12: Responsible Consumption & Production. By transforming the ways in which planting, irrigation and harvesting processes are optimized, agricultural robots use less than 90% of water for over 20x the amount per crop per acre.<sup>16</sup> As tireless workers, robots can detect crop diseases early on and even enhance access to food in resource-limited areas. By reducing production costs, they are making food more affordable for consumers, helping with SDG 2: Zero Hunger.



#### Footnotes

- 13 Philip Thornton, Agriculture in a changing climate: Keeping our cool in the face of the hothouse  
 14 World Economic Forum, Innovation with a Purpose: The role of technology innovation in accelerating food systems transformation  
 15 UN Food Systems Summit - 2, Food Systems for the Planet  
 16 AI for Good Blog, Agricultural Robots: Farming Smarter, Not Harder  
 17 RELX Emerging Tech Executive Report 2021

### Global Adoption & Results

The adoption of digital agriculture is gaining momentum worldwide, with countries like the US, the Netherlands and India leading the way. AI in agriculture is not wholly new - nascent iterations have been in use for over 20 years - like auto-steering guidance systems to row crops such as corn. But AI take-up in the past few years has been swift - according to some estimates, 87% of business in the US agricultural industry have been using AI in some shape or form since 2021.<sup>17</sup> The federal government, too, is currently fast-tracking the agriculture industry towards the technology, providing financial incentives to speed up development and deployment of AI across the country.

**87%**  
**OF BUSINESS IN THE US AGRICULTURAL INDUSTRY HAVE BEEN USING AI IN SOME SHAPE OR FORM SINCE 2021.**



### Food Deserts

One of the most important contributions of digital agriculture is its impact on global food security. By increasing yields and reducing input costs, digital tools help farmers produce more food with fewer resources. This is particularly critical in regions facing food shortages due to climate change, economic instability or limited arable land. AI-driven tools, for example, enable farmers to adapt to changing weather patterns, making crops more resilient to droughts, floods and pests.

Moreover, digital agriculture is helping to address the issue of food deserts - areas where access to affordable, healthy food is limited. Urban farming, powered by AI and automation is enabling the production of fresh produce in city environments, often where traditional farming is not feasible. Vertical farming systems that can produce 5 - 10 times more food per square meter than conventional farming are helping close the food gap in underserved areas. By optimizing urban food production, digital agriculture ensures that even communities in food deserts can access fresh, nutritious food.

**CEA vertical farms produce an average 516 times as many tonnes of harvest per 10,000m<sup>2</sup> than field farms following traditional farming techniques**

Talking Point 3

# CONSUMER BEHAVIOUR

Today, consumer behaviour around food is being driven by health awareness, economic challenges, sustainability considerations and the demand for convenience. These factors influence how people make choices about what they eat, from seeking nutrient-rich foods to finding affordable options amid rising prices. However, the interplay of these trends is more complex than it might appear, revealing deep shifts in attitudes and behaviour that are reshaping the food industry.



Footnotes

- 18 IFIC, 2024 IFIC Food & Health Survey
- 19 Food & Drink Digital, Global Plant-based Food Market 'Set for Substantial Growth'
- 20 Spherical Insights & Consulting
- 21 Phys.org, What's up with high food prices? Economists assess factors causing food prices to fluctuate
- 22 Tea & Coffee Trade Journal, Health claims highly influence and bolster younger consumers' F&B purchases



## Financial Pressures

Rising inflation and cost-of-living pressures are also affecting consumer behaviour, especially when it comes to food. Grocery prices have risen worldwide - rising 4.8% a year since 2019 - leading consumers to seek out more affordable options, often at the expense of their health.<sup>21</sup> Younger consumers, especially Gen Z are driving a move toward convenience and affordability. For many, dining out at fast food chains is perceived to be cheaper than purchasing groceries, making it an attractive option during times of financial uncertainty. However, the preference for affordable options does not entirely override the focus on health. Many consumers are still willing to pay a premium for healthier, cleaner options. For example, global ingredient supplier, Prinova, surveyed over 1,500 adult consumers in France, Germany, Italy, Spain, the UK and the US in June 2024 and found 72% were more likely to buy a food or beverage product if the packaging mentioned a health benefit. This number rose to 87% among those aged 18 to 24 and to 80% among those aged 25 to 34.<sup>22</sup>



## Health Consciousness

The prioritization of health has never been higher. Post-pandemic consumers are more focused on long-term wellness rather than short-term diet trends. According to the International Food Information Council's 2024 survey, 62% of consumers rank health as a primary consideration in their food purchases and this figure is likely to continue to grow.<sup>18</sup> A major shift has been observed in the type of food people choose. For example, high-protein diets have become particularly popular with more than half of consumers actively following some kind of specific dietary pattern. Food that is high in protein, rich in antioxidants and plant-based is dominating the market, driven by a consumer desire for products that support muscle health, immunity and mental well-being.

**62%**  
OF CONSUMERS RANK HEALTH AS A PRIMARY CONSIDERATION IN THEIR FOOD PURCHASES.

## Plant-based Food

The plant-based food market continues to be a key player with global sales up 12.8% in 2024, reflecting this growing interest, particularly among consumers who see plant-based eating as a way to align health with sustainability.<sup>19</sup> Beyond specific nutrients, the trend toward 'clean eating' continues to rise. Consumers are increasingly demanding transparency around the ingredients in their food with many seeking out products that are organic, non-GMO and free from artificial additives. In 2023, the global organic food and beverages market reached US\$277 billion and the demand for such products is increasing.<sup>20</sup>

**12.8%**  
THE PLANT-BASED FOOD MARKET CONTINUES TO BE A KEY PLAYER WITH GLOBAL SALES UP 12.8% IN 2024.



**Prinova, surveyed over 1,500 adult consumers in France, Germany, Italy, Spain, the UK and the US in June 2024 and found 72% were more likely to buy a food or beverage product if the packaging mentioned a health benefit.**

Talking Point 3 - Consumer Behaviour



Ethical Eating

Consumers are also increasingly aware of the environmental impact of their food choices. A 2023 McKinsey and NelsenIQ report correlated sales data volumes between 2017-2022 from 600,000 packaged goods and 44,000 brands in the US and their growth over the five-year period with the presence or absence of ESG claims on the packaging – terms such as “cage free,” “vegan,” “eco-friendly” and “biodegradable” – printed on product packaging. The results showed a positive growth rate for products with sustainability claims, accounting for 56% of all market growth.<sup>23</sup> Evidence from the report showed some demographic groups – such as higher-income households, urban and suburban residents and households with children – were more likely to buy products that made one or more ESG-related claims. Still, the research shows that a wide range of consumers across incomes, life stages, ages and geographies are buying products bearing ESG-related labels – with an average of plus or minus 15% deviation across demographic groups for environmentally and socially conscious buyers compared with the total population. This suggests the appeal of environmentally and socially responsible products is not limited to niche audiences.<sup>24</sup>

56% GROWTH RATE FOR PRODUCTS WITH ESG CLAIMS ON PACKAGING.

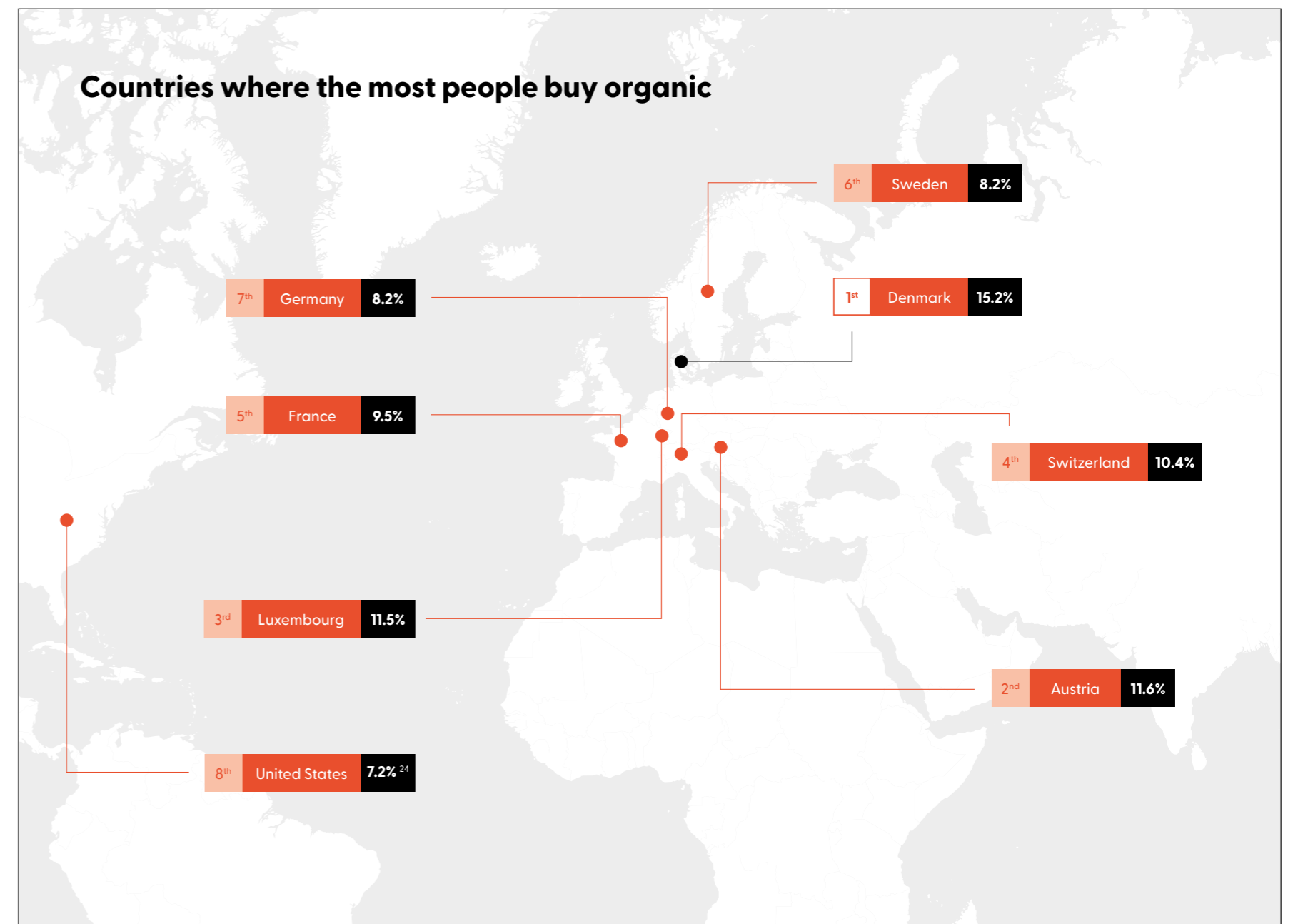
McKinsey&Company  
**NIQ**

Footnotes

- 23 McKinsey & Company, Consumers care about sustainability – and back it up with their wallets
- 24 Ibid
- 25 Statista Market Insights

Affordable, Convenient, Nutritious & Environmentally Friendly

As discussed, consumer behaviour in 2023-2024 is characterized by a delicate balance between health, affordability, sustainability and convenience. While inflation and financial pressures are pushing some consumers toward fast food and prepared meals, the demand for healthier, more sustainable options remains strong. The key for Omani brands in this changing landscape will be to offer products that align with these diverse needs – products that are affordable, convenient, nutritious and environmentally friendly. Those who can successfully meet these demands will be well-positioned to thrive in the evolving food market.





## Talking Point 4

# RECONNECTING

Today's food systems are characterized by industrial monoculture farming, long supply chains and the erosion of biodiversity. According to the FAO, 75% of the world's food is generated from only 12 plants and five animal species. Of the 4% of the 250,000 to 300,000 known edible plant species, only 150 to 200 are used by humans.<sup>26</sup> Only three - rice, maize and wheat - contribute nearly 60% of calories and proteins obtained by humans from plants. Such a heavy reliance on limited species not only reduces resilience to climate change but also weakens the cultural and nutritional diversity of food systems.<sup>27</sup> Additionally, between 2015 and 2019 the world lost at least 100 million hectares of healthy and productive land each year, that is 3.2 times the size of Oman.<sup>28</sup> These statistics underscore the need for urgent action as escalating land degradation continues to destabilize markets, communities and ecosystems around the world.<sup>29</sup> In this context, promoting gastronomic landscapes - agricultural systems designed around sustainability and cultural gastronomy - can help reduce emissions and foster healthier ecosystems.

**Of the 250,000 to 300,000 known edible plant species, only 150 to 200 are used by humans.**



## Footnotes

26 FAO, What is Agrobiodiversity

27 Ibid

28 UN Sustainable development Goals, Life on land

29 UN Convention to Combat Desertification, At least 100 million hectares of healthy land now lost each year

# PEOPLE WITH FOOD



## Sustainable Gastronomy

Sustainable gastronomy takes into account where ingredients are from, how food is grown, how it gets to our market and eventually to our plates. Cities like Milan and Copenhagen are leading the way with innovative food policies that promote sustainability, not just in the kitchen but throughout the entire food system. Products that align with these diverse needs - products that are affordable, convenient, nutritious and environmentally friendly. Those who can successfully meet these demands will be well-positioned to thrive in the evolving food market.

## Talking Point 4 - Reconnecting People with Food



### Milan's Sustainable Food Revolution

Milan has long been a pioneer in sustainable food systems – launching the Milan Urban Food Policy Pact (MUFPP) following World Expo 2015 - *Feeding the Planet, Energy for Life*. MUFPP is an international agreement among 290 cities committed “to develop sustainable food systems that are inclusive, resilient, safe and diverse that provide healthy and affordable food to all people in a human rights-based framework that minimize waste and conserve biodiversity while adapting to and mitigating the impacts of climate change.” Its main aim is to support cities looking to develop more sustainable urban food systems by fostering city-to-city cooperation and best practices exchange.

Milan's policies aim to reduce food waste by 50% by 2030, leveraging public-private partnerships to redistribute surplus food to those in need. This not only tackles hunger but also addresses environmental concerns and food waste. A report by the UN Environment Program reveals that households across all continents squander over 1 billion meals every day - generating 8 - 10% of annual GHG emissions, nearly five times the emissions of the aviation sector.<sup>30</sup>



**An international agreement among 290 cities committed “to develop sustainable food systems that are inclusive, resilient, safe and diverse that provide healthy and affordable food.**

### Waste Tax

Milan City Council has introduced a range of measures to reduce food waste. In 2018, it offered supermarkets, restaurants and canteens that donated food losses to charities a 20% discount on the city's waste tax. The measure also supported the mapping, strengthening and spreading of food donation initiatives across the city. Alongside the waste tax reduction, the council focused its attention on areas of the food system that could be controlled directly, for example, school canteens.

### Frutta a Metà Mattina

*Frutta a metà mattina* - Fruit in the morning - is an initiative developed by Milano Ristorazione - the public company managing Milan's school canteens. The initiative was developed to fight obesity among children, promote healthy habits and lifestyles. At the same time, consumption of fruit during the morning reduced food waste at lunchtime by 17%. The distribution of fruit as a snack also reduces financial pressure on vulnerable families who might struggle to provide healthy food for their children. A pilot project was launched in 2016, involving 30 primary schools and 4,000 children. The project has now become standard practice in over 75 of the city's primary schools targeting 20,000 children aged 6 to 10 in vulnerable neighbourhoods.



#### Footnotes

30 UNEP, World squanders over 1 billion meals a day

31 Vittoria Aureli, Maria Luisa Scavedi, Laura Rossi, Food Waste of Italian Families: Proportion in Quantity & Monetary Value of Food Purchases

32 Muscat Daily, Oman unveils first food waste-recycling initiative

**Italian families waste 399 kg of food per week - 4.4% of the weight of food purchased.**



### Food Waste

- Italian families waste 399 kg of food per week - 4.4% of the weight of food purchased. The economic value of food waste and loss along with the whole food supply chain in Italy is about US\$14.2 billion a year - with an average of 149 kg of food wasted per person.<sup>31</sup>
- Annual food waste in Oman is estimated at 560,000 tonnes - over US\$155 million in monetary terms.<sup>32</sup>

### Copenhagen's Organic Transformation

Launched in 2007, the Copenhagen House of Food - KBS Madhus - is an independent, non-commercial foundation that collaborates with professional kitchens, city councils and organizations across Denmark. Its mission is to change the eating culture, stimulate the senses and install a love of quality food in both the people who prepare public meals and the people eating them. The program has been instrumental in helping Copenhagen work towards achieving its goal of serving 90% organic food in public institutions, including schools, without increasing costs.

A key component of the House of Food's success is its training programs of kitchen staff, particularly in schools. They teach staff how to cook meals from scratch, plan menus sustainably and use organic, local and seasonal ingredients. Staff learn to reduce reliance on processed foods and meat and encouraged to engage students in understanding the value of sustainable eating.

The program also focuses on minimizing food waste in schools. By teaching kitchen staff about portion control, reusing ingredients and composting, the House of Food promotes a more sustainable approach to public meals.

Beyond the kitchen, the House of Food plays a role in educating students directly about food sustainability - organizing workshops and events where students learn about organic farming, the environmental impact of food choices and how to make healthier, more sustainable eating decisions.

**COPENHAGEN IS WORKING TOWARDS SERVING 90% ORGANIC FOOD IN ALL PUBLIC INSTITUTIONS.**



Talking Point 4 - Reconnecting People with Food

**Copenhagen's Climate & Environment Target**

- “Meals in the City of Copenhagen must be sustainable and climate friendly. Our target is to implement a reduction in the carbon footprint of at least 25% per capita by 2025.
- The City of Copenhagen's kitchens use 90% organic raw products and are Gold Organic Food Mark certified by the Danish Veterinary and Food Administration.
- With its ambitious climate and environmental targets, the City of Copenhagen must lead the way and change how food products are produced today in Denmark and in the rest of the world.
- The City of Copenhagen must reduce its food waste in municipal kitchens and institutions. The UN Global Development Goal 12 recommends a 50% reduction in global food waste per capita.”<sup>33</sup>
- Denmark became the first country in the world to introduce legislation on organic production. The first act was passed in 1987. Shortly afterwards, the state inspection logo, known as the red Ø logo, was introduced.



Footnotes

- 33 City of Copenhagen's Food Strategy
- 34 Harvard Health Blog, Katherine D. McManus, What is a plant-based diet and why should you try it?








**Lessons Learnt**

Public procurement, particularly in cities, can have a major impact because governments can influence market demand for sustainable products. Furthermore, these policies highlight the importance of food literacy and public engagement. In both Milan and Copenhagen, public awareness campaigns have played an important role in shifting consumer behaviour towards more sustainable diets, showing education is a critical component of any sustainable gastronomy initiative.

Milan and Copenhagen demonstrate that sustainable gastronomy can be a powerful tool in addressing environmental, social and economic challenges. Their various initiatives show that by focusing on local production, reducing food waste and encouraging plant-based diets, cities can reduce their carbon footprints, drive market demand for sustainable food and improve public health.



**Plant-based Diet**

<p>Eat lots of vegetables. Fill half your plate with vegetables at lunch and dinner. Make sure you include plenty of colours in choosing your vegetables. Enjoy vegetables as a snack with hummus, salsa or guacamole.</p>	<p>Change the way you think about meat. Have smaller amounts.</p>	<p>Choose good fats. Fats in olive oil, olives, nuts and nut butters, seeds and avocados are particularly healthy choices.</p>	<p>Cook a vegetarian meal at least one night a week. Build these meals around beans, whole grains and vegetables.</p>	<p>Include whole grains for breakfast. Start with oatmeal, quinoa, buckwheat or barley. Then add some nuts or seeds along with fresh fruit.</p>	<p>Go for greens. Try a variety of green leafy vegetables such as kale, collards, Swiss chard, spinach and other greens each day. Steam, grill, braise or stir-fry to preserve their flavour and nutrients.</p>	<p>Eat fruit for dessert. A ripe, juicy peach or a refreshing slice of watermelon or a crisp apple will satisfy your craving for a sweet bite after a meal.<sup>34</sup></p>
						

## Talking Point 5

# SLOW FOOD MOVEMENT



Italy's Slow Food Movement is one of the most prominent and influential examples of how farm-to-table principles can reshape food systems on a global scale. Founded in 1986 by Carlo Petrini, Slow Food was initially a reaction against the opening of a McDonald's near the Spanish Steps in Rome. The movement's aim was to defend regional traditions, promote sustainable farming and encourage a deeper connection between consumers and the origins of their food. What started as a small protest in Italy quickly grew into an international campaign for sustainable food systems and cultural preservation.

**Italy's Slow Food Movement aims to defend regional traditions, promote sustainable farming and encourage a deeper connection between consumers and the origins of their food.**

## Slow Food Philosophy

At the heart of Slow Food is the idea that food should be good, clean and fair.

- Food should taste good and be of high quality, reflecting traditional flavours and practices of the region.
- The production and consumption of food should not harm the environment, promoting sustainability through organic farming and biodiversity.
- Food production should support fair pay for farmers and workers, helping local economies benefit from sustainable food systems.

By advocating these principles, Slow Food seeks to counteract the industrialization and homogenization of global food systems which often prioritize efficiency and profit over cultural diversity, environmental health and social equity.

**“SLOW FOOD UNITES THE PLEASURE OF FOOD WITH RESPONSIBILITY, SUSTAINABILITY AND HARMONY WITH NATURE.”**

**CARLO PETRINI,  
SLOW FOOD MOVEMENT FOUNDER**

## Farm-to-Table

Although starting in Bra, Italy, the Slow Food movement has expanded over the decades and now operates in over 160 countries. Each region interprets the Slow Food principles through the lens of local customs, environmental conditions and culinary traditions. One of the key principles of the movement is the emphasis on the concept of “farm-to-table.” Promoting a direct connection between farmers and consumers, shortening the supply chain and eliminating intermediaries. By sourcing food locally, consumers have the opportunity to engage with producers, learn about their farming practices and support small-scale, sustainable agriculture. This approach not only ensures the freshest ingredients but also fosters a sense of community and appreciation for the efforts of local farmers.



## Talking Point 5 - Slow Food Movement

### Eggs in One Basket

Biodiversity is one of the keys to building sustainable food sources. It may look good to mass produce crops to feed the world's growing population and it probably is - in the short-term. Like all things that are too good to be true, large-scale farming comes with a heavy price and short shelf life. Wheat, rice and corn make up 60% of our food production while 75% of our edible food plants are extinct. As discussed earlier, overconsumption, habitat loss, invasive species, pollution and climate change all contribute to this loss.<sup>35</sup> Indeed, the fate of each species is so often interdependent on the fate of others. Relying on wheat, rice and corn means not only have we removed significant amounts of habitat and food sources for other species but we are putting all our efforts into single food sources. If, or when, they fail, it will be catastrophic.

**“One gram of moss from the forest floor, a piece about the size of a muffin, would harbour 150,000 protozoa, 132,000 tardigrades, 3,000 springtails, 800 rotifers, 500 nematodes, 400 mites and 200 fly larvae. These numbers tell us something about the astounding quantity of life in a handful of moss.”<sup>36</sup>**

### Pollinators

Pollinators are at the heart of the Slow Food movement's mission to foster sustainable food systems. From bees and butterflies to bats and birds these creatures ensure the reproduction of 75% of the world's flowering plants, underpinning 35% of global food crops.<sup>37</sup> Without them, our diets - rich in fruits, vegetables, nuts and coffee - would suffer a devastating loss in diversity and nutrition. Slow Food emphasizes the importance of protecting these essential species by advocating for urban gardens, planting native flora and promoting pollinator-friendly landscapes.

Slow Food's *Ark of Taste* highlights the reliance of many endangered foods on pollinators. By preserving traditional agricultural methods and protecting native food species, Slow Food is safeguarding the delicate ecosystems that pollinators depend on. The movement's initiatives aim to counteract modern agricultural practices which threaten these vital species through pesticides, monocultures and habitat destruction.

The reality is stark - pesticides like neonicotinoids damage pollinator health, disrupting their ability to navigate and reproduce. Monocultures strip away the diverse habitats they need to thrive. In response, Slow Food campaigns raise awareness about pollinators' plight, stressing the urgency of preserving biodiversity to maintain the ecological balance essential for sustainable agriculture and healthy ecosystems. Without pollinators, both our food systems and our environment face a fragile future.



#### Footnotes

- 35 FAO, What is Agrobiodiversity  
 36 Robin Wall Kimmerer, *Gathering Moss: A Natural and Cultural History of Mosses*  
 37 Nature, Widespread losses of pollinating insects in Britain  
 38 Slow Food Foundation for Biodiversity, *Ark of Taste*  
 39 <https://slowfoodyouthnetwork.org/news/the-disco-soup-cookbook>  
 40 <https://2024.terramadresalondegusto.com/en>

### Initiatives

Since its beginnings, Slow Food has grown into a global movement involving millions of people promoting environmentally and culturally sustainable agriculture and fishing. It coordinates numerous projects in support of local communities, providing them with technical and financial assistance. For example, Slow Food's *A Thousand Gardens in Africa* project actively supports communities in 25 African countries to fight for freedom from hunger, the right to food and food security. It has also led to the creation of the *Presidia* and *Ark of Taste* initiatives. *Presidia* aims to safeguard traditional food products at risk of extinction by providing support to small-scale producers. This includes preserving heirloom varieties, traditional farming techniques and reviving forgotten recipes. The *Ark of Taste*, on the other hand, is a catalogue of well over 1,000 forgotten or endangered food products from more than 75 countries. It serves as a reference for consumers, chefs and producers, raising awareness about the importance of biodiversity and cultural heritage.<sup>38</sup>

**Slow Food's *A Thousand Gardens in Africa* project actively supports communities in 25 African countries to fight for freedom from hunger, the right to food and food security.**



### Disco Soup & Food Waste

Slow Food's Youth Network is actively involved in efforts to tackle food waste - including the popular Disco Soup events. In France, Ireland, the Netherlands and the US among other locations, Disco Soup volunteers come together to cook free meals using good quality fruits, vegetables and other ingredients leftover from markets, businesses or households. DJs provide the background music for the chopping, peeling and slicing, before the food is distributed locally.<sup>39</sup>

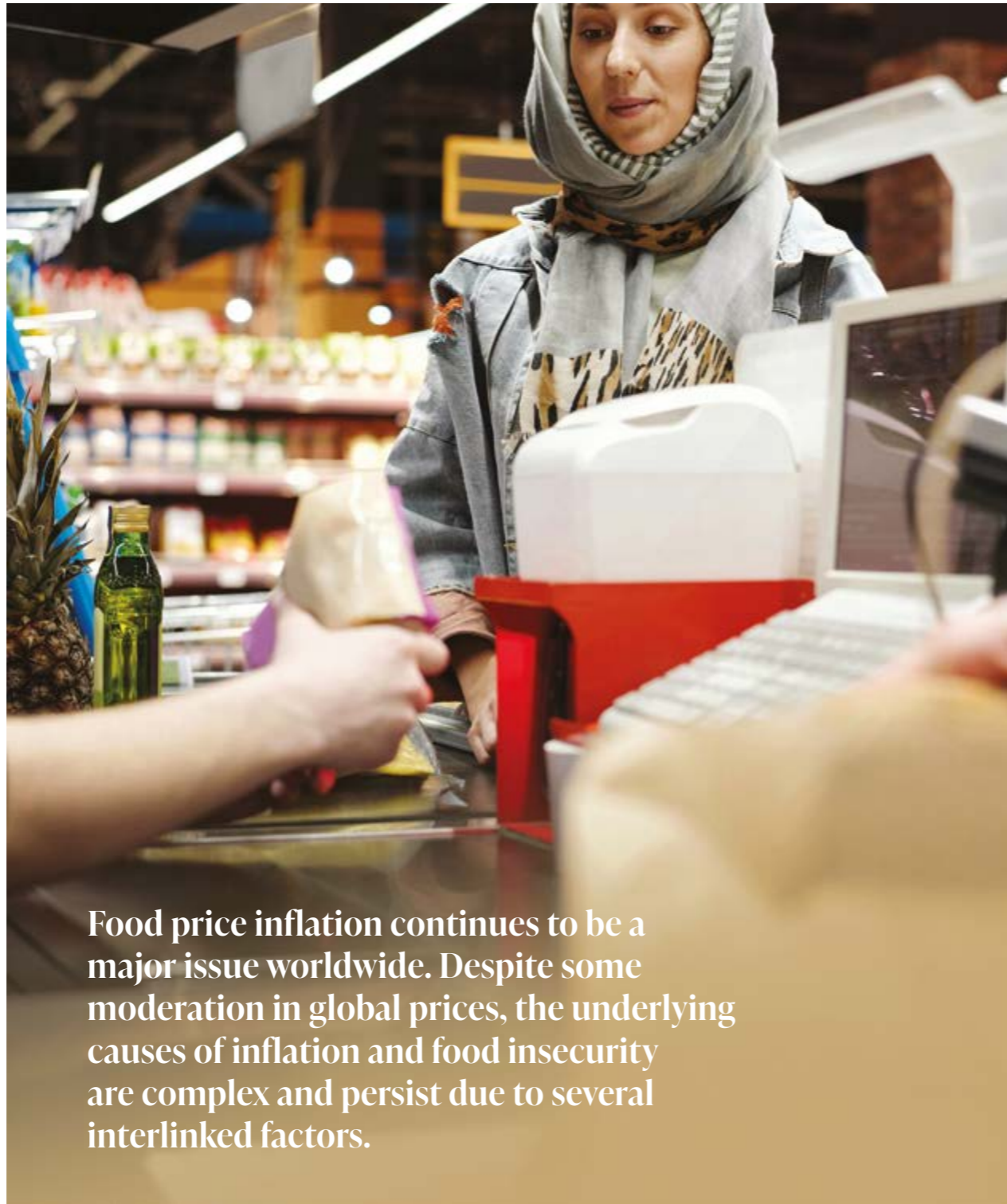


From an economic perspective, Slow Food generates considerable revenue for small-scale farmers and local artisans. By promoting local food products through international markets and festivals, such as *Terra Madre*, the movement creates economic opportunities for farmers who might otherwise struggle to compete in a globalized food market dominated by industrial agriculture.<sup>40</sup>

Talking Point 6

FOOD PRICES &

INFLATION



Food price inflation continues to be a major issue worldwide. Despite some moderation in global prices, the underlying causes of inflation and food insecurity are complex and persist due to several interlinked factors.

Global median food price inflation reached about 14% in late 2022 but has since moderated to 6% in 2023.<sup>41</sup> The UN FAO Food Price Index has shown that while prices fell mid-2023 they remain elevated compared to historical norms. Notably, countries that are more reliant on food imports have faced higher inflation due to international supply disruptions, especially in low- and middle-income regions where food price inflation remained between 9% - 15%.<sup>42</sup> In many low-income countries food inflation remains in double digits with some countries like Sudan, Egypt and Lebanon experiencing food price inflation exceeding 30%.<sup>43</sup> In high-income countries like the US and parts of Europe, inflation has decelerated to around 2.7% but it remains a cost-of-living issue for many households.<sup>44</sup>

Footnotes

- 41 World Bank Blogs, Food prices mirroring past peaks despite continuous drop
- 42 IFPRI Blog, Despite improved global market conditions, high food price inflation persists
- 43 Ibid
- 44 Ibid
- 45 World Bank Blog, El Niño's Impact on Global Agriculture
- 46 Carbon Brief, Middle East Agriculture and Climate Change
- 47 World Economic Forum, Energy Prices and Global Food Costs
- 48 World Bank, Global Energy Prices and Agriculture
- 49 World Economic Forum, Fertilizer Shortages Post-Ukraine War
- 50 IFPRI, Currency Depreciation and Food Inflation in Lebanon, Turkey & Egypt

Causes of Rising Food Prices

The rise in food prices globally is driven by a confluence of several factors which have either created supply shortages or increased the cost of production. The most significant drivers include:

Climate Change

Global food production is increasingly vulnerable to extreme weather events with a significant impact on agricultural output and food prices worldwide. In 2023, the intensification of the El Niño weather phenomenon exacerbated these challenges, particularly in West Africa and Asia. Prolonged droughts and erratic rainfall patterns in these areas led to reductions in crop yields. For example, India, a major global rice exporter, saw its 2023 rice harvest decline due to a combination of floods and droughts. This contributed to a surge in global rice prices with the World Bank reporting a 10 - 12% rise in rice prices globally.<sup>45</sup>

In the Middle East, water shortages and desertification have further strained agricultural production. Jordan, Iraq and parts of Saudi Arabia are particularly affected due to their reliance on irrigation systems that are now challenged by increasingly scarce water supplies. The region's dependence on food imports compounds this issue with local food prices rising sharply in response to global price increases. For example, food prices in Jordan rose by 6.3% in 2023 alone - driven largely by water scarcity and higher import costs.<sup>46</sup>

Energy Prices

Agriculture is highly dependent on energy for both transportation and the production of essential inputs like fertilizers. Since 2021, global energy prices have been volatile with spikes in oil and natural gas prices. These fluctuations have increased the cost of transporting food and raised fertilizer prices by as much as 66%.<sup>47</sup> Countries in the Middle East that import a large volume of food have been hit particularly hard by energy price increases. The rise in transportation costs, especially during and post-COVID-19 led to a 15 - 20% increase in the overall cost of imported goods.<sup>48</sup> In addition, the ongoing war in Ukraine and sanctions on Russia have resulted in fertilizer shortages with Russia reducing its fertilizer exports by 35% in 2023 - leading to higher costs for farmers globally and especially in import-reliant regions like the Middle East.<sup>49</sup>

Currency Depreciation & Supply Chain Issues

For many low- and middle-income countries food price inflation has been compounded by currency depreciation. The depreciation of local currencies against the US dollar has increased the cost of food imports. For example, countries such as Lebanon, Turkey and Egypt have experienced depreciation of their currencies - making food imports more expensive. Lebanon saw food inflation soar by over 150% in 2023, driven both by currency devaluation and rising global prices. Egypt, facing similar challenges, saw food prices rise by 13.5% over the same period.<sup>50</sup>



## Talking Point 7

# POLICIES & LAWS



Food systems are a key driver of environmental problems, accounting for about 30% of global GHG emissions.<sup>51</sup> These emissions come from various stages, including land use, food production, transportation and food waste. A large portion is due to methane emissions from livestock and carbon dioxide from deforestation for agriculture. In addition, food systems are responsible for nearly 60% of biodiversity loss due to practices like pesticide use, monocropping and agricultural runoff that pollute ecosystems.<sup>52</sup> These environmental impacts significantly contribute to climate change, further endangering food security by reducing the resilience of agricultural systems.

**30%**  
OF GLOBAL GHG EMISSIONS ARE  
CREATED BY FOOD SYSTEMS

## Shocks

The global food system is also increasingly vulnerable to shocks. The COVID-19 pandemic and the Ukraine crisis highlighted the system's over-reliance on a few crop varieties and long supply chains. These crises disrupted food supply and trade, leading to an increase in global hunger. In 2023, more than 2.4 billion people were experiencing moderate or severe food insecurity with the FAO reporting between 691 and 783 million people faced hunger in 2022, an increase of 122 million people compared to 2019.<sup>53</sup> The disruptions not only worsened hunger but also showed the weaknesses in food systems that are overly dependent on global trade and vulnerable to geopolitical and health crises.

Addressing these challenges requires urgent reform in food systems to meet global sustainability goals. Policies should integrate environmental and agricultural strategies, but many national climate plans fail to consider the full environmental impact of food systems. A focus on sustainable practices like regenerative agriculture, agroecology and agroforestry could help reduce GHG emissions while improving biodiversity and soil health.

FAO research suggests improving land use, reducing food waste and promoting sustainable diets could provide 20% of the climate mitigation needed by 2050 to keep global warming below 1.5°C.<sup>54</sup> Equally important is addressing social issues like land tenure, particularly for women and marginalized communities. In many regions of the world, women who work in agriculture lack secure land rights, limiting their access to credit, financial services and agricultural technology. This not only hinders their ability to improve productivity but also discourages long-term investment in land sustainability. Reforming land laws to ensure secure land tenure, alongside policies promoting green trade and sustainable urban food systems is key to building resilient and equitable food systems. Without such reforms, achieving global food security and environmental goals will remain a challenge.

## Footnotes

- 51 UN, Food & Climate Change: Healthy diets for a healthier planet  
52 UNEP, Food Systems & Natural Resource  
53 UN, Peace, dignity & equality on a healthy planet  
54 FAO, Greenhouse Gas Emissions from Agrifood Systems Global, Regional & Country Trends, 2000-2020



**IMPROVING LAND USE, REDUCING FOOD  
WASTE AND PROMOTING SUSTAINABLE  
DIETS COULD PROVIDE 20% OF THE  
CLIMATE MITIGATION NEEDED BY 2050  
TO KEEP GLOBAL WARMING BELOW 1.5°C.**

FAO RESEARCH

Talking Point 8



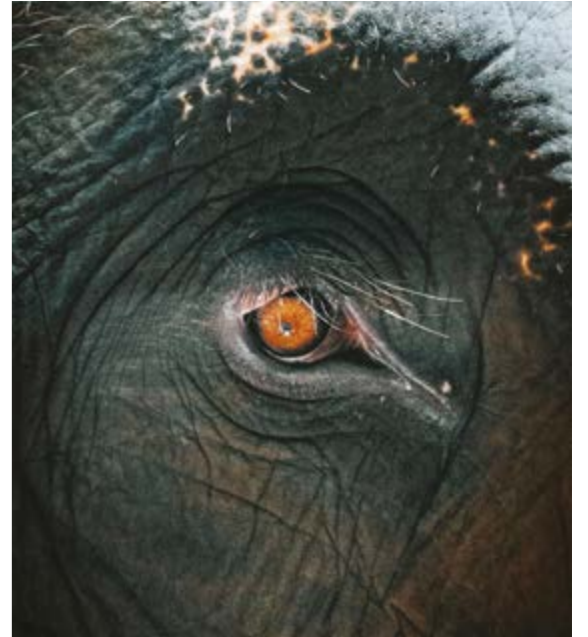
# BIODIVERSITY

# LOSS

Footnotes

55 The Guardian, Humanity has wiped out 60% of animal populations since 1970  
56 Reuters, UN urges world to slow extinctions: 3 each hour

**Biodiversity loss is intensifying at a pace that far exceeds historical trends. It is estimated humans have already wiped out 83% of known wild mammals and about half of all identified plants and extensively changed two-thirds of marine environments. One million species are at risk of extinction in the next several decades - a rate ten to hundreds of times higher than the average over the past 10 million years.<sup>55</sup>**



## Extinction

According to the UN, approximately 150 species are becoming extinct every day, representing an extinction rate of between 18,000 and 55,000 species per year.<sup>56</sup> This figure is much higher than the natural extinction rate and is the result of habitat degradation, pollution, climate change and the global food system. The expansion of agricultural land - especially monocultures such as soy, palm oil and livestock grazing - has led to the clearing of vast areas of forests, wetlands and other critical habitats. This transformation of natural ecosystems for food production is responsible for 60% of global biodiversity loss.

The impact of industrial agriculture on biodiversity is profound. The widespread use of monocultures reduces genetic diversity in crops, making them more vulnerable to pests and diseases which in turn prompts the increased use of pesticides and fertilizers. These chemicals not only degrade soil health but also seep into waterways, causing pollution that threatens freshwater and marine biodiversity. Furthermore, land-use change disrupts ecosystems by fragmenting habitats, isolating species and decreasing the resilience of ecosystems to environmental stresses such as climate change. As agricultural land expands, especially in tropical regions rich in biodiversity, ecosystems lose their ability to provide essential services such as carbon sequestration, water regulation and pollination, further amplifying the biodiversity crisis.

The biodiversity challenge we face today is not only a matter of species disappearing but also a complex unraveling of ecosystems on which human societies depend. The food system, while essential for feeding the world's population has emerged as one of the most significant contributors to this crisis. A move toward more sustainable agricultural practices, such as agroecology, regenerative farming and habitat restoration is urgently needed to halt further biodiversity loss and secure the long-term health of the planet.

**150**  
species are becoming extinct every day, representing an extinction rate of between 18,000 and 55,000 species per year.



Talking Point 9



The cheaper food paradigm has created a cycle where lower food prices encourage greater demand, which in turn pressures farmers to produce more food even more cheaply. To meet this demand, farming intensifies through methods like increasing inputs - fertilizers, pesticides, water, expanding agricultural land, deforestation and focusing on high-yield crops. These practices not only harm biodiversity but also deplete natural resources and degrade ecosystems.

Footnotes

- 57 Greenpeace, Agribusiness & Deforestation
- 58 In 1000 CE the world population was probably 300 million
- 59 World Economic Forum, 50% of all land in the world is used to produce food
- 60 UN Sustainable Development Goals Fact Sheet: 15 Life on Land
- 61 FAO, Action Against Desertification
- 62 The Economics of Land Degradation, The Value of Land
- 63 Chatham House, Food System Impact on Biodiversity
- 64 Ibid

As we rely on industrial agricultural commodities such as palm, soy and industrial produced meat and dairy we are losing forests and accelerating a climate and ecological emergency. It is estimated 80% of global deforestation is a result of agricultural production which is also the leading cause of habitat destruction. Animal agriculture - livestock and animal feed is a significant driver of deforestation and is also responsible for approximately 60% of direct global GHG emissions. Overall, emissions from the food system as a whole, including production and consumption, represent up to a third of total global human-induced GHG emissions.<sup>57</sup>

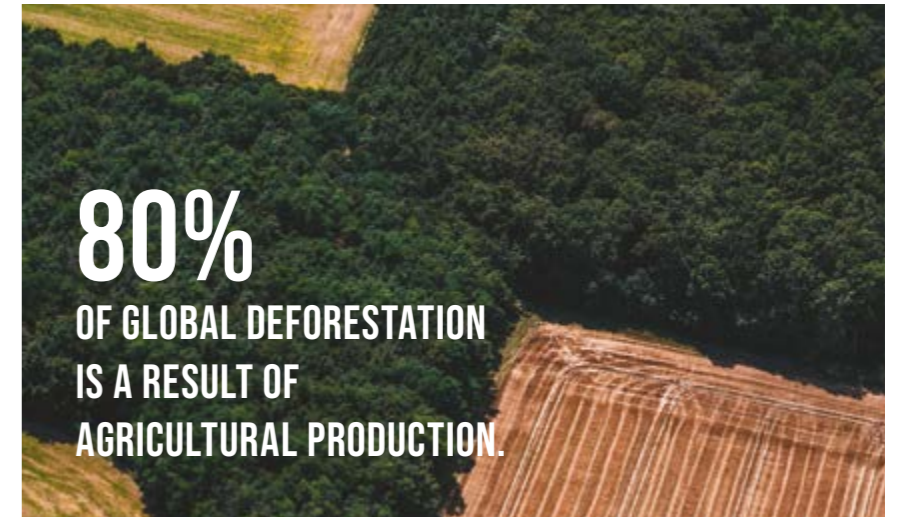
**Expanding Footprint**

Increasingly, the world's agriculture system is expanding its terrestrial footprint to produce livestock feed that meets the growing demand for meat and dairy products or crop-based biofuels. A 1,000 years ago, it is estimated 4 million km<sup>2</sup> - less than 4% of the world's ice- and desert-free land was used for farming.<sup>58</sup> Today, almost half - 44% - of the world's habitable land is used for agriculture. In total it is an area of 48 million km<sup>2</sup> - 155 times the size of Oman. This type of growth is putting more pressure on forests and increasing the destruction of critical ecosystems. Protecting and restoring forests and revamping the global food system through dietary change are key solutions to the escalating biodiversity, climate and food security crises.<sup>59</sup>

**Social & Environmental Impact**




While cheaper food benefits consumers by keeping food prices low, costs are externalized onto the environment and society. According to the UN, 2.6 billion people depend directly on agriculture, yet 52% of agricultural land is moderately or severely affected by soil degradation with arable land loss estimated at 30 to 35 times the historical rate.<sup>60</sup> Unsustainable land management practices, adopted to produce more food, can turn into a serious threat to agricultural production and food security. FAO estimates indicate.

**Approximately two-thirds of arable land could be lost to desertification in Africa by 2030.<sup>61</sup>**



**Cheap Grub Comes at a Cost**

- Every item we have or consume costs land. A cup of coffee costs 4m<sup>2</sup>. A city taxi ride 150m<sup>2</sup>. A laptop 10m<sup>2</sup>. Estimated value of ecosystem losses - as a result of land degradation - between US\$850 and US\$1,400 per year for every one of us on the planet.<sup>62</sup>

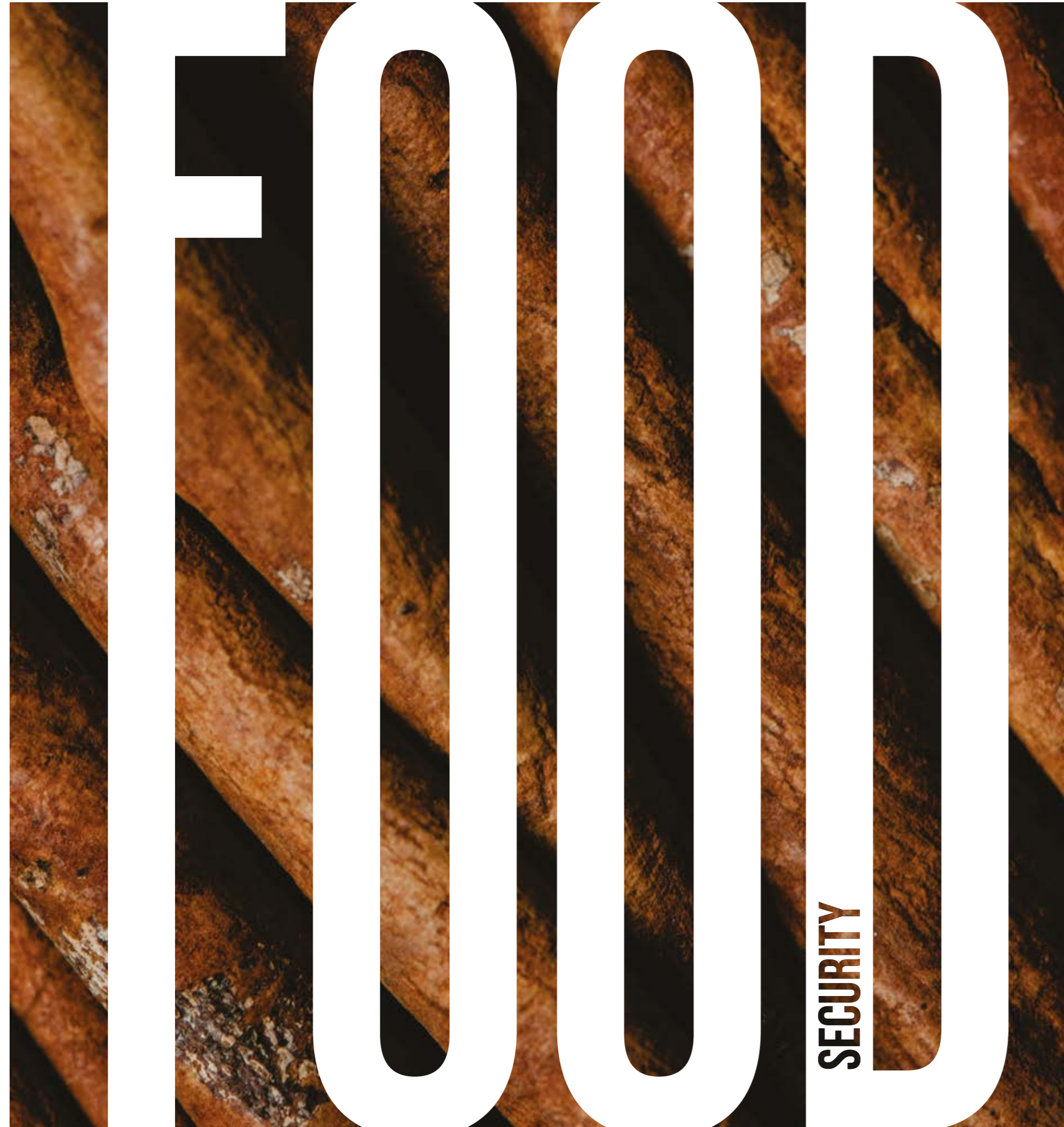
			
	Cup of coffee	Taxi ride	Laptop
Land cost	4m <sup>2</sup>	150m <sup>2</sup>	10m <sup>2</sup>

- The cheaper food paradigm, which has shaped global agriculture for decades is now recognized as a major driver of biodiversity loss, environmental degradation and climate change. This model prioritizes producing large quantities of food at lower costs, but its hidden costs are increasingly visible in the form of species extinction, habitat destruction and pollution.

- Agriculture is responsible for endangering 86% of the species at risk of extinction globally. This means that out of 28,000 species threatened with extinction - around 24,000 species face dangers from agricultural activities.<sup>63</sup>

- The current global rate of species extinction is higher than it has been in the last 10 million years.<sup>64</sup>

Talking Point 10



SECURITY

Footnotes

- 65 The Global Goals, 2 Zero Hunger
- 66 Steven Cummins, "Food Deserts" - Evidence & Assumption in Health Policy Making
- 67 Cong. Rsch. Serv., IF1844, Defining Low Income, Low Access Food Areas (Food Deserts)
- 68 Cong. Rsch. Serv., supra note 4; Supermarkets and large grocery stores - defined as food stores with at least \$2 million in annual sales and containing all the major food departments - are often used as proxies for sources of healthy and affordable food. Economic Research Service, Documentation, USDA
- 69 <https://foodfoundation.org.uk/initiatives/food-insecurity-tracking>
- 70 The Guardian, Supermarkets must help those in England's 'food deserts', says Which?

Today, some 56% of the world's population – 4.4 billion inhabitants – live in cities and are increasingly critical in the global fight for food security. UN SDG 2 explicitly aims to “end hunger, achieve food security, improve nutrition and promote sustainable agriculture” by 2030.<sup>65</sup> As part of this effort, cities play an important role, given their high population density and growing urbanization. However, food deserts – urban areas where access to affordable, nutritious food is limited – pose significant health and economic challenges, disproportionately affecting low-income communities.

In response, cities around the world are adopting innovative solutions to tackle this challenge. These efforts include urban agriculture, vertical farming and community-supported food systems, all aimed at building resilient, localized food systems. These initiatives are not only about improving access to fresh, healthy food but also about promoting equity and sustainability within urban food supply chains. By enhancing local production, cities can reduce their reliance on long, vulnerable supply chains and mitigate the risk of food shortages due to global disruptions – such as those seen during the COVID-19 pandemic or due to climate-induced disasters.

**Food Deserts**

The term food desert is reported to have been created by a Scottish public housing resident in the early 1990s.<sup>66</sup> Use of the term quickly grew in popularity in the UK and in the 2000s was commonly used by US public health and food policy advocates. Food desert first appeared in federal legislation in the 2008 Farm Bill, also known as the Food, Conservation & Energy Act of 2008 when Congress directed the US Department of Agriculture (USDA) to study and produce a report on food deserts.<sup>67</sup>

Although there is no definition of the term in US federal law, the USDA Economic Research Service, US Treasury Department and US Department of Health & Human Services developed a definition after the 2008 Farm Bill used census tract data to qualify areas as food deserts. According to this definition, food deserts are low-income census tracts with a substantial number or share of residents with low levels of access to large retail outlets selling healthy and affordable foods. Specifically, an area qualifies as a food desert if it meets the following low-income and low-access thresholds:

**Low income**

A poverty rate of 20% or greater, or a median family income at or below 80% of the statewide or metropolitan area median family income.

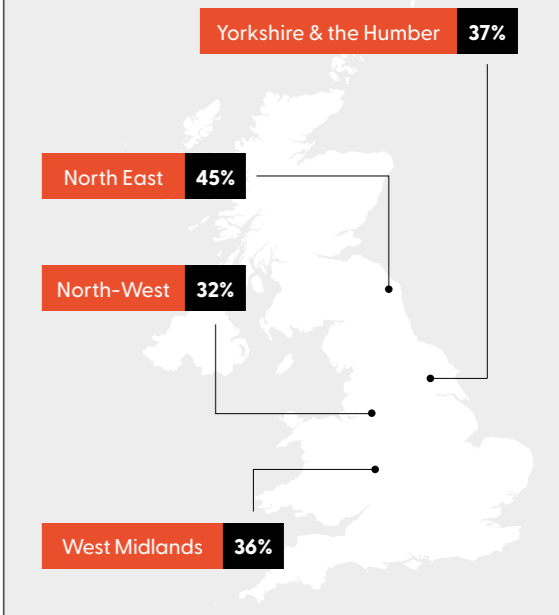
**Low access**

At least 500 persons or 33% of the population living more than 1.6kms from a supermarket or large grocery store – or 16kms, in the case of rural areas.<sup>68</sup>

**Food Insecurity**

The problem of food deserts has long been an issue in economically deprived UK areas, with poor or expensive public transport links to larger supermarkets most likely to offer good-value produce. However, rising prices and low incomes have highlighted the problem. According to the Food Foundation tracker – in January 2024 – 15% of UK households experienced food insecurity.<sup>69</sup> On a regional basis, the north-east of England is the worst affected with nearly half (45%) of local neighbourhoods facing poor access to cheap and healthy food, closely followed by Yorkshire and the Humber (37%), the West Midlands (36%) and the north-west (32%). This contrasts with relatively high levels of affordable food access in London and the south-east. Just 4% of neighbourhoods in the UK capital are likely to experience a dearth of access to cheap, fresh food and 7% in the south-east.<sup>70</sup>

**UK FOOD INSECURITY**



% of households who experience poor access to cheap and healthy food per region.

## Talking Point 10 - Food Security

### Singapore's 30 by 30: Grow More with Less

Singapore's 30 by 30 strategy is an ambitious and forward-thinking plan aimed at strengthening the country's food security by ensuring 30% of its nutritional needs are met through local production by 2030. Given Singapore's heavy reliance on food imports - over 90% - this initiative is a bold move toward self-sufficiency, especially considering the country's limited land and natural resources. The strategy is led by the Singapore Food Agency which coordinates efforts across the public and private sectors to revolutionize urban farming and food production.<sup>71</sup>

### Vertical Farming Tech

One of the flagship initiatives under 30 by 30 is the development and expansion of vertical farming technologies. These farms utilize cutting-edge techniques that allow crops to be grown indoors in stacked layers, maximizing space and producing high yields in compact areas. Several leading companies, such as Sustenir Agriculture are pioneering these technologies in Singapore.<sup>72</sup>

Sustenir Agriculture specializes in growing non-native crops, such as kale, spinach and arugula in climate-controlled environments. Using hydroponics, plants are grown without soil, instead relying on nutrient-rich water solutions. The LED lighting systems ensure the crops receive optimal light for photosynthesis while energy-efficient climate control systems create the perfect environment for year-round production. Today, Sustenir grows more than 150 tonnes of leafy greens annually, contributing to local food production.<sup>73</sup>



### Rooftop Farms

In addition to vertical farming, Singapore is harnessing its urban spaces - especially rooftops - to grow food. Edible Garden City (EGC) is one of the key projects driving this effort. Established in 2012, EGC builds urban gardens to promote self-sufficiency, food waste management and community building in Singapore. Founder Bjorn Low created a model of accessible pop-up farms run by local "agripreneurs" as spaces that bring people together. Championing inclusive and sustainable spaces in the urban landscape. Over the past 10 years, the initiative has built around 280 gardens for hotels and restaurants, as well as schools, private homes and property developers.<sup>74</sup>

**Singapore's 30 by 30 strategy is an ambitious and forward-thinking plan aimed at strengthening the country's food security by ensuring 30% of its nutritional needs are met through local production by 2030.**

#### Footnotes

- 71 <https://www.ourfoodfuture.gov.sg>  
 72 <https://sustenir.com>  
 73 Ibid  
 74 MC/Asia, Greening the corporate world one plant at a time  
 75 Knowledge Hub, Edible Garden City in Singapore  
 76 <https://www.timeout.com/singapore/restaurants/noka>

### Community Engagement

EGC also provide training, educational workshops and farm tours for schools, businesses and other communities interested in strengthening their internal sustainability. In addition, they have also collaborated with the Autism Resource Centre, Employment for People with Intellectual Disabilities and the Singapore Prison Service to teach farming skills to people with autism, mental disabilities and to inmates.<sup>75</sup>



### Funan Mall Rooftop Farm

Funan is an integrated development combining retail, entertainment, leisure, wellness, office, co-working and co-living. Conceived as an 'experiential creative hub', the mixed-use development integrates public spaces and a multi-level landscape and public realm strategy. Spaces connect laterally and vertically throughout the building to provide an integrated environment that blurs traditional zones of function and experience to offer a choice of lifestyle activities under one roof. Funan is also home to the largest rooftop urban garden in Singapore's downtown area. The project is a collaboration between EGC and respected lifestyle entrepreneur Cynthia Chua who pioneered the farm-to-table concept in Singapore's F&B scene. Funan's 464 square metre rooftop garden is tended by EGC farmers and sits alongside Chua's Japanese restaurant Noka.<sup>76</sup>



## Talking Point 10 - Food Security

### Challenges & Opportunities

While Singapore's 30 by 30 strategy is making progress there are still challenges the country must navigate to achieve its ambitious goals.

#### Challenges

- **High Capital Investment**

High initial investment costs for infrastructure, technology and energy present significant challenges to companies looking to enter the vertical farming market. One estimate reported an initial investment cost of approximately US\$11 million per acre to set up a hi-tech vertical farm compared to approximately US\$6 million estimated for a hi-tech greenhouse of a similar size.<sup>77</sup> While Singapore's government has provided subsidies and grants to support local producers, scaling these technologies to meet 30% of the country's nutritional needs will require continued financial support and investment from both public and private sectors.

- **Technological Complexity**

Vertical farming systems rely on sophisticated technology and expertise to manage and optimize growing conditions. From monitoring environmental parameters to troubleshooting equipment malfunctions, operators must have a deep understanding of specialized skills such as agricultural science, engineering and computer technology. Finding and paying professionals with these skills can be challenging and expensive. Nevertheless, advances in areas such as AI, robotics and system control may help lower costs associated with technological complexity of vertical farms.

- **Limited Crop Range**

While vertical farming systems offer the highest yield per surface area of growing space compared to greenhouses and traditional outdoor farming, crops that can be grown by this method are still restricted to herbs and leafy vegetables, limiting scalability and its contribution to mainstream agriculture. Expanding the range of crops that can be grown by vertical farming will require intensified R&D efforts to overcome technical challenges. There are currently efforts to use vertical farms to grow more crops such as chilies, tomatoes and strawberries.

**To companies looking to enter the vertical farming market. One estimate reported an initial investment cost of approximately US\$11 million per acre.**

*Footnotes*

77 Farrelly Mitchell, Vertical farming systems: Challenges & key considerations



### Opportunities

- **Global Leadership in Urban Agriculture**

Singapore's success with vertical farming has positioned it as a global leader in urban agriculture. The country's model is being replicated in other dense, resource-constrained cities such as Hong Kong, London, New York and Tokyo. By continuing to innovate, Singapore can serve as a blueprint for other urban centres aiming to improve their food security.

- **Tech Advancements**

Continued advancements in agri-tech, such as AI-driven crop monitoring, smart irrigation systems and automation offer opportunities to enhance productivity and reduce costs. Singapore's investment in R&D will likely accelerate the adoption of these technologies, making urban farming more sustainable and scalable.

- **Resilience to Global Supply Chain Disruptions**

One of the main benefits of the 30 by 30 strategy is its potential to insulate Singapore from global food supply chain disruptions, such as those experienced during the COVID-19 pandemic. By producing more food locally, Singapore can reduce its vulnerability to trade restrictions, logistics challenges and price volatility in international markets.

Singapore's 30 by 30 strategy represents an innovative approach to food security in urban settings, leveraging hi-tech agriculture and community engagement. While challenges such as energy consumption and high capital investment remain, the country's commitment to transforming its food production system has set a strong foundation for achieving its goals. As other cities face similar challenges with limited land and increasing populations, Singapore's model provides invaluable lessons on how to create sustainable, resilient and self-sufficient urban food systems.

## Q&amp;A

**HUSSAIN AL LAWATI**  
CEO  
Development Bank



### Wasted Potential: How Development Banks Can Curb Food Loss

With global food loss and waste contributing up to 10% of GHG emissions, Hussain Al Lawati, CEO, Development Bank discusses how targeted investment in infrastructure, technology and awareness campaigns can tackle inefficiencies, promote sustainability and improve food security.

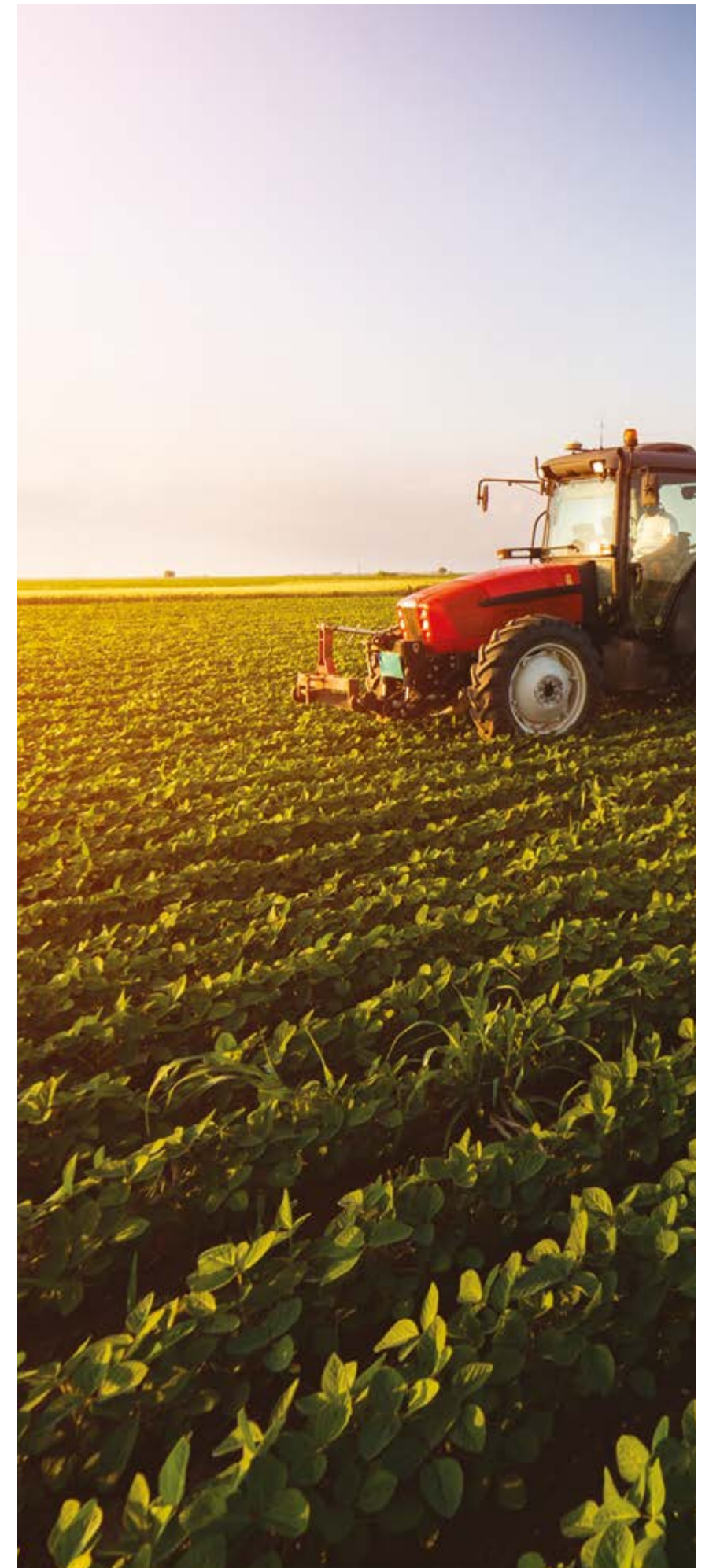
# TEJARAH TALKING

### One-third of all food produced is lost or wasted. How can development banks help tackle this issue?

This is an area that concerns us deeply and is something that is reflected in the support we provide to agrifood. For example, in the first nine months of 2024 Development Bank (DB) lent US\$24.4 million to the local agriculture sector – quite literally helping it grow. On top of this, between 2021 and September 2024 DB funding of Oman's food industry grew from US\$11.8 million to US\$24.4 million an impressive increase of 107%.

According to UNEP, 19% of food available to consumers is wasted at the retail, food service and household levels, in addition to the 13% lost within the supply chain. And the environmental impact is significant. It is estimated food loss waste (FLW) contributes up to 10% of global GHG emissions. In this context, development banks like DB can certainly play an important role by supporting a broad range of solutions that target both the causes and consequences of FLW. The question is how this can be done? Well, for me a good place to start is facilitating infrastructure investment in cold storage, transport and food processing facilities. Supporting start-ups working on innovative solutions like circular economy models where food waste is repurposed for use in animal feed, bioenergy or other value-added products is also a positive move. Another fruitful option is organizing awareness campaigns with local partners aimed at helping consumers reduce household food waste. Campaigns like these can empower people to make more informed choices about purchasing, storing and using food.

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## Q&amp;A

**Isn't measuring food loss and waste key to solving the problem?**

Let us be clear, reducing FLW generates benefits for communities, businesses, consumers, human health and the environment. It is estimated if we reduced consumer food waste by 25% by 2030, we could save the world up to US\$300 million per year. And by consuming more of what we buy, households can reduce their overall spending on food. In fact, studies from the World Resources Institute show that by eliminating avoidable food waste the average UK family would save US\$870 each year - while in the US, the average family would save US\$1,800. These are sizeable savings by any measure. We have to invest in analytics that track food loss across supply chains, helping government, businesses and families pinpoint inefficiencies. It is all about making invisible losses visible so they can be tackled effectively.



**30% REDUCED CONSUMER  
FOOD WASTE WE COULD  
SAVE THE WORLD UP TO  
US\$300MN PER YEAR.**

**Development Banks are known for financing infrastructure. Would modernizing facilities like cold chain storage and transport help reduce FLW?**

Most definitely. According to the World Bank every 1% reduction in postharvest loss results in US\$40 million of gains and the main beneficiaries of these gains are small farmers. Upgrading infrastructure - whether that is better roads for faster transport or cold chain systems for perishable goods - would help more food reach the retail stage in optimal condition. These interventions also align with efforts to reduce food insecurity, as improved efficiency means more food can be distributed, ultimately benefitting the entire supply chain.



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**Are Environmental, Social and Governance regulations shaping the way businesses address FLW?**

The agrifood landscape is clearly undergoing a profound shift, placing increased responsibility on food producers to meet the evolving demands of consumers and comply with ESG regulations. For example, the EU's recently introduced Corporate Sustainability Reporting Directive is expected to impact 40,000 EU companies and 10,000 non-EU companies in the food and beverage sector. Requiring businesses to disclose information about their ESG practices across the entire value chain - from resource utilization, waste management and GHG emissions to labour conditions and supply chain transparency. It is important we support Omani companies meet such regulations by providing financing for solutions like waste reduction technologies and sustainable supply chains, helping them adapt while benefiting the environment.

## Q&A

### Beyond policy and infrastructure there is a strong business case for reducing FLW.

You are absolutely right. There is in my opinion a clear financial incentive. Research conducted by the World Business Council for Sustainable Development involving 700 companies in 17 countries showed that for every US\$1 invested to reduce FLW companies saved US\$14 in operating costs. The type of investment ranged from quantifying and monitoring food loss and waste, training staff on practices to reduce waste, changing storage and handling processes to reworking packaging to extend shelf-life.

### How can development banks collaborate with the private sector and other financial players to create sustainable solutions for FLW?

Collaboration is essential in addressing FLW. Development banks have the ability to leverage their relationships with businesses, private financial institutions and government to create innovative funding mechanisms such as sustainability bonds and sustainability-linked loans. These instruments can specifically target FLW reduction across the supply chain. In 2023, for example, issuance of impact bonds - green, social, sustainability and sustainability-linked - totalled US\$939 billion - a 3% increase on 2022 - demonstrating the appetite for investments that deliver both financial returns and environmental benefits. By pooling resources with the private sector, development banks can scale-up interventions, financing cold storage facilities, logistic upgrades and innovative waste-reduction technologies that are vital to reducing FLW.

### Looking ahead, what impact do you think development banks can have on food security by addressing FLW along the supply chain?

Without doubt, tackling FLW can have a significant impact on food security. According to the FAO, food that is lost and wasted could feed 1.26 billion hungry people every year. By focusing on strategic interventions, we can reduce waste, lower GHG emissions and use resources more efficiently, all contributing to a more sustainable global food system. It is a win-win all round.

**Every US\$1 invested to reduce FLW companies saved US\$14 in operating costs.**



**IN 2023, IMPACT BONDS  
- GREEN, SOCIAL, SUSTAINABILITY  
AND SUSTAINABILITY-LINKED  
- TOTALLED US\$939 BILLION,  
A 3% INCREASE ON 2022.**

Tejarah Talks are held at Oman Convention & Exhibition Centre



**THANK YOU**  
TO OUR PANELISTS & ALL  
THOSE WHO ATTENDED

1. Sayyid Fahar Al Said
2. Moza Al Kharusi
3. Dr. Masoud Al Azri
4. Q&A
5. Great turn out

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