

**FORUM
FOR THE
FUTURE**

Case for Action:

The Future of Protein in a Changing Region

How can financial actors enable transformative change towards a just and regenerative protein system in Southeast Asia?



Executive Summary

We are at a crossroads for humanity where we face multiple global challenges, from climate change to a public health crisis. The investment community is waking up to this challenge - capital is flowing into new innovations, financial actors are re-evaluating their stewardship role in influencing corporate action and new initiatives are driving forward discussions about how to deliver transformative finance.

The world is signalling new goals for the future - climate stability, resilient livelihoods, nutrition, land rehabilitation and biodiversity restoration. These goals will be rewarded in the future and need to form the guiding light for decisions in the finance sector going forward.

In the face of these challenges, the protein system globally is in an unprecedented state of dynamism, with growing attention on the impacts of livestock on greenhouse gas emissions and the rise of alternative protein companies. This has seen financial actors flocking to the space, which is ripe for innovation.

In Southeast Asia, this 'protein challenge' has never been more acute. There is growing demand for protein, particularly across emerging economies, as the population increases and a growing middle class aspires to eat more meat (see PART 1 for a breakdown of the available protein production and consumption data). This is fuelling concerns around food security into the future. Even now - as fish, seafood and plant-based foods dominate the protein in peoples' diets - it is clear that there are a number of deep social and environmental concerns, from widespread malnutrition, to limits of agricultural productivity and rising risks of antibiotic resistance.

Box 1: Inquiry Questions

These questions have prompted the creation of the Protein Challenge Southeast Asia initiative, with the aim of working collectively with different stakeholders to better understand what it would take to accelerate the transition to a protein system in the region that can meet the challenges ahead, and specifically how financial actors can play a role in that shift. This Case for Action paper, based on desk-based research and interviews from November 2020 to June 2021, provides a starting point for the initiative by exploring a series of key inquiry questions.

How are the current perceptions of the protein challenge in Southeast Asia influencing the approach to achieving a sustainable protein system?

How is this shaping the current behaviours and mindsets of those investing in sustainable protein in the region?

To what extent are these approaches creating a future-fit protein system, one that will be resilient in facing systemic social and ecological disruptors likely to emerge in the coming decade?

What will it take to achieve a future-fit protein system - that is, one which is ecologically regenerative and socially just for current and future generations?

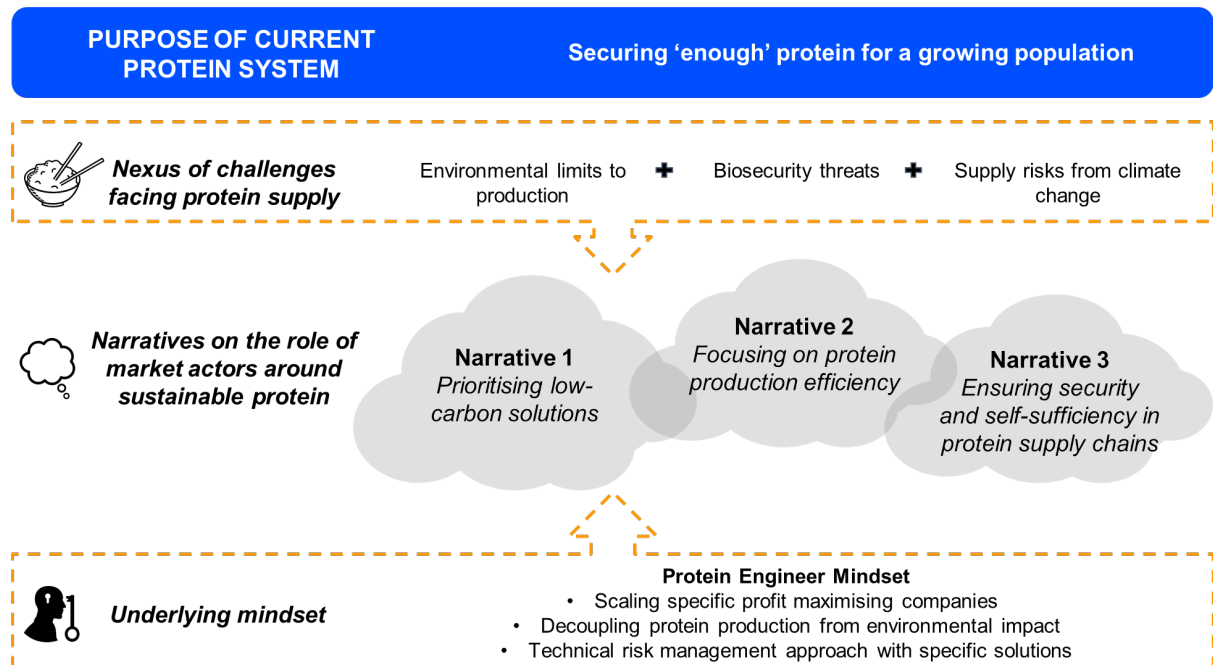
What could the role of financial actors be as change agents?

How can we build out a protein system that meets these demands? Is current action adding up, and what more is needed?

Our research shows that, while current approaches are working to address key issues in the immediate context, they are at risk of not solving the core challenges that lie behind them and may underestimate the scale of transformation needed. By focusing on a narrow set of goals, such as food security and climate, they risk perpetuating current extractive models and have the potential for deep social harm, and even the exclusion of hundreds of thousands of smaller farmers and growers that currently provide four out of five plates eaten in Southeast Asia.

What's driving food system action?

Our research showed that actors across the board, from business to investors, civil society and policy makers, consistently highlight the ‘sustainable protein’ challenge in the region in the same way through the lens of food security. The focus of this rationale is on maximising productivity efficiency - delivering abundant protein in the region to meet growing demand, while decoupling production from environmental impacts to avoid limits to production, biosecurity risks (such as zoonotic diseases) and supply disruptions.



This deep-rooted ‘Protein Engineer’ mindset targets quick fixes and focuses on investing in and promoting specific managerial or technological interventions that scale up low-carbon solutions, drive efficiency and improve security of supply chains. It does not directly address the wider social and economic context, or more ingrained environmental challenges in food production. These are critically important goals and the Protein Engineer mindset may deliver some short-term gains - but what are the risks?

The decade ahead will be turbulent and unpredictable, with the potential for significant systemic disruptions - such as Mekong Delta rice harvest failures and coral reef collapse. Such disruptions could far eclipse the pattern of cascading impacts we have seen ripple across the globe from the COVID-19 pandemic. Actions to shape a protein system that is future-fit need to be able to be sustained, resilient and commensurate with the scale of these challenges - or risk resulting in shocks, stranded assets and reputational damage.

Achieving sustained, meaningful and resilient change in the face of disruption necessitates a deeper approach that addresses these existing challenges in a way that also supports a transition to a ‘future-fit’ protein system.

The role of Protein Visionaries in catalysing a transition to a just and regenerative protein system

To really transform the protein system in Southeast Asia, we will need Protein Visionaries, not just Engineers. Protein Visionaries see the protein challenge through a wider aperture. They recognise the potential for a protein system to go beyond tackling security of supply to address the wider systemic challenges of overcoming deeper societal and planetary conditions and the necessity of doing that for achieving long-term food security and lasting climate mitigation efforts. In particular, addressing:

- **Ecological fragility:** Regional agriculture practices such as biomass burning, fertilizer overuse and groundwater depletion have led to phosphorus deficiency, increased water pollution and greater carbon emissions, ultimately depleting the land's ability to nourish us over time. A future-fit system requires us to go beyond extractive models and efforts to 'spare' land from agricultural expansion. What is needed is a fundamental shift to restorative forms of agriculture that replenish depleted soils and biodiversity.
- **Social inequities:**
 - With 100 million smallholder producers in the region, as well as food and farming sector workers at the core of the future food system, it is essential to focus on a 'just transition' where no one is left behind. The current tendency for consolidation of market models compounds the problems smallholders face in engaging with the market.
 - Maximising production of protein in a region where there is, at least theoretically, 'enough' protein produced does not address the issues of access to nutritious and affordable food across the region. Any future-fit strategy needs to unlock access and affordability, both as a fundamental human right and as a means of ensuring that all can play their role in the region's economic development.
- **Adaptability and resilience:** Disruption will be the norm and will influence the operating context of the food and agriculture sector for decades to come. A diversity of approaches and routes to action, rather than specific solutions, will be critical for resilience in the face of immediate and long-term uncertainties.

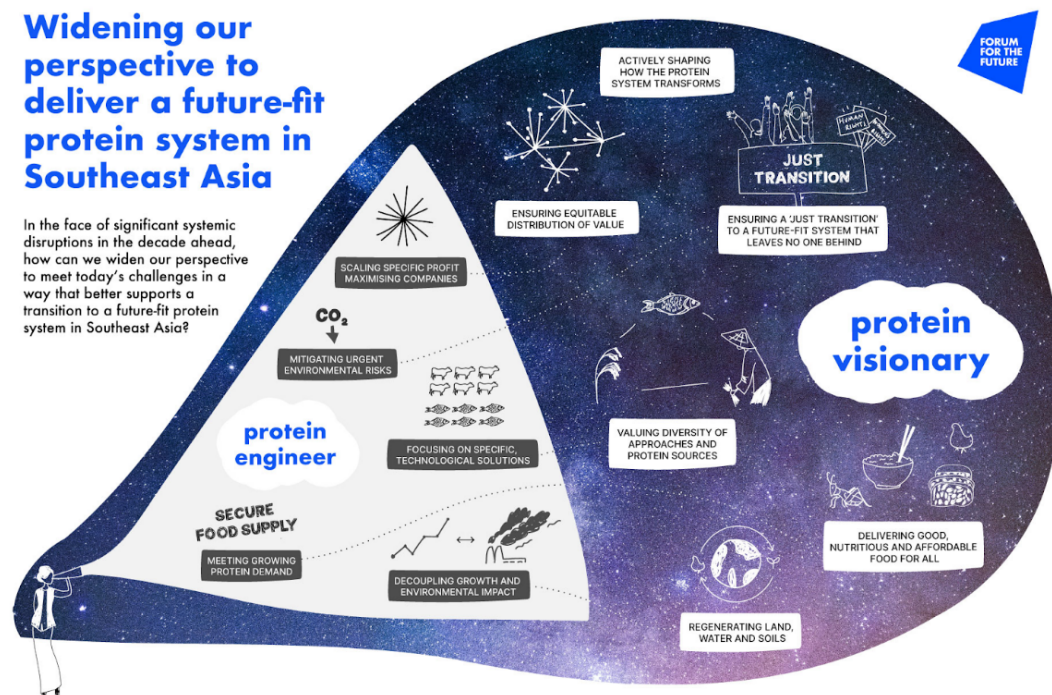
As these challenges converge, it is clear that we need to move from our current goal of securing a 'sustainable' protein supply to a goal of achieving a 'just and regenerative' protein system. This evolved system would restore and regenerate our living systems, create conditions for social equity, and respect for human rights. It would also be adaptive, resilient and healthy for generations to come.

There is huge potential to unlock this shift in Southeast Asia and a number of exciting visions are already emerging:

- A **regenerative protein system** that replenishes degraded land and ocean ecosystems.
- A **diversified protein system** that encourages the use of local traditional knowledge, and taps the potential of harnessing existing solutions in the region, alongside novel, high-tech approaches.
- A **decentralised protein system** that foregrounds the role of smallholders in the agricultural system and prioritises the creation of rights-respecting and decent jobs for the many workers in protein supply chains.

Widening our perspective to deliver a future-fit protein system in Southeast Asia

In the face of significant systemic disruptions in the decade ahead, how can we widen our perspective to meet today's challenges in a way that better supports a transition to a future-fit protein system in Southeast Asia?



The Protein Challenge Southeast Asia Initiative:

This initiative - incubated by Forum for the Future - aims to cultivate a cohort of Protein Visionaries to imagine and drive a transition to a just and regenerative protein system in Southeast Asia. Their mission will be to demonstrate the 'art of the possible', drawing others towards a goal of widening our aperture on what transforming the protein system entails. This will involve challenging ourselves to create new visions for a decentralised, regenerative, adaptive and future-resilient system. It will also involve experimenting with a diverse array of imaginative solutions to achieve this.

How might we harness the potential of financial actors to transform the protein system in Southeast Asia?

Whilst there are multiple ways to come at this challenge, the initiative will focus upon exploring the change agency of financial actors in enabling this transition towards a just and regenerative protein system. Their role in directing finance towards particular products and business models gives them leverage to shift norms and behaviours within value-chains.

This is already happening, with investors funding protein innovation to provide alternatives to animal protein. There is also a growing focus on ESG in investments in sectors such as livestock farming. Yet, these approaches may not be enabling the deeper levels of transformation needed to respond to ecological fragility, deepening social inequities and inter-generational resiliency in the protein system in the region.

Current Protein Engineer mindsets and approaches coupled with short-term, 'business-as-usual' thinking are limiting the change potential of finance to equip the protein system for the ecological and social challenges of the decade ahead.

The Protein Southeast Asia Initiative is putting forward a futures-led inquiry into: *How can we harness the potential of financial actors¹ to catalyse change in the protein system in this region?* It will collectively explore the paradigms, mindsets and behaviours that financial actors bring into the protein system with a view to understanding how these might support a transformative trajectory. Inquiry questions include:

- How can financial actors see themselves as part of the protein system, recognising their agency - and responsibility - through investment decisions to shape the system towards just and regenerative goals?
- How can financial actors move from individual deals in low-carbon protein or influencing specific company strategies, to building strategic portfolios which collectively leverage change in the protein system?
- How can financial actors incorporate a more holistic approach to screening and managing protein production and consumption impacts? We need to see a shift from a narrow focus on greenhouse gas emissions, biosecurity risks and securing supply towards systemic applications of ESG processes, as well as exploration of alternative ways of leveraging change through finance.
- How can financial actors reimagine value models to incorporate more than financial value in protein portfolios? A truly regenerative and just protein system is not just about doing 'less harm'. It is about how financial actors can help unlock positive value for society and influence the development of the wider market.
- How can financial actors respond to the need for a just transition as we shift the goals of the region's current protein system towards just and regenerative ones? Every transition has consequences and how might we ensure no one is left behind in the production, distribution and consumption of affordable, sustainable and nutritious protein?
- How can financial actors spearhead collective and collaborative approaches amongst a diverse group of actors to achieve transformations in the protein system?

CALL TO ACTION

If you are a financial actor in the region, a business working and innovating in the protein sector, an NGO working on food system transformation or a governmental body wanting to channel the power of the market to deliver a 'future-fit' protein system, this inquiry will provide new insight into how finance can be a systemic lever of change in efforts to transform the protein system in Southeast Asia.

1. **Join the Protein Challenge Southeast Asia initiative** in order to:
 - Set a collective vision for a just and regenerative protein system in Southeast Asia.
 - Generate recommended ambitious interventions designed to lift barriers to - and unlock opportunities for - enabling a transition.
 - Catalyse prototyping in a range of opportunity areas to activate the system change process.
 - Inspire other actors in the Southeast Asia protein system to collaborate in the prototyping, thus growing the cohort of Protein Visionaries.
2. **Share the report and call to action with your networks:** it will take a cross-sector group to drive action, including financial actors, policy, civil society, business and innovators. Who do you think should be part of this effort?

¹ We understand financial actors as a broad term to include actors who are investing into (or managing investments into) the protein space with some expectation of financial return, be it corporations, venture capital, institutional investors or development finance institutions.

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Table of Contents

Introduction: Why are we exploring the protein challenge in Southeast Asia?.....	9
<i>Explores the protein challenge in Southeast Asia and why it is so urgent and dynamic.</i>	
1.1. The protein system as a keystone issue for food system transformation	
1.2. The protein challenge in Southeast Asia	
1.3. Why now?	
1.4. Unlocking the transformative agency of financial actors	
1.5. Methodology	
Part 2: Understanding the context: The Southeast Asian Protein system.....	15
<i>Provides a snapshot of the current protein system in the region in relation to protein production and consumption.</i>	
2.1. Protein Production	
2.2. Protein Consumption	
Part 3: Exploring the current sustainable protein strategies of financial actors.....	18
<i>Highlights the two main ways that financial actors currently seek to influence the development of sustainable protein.</i>	
3.1. Investing in alternative proteins	
3.2. Using ESG tools for screening and engaging companies on sustainable protein	
Part 4: What are the barriers to deep transformation in the protein system in Southeast Asia.....	23
<i>Explores the current framing of sustainable protein around food security and the resulting challenges and narratives that inform (and limit) the strategies being employed by financial actors.</i>	
4.1. Nexus of challenges facing protein supply	
4.2. What narratives are shaping market actor responses towards creating a sustainable protein system in Southeast Asia?	
Part 5: The limitations of a Protein Engineer mindset in delivering a future-fit protein system in Southeast Asia.....	29
<i>Scrutinizes the limitations of the powerful ‘Protein Engineer’ mindset - the mindset that underpins this current framing of sustainable protein - in the context of systemic disruptions in the decade ahead.</i>	
5.1. The ‘Protein Engineer’ mindset	
5.2. Potential disruptors in the decade ahead	
5.3. Systemic disruptions necessitate responses that are future-fit	
5.4. Limitations of a Protein Engineer mindset	
Part 6: Protein Visionaries as catalysts for a ‘just and regenerative’ protein system.....	38
<i>Sets out a Protein Visionary mindset capable of driving a future-fit transformation and the shift in focus to a ‘just and regenerative’ protein system. It also shares emerging visions of what that could look like in the region.</i>	
6.1. The ‘Protein Visionary’ mindset	
6.2. Protein Visionaries shift the focus from a ‘sustainable’ to a ‘just and regenerative’ protein system	
6.3. Emerging visions of a just and regenerative protein system	

Part 7: The Protein Challenge Southeast Asia Initiative	45
<i>Calls for a forward-looking inquiry to collectively explore how financial actors can play a role in shifting behaviours and approaches to protein to enable the changes needed going forward.</i>	
7.1. How can we harness the potential of financial actors to transform the protein system in Southeast Asia?	
7.2. How can you be involved?	
Appendix 1: Further Inquiry Questions	48
Appendix 2: Bibliography	50

Introduction: Why are we exploring the protein challenge in Southeast Asia?

In the face of critical climatic, ecological and social disruptions, the need to transform the protein system in Southeast Asia has never been more acute. Protein - whether animal, plant or alternative - remains a crucial nutritional need, and its production, a key provider of livelihoods for many. Yet, its production and consumption can either generate adverse or positive impacts for people and the planet. At this present time, our future depends upon achieving climate stability, environmental restoration, soil and ocean rehabilitation, alongside social equality and equitable access to health and nutrition. Having a protein system that creates socially just, ecologically safe and regenerative impacts will significantly contribute towards these ends.

Recently, we have seen increased activity on sustainable protein in the region, clearly signalling that we recognise there is a problem to tackle. Meat production companies have been pressured to address ESG impacts by investors particularly on carbon emissions, deforestation, antimicrobial resistance and food safety. Meanwhile, new plant-based and alternative protein innovations are making their way into the marketplace, backed by a range of financial actors and instruments.

Yet, a deeper look into how the protein system is responding to these activities suggests that they may not be catalysing the deeper, transformative impacts we actually need and which are being called for to meet global challenges (WWF, 2020a). The challenge we face is that prevailing protein production and deployment is not yet being designed to:

- deliver equitable access to nutritious sources of protein for current and future generations of Southeast Asians;
- restore and regenerate soil, ocean health and our living systems;
- create protein value-chains that reach their full potential to create decent, dignified work and access to markets in ways that distribute value fairly; and
- nurture a protein system that is adaptive and resilient to future environmental and social disruptions on the horizon.

The Protein Challenge Southeast Asia initiative focuses on how action on sustainable protein is happening currently, and explores how it could shift to enable a just and regenerative transformation in the food system. In particular, it will shine a light on the potential for financial actors to enable this shift. Their role in directing finance towards particular products and business models gives these actors the ability to shift norms and behaviours within value-chains. We see this already happening, with investors funding protein innovation to provide animal protein alternatives, with a growing focus on ESG in investments in sectors such as livestock farming. Yet, we also see that approaches may not be enabling the deeper levels of transformation needed to respond to ecological fragility, deepening social inequities and inter-generational resiliency in the protein system in the region.

If you are a financial actor in the region, a business working and innovating in the protein sector, an NGO working on food system transformation or a governmental body wanting to channel the power of the market to deliver a 'future-fit' protein system, this paper provides a frame for an inquiry on how finance can be a systemic lever of change in efforts to transform the protein system in Southeast Asia.

1.1. The protein system as a keystone issue for food system transformation

'Protein' is a term to describe the parts of our food system that are important in the provision of protein in our diets, whether that comes from animal, plant or other alternative sources (e.g. meat, fish, dairy, nuts, pulses, insects, mycoprotein and grains). Though, of course, these foods provide and represent far more than just a protein source.

The protein system is a 'keystone' element of the food system. Protein is such an essential part of our diets that it has a disproportionate impact on a whole range of sustainability issues, from climate change to public health and malnutrition, the latter having knock-on impacts on regional development and growth.

The sustainable protein agenda has become highly dynamic. Animal protein producers are taking more seriously the need to improve the sustainability of production; policy makers are exploring new economic opportunities for protein production and innovation; innovators are developing popular new plant-based options that mimic meat in taste and texture; and technology start-ups hold big hopes for cell-based meat options.

As the momentum builds, it is important to pay attention to how these various interventions are changing the protein system. To date, the vast majority of sustainable protein activities have coalesced around two or three key issues - the greenhouse gas impact of livestock, concerns around zoonotic diseases, and how climatic changes will impact the security of food supply. Yet, protein production and consumption - with its keystone characteristics - have multiple, interconnected impacts on the wider food system. A narrow, linear focus on mitigating immediate and specific hot-spot risks may be missing opportunities for deeper levels of system transformation to create a healthier, resilient, future-fit protein system with positive impacts on other systems too.

Box 2: Examples of why protein is a keystone issue

Animal and plant sources of protein (including the associated micronutrients) are critical sources of nutrition. However, access to the quantity and quality needed for healthy diets remains very unevenly distributed.

The production and consumption of protein has one of the biggest impacts upon our ability to stay within planetary boundaries, across a range of issues from the balance of the nitrogen cycle through to devastating impacts on water quality, as well as land-use change contributing to biodiversity loss and greenhouse gas emissions.

Climatic disruption will hit protein supply and markets profoundly, with examples of this already beginning to emerge.

Smallholders and informal workers remain at the core of current protein production and processing globally, often suffering from precarious livelihoods and human rights abuses.

Animals are an important source of protein. Their rights, health and welfare are a key consideration for how we produce food.

1.2. The protein challenge in Southeast Asia

There are multiple challenges related to protein in Southeast Asia, straddling shifting demand and pressure on supply, concern for environmental impacts and social inequalities. In Asia, demand for protein - especially meat - is expected to rapidly increase by 78% over the coming decade and through to 2050 (McCarron et al., 2018). China is often the focus of these projections, based on population growth and growth of incomes. Southeast Asia² however, is also expected to experience significant growth in demand. It has the third largest population in the world and is expected to be the

² We refer to Southeast Asia as the ten ASEAN countries : Indonesia, the Philippines, Viet Nam, Thailand, Myanmar, Brunei, Singapore, Cambodia, Laos, Malaysia.

world's fourth largest economy by 2030 (WEF, 2020), creating the dual effect of more mouths to feed at the same time as shifting food demand from increasing incomes.

The region also plays an important role in the global food basket, particularly for its water-based wealth of fish, seafood and rice, and is positioned as the future “back garden” for China’s agricultural production (IISD, 2008). While most of the food in the region is produced by smallholders, a significant portion of capital is not reaching them, instead flowing into venture capital and the rise of animal agribusiness. How the region will manage growing domestic demand alongside growing export markets will likely be a challenge. This is pertinent in the context of the many challenges already faced by the region in relation to protein production and consumption. This will be compounded over the next decade when production becomes increasingly difficult due to climatic changes, water pollution and land degradation. The IPCC special report identifies Southeast Asia as one of the planet’s most vulnerable regions to sea-level rises and tropical cyclone risks (IPCC, 2021). Nineteen of the 25 cities most exposed to a one-metre sea-level rise are in Asia, seven in the Philippines alone (IPCC, 2021).

Nutrition: Until recently, the poorest in the Philippines and Vietnam were eating an average of just 37g and 44g of protein per day - under the recommended 45-55g (FAO STAT, n.d.).

Poverty: While poverty rates reduced from 2000-15, most of the world's new poor due to the COVID pandemic are in the region - with the livelihoods of 218 million informal workers at risk (Allard, 2020) (Alegado et al., 2020).

Antibiotic resistance: SE Asia is deemed to be one of the highest risk WHO regions for the emergence and spread of antibiotic resistance among humans (BMJ, 2017).

Human rights abuses: Six countries in the region are classified as high or medium risk for human rights abuses by EIRIS (UNEP Finance Initiative, n.d.). Rights abuses of migrant workers in the livestock and fishing industries are of particular concern (e.g. the accusations of widespread forced labour and trafficking in Thailand's fishing fleets (Human Rights Watch, 2018).

Nitrogen pollution: Research shows the global livestock supply chain now emits 65 trillion grams of nitrogen into the environment every year, already exceeding the amount estimated to represent the planetary boundary. Per hectare of agricultural land, nitrogen (20kg/ha) and phosphate (9.9kg/ha) excretions from livestock are 2nd highest in SE Asia (Otte et al., 2019).

Deforestation: According to USDA's projections, SE Asia will become the fastest growing importer of soybean meal for animal feed by 2022 (Good, 2019). This growth comes at high risk of driving deforestation and natural ecosystem loss.

Overfishing: 64% of SE Asia's fisheries are at a medium to high risk of overfishing – a critical threat to food security given the high proportion of the population that relies on fish for their protein intake (DeRidder & Nindang, 2018).

GHG emissions: In a BAU scenario, GHG emissions from meat and seafood consumption across Asia will grow almost 90% from 2.9 to 5.4 billion tonnes CO₂e from 2017 to 2050 (McCarron et al., 2018).

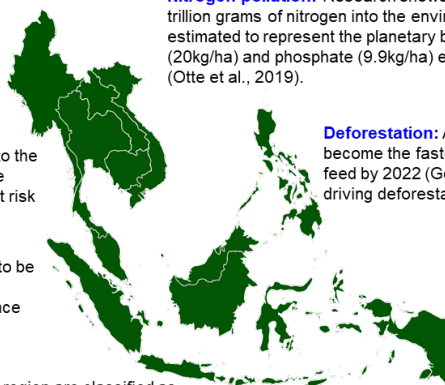


Diagram 1: Key challenges in Southeast Asia related to protein

1.3. Why now?

At this juncture, the elements are in place for Southeast Asia’s protein system to evolve along different trajectories. This makes it a critical time to explore what deeper levels of transformation are needed and how we intentionally shape the pathways to achieve them. We highlight here some of the factors that make this a moment for inquiry:

1. COVID has intensified actual and potential adverse impacts from within the protein system upon people and the planet

COVID-19 has intensified the impetus for change by bringing into stark relief the interdependence between planetary health and human health, with wildlife protection and livestock health at the nexus. The pandemic is highlighting the inequalities throughout food systems and value chains, including workers’ rights in supply-chains. Shifts in consumption patterns due to COVID-19 and the resulting economic slowdown are also predicted to significantly impact the demand for meat and fish products (Asia Pacific Foundation of Canada, 2021, p.37). Perhaps most importantly, COVID has redoubled the region’s focus on food security and the importance of increasing self-sufficiency (Association of Southeast Asian Nations, 2020). The impacts of COVID will necessarily prompt both public policy and

business strategy reviews. Setting the right framing questions through which to make decisions will be important.

2. The opportunity to course-correct before systemic ecological and social disruptions hit

Scientists are highlighting that we are on the brink of hitting a number of critical ecological and social thresholds in the decade ahead. The potential for systemic disruption beyond anything we have previously experienced means we have to brace for a new, unsettled reality. Solutions devised to mitigate risks during periods of relative stability may no longer be fit-for-purpose. It is imperative to use the window of time we have now to make sure we have a future-fit food system capable of meeting these challenges.

There is huge potential for the region to chart its own path on protein production and consumption. It is starting from a low per capita consumption of animal protein and has solid foundations for sustainable protein growth, building from cultural traditions of consuming tofu, tempeh, insects and delicacies derived from eating the whole animal. Southeast Asia also boasts a huge diversity of cultures, religions, people and economies that is mirrored in the diversity of food production and consumption, including a predominance of diverse and small scale production systems. Smallholder farmers have historically fed most in the region and many of them rely on small-scale livestock production for their livelihoods, requiring unique sustainable and regenerative practices. This wealth of diversity could be a rich starting point for developing potential solutions, rekindling successful nature-positive practices or developing new ones.

Southeast Asia's trajectory needs to be shaped by its unique context and potential. Any shifts in the protein system will (and should) look very different to those we have witnessed to date in other parts of the world - perhaps beyond anything we have yet seen or imagined.

3. A key moment in time to harness the transformative potential of sustainable protein innovations

The region has seen a 440 per cent increase in vegan and vegetarian plant-based product launches since 2016 (Dion et al., 2020, p.24). We are also seeing an increase in investment going into fermentation and cell culture production. There are predictions that these disruptive technologies will drive the cost of protein down globally, to five times cheaper by 2030 (Tubb & Seba, 2019) and will reach price parity with slaughter-based production methods in 3 to 5 years (CellIX, 2021). While these may not be entering mainstream diets yet, the potential for these innovations to disrupt the current livelihoods of the traditional protein system is significant. There are also wider agri-tech innovations with the potential to rapidly change the attractiveness of different proteins, such as the use of Recirculation Aquaculture Systems. However, important questions and uncertainties remain on how these forms of technological disruption solve the fundamental challenges of malnutrition, rural access and affordability in the region.

1.4. Unlocking the transformative agency of financial actors

Those providing investment or finance into protein are all providing the lifeblood into the industry - be it private or public money; in exchange for equity or capital; as part of corporate investments or financial products; and regardless of whether or not their actions directly release 'new capital'. Indeed, private ASEAN-based investors have a particularly important role to play as they dominate investments into the region's agriculture, in the absence of strong national government interventions (Warmerdam et al., 2020).

Investor behaviours therefore have a significant impact on how the protein sector operates. The length of investments, the return expectations, the balance of investments being made into different

parts of the sector and the priorities being communicated from owners to management all impact the sector's agency, interpretation and operationalisation of its abilities to address the ecological and structural inequity challenges the region is facing.

As financial actors invested in the food system begin to recognise their role in the sustainable protein space, many experiment with portfolio decarbonisation, company engagement, sustainability-linked loans and the use of ESG (environmental, social and governance) criteria - all increasingly common approaches for addressing exposure to animal protein-related investments. Equally, venture capital funds (including corporate venture capital) and those positioning themselves as impact investors are engaging start-ups across the protein system and investing capital for expansion, acquisition and new innovation.

Whilst current efforts to embed sustainable financing norms and practices into the protein system have begun to shift expectations, there is a second-level inquiry needed into the nature of their impacts.

Questions remain around whether the design and implementation of ESG methods are impeding the ability to attend to the full range of environmental and social sustainability impacts in relation to protein production, supply and consumption in the region.

Impact investing, for example, has progressively introduced alternative proteins into the market. Yet, investments are often designed predominantly to capture novel market opportunities, rather than seizing the opportunity to catalyse value-models that prioritise equitable access to protein nutrition, access to livelihoods or longer-term ecological safety. The extent to which current sustainable financing approaches are equipped to respond to systemic disruptions and uncertainty is an open question. Yet, financial actors hold the potential to unlock the transformative potential of finance to evolve the protein system in the region in ambitious ways.

1.5. Methodology

Our research aimed to build an understanding of how the challenges around ensuring protein is sustainably produced and consumed are currently framed; and the extent to which the framing of the problems is resulting in a limited scope of interventions. We ask whether these interventions might be improving sustainability impacts to some degree and yet actually building barriers to achieving a future-fit, resilient protein system in Southeast Asia. In undertaking this exercise, we gained insights into the implications upon the ability of market actors to act as change agents in activating the necessary transformation, in particular financial actors.

The research was carried out from November 2020 to June 2021. Desk-based research was used to understand the current production and consumption patterns of protein in the region, the current use of investor strategies to address sustainable protein and potential systemic disruptors that may impact



Diagram 2: the Iceberg Model

You can only see the top 10% of an iceberg above the water. It is a powerful analogy for why we need to go beyond observing the current behaviours of financial actors to understand what narratives and mindsets 'sit beneath the water' and may be influencing the direction of travel around sustainable protein.

the protein system over the coming decade. We then used a combination of desk-based research and interviews to analyse both the dominant narratives and mindset underpinning current action around sustainable protein, but also to identify emerging visions and mindsets around a future protein system that was just and regenerative. This included conducting a series of 16 interviews with people from a cross-section of financial organisations, companies, government agencies and civil society who have an interest in the future of the protein system in the region.

Part 2: Understanding the context

The Southeast Asian Protein system

This section provides a snapshot of key characteristics of the protein system in the region that we believe are relevant to the inquiry. It is not intended to provide a comprehensive landscape assessment of the protein system. Rather, it sets the scene for why and how the current protein system is growing and expected to keep growing. It also highlights the different context to other regions, such as the US and Europe.

2.1. Protein Production

Key Takeaway: Meat & aquaculture production has grown significantly in recent decades. The production system is still dominated by smallholder farmers, but there is an increasing trend towards consolidation of the value chain. This has the potential to be reinforced by the rise of alternative proteins, but the agri-food tech sector is still in its infancy.

Indonesia, Vietnam and Myanmar are currently among the top 10 fish producing countries globally (Yee Chan et al., 2017, p.10). Fisheries and aquaculture production increased by 75% from 2000-2015, with the largest growth coming from inland aquaculture (OECD/FAO, 2017 p.75). During the last two decades, the fisheries sector in Southeast Asia has transformed from small-scale capture fisheries production mainly sold domestically, toward a mixture of smaller-scale and larger-scale export-oriented fisheries (ibid, p.65). ASEAN produced 15% of the world's total aquaculture in 2014 and is seeing a dramatic growth compared to capture fisheries (ibid, p.73). While Indonesia dominates across Southeast Asia, production has almost tripled between 2000 and 2015 in Vietnam and Myanmar (ibid, p.65).

Meat production in the region has also grown significantly from 9.6 million tonnes in 2000 to 21.6 million tonnes in 2018 (UN FAO, n.d.). The growth trajectory has been particularly conspicuous in Myanmar and Vietnam – the latter increasing production by 162% up to 5.23 million tonnes, securing its position as the largest meat producer in the region (ibid). The type of production differs significantly by country, closely mirroring the dominant religious cultures – with Indonesia dominating in poultry and egg production, while Vietnam tops the region for pork production, as well as aquaculture (ibid). In contrast, Cambodia and Laos have relatively little livestock production (ibid). Going forward, poultry production is projected to have the strongest regional growth (1.8%/yr) and is projected to overtake pig meat as the largest meat sector by 2026 (OECD/FAO, 2017, p.84).

The region has a mix of meat production systems, with 90% of meat production still coming from smallholder farmers operating on less than 20ha of land (Herrero et al., 2017). There has been significant investment into large scale agriculture (Vorley, 2016) and high output, intensive production facilities (often also supplied by smallholders), which has helped to bring more affordable protein into the market. This is resulting in an increase in production unit size, throughput and specialisation. It also plays into an increasingly commoditised market. Across agriculture in the region, very small farms of less than 1 ha still dominate as a percentage of the total number of farms, particularly so in Indonesia (75%) and Vietnam (85%) (OECD/FAO, 2017).

Many commentators are expecting to see growth in alternative proteins in the region – from plant based alternatives, through to insect farming and cell-based meat culture. Some of the investment flowing into alternative protein production has been stimulated by Singapore's government-linked funds, which have shown a particular interest in the potential of protein innovation. At the same time, a number of global brands are looking to launch their plant-based products in the region, with recent announcements such as Eat Just establishing a new production facility in Singapore and Impossible

Foods is launching its products in 100 retail stores in Singapore (Marston, 2020). We discuss these shifts further in Section 3.1.

2.2. Protein Consumption

Key takeaway: Demand for meat is growing and this has been closely associated with rising incomes. However, it is important to note that fish, seafood and plant-based sources of protein continue to dominate diets, and the extent to which meat displaces these sources should not be taken for granted.

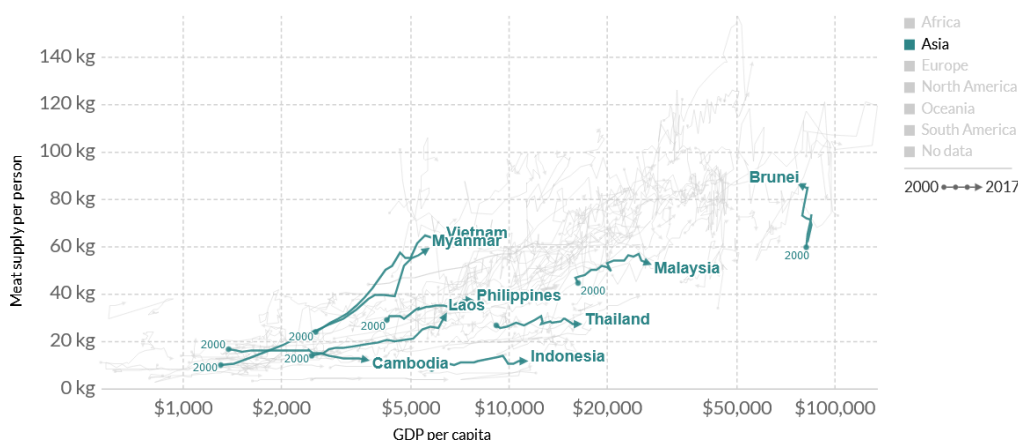


Diagram 3: Changes in meat supply per person in relation to GDP per capita across 9 countries in Southeast Asia from 2000 to 2017 (Our World in Data, n.d., based on source data from UN FAO, World Bank, World Development)

The region has experienced an increasing demand for protein from animal-based sources with overall supply available for human consumption increasing in the region from 26 grams per capita in 2014 to 28 grams per capita in 2018 (FAO STAT, n.d.). The relative increases in meat consumption have varied between countries, with large increases in per capita supply of meat since 1990 occurring in Vietnam (90% increase) and Malaysia (197% increase), when compared to Cambodia (where meat consumption has actually decreased over the same period) and Indonesia (Our World in Data, n.d.).

Animal protein consumption in the region is dominated by poultry (16% of daily protein intake), which is the preferred source of protein in Indonesia, Malaysia and Myanmar. Pork is a close second (13% of protein), and a favourite in Vietnam. Eggs (8%) and milk (7%) follow (FAO STAT, n.d.). There is relatively little consumption of beef or other dairy products like cheese, although bovine meat remains a staple in Cambodia and Laos (ibid). Meanwhile, Indonesian demand for beef has exhibited recent strong growth due to increasing middle-class income and population growth (Asikin et al., 2020).

Many projections assert that demand for animal protein - and specifically meat - in the region will increase significantly over the coming decades. These projections are typically based on the expected population growth impacting protein demand, alongside income growth in the region shifting the demand to different sources of protein (given the observed correlation between income and meat consumption). For example, ARE's report, 'Charting Asia's Protein Journey' points to an expected 4.4% annual (CAGR) increase from 2017-30 for meat and fish consumption in Indonesia and a projected three-fold growth up to 2050. It also highlights the potential role of frontier and emerging economies in Asia (a group of 13 countries grouped together in their analysis) which is expected to experience a 5.1% annual (CAGR) increase in consumption, mainly driven by the four most populous countries in the group - the Philippines, Vietnam, Thailand and Pakistan (a South Asian country) (McCarron et al., 2018). The growing demand for animal protein will also increase reliance on importing animal feed sources such as soy and Distillers Dried Grains (DDGs).

Fish and seafood is embedded in the region's food traditions and remains one of the most significant sources of protein in the region, still accounting for 41% of daily animal protein intake - double the world average (FAO STAT, n.d.). Yet with increasing incomes, the proportion of fish to meat consumed in ASEAN decreased from 1960 to 1990, and has remained constant since then (McCarron et al., 2018, p.15). By 2018, the average grams per capita per day of animal protein consumed was 28g - still considerably below the average of the OECD (39g). The majority of intake in the region (62%, or 45g) comes from plant based sources - principally from rice as the staple in almost every meal (FAO STAT, n.d.), which is notably deficient in key essential amino acids. The region - and particularly Indonesia - is also known for its soy food consumption through tofu and tempeh (accounting for 25% of the world's demand for soy food), with demand growing at an estimated 4% per year (US Soy.org, 2020).

Part 3: Exploring the current sustainable protein strategies of financial actors

Financial actors have a key role to play in the transition to a future-fit protein system. There are two primary avenues through which financial actors are currently influencing the shape, dynamics and impacts of the protein value-chain in relation to sustainability: (i) investing in alternative proteins as part of wider 'agri-tech' investments and (ii) using ESG tools in screening and engaging with companies on sustainable protein. Both these avenues are still nascent in Southeast Asia, which opens up an interesting question as to whether there is a potential for financial actors active in the region's protein system to innovate with different approaches - 'leapfrogging' to interventions that drive deeper levels of transformation than are being achieved through current ones.

3.1. Investing in alternative proteins

A total of \$423 million was invested into Southeast Asian agri-food tech startups in 2019, across 99 deals (AgFunder, 2020). This has been hailed by many as an important signal of investment interest in this new sector and represents 33% year-on-year growth since 2014 (ibid). Singapore and Indonesia have been particularly important in driving this investment and attracted \$177 million and \$165 million respectively in 2019 – over five times the funding of all the other ASEAN states combined (ibid). ASEAN's agri-food tech scene, however, is still early-stage with the vast majority of deal-making activity still taking place at the seed or pre-seed stage (Dion et al., 2020, p.26).

Dominating these investments, in terms of size and volume, are start-ups focused on wider food trends - such as, food safety and traceability and online restaurant and grocery (which will also have ramifications for the protein system). However, specific investments into alternative proteins, from innovative food products to insect farming systems, are growing rapidly year-on-year (AgFunder, 2020). The majority of current investment flows in alternative proteins are going into plant-based proteins or fermentation. Smaller volumes are flowing to the cell-based meat sector, reflecting its longer time horizon for return-on-investment. Cell-based meats are not yet at commercial scale with heavy CapEx investment required and the use of growth mediums that remain very expensive.

The venture capital sector in Southeast Asia is still young and most are generalists, without a sector focus. Much of the investment is therefore still coming from international investors. Asia-based investors are still demonstrating relative reluctance in investing in this growing trend (AgFunder, 2020). For example, family offices in Hong Kong who spoke to Citywire Asia were divided on whether alternatives meat was a worthy bet (Liang, 2019); and Green Queen notes that investors in Asia are more conservative than investors in other innovation hubs such as Silicon Valley (Dion et al., 2020, p.26). In general, Asian investors prefer to see traction before signing term sheets, and appear to be waiting for this incipient sector to prove itself first.

There are however, a handful of dedicated venture capital companies - often doubling up as accelerators - focused on alternative proteins and agri-tech more broadly emerging within Singapore, such as [AgFunder](#), [Big Idea Ventures](#), and [Blue Horizon](#). While these venture capital funds have often been drawn to the food and agriculture sector as an under-recognised climate mitigation solution, they are also responding to what they see as a clear market opportunity - that is, growing consumer demand, as well as a conducive innovation environment supported by the Singaporean Government's '[30-by-30' strategy](#) to increase food security. [Temasek](#), the Singaporean state-owned company, positions itself as a 'generational investor', supporting sustainable value over the long-term and has made considerable investments into alternative proteins on this premise (Temasek, n.d.). It is increasingly focused on creating the wider infrastructure for the alternative protein sector to flourish in the region, encouraging others to crowd in investment. Both the Thai and Indonesian governments are also looking at how they can provide conducive enabling environments for agri-tech investment:

Thailand's National Innovation Agency for example, has co-founded the [SPACE-F accelerator](#) for food-tech.

Venture capital funds see their role as helping to accelerate the potential of the entrepreneurs they are investing in, both through providing the capital for investment and growth, as well as providing support with the technical and commercial development. A number of the accelerators in the region are also engaging with regulatory bodies to help with the development of the whole ecosystem. The funds are looking to identify 'rockstar' entrepreneurs that have a strong vision and the resilience to see it through; a demonstration that there is a large enough Total Addressable Market; and novel, defensible intellectual property. Most of the investments are expected to fail at this early stage, but by investing in a large number of entrepreneurs, investors are looking to chance upon the next 'unicorn' investment.

Corporate venture capital is also starting to flow into alternative proteins, either through supporting accelerators in the region (e.g. [Tyson, Buhler, Bel and NR Foods becoming limited partners of Big Idea Ventures](#)); by directly investing in companies (e.g. as part of [Thai Union's commitment of USD 30 million in its food-tech innovation venture fund](#)); or by acquiring brands to support scale (e.g. Filipino food & beverage company, [Monde Nissin, buying Quorn in 2015](#)). This positions companies in the traditional protein sectors to explore what innovations are emerging and to incubate new ideas outside of a bureaucratic corporate structure. Their direct venture capital funds are often more risk-averse and more targeted on business-relevant investments than the wider market. Few corporate investors are yet invested in 'home-grown' Southeast Asian alternative protein companies, although notably, CP Group, Thailand's largest private company and one of the world's largest conglomerates, is [supporting the commercialisation of black soldier fly](#) as an insect-based source of protein in Thailand through a partnership with the Chiang Mai University.

As alternative protein companies begin to scale, there is increasing interest from larger private equity investors and institutional investors to include these companies in their portfolios, to not only capture the market opportunity, but also help keep the overall carbon footprint of their investments low. For example, [Proterra Investment Partners Asia led a consortium of investors investing up to US\\$100m alongside Eat Just](#) to establish a plant protein production facility in Singapore (Just Food, 2020). Specialist private equity firms not only provide investment, but also support with business partnerships and guiding the companies' development through management support.

3.2. Using ESG tools for screening and engaging companies on sustainable protein

The influence of environmental, social and governance metrics on financial and investment decision-making continues to grow. This trend, often referred to as ‘responsible investment’ or ‘sustainable investment’ is seen as a means of screening out the most harmful investments. It is also a means of positively identifying and enabling good practices, long-term growth and value creation for investors, as well as using finance as a lever for driving the transition to a sustainable economy.

While much of the ESG movement to-date in relation to protein has focused heavily on screening and engaging companies based on their greenhouse gas emissions and carbon footprint, it is starting to be more widely applied. For example, plans are in place for the creation of a [Taskforce on Inequality-related Financial Disclosures](#) (TIFD), and a [Taskforce on Nature-related Financial Disclosures](#) (TNFD). Increasingly, we are seeing ESG metrics being applied to a wider range of sectors and with a greater range of metrics specific to agriculture, food systems and specifically protein.

The provision of ESG information by companies is most established in public capital markets, given the greater expectations placed on publicly listed companies to disclose information that is materially relevant to their financial performance. Many listed food and agricultural companies are already requested to share disclosures regarding their Scope 1 and 2 (and in some cases, Scope 3) greenhouse gas emissions. Some are also requested to disclose their water use, as well as use of deforestation-related products like soy (for example, through [CDP's disclosure platform](#)).

Against this backdrop, the [FAIRR initiative](#) has pioneered the assessment of ESG metrics specifically designed for the animal agriculture industry. The index assesses publicly available information to score companies' approaches to: GHG emissions, deforestation & biodiversity, water use & scarcity, waste & pollution, antibiotics, animal welfare, working conditions, food safety, governance, and investments in alternative proteins. Notably, 88 institutional investors are now part of FAIRR's Sustainable Protein engagement network that engages traditional protein companies around their ESG performance, representing over \$13 trillion in assets under management (FAIRR Initiative, n.d.). For many protein producers, this is the first time they are being engaged around ESG and their approach to sustainable protein. This is still at a very early stage in Southeast Asia, with [FAIRR's Protein Producer Index](#) assessing 9 of the largest public companies involved in animal protein production in the region. Six of these Southeast Asian companies are currently scored as ‘high risk’, with CP Group, Thai Union and Vinamilk scored as ‘medium risk’.

Box 3: What's the theory of change behind ESG?

Companies with strong environmental, social and governance (ESG) metrics are judged as more likely to successfully mitigate material risks to their business operations which, all else being equal, implies higher risk-adjusted returns to investors and financial institutions. According to risk and portfolio analytics provider Axioma's 2018 research, companies with better ESG scores consistently outperformed their financial benchmarks, with over 80% of S&P 500 companies now reporting on ESG in 2018 as compared to one in five in 2011 (Thompson, 2018). If this correlation stands (which remains highly contested), investors should value ESG leaders at a premium, and ESG laggards at a discount. In turn, this should increase the cost of capital and lower the share price of laggards, relative to leaders (BlackRock, 2018).

A higher cost of capital makes it harder to externally finance investments, and therefore, to remain competitive in an evolving marketplace. A low share price increases the risk of takeover from activist investors looking to squeeze value from ‘underperforming’ firms. Investors thus view ESG criteria as a lever with which to increase their returns. It is also regarded as a tool for positive social and environmental impact, by directing capital towards ESG leaders and encouraging laggards to improve their ESG performance in order to remain competitive. Based on this theory of change, the overall ESG performance of the system should steadily improve over time.

The ESG information collected by disclosure platforms is intended principally for public equity investors to use both in screening companies for investment, as well as supporting investor engagement of companies to encourage improved performance. However, privately-owned companies are also starting to be assessed against ESG criteria. This is important as the vast majority of enterprises in the region are small and medium-sized firms (89-99%) (Pratama, 2019) and are typically too small to be publicly listed. These small and medium-sized companies are likely to be owned by a combination of families, high net-worth individuals and private equity. In a survey conducted by Bain in 2019, 68% of private equity general partners in Southeast Asia felt under pressure from their limited partners to incorporate sustainability into their decision-making. It is notable though that only 13% had fully incorporated ESG factors into their processes (Yang et al., 2019).

Banks and those providing capital and debt financing are also starting to use ESG metrics as an incentive for good corporate and sustainability management. Alongside “green” bonds, in which the capital raised is earmarked for specific sustainable investments, ‘sustainability-linked’ loans provide general corporate capital, but enable the interest rate to be lowered for companies that can demonstrate improved performance against an agreed ESG benchmark (typically a general one covering a wide range of issues, with the exception of examples such as [Chew’s Agriculture](#) that are more protein-specific loans). This approach gained widespread attention when [Thai Union recently announced its first sustainability-linked loan for \\$400m over the next 5 years](#). However, the extent to which these incentives are being used beyond the leading banks and largest companies is not clear. Certainly it seems that many commercial banks have yet to embed ESG criteria into their commercial loan covenants to small and medium sized enterprises.

Finally, venture capital investors do also often overlay some level of ESG analysis on the investments they are making in the alternative protein sector. However, our research showed that current practice is quite ‘light-touch’ - usually aligned to needs around securing protein supply and product safety as a top priority, followed by assessment on greenhouse gas reductions.

It is noticeable that the range of ESG factors that are being attended to in relation to protein companies is still quite limited. There are clearly a number of ESG ‘blindspots’, especially in relation to new alternative protein companies where the assumption is that because the product itself is designed to promote environmentally-friendly consumption, there is no need to look into upstream ecological and social impacts in the supply-chain. This raises questions as to how effective the application of ESG is in catalysing systemic change in the protein system, when it is only targeting specific areas of risk such as carbon or food safety. Moreover, it is not yet making the connections to

BOX 4: Deepening our analysis surrounding financial actors

This analysis gives an initial overview of how sustainable protein is starting to influence financial actors’ strategies. However, there are underlying questions around the current role of financial actors in the protein system that deserve further attention to support a deeper analysis of key leverage points for change.

For example, the role of the banking sector across the whole industry needs further exploration. SMEs in the region are thought to be able to finance 72% of investments internally from their own balance sheets, rising to as much as 96% in Cambodia (OECD, 2020). A significant proportion of smallholder farmers and small agri-food companies are also unbanked and are currently dependent on friends, family and expensive informal lenders for financing. This is fuelling an interesting movement by fintech companies to increasingly incorporate these smaller enterprises into the financial system. The influence of the financial system on these smaller companies and smallholders may currently be limited and there may be other opportunities for driving change in these areas that are not covered by this report.

and between a much wider range of ecological and social impacts emanating from protein production and consumption in the region³.

As these sustainable investment approaches develop in Southeast Asia, there is an opportunity to experiment with more systemic financial interventions. We are at a time when the narrative around sustainable finance is rapidly evolving globally. There are increasing critiques of current ESG approaches (FT, 2021), new concepts and models emerging (such as [‘beta-stewardship’](#) and [‘zebra’ - rather than unicorn - investments](#)⁴), and a number of initiatives⁵ exploring what ‘transformational finance’ could really look like. Experimenting with how to apply these developments to support a future-fit protein system in the region holds huge potential and could help to unlock new investment opportunities.

³ Though anecdotal, it is worth noting that some private investors are starting to question whether investments in traditional animal protein companies that are asset-intensive, slow moving and produce ‘commodity-style products’ will continue to make sense financially altogether. The question surfaces especially in light of climate risks, prompting increasing focus on those protein companies trying new value-added models.

⁴ There is a growing movement calling on venture capital to turn its focus away from chasing so-called ‘Unicorns’, towards incubating a new breed of enterprise (or ‘Zebras’) that are focused on serving the needs of diverse communities with realistic, regenerative growth potential (Scholz, 2020).

⁵ Such as the [TransCap Initiative](#), [North Star Transition](#), [The Investment Integration Project](#), and [The Pre Distribution Initiative](#)

Part 4: What are the barriers to deep transformation in the protein system in Southeast Asia?

Recent increased activity on sustainable protein in the region clearly signals a recognition that there is a problem to tackle. Yet, a deeper look into how the protein system is responding to these activities suggests that they may not be catalysing the deeper, transformative impacts we actually need in order to secure a just and regenerative future protein system. Our initial diagnosis indicates that while current approaches might be generating some positive impacts in the immediate term, they may not be addressing deep-rooted causes of ecological fragility or social inequalities in the protein system. This could make it vulnerable to future shocks and undermine long-term efforts around food security and climate mitigation. The scale and depth of transformation needed is being underestimated.

We need to review and re-imagine our approach to sustainable protein. A starting point is investigating why actors in the protein system are foregrounding a set of narrow, linear interventions. Our observations suggest that one key factor is that actors across the board - companies, investors, civil society and policy makers - are designing their sustainable protein solutions with a primary - and often sole - goal of meeting the food security challenge. With this goal, solutions are thus aimed at maximising productivity efficiency to deliver abundant protein to meet growing consumer demand. Often steps may be taken to ensure that future production and supply is not undermined by environmental impacts, for example due to water depletion, biosecurity risks (such as zoonotic diseases) or disruptions to supply. However, while these types of food security-linked sustainable protein solutions do bring some clear immediate benefits, they also carry real risks of being un-systemic fixes for the long term.

This section unpacks our insights on what might be shaping the mindsets behind current approaches to sustainable protein in Southeast Asia. It starts with looking at how a food security goal informs what protein challenges and impacts are in the spotlight. We then consider how this understanding of risks is driving three dominant narratives around how the market can or should respond to deliver a sustainable protein system: (1) by prioritising low-carbon solutions; (2) by focusing on protein production efficiency; and (3) by ensuring security and self-sufficiency in protein supply chains.

4.1. Nexus of challenges facing protein supply

Our research indicated that, due to a focus on food security, much of the activity around sustainable protein is targeted at delivering an abundant supply of protein to capitalise on growing demand. The following section outlines how the three corresponding challenges to protein supply are framed by public policy makers and market actors alike - especially in the face of changing demands from both a growing population and a growing middle class.

1. Environmental limits to production

Animal production is under scrutiny given its direct impact on greenhouse gas emissions. This further extends to the carbon emissions associated with land-use change due to feed production (a large percentage of soy imported for animal feed into the region comes from Latin America, where there are high risks of deforestation and natural ecosystem loss). There is a greater push towards net zero, with countries like [Germany, Sweden and Denmark going a step further to consider meat taxes](#). Many organisations such as [Tyson Foods](#), [UK retailer Morrisons](#), [Brazilian beef producer Marfrig](#) and [Australia's plant-based meat producer Fenn Foods](#) are starting to set targets to achieve net zero emissions, even in their supply chains. While no specific statistics are available for Southeast Asia,

Asia Research and Engagement (ARE) estimates that, in a BAU scenario, GHG emissions from meat and seafood consumption across Asia will grow almost 90% from 2.9 billion tonnes carbon dioxide equivalent (CO₂e) to 5.4 billion tonnes CO₂e from 2017 to 2050 (McCarron et al., 2018). Against this backdrop, livestock production facilities are also under greater scrutiny at a local level for environmental and social impacts of waste management and water pollution.

Land expansion has also historically been the primary means of growing agricultural output to date. According to the FAO, while agricultural land has increased by close to 40% in the last three decades, any further area expansion is likely to be limited as there is a high population density and increasing pressure to prevent further expansion into natural ecosystems (OECD/FAO, 2017). For example, shrimp production has had devastating impacts on much of the region's mangrove forest -100,000 hectares of forest were lost between 2000 and 2012, with aquaculture accounting for 30% of this loss (Richards & Friess, 2015). Mangroves are increasingly recognised as an important carbon sink, habitat and nursery for key commercial species, as well as a key buffer to extreme weather events as climate impacts hit.

2. Biosecurity threats

The frequency of new disease outbreaks is increasing to the point of being a regular occurrence in some supply chains (WWF, n.d.). Southeast Asia - the Greater Mekong region in particular - is considered a zoonotic disease hotspot due to growing population, deforestation and growing animal protein demand (WWF, 2020b). For example, East, South and Southeast Asia contribute disproportionately to the evolution of seasonal H3N2, the most evolutionarily successful contemporary strains of seasonal influenza A (Wen et al. 2016), Furthermore, Avian Flu and African Swine Fever devastated poultry and pork production respectively. How to effectively prevent and control these zoonotic diseases has become a priority.

The associated human health risks have also been thrust into the spotlight due to the emergence of COVID-19 in a wet market in Wuhan, while three of the nine global pandemics linked with the food and agricultural system in the last 170 years have originated in Hong Kong, China and Malaysia (Levitt, 2020). Antibiotic resistance is also high on peoples' radar, with concerns about the lack of controlled and appropriate use in production facilities, especially among smaller scale farmers who can't afford to risk large production losses. There are likely to be increasing requirements and expectations to effectively manage these issues at the production level.

3. Supply risks from climate change

There is a recognition that climate change will increasingly impact local food security in the region in an acute manner. Already, agricultural yields are being adversely affected by climatic changes. For example, the rise in night temperature as a result of global warming has already led to a drop in rice yield – 10% for every 1% rise in the minimum temperature during the growing season (Zhao et al., 2017). A study has estimated there could be a 40% reduction in rice yield by 2100 (Muehe et al., 2019). As a dietary staple, rice remains the dominant source of protein in the region, so this decline will increase pressure on other sources.

There is also growing recognition of the potential for extreme weather events to impact supply and disrupt distribution routes. COVID has made the importance of more localised, shorter supply chains a priority, especially in relation to urban environments. As a city-state that has traditionally imported over 90% of its food (Singapore Food Agency, n.d.), Singapore especially recognises this. Accordingly, in 2019, the country announced its ['30 by 30'](#) goal to locally produce 30% of Singapore's nutritional needs by 2030.

4.2. What narratives are shaping market actor responses towards creating a sustainable protein system in Southeast Asia?

The dominant concern with securing food supply - and the prevailing understanding that risks to food security come from the triad of challenges outlined above - has influenced market actors' thinking on how to intervene on sustainable protein. Three dominant narratives are informing the design of sustainable protein strategies: (1) the need to prioritise low-carbon solutions; (2) focussing on protein production efficiency; and (3) ensuring security and self-sufficiency in protein supply chains.

Where and how these narratives turn up varies. For example, the same narratives are used by different proponents to argue for the merits of different protein sources - animal protein (ruminants, pigs, poultry and eggs, wild and farmed fish and shellfish), or so-called 'alternative' proteins (plant-proteins, insects, cell-cultured meat, mycoproteins and other fermented products).

Note: Each of the narratives is expressed as we have heard them, they do not reflect the view of the authors.

Narrative 1: Prioritising low-carbon solutions

Summary: *“By backing low carbon protein sources, we can support under-recognised climate solutions while driving production to scale to provide affordable protein.”*

This narrative proposes:

“We see food companies as an attractive solution space. We can play an important role in scaling the production of low carbon protein sources to meet rising demand in the region, while contributing to a net zero future. We see this as a huge market opportunity (and export market opportunity) that naturally aligns with nutritional benefits and economic development - although perspectives differ wildly as to which type of protein will (or should) ‘win out’ in the market.”

Animal protein: *“We will see a huge demand boom for animal protein due to increasing incomes in the region (as many people aspire to eat meat) and as governments work to address nutritional deficits across the population. Not only will domestic demand go up, but we expect to see increasing demand for imports of protein from China. We can support the growth of pork, poultry and aquaculture production in the market as relatively low carbon options, as well as a source of good, affordable nutrition. We may also be able to capitalise on the export of value-added products to markets like Europe and the US, where there are growing expectations around climate-friendly products and growing advocacy around shifting away from beef consumption.”*

Alternative protein: *“We see alternative proteins as the ultimate low carbon supply of protein that removes the unnecessary exploitation of animals from our production systems and can rapidly be scaled to meet growing protein needs. We expect to witness a growing demand for tasty, culturally appropriate alternative protein products - particularly for plant-based chicken and pork meat and fish mimics - as many people are concerned about their health and have more disposable income to try innovative food products (especially in a region that is no stranger to plant-based eating and soy foods). As the price comes down, we see the real potential for mass adoption. Cell-based culture of meat and fish is further off from commercial scale but we think it holds real potential for reducing greenhouse gas impacts and producing slaughter-free food without the need for consumers to shift what they choose to eat. We would also advocate that this could be a huge opportunity to derive a real economic benefit and job opportunities from the productive capacity and history of the region (for instance the*

strong history of insect farming) and export processed proteins to other markets (e.g. exporting protein supplement powders to China).

These products are a key climate solution and we believe that we shouldn't expect an early stage market to yet be on top of (or held back by) a wealth of other sustainability requirements which pale in comparison to the ultimate benefit for GHG emissions."

Signals of this narrative:

- Chinese company, [New Hope, is establishing two large new pig farms in Vietnam](#) which will produce more than 700,000 hogs annually at full capacity (capitalising on the exit of small hog farmers from the industry after the impacts of African Swine Fever).
- Thailand continues to see [growing opportunities to export](#) cooked poultry products to the UK and Europe, even after Brexit.
- Bill Gates has suggested [that developed nations should completely replace their consumption of cattle-derived beef with](#) "synthetic" alternatives.
- The [IFC defends its investments](#) in factory farming by pointing to the impact of those investments in terms of poverty reduction, while meeting growing demand for meat in countries where incomes are rising.

Narrative 2: Focusing on protein production efficiency

Summary: "We need to support companies to optimise protein production through intensification and innovation and prevent further expansion of its environmental footprint."

This narrative proposes:

"We need to recognise that Southeast Asia does not have the land to continue increasing food production through expansion. To meet the growing food demand therefore, we will need to see companies optimising production by reducing the environmental impact per unit output of protein. We need to improve the efficiency and control measures for animal protein production if we want to preserve the sector's licence to operate in the face of environmental breakdown and public health crises. We might also advocate that alternative proteins are inherently more efficient and can help act as an important 'pressure valve' on the growing impacts of the animal protein sector."

Animal protein: *"We believe sustainable intensification of animal protein production simply makes commercial sense and is key for a resilient system and continued license to operate from governments and citizens. We know that efficient production and processing practices are an indicator of a well-run company with little waste, pollution or unnecessary use of inputs e.g. antibiotics or animal feed. Small-scale production is particularly inefficient. No doubt, automation can support some of these shifts to keep driving better outputs in the knowledge that high tech approaches can also support better controls from a food safety and biosecurity perspective. Moving towards efficient production methods provide an opportunity for larger Southeast Asian as well as international companies to support the growth of sustainable methods of production."*

Alternative protein: *"We believe that by removing the need for animal husbandry, plant-based products and cell-cultured meat are inherently more efficient, not only offering significant greenhouse gas emission reductions, but also avoiding the issues associated with waste and by-products or by-catch. This also means alternative proteins are divorced from many other risks associated with animal protein, such as zoonotic diseases, antibiotic resistance, slave labour, mangrove conversion and even fraud and food safety issues. We*

also recognise that alternative proteins can be produced efficiently in highly controlled and sanitised conditions, providing clear assurances around their quality and safety.”

“We know that many of our animal protein production systems are getting towards the limit of what they can produce efficiently and sustainably and scaling up alternative proteins as part of the mix (or to replace unsustainable sources of animal feed) could represent a way to take the pressure off these production systems, while still meeting our food production needs.”

Signals of this narrative:

- [Thai Union Group](#) launched its first sustainability-linked loan in February 2021 with a consortium of regional and international banks. The interest rate is linked to making gradual improvements in its ESG ratings, including reducing its GHG emission ‘intensity’ of finished goods (at the same time as growing its overall product output).
- Vietnam’s leading seafood firm [Minh Phu Corporation](#) has announced its intention to automate up to 70% of its shrimp manufacturing process to reach its ambition of reaching an annual capacity of 150 tonnes per hectare, as compared to the current 10 tonnes.
- Singapore-based Growthwell Group, has raised [US\\$8 million in a 2020 funding round](#) to create an end-to-end centre for alternative protein in Singapore with the latest extrusion technologies and a completely automated manufacturing production line to enable production at scale.

Narrative 3: Ensuring security and self-sufficiency in protein supply chains

Summary: *“We need to encourage companies to actively invest in protein transparency, self-sufficiency and different sources of protein to improve security of supply, as well as meet changing market needs”*

This narrative proposes:

“We need to invest in a protein system that can withstand supply disruptions, while meeting changing consumer demands. We believe that this goes beyond just improving efficiency, to investing in efforts to improve self-sufficiency of production, increase transparency and produce different types of proteins, including alternative proteins that secure consistent supply and support local economic growth.”

Animal protein: *“We need to see real investments in technological innovation, such as alternative animal feeds (reducing the need for imports) and traceability mechanisms to support animal protein production. This is essential to protect supply in the face of climate shocks, disease risks and challenges going forward. We anticipate that many food companies will need to carefully manage their supply chains going forward to ensure security of supply (especially in the absence of strong governance), or perhaps even invest in alternative proteins to build resilience and meet changing consumer needs. It may not yet be priced into investments, but we believe there is a real opportunity here to get ahead of the market and demonstrate that traditional protein companies can continue to provide a sustainable, self-sufficient protein source.”*

Alternative protein: *“We believe that alternative proteins can provide many new opportunities for local food security, particularly in cities. We know that animal protein production practices may need to change and that supply routes may get disrupted as the climate shifts - for example the drought experienced in Thailand in 2020. There is also a current reliance on a number of imported inputs, such as soy for animal feed. By incorporating different types of protein sources, we believe there is an opportunity for being more self-*

sufficient and to open up new value-added markets that support local economic growth and jobs. To achieve this, we need to support a shift towards ingredients that can be more locally grown or produced, such as mung beans, and explore production models that can become attractive, high tech propositions for the next generation that aren't as interested in farming.”

Signals of this narrative:

- CPV Food, a subsidiary of CP Vietnam and owned by the large Thai conglomerate CP Food, [opened Southeast Asia's largest chicken breeding and processing unit](#) in December 2020, with a capacity of 100 million broilers a year, heralding the 100% traceable supply chain and disease-free system designed to protect broilers from avian flu and Newcastle disease.
- [Singapore issued the first regulatory approval for lab-grown meat](#) to Eat Just, in line with its 30 by 30 strategy to increase food security.
- The [Good Food Institute launched its Asian Croppportunities report](#) highlighting the potential of 14 different raw materials for plant-based products from across seven Asian countries

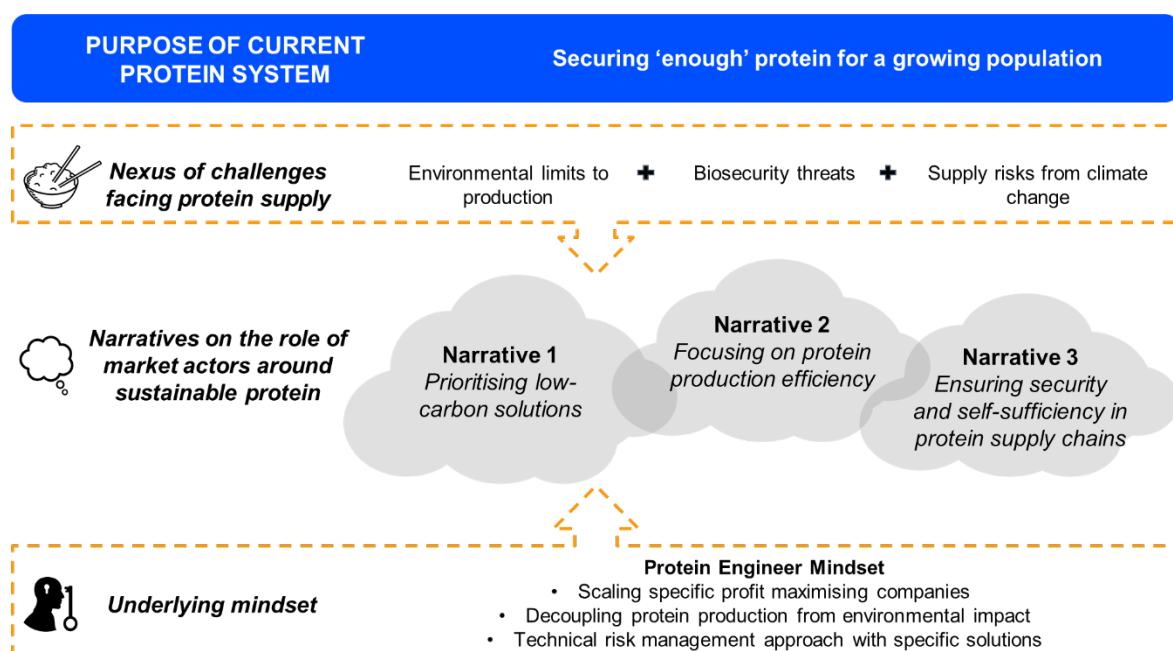
Part 5: The limitations of a Protein Engineer mindset in delivering a future-fit protein system in Southeast Asia

The three dominant narratives of how market actors should respond to the challenges of protein supply - by prioritising low carbon solutions, driving protein production efficiency and ensuring security of supply chains - are the basis of current sustainable protein interventions. Together, they crystallise into a single, powerful mindset which we have termed the 'Protein Engineer'. In this section, we explore the implications of this mindset for creation of a protein system in Southeast Asia that is fit for the future.

5.1. The 'Protein Engineer' mindset

'Engineers' play a valuable role in society - trained and skilled in the design, construction, use and repair of machines. They are crucial for keeping the lights on and our societies running. Likewise, those focused on sustainable protein with a 'Protein Engineer' mindset work hard to fix the critical issue of how to grow a secure supply of protein, while mitigating key impacts.

Protein Engineers' primary goal is securing a sustainable supply of protein - proteins that are produced with the least adverse environmental impacts, whilst making sure there is 'enough' protein to meet the growing demand in the region. As such, the challenge they seek to overcome is to efficiently manage a core set of production-related environmental risks. This drives them towards market opportunities that promise to mitigate these risks through scaling low carbon protein sources such as plant-based and alternative proteins; increasing efficiency in protein production (e.g. through feed optimisation); and through securing supply and self-sufficiency of protein sources.



Protein Engineers pursue specific managerial or technological interventions designed to decouple impacts from the growth in production. They are executed through efficient and standardised approaches focused on improving individual company performance and profit maximisation. Furthermore, their solutions are well crafted to address *immediate* problems and risks prevalent in the current context, with less of a tendency towards imagining uncertain *future* disruptions or needs.

Table 1: The Protein Engineer mindset in more detail

Mindset	Protein Engineer
Purpose of the protein system	Food Security by securing 'enough' protein for a growing population.
Goals	A secure 'sustainable' supply of protein, with a lower environmental footprint.
Timeframe	Mitigating urgent environmental risks in the current system.
Theory of change	<p>Decoupling protein production from environmental impact - for protein production to grow it needs to have a smaller 'footprint' in order to manage key environmental limits and risks.</p> <p>Scaling specific profit maximising companies and centralised around a small number of well-managed companies that can run efficient and standardised production systems.</p>
Key risk factors	<p>Delivering improvements against a narrow set of environmental factors:</p> <ul style="list-style-type: none"> ● Environmental limits to production (e.g. staying within climate targets) ● Biosecurity threats ● Supply risks from climate change
Approach to risk	Management approach - isolating and managing for specific and independent risk factors.
Solutions	Specific, technological solutions – 'sustainable' intensification of animal protein & growth of alternative proteins.
Sphere of focus	<p>Global outlook around scalable protein solutions,</p> <p>Focus on production impacts specifically (less so on the rest of the value chain).</p> <p>Individual company changes or innovation.</p>

5.2. Potential disruptors in the decade ahead

In the coming decade, our food system is likely to experience significant climatic and social inequity tipping points that will bring cascading, multiple, interconnected effects, systemically and deeply disrupting its functioning. This is likely to be beyond anything we have previously experienced.

Research suggests that these kinds of systemic risks⁶ determine 75 - 94% of investment returns (Ibbotson, 2010). Yet the existing tools used by companies, investors and financiers provide no means of engaging with these fundamental uncertainties (the unknown unknowns) that generate tipping points and non-linearities (Hofstetter, 2020) and could wipe-out returns over longer time horizons.

The question is, will the current solutions pursued by Protein Engineers stand up to the challenges coming down the track?

What follows are five plausible examples of systemic disruptors that are likely to affect Southeast Asia's protein system in the decade ahead, each bringing unpredictable outcomes.

Box 5: What is a systemic Disruption?

The ramifications of the COVID pandemic is a powerful example of a systemic disruption triggered by a combination of underlying drivers. The cascading, unpredictable and wide-ranging impacts illustrate the nature of the challenges ahead.

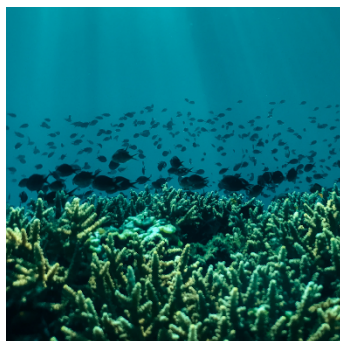
Zoonotic pandemics have emerged with regularity over the last few decades and have included SARS, Swine Flu and AIDS among many other examples, but this is the first pandemic to result in global lockdowns and the suspension of large parts of the global economy. Why?

Firstly, the likelihood of zoonotic pandemics has increased with the relentless and chronic degradation of ecosystems, the spread of intensive farming practices and the increasing incorporation of even remote parts of the world into globalised commerce and international air travel. Not only have these changes increased the risk of a zoonotic pandemic starting, but they have also increased the ability of a pandemic to spread quickly across borders and previously disconnected regions.

Secondly, the pandemic has caused cascading effects unlike any other, and reached deep into human lives and systems due to the chronic level of underlying vulnerability in our societies. Several factors are maintaining and even increasing this level of vulnerability - from increasing climate change impacts, deepening wealth inequality and increasing economic precarity in local rural economies, to name a few. This makes attempts to prevent new pandemics through focusing solely on managing single factors, such as 'biosecurity', futile.

Instead, taking a systemic view leads us to also prioritise the resilience, healing and health of the degraded systems (and people within them) - both to reduce this systemic vulnerability, and also as an adaptation measure to cope better with the impacts of any future pandemic. For example, a focus on supporting sustainable local rural economies and enabling smallholders to benefit from ecosystem service payments could enable the multiple benefits of reducing the risk of further zoonotic outbreaks by restoring degraded ecosystems and reducing reliance on intensive farming methods that incubate disease, as well as reducing incentives to hunt bushmeat. These benefits are coupled with increasing the economic and health resilience of communities over time.

⁶ In finance, "Systematic Risk" is a term used to refer to those risks that are inherent to an entire market or market segment. Also referred to as "undiversifiable" risk, they cannot be mitigated by the spreading risk across a large number of securities, or by screening certain borrowers. See the Corporate Finance Institute's [definition](#) for more information.



Example 1: Coral reef collapse.

70-90% of coral reefs will be lost at 1.5C warming (IPCC, 2018), and this level of warming could now happen as soon as 2027 (Hébert et al., 2021). Encompassing much of what is known as the 'Coral Triangle', Southeast Asia is home to 34% of the world's coral reefs. Over 130 million people depend on these reefs for their food and livelihood (Burke et al., 2011), as well as for barriers to natural disasters. Almost 50% of reefs in the region are already under high threat from human activities and therefore not resilient to warming (Burke et al., 2011), leading to the imminent risk of catastrophic collapse over the next decade. This will have cascading effects through ocean food webs, as thousands of fish species and 25% of all marine life depends on reefs (WWF, 2015). On the current warming trajectory, all warm water coral reefs will be lost by 2050 (Hoegh-Guldberg et al., 2019), and even under the best-case IPCC scenarios, coastal ecosystems in the Coral Triangle are estimated to only be able to provide 50% of the fish protein that they do today (WWF Australia & University of Queensland, 2009).

As well as being a disaster for biodiversity, with severe knock-on effects for ocean ecosystems, this would constitute a massive, chronic societal and economic problem that affects food security, diet and livelihoods into the long term, with no easy fix.



Example 2: Mekong Delta rice harvest failures

Climate change is threatening rice production in the Mekong Delta via three main effects - salt water incursion from sea level rise, drought, and rice pollen sterility at warmer temperatures (36°C and above). This is particularly pertinent to the protein system, as rice is such a dietary staple and is currently the dominant source of protein in the region. Hydropower dams upstream from the delta in China are adding further stress (Perlez, 2016) by restricting the flow of fresh river water and impeding valuable sediment from reaching the crops there. This pressure will increase significantly over the next decade as [eleven additional hydropower dams are being built in Laos and Cambodia](#), despite warnings of severe, unmitigable impacts on both agriculture and fishing in the Delta (ICEM, 2010). Rice harvest failures are becoming more pronounced as El Nino years (with excessive heat and reduced rainfall) become more dramatic.

During the 2019-2020 El Nino, the resulting drought [damaged tens of thousands of hectares of rice paddies in Thailand, Vietnam and Cambodia, hit second crop yields by up to 54% in Thailand](#), and forced abandonment of second crop planting altogether in Cambodia, with implications for food security. The drought's impacts were [exacerbated by the Chinese dams on the upper Mekong](#), and the situation is set to worsen even further as planned dams are constructed. There is a risk that Vietnam - currently the world's second largest exporter of rice - becomes no longer able to fulfil this role, with knock-on impacts for the whole region of Southeast Asia. There is also a long-term risk that the entire delta gradually becomes unfarmable once the new dams come on-stream, as a result of diminishing water flow, drought, salt incursion and loss of fertilising sediment (Perlez, 2016). Dr Thien, a wetlands specialist and one of the authors of the ICEM assessment report on the dams, noted in 2016 that the impact of the new dams "will be irreversible" (Perlez, 2016).



Example 3. Water crisis as ‘black elephant’

The global water crisis has been foretold for the last two decades, but surprisingly little has been done to avert it or prepare for it across much of the world (UN HRC, 2021). Southeast Asia is particularly water stressed already (Prokurat, 2015) and reliant on dwindling aquifers and shrinking rivers as its population grows (Atkins, 2020). Cities such as Jakarta, Manila and Bangkok are already experiencing chronic water shortages (Prokurat, 2015). Climate change impacts such as drought are sharpening the problem further, with serious impacts now becoming possible for agriculture and urban populations (Atkins, 2020). Furthermore, management of important transboundary rivers such as the Mekong does not happen equitably (Atkins, 2020), with serious repercussions for the agriculture of downstream nations. For example, Laos could [only plant rice on 40% of its arable land in 2020](#), due to upstream dams in China discharging half the usual amount of water and exacerbating the effects of a drought.

Fisheries are also affected. The Mekong River system is the world’s largest freshwater fishery, usually producing over 2.6 million tons of fish per year. A quarter of this comes from Cambodia, mostly from the Tonle Sap Lake (Weatherby & Lichtefeld, 2020). However, in 2019, [drought and dam interference with water flow caused a collapse in fish catches from this lake](#), prompting a 60 to 70 per cent below average decline. As fish provides 70% of animal protein consumed in Cambodia, this caused [a spike in food insecurity, economic precarity and outmigration of labour](#). Water management tensions between the eight countries that share the Mekong are increasingly recognised to threaten the long term peace and stability of the region (Atkins, 2020).

The water crisis is a particularly acute systemic risk given the essential nature of water to human health, agriculture, industry and almost every sector. Notwithstanding this fact, it is still rarely factored into planning (Rahan, 2019). Access to clean water is crucial to the production and processing of all forms of protein, from the basic staple of rice through to animal proteins, plant-based alternative proteins and cultured meat. Competition for water is likely to increase, with the prospect of outright shortages increasingly likely to occur. A sobering reference point to this effect is the Cape Town water crisis of 2017-2018, where strict water rationing was enacted for almost a year to postpone ‘Day Zero’, the day when almost all municipal water supplies would have to be turned off completely (Parks et al., 2019). Businesses were forced to make 45% savings regardless of their ability to do so, and hard limits on agricultural water quotas were enforced, leading to significant drops in yield for irrigated crops (Parks et al., 2019). More recently, Jakarta’s already [chronic water stress has been worsened by the pandemic](#), due to increased demand for hand washing and sanitation, with [debilitating effects on the urban poor and water-intensive industries](#) such as dairy farming and processing.

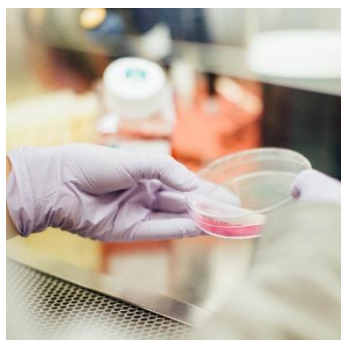


Example 4. Demographic shift as a multiplier

It is well known that demographics are shifting rapidly in Southeast Asia, with two important elements in play - the ‘youth bulge’ in countries such as Indonesia, Malaysia, Laos and the Philippines; and rapid population ageing in Singapore, Thailand and Vietnam (West, 2018). The ‘youth bulge’ in particular can act as a systemic multiplier for both positive and negative disruption, as generational differences in attitude can drive rapid social change in multiple areas, from dietary changes, social norms and family structures, to the political arena.

Large youth populations can produce a ‘demographic dividend’ when adequate education and employment opportunities are present (West, 2018). Conversely, this can flip to a ‘demographic disaster’ if prospects are poor, with increased risks of civil unrest and even conflict, as was seen in the fallout from the 2011 ‘Arab Spring’ (Bajoria & Assaad, 2011), where the effect of multiple factors

was amplified further by demographics. With regards to protein, generational differences in attitude could potentially enable rapid adoption of new forms of protein. Conversely, any crisis could be amplified by the presence of large youth populations.



Example 5. Cultured meat as a disruptive innovation

Cultured meat is generally expected to be far off commercially, due to cost. However, it is possible that we could see a repeat of dynamics in the solar PV industry (WEF, 2019), where strong investment by China drove the price down to 'grid parity' far faster than expected, enabling exponential growth and disruption in the global electricity generation sector. China is trying to reduce reliance on imported meat, the environmental footprint of livestock farming and the health impacts of meat over-consumption in the population (Milman & Leavenworth, 2016). Cultured meat could prove an attractive solution, and [Chinese start-ups \(such as CellX\)](#) are already emerging that are pushing aggressively for price parity with meat within three to five years and then cheaper. [Investment from the Singapore government](#) is also focusing on this area, and in 2020, it became the first government to [give regulatory approval for selling lab-grown meat](#). Convergence here with shifting attitudes in younger generations could cause rapid disruption in the protein sector, with particular impacts on livestock producers and smallholders if the transition to cost-parity is rapid.

5.3. Systemic disruptions necessitate responses that are future-fit

Any attempts at creating a sustainable protein system need to be ready for systemic disruptions in the landscape in order to ensure the resilience and health of the system. In this context, efforts to drive food security or address carbon emissions risk not being effective long-term unless they are designed to be future-fit, specifically:

- **Meaningful:** They don't exacerbate the underlying drivers they are trying to address and proactively address vulnerabilities to disruption to achieve a longer-term system transformation. For market actors this will be critical not only for reducing exposure to shocks, but also delivering change at a scale commensurate with the challenges, supporting a viable long-term model and remaining a credible actor as part of a society grappling with a turbulent reality.
- **Sustained:** They set out to achieve lasting change. This requires models that are self-sustaining and which, for market actors, reduce the risk of stranded assets, regulatory breaches or reputational damage from missed targets. For example, delivering long-term reductions in greenhouse gas emissions without locking in unsustainable models of production or increasing the risk that efforts then simply get reversed through disruption or civil unrest.
- **Resilient:** They create agility and have the capacity to keep changing in the face of systemic disruptors and volatility. A diverse system that can innovate quickly and evolve its approach as the context changes, is one that will be best placed to navigate the highly unsettled decade ahead, while continuing to deliver and secure market value by providing reliable access to nutritious protein.

4.4. Limitations of a Protein Engineer mindset

The current protein system in Southeast Asia is showing signs of strain, especially when considered in the light of potential disruptions on the horizon. While the efficiency-focused efforts of Protein Engineers are driving important impact in minimising current adverse environmental impacts of production and shifting norms around consumption through the provision of alternative sources of protein, they may not yet be creating the optimal conditions for the emergence of a future-fit protein system that delivers for deeper social, environmental and economic outcomes. This could undermine important efforts to achieve food security and climate mitigation - as well as a whole host of other outcomes - on a long-term basis.

On its own, a 'Protein Engineer' mindset may be at risk of patching up the current way of operating in the food system, constraining the potential for true transformation to a future-fit protein system that can withstand the potential disruptions facing us in the decade ahead.

Solutions pursued by those in a Protein Engineer mindset risk falling short of delivering meaningful, sustained or resilient changes in the face of:

Increasing ecological fragility

Regional agriculture practices such as biomass burning, fertilizer overuse and groundwater depletion have led to phosphorus deficiency, increased water pollution and greater carbon emissions, ultimately depleting the land's ability to nourish us over time.

The current Protein Engineer mindset around sustainable protein is typically focused on more commoditised production and primary processing. These systems are designed for high productivity - from the intensive production of chicken, through to tilapia and even the ingredients of animal feed and plant protein products, which are predominantly reliant on commodity traded inputs like mung beans and soy to keep costs low. These production systems are effective at capturing value through producing consistent, high volumes of affordable protein sources, while driving efficiencies. For example, around half of poultry production in Southeast Asia is now conducted in intensive medium to large commercial farms (Wright, 2019).

Many people are doing important work to mitigate the adverse effects of commoditised production and supply models, for example, by measuring and reporting carbon emissions and water use as part of ESG approaches. These measures however, may be at risk of locking in rather than opening up the possibilities of changing production models to address the underlying ecological depletion and fragilities. For example, switching production from Black Tiger Shrimp to Whiteleg shrimp, which are better suited to intensive farming practices, may appear to be a key means of improving productivity and preventing further expansion and mangrove deforestation. In practice, however, the intensification of existing shrimp ponds with Whiteleg shrimp has led instead to unintended consequences with devastating disease outbreaks and wastewater pollution (Naylor et al., 2021).

Equally, some argue that a key part of the problem is the artificial separation and intensification of arable and livestock production systems (Martin et al., 2016), an approach which is very attractive due to its better efficiency for delivering yields. However, dedicated livestock production systems require considerable volumes of feedstock and then produce large amounts of waste that have to be managed. Equally, large proportions of arable land are dedicated to animal feed production and require considerable inputs of fertiliser, often synthetically produced from oil. Yet well-managed

integrated, regenerative systems (typically with relatively lower stocking densities of animals) have been shown to help balance the cycle of nitrogen and contribute to soil health, natural pest management, as well as biodiversity (Rhodes, 2017). This sheds a new light on the value of traditional mixed farming systems still practised across much of Southeast Asia (WEF, 2019), some of which are at risk of being out-competed by the expansion of large-scale livestock production. Equally these farming systems are at risk of being at the receiving end of critique aimed at high impact livestock production by those advocating for meat-free diets.

Deepening social inequalities and the need for just transitions:

There are an estimated 100 million smallholder farmers in the region, providing four out of five plates eaten in Southeast Asia (Zein, 2019). In general, farmers' average earnings are significantly lower than the returns earned downstream in the supply chain. While the mainstreaming of alternative proteins in Southeast Asia has the potential to substantially lower the carbon footprint of the protein sector, inputs for these products such as soy, pulses, and insects - like those for the animal protein sector - still require the labour of millions of farmers (largely smallholders) and workers. These farmers and their livelihoods – particularly those from indigenous and marginalised backgrounds – face deep vulnerability in the form of low wages, poor working conditions, food and water insecurity, loss of land rights, as well as in some cases, restrictions in their freedom of association and collective bargaining. Many farmers in the region increasingly have urban aspirations, hoping that their children will not grow up to be farmers themselves.

A market-driven collapse in the price of protein due to high investment in cost-competitive alternative proteins, or increasingly controlled and efficient animal protein production technologies, could result in widespread loss of livelihoods among smallholder farmers. This is particularly so in the absence of a deliberate effort to provide decent rural livelihoods and a just transition. Not only would this be a social failure, but it could exacerbate the food security challenge, due to loss of incomes and further detachment from food production (the ability to fall back on local food production often provides a natural safety net during disruptions). There are important questions therefore, about how to drive these changes in ways that enable a 'just transition' that leaves no one behind.

Such issues are not isolated to the production end of the protein supply chain. Typically, larger and more integrated organisations have a competitive advantage in instances where a 'Protein Engineer' mindset is prevalent. This is because more consolidated supply chains can achieve greater economies of scale. Also, many of the technological innovations (including the manufacture of alternative proteins) and standardised approaches lend themselves to being scaled up through large integrated agri-food businesses that have the manufacturing capacity and ability to invest the capital required. As protein production systems are incentivised to get more efficient and automated to help meet growing food demand, there may be continued downward pressure on wages, decreased need for labour, and difficult conditions for smaller or medium sized businesses to compete in the market. Additionally, as innovators and investors seek to develop defensible intellectual property, there is a risk that a small number of organisations with the R&D and legal capacity dominate the future protein system. This may raise further questions around equity if those protein innovations are not scaled or made affordable and available for more people.

In relation to equitable access to protein as a nutritional source, the Protein Engineer mindset brings an important perspective around the need to secure more supply of protein for the expanding population and growing middle class. Whilst this is critical, addressing the vulnerabilities around food security in the region is not limited to securing volumes of protein alone.

In theory, every country across Southeast Asia currently has enough grams of protein available (73g per capita, on average (FAO STAT, n.d.)) for everyone to consume sufficient volumes. However, Asia as a whole remains the number one region globally for energy-protein malnutrition, accounting for

70% globally (Lee, 2014). Moreover, those on the poorest incomes in the region are still eating well-below the daily protein requirements. Until recently, those on the poorest incomes in the Philippines and Vietnam were eating an average of just 37g (2003 data) and 44g (2006 data) of protein per capita per day (FAO STAT, n.d.) - under the 45 - 55g usually recommended for women and men, respectively (British Nutrition Foundation, n.d.). This points to a deeper question of inequalities of access to sufficient nutritious foods - a matter that hinges on livelihoods, physical access, affordability and many other related factors. The high prices and high-end target market of current alternative plant-based proteins, in addition to the potential for [current sustainability trends and disruptions to cause a rise in prices of animal protein in the region](#) could well pose a challenge to affordable access to protein.

Further, an average of 31.5% of children under 5 are affected by stunting in the region and 38% suffer from anaemia (as well as 36% of pregnant women) (ASEAN & UNICEF, 2016). There are also critical micronutrient deficiencies of folic acid, iron, iodine, zinc (33.1% of individuals at risk) and vitamin A (Lee, 2014). These are very serious health concerns in the region, not least because they also increase the number of 'obesity-prone' children later in life - already 4.5 million children under five are currently overweight or obese (ASEAN, 2016). Despite economic gains, issues such as undernutrition, vitamin and mineral deficiencies, obesity and diet-related chronic diseases persist in many countries.

A future protein system can lead the charge by more aptly responding to the growing nutritional needs in the region. To do so, especially for communities that are currently most underserved, will prove instrumental to unlocking the human capital and unrealised potential in Southeast Asia.

The need for the protein system to be agile and adaptive in the face of systemic disruptors:

Sustainable protein interventions that have been designed in the context of relative stability may be unfit for purpose as we enter what is likely to be a long period of instability. If we are to ensure resilience in a new protein system in the face of immediate and long-term disruptions such as those described in Section 5.2., we must encourage a diversity of approaches and routes to action rather than limit ourselves to a few solutions. We will need to design protein production so that it supports an adaptive and future-fit food system.

Part 6: Protein Visionaries as catalysts for a ‘just and regenerative’ protein system

A shift is needed to widen our perspective from a Protein Engineer mindset towards one we have termed the ‘Protein Visionary’. This changes the focus from delivering a ‘sustainable’ protein system to one that is ‘just and regenerative’.

This transition in mindset does not dismiss the concerns and efforts of the ‘Protein Engineer’. It remains critical to mitigate environmental impacts - including critical climatic impacts - and secure the supply of protein to meet growing demand in a way that can still produce affordable food, at scale. The question is ‘how’ can this be done in a way that better supports these outcomes on a long-term basis?

6.1. The ‘Protein Visionary’ mindset

To really transform the protein system in Southeast Asia, we will need Protein Visionaries, not just Engineers. Protein Visionaries see the protein challenge from a wider view. They recognise the importance of going beyond tackling security of supply, to overcoming deeper systemic societal and planetary conditions that are showing up in Southeast Asia’s protein system, enabling long-term food security and lasting climate mitigation outcomes.

Protein Visionaries will need to demonstrate the ‘art of the possible’, drawing other actors towards a wider set of goals for transforming the protein system, challenging us to create alternative visions for a more decentralised, regenerative and adaptive, disruption-resilient system, and experimenting with a diverse array of imaginative solutions to achieve this.

Far from seeing these goals as out of their reach, Protein Visionaries recognise the limits of individual action and focus on building their agency to evaluate where, how and with whom they can create maximum systemic impact. As part of mitigating current risks in the protein system, their focus is on how these efforts can support a longer-term, ‘just transition’ to a future-fit protein system.

Table 2: Protein Mindsets compared

Mindset	Protein Engineer	Protein Visionary
Purpose of the protein system	Food Security by securing ‘enough’ protein for a growing population.	Access to enough, nutritious food for all.
Goals	A secure ‘sustainable’ supply of protein, with a lower environmental footprint.	Regenerative and just protein system that is healthy and can thrive in-perpetuity to provide a secure supply of protein.
Timeframe	Mitigating urgent environmental risks in the current system.	Just transition to a ‘ future-fit ’ system by driving responses that are meaningful, sustained and resilient.

Theory of change	<p>Decoupling protein production from environmental impact - for protein production to grow it needs to have a smaller 'footprint' in order to manage key environmental limits and risks.</p> <p>Scaling specific profit maximising companies and centralised around a small number of well-managed companies that can run efficient and standardised production systems.</p>	<p>Everything is interconnected and needs to exist in balance, as part of a regenerative system - the whole protein system needs to operate in a way that is self-sustaining and which replenishes the health of the soil and regenerates land.</p> <p>Equitable distribution of value with a more decentralised approach to enable all people along the value chain to thrive.</p>
Key risk factors	<p>Delivering improvements against a narrow set of environmental factors:</p> <ul style="list-style-type: none"> ● Environmental limits to production (e.g. staying within climate targets) ● Biosecurity threats ● Supply risks from climate change 	<p>Focus on approaches that better address a range of social, environmental and economic drivers of underlying risk and vulnerabilities, including:</p> <ul style="list-style-type: none"> ● Regenerative agricultural practices ● Decent livelihoods ● Affordable nutrition
Approach to risk	Management approach - isolating and managing for specific and independent risk factors.	Agility in the face of complex, systemic, emergent risks with potential for disruption, to some extent unknowable & incalculable.
Solutions	Specific, technological solutions - 'sustainable' intensification of animal protein & growth of alternative proteins.	Valuing a diversity of approaches and protein sources, as well as mixed arable-livestock systems.
Sphere of focus	<p>Global outlook around scalable protein solutions</p> <p>Focus on production impacts specifically (less so on the rest of the value chain).</p> <p>Individual company changes or innovation.</p>	<p>Capitalising on the unique potential and context in Southeast Asia.</p> <p>Whole value chain approach.</p> <p>Actively shaping systemic change in the protein system with collaborative approaches.</p>

5.2. Protein Visionaries shift the focus from a 'sustainable' to a 'just and regenerative' protein system

A Protein Visionary mindset helps to widen the aperture, and in so doing, highlights the need to go beyond a 'sustainable' protein system, to one that is 'just and regenerative'. This is likely to be a key route to delivering meaningful, sustained and resilient change - and ultimately a healthy, thriving region. This mirrors the findings of Forum for the Future's wider work across the food system and involvement in many international fora, where it is now widely recognised that current approaches to sustainability - and particularly a focus on minimising harms - will not deliver the impact needed.

Defining a just and regenerative approach:

A just and regenerative approach recognises the power of nature, including humans as part of nature, to renew and regenerate. It respects everyone's universal rights and potential to thrive. Broadly, this approach:

- **redefines the meaning of a prosperous economy** to one that supports life, meets the needs of everyone in society to thrive, creates value fairly and operates in harmony with nature and within planetary boundaries.
- **addresses the root causes of today's biggest challenges** – the climate emergency, nature in crisis and mounting inequality – by reconfiguring the systems we are part of to restore and replenish our ecosystems while promoting dignity, fulfilment and equity for everyone.
- **enables the capacity of social and environmental systems** to adapt to and address challenges of the future.

A just protein system is one where value is equitably distributed along the different protein value chains. In doing so, the fundamental importance of food producers and labourers in meeting the region's nutritional needs are duly valued through recognition and redistribution. Their importance needs to also be recognised in terms of participatory governance, fair compensation and protection of rights. At the consumer end, a just protein system goes beyond securing 'enough' protein. The ultimate aim of the system is to achieve access to affordable foods that fulfil nutritional needs for the vast majority of consumers.

A regenerative protein system is one that manifests regenerative agricultural practices (Forum for the Future, 2020). There is a growing focus on regenerative agriculture and circular food systems (Project Drawdown, 2020), with a number of major companies investing significantly in understanding what this looks like. Examples include [Olam's commitment to ecosystem regeneration through its Living Landscapes Policy](#), as well as [Danone supporting farmers with long-term contracts and capacity-building around regenerative agriculture](#). At their core, these practices take an approach to farming that puts more back into our living systems than it takes out. This includes respect for the animals that are a core part of our food system. As part of creating an agricultural system that is fit for the future, regenerative agriculture practices have the potential to create more resilient supply chains, restore soil health and enable farmers and businesses to thrive.

5.3. Emerging visions of a just and regenerative protein system

Protein Visionaries can catalyse a shift to a just and regenerative protein system by finding ways to shift the system towards new norms and behaviours. Key to this will be providing actors in the protein system in Southeast Asia with new visions that reimagine protein production and consumption.

Through our research, we have identified three emerging visions of what a future protein system could deliver if re-orientated around regenerative and socially just goals, and where there are indications that these visions are beginning to unfold in Southeast Asia. These are not about misplaced nostalgia for old food systems, but about harnessing the hard-won wisdom and potential in the region, while building upon signals of new thinking, technology and approaches. There are certainly no easy answers or 'silver bullet' solutions.

Vision 1: [A regenerative protein system that replenishes soil and restores degraded land and aquatic ecosystem health, while boosting local livelihoods and rights](#)

Pointing to the intensiveness of unsustainable farming practices, the [Good Food Institute](#) (GFI) advocates for an alternative plant-based protein economy that supports regenerative agricultural practices and builds soil fertility. Instead of eroding agrarian livelihoods, the GFI sees such a transition as a chance to both drastically reduce land use, while *"freeing up labor, research funding, and resources to dedicate to cultivating a regenerative, soil-building farming"* (Allen, 2019). This restorative approach could also be an important part of 'nature-based solutions' for addressing climate change and is part of a wider movement around 'regenerative agriculture' that is gaining in traction globally.

Other organisations like [IPES-Food and ETC](#) caution that this is not just about soil. Critical to regenerative practices is “*confronting, not ignoring, the core issues (including race, ethnic and gender elements) faced by agricultural, fisheries, and food industry workers.*” They imagine a people-led, labour-centred agroecological transition, where land and data rights are enshrined as universal rights.

What this looks like in Southeast Asia:

As a region experiencing overfishing and serious degradation of arable land, replenishing soil and ecosystems is critical. A regenerative movement is building in the region, through the use of future-fit crops like drought-resistant mung beans, to help regenerate depleted soils. For instance, planting jackfruit trees - whose fruit provides an interesting texture for plant-based alternatives - can help reforest areas, sequester carbon, prevent soil erosion on exposed slopes and provide shade for other crops (Tacio, 2018). [AGREA International](#) is working with local research centres in the Philippines by planting dwarf strains strategically in typhoon areas. This creates alternative livelihoods while boosting local resilience to extreme weather events (AGREA International interview, 2021). [WhatIF Foods](#) plants orphan crops like Bambara groundnuts and moringa - both nitrogen fixing plants - on degraded palm oil land to replenish the soil and support new income streams for farmers and workers. These are then made into products that are convenient and healthy - “360 degree sustenance for people, planet & livelihoods” as they call it. Also, [Aloha House](#) - a small-scale ranch and organic farm in the Philippines - uses animal power, manure and other animal by-products to enrich the soil for growing vegetables, make fertilizers and turn other wastes like forage crop residues into useful materials including biochar.

Large procurers are starting to actively support ecosystem restoration efforts in and around their sourcing areas. [The Rimba Collective](#), developed by Lestari Capital (a Singapore-based impact investment firm) and backed by palm oil buyers like PepsiCo and Nestlé, will fund projects that protect and restore more than 500,000 hectares (1.2 million acres) of tropical forests in Indonesia and the region. Funding for this restoration is directly linked to procurement volumes and is focused on generating resilient jobs and incomes for local communities (Lestari Capital, 2021). This is part of a wider movement that recognises the crucial role of farmers as land stewards, who are well placed to manage the land for multiple purposes.

Vision 2: A diversified protein system that encourages the use of local knowledge and working with local cultures, harnessing existing solutions in the region, alongside novel, high-tech approaches to encourage a diversity of protein sources

[Thought for Food](#) points out the sheer diversity of plant-based protein alternatives cultivated by generations of indigenous farmers that are being lost to market consolidation. The organisation advocates “*rethinking the possibilities of what we eat by tapping into the vast suite of diverse, nutritious, locally-relevant crops that the world offers.*” (Thought for Food, 2020). Doing this ethically, in a way that respects the intellectual property rights of those communities, is critical.

[IPES-Food and ETC](#) imagine a future protein system where “*indigenous peoples and peasants once again show a capacity for rapid innovation and adaptation: they safeguard landscapes and nurture a wide range of crops and their wild relatives via proliferating community gene banks, living collections, and farmer-to-farmer and fisher exchanges across neighbouring ecosystems*” (IPES-Food & ETC Group, 2021). Finally, the [UN Food Systems Summit’s 2021 Blue Foods Brief](#) highlights the potential to harness a greater nutritional diversity of blue foods without increasing pressure on existing fish stocks, by focusing on context-specific local nutrient availability and needs (Leape et al., 2021).

Organisations are also promoting local connections to the food system to increase appreciation for food diversity and enable local agency in determining food resilience. The [International Institute for Environment and Development](#) shares an alternative vision emphasising the agency of citizens,

particularly in the informal food economy, pointing out how diverse, informal 'food systems of the majority' have been crucial to the continued provision of affordable, accessible and nutritious food in the pandemic. Yet, these views are often neglected by policymakers, governments and even NGOs (Vorley, 2020). This is not about being nostalgic for the past, but about harnessing the power of local food systems and traditional knowledge to support new visions for the future that are future-fit.

What this looks like in Southeast Asia:

Historically, this is a region that drew on its fertile plains to irrigate rice, as well as its local river systems and coasts for fishing and maritime trade. This has shaped the diversity and adaptability of culture in the region, as well as diets. While there is great culinary diversity, regional diets increasingly rely on fish, rice and tofu.

Our interviewees shared examples of local foods being promoted to draw on the region's existing biodiversity to stimulate nutritional diversity. [Lavva's](#) pili nuts sourced from Indonesia and the Philippines are a good example. Native to the region, pili nuts are naturally pollinated and do not require pesticides to grow. Moreover, they prevent soil erosion and restore land disrupted by nearby volcanic activity (Lavva, n.d.). In the Philippines, [AGREA International](#) is working with smallholders to plant mung beans in rice crop rotations to replenish soil degraded by rice monoculture, providing another source of income to farmers, while improving drought resistance. The Filipino Government then distributes mung bean nutrition bars to schools to improve nutritional outcomes (AGREA International interview, 2021). By diversifying the crops grown, this also has the potential to improve the local nutrition of farmers - the amino acids in beans and rice complement each other to provide a complete source of protein.

Fermented, cured and pickled local produce is also gaining traction, with start-ups like [Better Nature](#) aiming to revolutionise tempeh, Indonesia's traditional staple food and a high-protein fermented soybean product. Cambodia's [Kadoorie Farms](#) are conserving the biodiversity of a 13,000-hectare Chinese-owned Economic Land Concession in Kratie Province of eastern Cambodia, home to half of the world's banteng - a critically endangered wild cattle.

Insect protein - a traditional part of Southeast Asia diets, as well as a potentially interesting source for sustainable animal feed - is gaining much traction. Singapore's [Nutrition Technologies](#) manufactures sustainable insect proteins and oils for the aquaculture, pet food and animal feed industries. It does so by using a unique combination of bacteria and black soldier fly larvae to upcycle nutrients from agricultural and food processing by-product. This culinary richness and diversity that is tied to the natural resources and ecology can be harnessed and form the cornerstone of more plural and ecologically attuned protein systems. There is also increased attention to preserving and protecting this heritage amongst chefs, with more fine dining chefs such as [Bangkok's Chalee Kader](#) and [Michelin-starred Chef Bee Satougun's Paste Laos](#), seeking out local flavours.

Beyond food entrepreneurs and chefs, everyday citizens and consumers are also advocating for localising and diversifying food systems. Groups like the [Philippines permaculture movement](#) and Singapore's [Foodscape Collective](#) engage local communities to increase community urban farming through initiatives. People - especially younger generations - are directly stewarding and building communities towards self-sufficiency and new land relationalities. Fostering greater collaborative capacity for these groups to work with other actors such as food technologists, policymakers and incumbent food producers will help grow momentum.

Vision 3: A [decentralised protein system](#) that focuses on smallholders in the agricultural system and prioritises the creation of decent, rights-respecting and decent jobs for the many workers in protein supply chains.

A future protein system needs to respect and harness the skills and land relationships smallholders have cultivated over centuries. These must be paired with new digital skills to put them in the driver's seat of the region's protein transformation.

In the IPES-Food and ETC's 2021 ['Long Food Movement' report](#), authors imagine a decentralised food future that reinstates the role of civil society and social movements – “*from grassroots organizations to international NGOs, from farmers' and fishers' groups to cooperatives and unions*”, where actors closely collaborate “*to transform financial flows, governance structures and food systems from the ground up.*” (IPES-Food & ETC Group, 2021).

Moving up the food chain, the UN Food Systems Summit's 2021 brief ['The Vital Roles of Blue Foods in the Global Food System'](#), focuses on the value of smallholders, calling for expansion of investment in small-scale actors. This call is made with a view to enabling the diversification of the sector and ensuring that trade and economic policy values their roles in providing equitable economic opportunity and nutrition (Leape et al., 2021). The [Stockholm Environment Institute](#) also specifically points out the role of smallholder farmers as landscape managers and custodians of culture, who face significant threats in the form of rural flight, rural destitution, as well as land grabbing and consolidation (Grunbuhel & Powell, 2019).

It is easy to romanticise smallholder production systems when the reality has often been one characterised by poverty and poor working conditions. This vision is not about fixing smallholders in a role and status from the past. It is about exploring how we can unlock the deep knowledge of those who have been working the land, as well as supporting smaller scale producers to engage and adapt their own livelihoods and use of land going forward.

What this looks like in Southeast Asia:

Southeast Asia's small-scale and smallholder base currently produces 80% of the food grown in the region. Harnessing the deep knowledge and potential of this cohort is thus critical. This presents a challenge, given their diversity in size and geographic spread. However, given their proximity and familiarity with their lands, smallholders have often developed interesting agricultural strategies tied to natural ecological processes. Examples of this include Vietnam's traditional farming system [Vuon — Ao — Chuong \(VAC\)](#), as well as the Japanese integrated duck-rice farming that is widely practised across Southeast Asia. Our interviewees also pointed to examples of companies harnessing the land relationalities of smallholders in the region, such as Indonesia's [Green Rebel Foods](#), which works directly with farmers from different parts of the country to source key ingredients (e.g. sourcing its sea salt from Bali, cassava flour and spices from in Java and coconut oil from sustainably grown coconut trees in Riau). In Thailand, where there are an estimated 20,000 small and medium-scale insect farms, smallholders can earn an additional US\$450 a month from insect farming - almost doubling the average monthly income of farmers in this country (National News Bureau of Thailand, 2019). This is partly due to the constant source of insects, in contrast to plant harvest cycles (Villadiego, 2019).

Whereas many alternative protein companies currently embrace centralised models, they also can experiment with decentralised models and work directly with smaller scale producers and processors

instead. On the global stage, [Impossible Foods](#)' founder, Pat Brown hopes that in the future, they can license their intellectual property to accelerate wide-scale production (Jaju, 2021). [Shiok Meats](#), a Singaporean cell-based meat and seafood company, envisages being able to licence its technology to farmers to support new ways to produce meat and seafood. With a licencing B2B model, Shiok Meats sees itself as a potential provider of cell lines that smallholder farmers can then grow on their own using Shiok Meats' innovative technology (Shiok Meats interview, 2021).

The low uptake of digital technology is a key barrier to fully tapping into the potential of the region's smaller scale farmers or smallholders. Of the over 100 million smallholders making up the majority of farmers in ASEAN, approximately, only 2.5% are active users of digital agri-tech technologies (Soerjanto, 2020). COVID has nonetheless accelerated some digital adoption across the region. According to analysis from Bain, Google and Temasek, 40 million people became internet users during 2020 across Singapore, Indonesia, Philippines, Vietnam, Malaysia and Thailand. This translates into 70% of the people in those countries now being online and able to access digital remittances, doubling the pay of migrant workers in some countries (Choudhury, 2020). More investors are broadly looking into financing technologies that impact smallholders - a trend characterised by a whopping 400% increase since 2014 (AgFunder, 2020). That said, Grow Asia cautions that most of these current investments are still in early stages (Grow Asia, 2019). One such example is that of [Aruna](#), an e-commerce aquaculture platform that works with thousands of fishers in 31 coastal areas across Indonesia. Its focus is to scale up its export market to East Asia, Southeast Asia, the Middle East and North America. These examples highlight the importance of putting smallholders' needs at the heart of the design of new technologies and dedicating corresponding efforts to improve digital literacy and access for these technologies to be meaningfully taken up by farmers.

Taken at face value, each of these visions could simply encourage an incremental change to the current trajectory of the protein system, for example, by building a bit more agrobiodiversity into current large-scale cropping systems. Taken together however, they speak to a powerful shift towards a more decentralised, restorative and replenishing system that embraces the region's protein heritage and diversity.

There are likely to be other emerging visions out there of a just and regenerative system that we haven't captured through our research. In particular, we recognise that the ones we highlight focus on the production-end of the value chain and the implications for rural areas. These may not be sufficiently addressing human and worker rights issues along the supply chain, nor animal welfare issues. These emerging visions might also be considered niche and small-scale. None of them can transform entire ecosystems in and of themselves. However, an integrated systems approach of improving nutrition and growing crops in ways that are environmentally restorative and which boost local livelihoods is worth pursuing.

In a region where over half the population is under 30, technologically savvy and many are at the forefront of grassroots movements to call for change, there is a palpable opportunity to innovate and experiment with creating new pathways in Southeast Asia that may help other regions to re-imagine what protein systems change means.

Part 7: The Protein Challenge Southeast Asia Initiative

This initiative - incubated by Forum for the Future - aims to cultivate a cohort of Protein Visionaries to reimagine and drive the transition to a just and regenerative protein system in Southeast Asia. Their mission will be to demonstrate the 'art of the possible', drawing others towards a goal of widening our view of what transforming the protein system entails, challenging us to create new visions for a decentralised, regenerative and adaptive, future-resilient system, and experimenting with a diverse array of imaginative solutions to achieve this.

The Protein Challenge Southeast Asia initiative aims to engage Protein Visionaries in the region to:

- Set a collective vision for a just and regenerative protein system in Southeast Asia.
- Generate recommended ambitious interventions designed to lift barriers to - and unlock opportunities for - enabling a transition to this system.
- Catalyse prototyping in a range of opportunity areas to activate the system change process.
- Inspire other actors in the Southeast Asia protein system to collaborate in the prototyping, thus growing the cohort of Protein Visionaries.

6.1. How can we harness the potential of financial actors to transform the protein system in Southeast Asia?

Whilst there are multiple ways to approach this challenge, the initiative will focus upon exploring the change agency of financial actors in enabling the transition towards a just and regenerative protein system. We have prioritised a focus on financial actors due to their role in directing finance towards particular products and business models, which gives them significant leverage to shift norms and behaviours within value-chains. This is already happening, with investors funding protein innovation to provide alternatives to animal protein, and a growing focus on ESG in investments in sectors such as livestock farming. Yet, these approaches may not be enabling the deeper levels of transformation needed to respond to ecological fragility, deepening social inequities and inter-generational resiliency in the protein system in the region. Current Protein Engineer mindsets and approaches coupled with short-term, 'business-as-usual' thinking could limit the change potential of finance to equip the protein system for the ecological and social challenges of the decade ahead.

The Protein Southeast Asia Initiative is putting forward a futures-led inquiry into: **How can we harness the potential of financial actors to catalyse change in the protein system in this region?** It will collectively explore the paradigms, mindsets and behaviours that financial actors bring into the protein system in the region, with a view to understanding how these can support a transformative trajectory. Inquiry questions include:

- **How can financial actors see themselves as part of the protein system, recognising their agency - and responsibility - through investment decisions to shape the system towards just and regenerative goals?** How might they transcend current dominant logics - such as Modern Portfolio Theory and Discounted Cash Flow analysis - that are commonly used by a range of financial institutions to make decisions, determine the so-called 'investable universe' and establish credit scores? How can they imagine different approaches to identifying investments and proactively shaping change? How might they take a more experimental and learning-oriented approach to funding that supports a diverse, innovative ecosystem to evolve and adapt as the context changes?
- **How can financial actors move from individual deals in low-carbon protein or influencing specific company strategies to building strategic portfolios which collectively leverage change in the protein system?** How might they take advantage of synergistic investments, for instance across a diversity of complementary proteins, or

investments clustered around strategic parts of the value chain - that create value at the level of the portfolio, but may not meet return expectations on their own terms? Seeds of this practice are beginning to emerge in the top-down construction of net-zero portfolios that are aligned with a strategic vision for net-zero carbon economy (Babcock & Weiss, 2021).

- **How can financial actors incorporate a more holistic approach to screening and managing protein production and consumption impacts?** How might they go beyond a narrow focus on greenhouse gas emissions or biosecurity risks or securing supply towards systemic applications of ESG processes, as well as exploring alternative ways of leveraging change through finance?
- **How can financial actors reimagine value models to incorporate more than financial value in protein portfolios?** A truly regenerative and just protein system is not just about doing 'less harm'. Financial actors can help unlock positive value for society and influence the development of the wider market. How might financial actors account for the non-market social and environmental forms of value that underpin financial returns, such as decent livelihoods and nutritional outcomes? How might they recognise the potential for companies to not just create direct impact, but also to influence the development and growth of the overall sector?
- **How can financial actors respond to the need for a just transition as we shift the goals of the region's current protein system towards just and regenerative ones?** Every transition has consequences - how might we ensure no one is left behind in the production, distribution and consumption of affordable, sustainable and nutritious protein? Financial actors can play an important role in delivering more equitable financial and business models. This includes those better equipped to distribute value to those upstream in the value chain, recognise the value of indigenous knowledge and intellectual property, as well as supporting a more 'open innovation' approach to intellectual property rights. This is in addition to new financial vehicles that link investors to the great potential of smaller farmers to engage in the market. They may consider accelerating the availability of financial products and services to small and medium-sized companies throughout the protein value chain and adapting ESG approaches for organisations that might otherwise be disadvantaged by standards and disclosure-based processes. Or they might invest in market solutions that increase affordability and accessibility of protein to food insecure and poor consumers.
- **How can financial actors spearhead collective and collaborative approaches amongst a diverse group of actors to achieve transformations in the protein system?** How might they listen to more diverse voices and form partnerships with non-financial institutions in order to further shape a future-fit strategic vision and deliver better decision making? For example, there is a growing community of accelerator programmes, such as [Mozilla Builders](#) and [Boost VC](#), actively structuring their calls for application, themes, programmes and support services to appeal to entrepreneurs from diverse or marginalised backgrounds. How might they explore blended finance approaches working with public, private and philanthropic capital through the creation of innovative syndicates and partnerships (Blended Finance Taskforce, n.d.)?

6.2. How can you be involved?

We invite you to join us in this inquiry process, to collectively explore these questions with other Protein Visionaries in the region.

You will not only be at the forefront of the emerging opportunities in the protein system and at the cutting edge of sustainable finance, but you will also be playing an active part in building a community and sowing the seeds for transformative change in the Southeast Asian protein system.

We also encourage you to share this report and call-to-action with others that you think would benefit from engaging in this initiative – whether financial institutions or others shaping the ecosystem, from civil society to policy, innovators and businesses.

By paving the way towards a just and regenerative future, we can redefine what a future-fit protein system is and begin modelling the way for the wider, global protein system.

Join us in shaping and progressing the initiative by getting in touch with Roberta Iley (r.iley@forumforthefuture.org) and Sumi Dhanarajan (s.dhanarajan@forumforthefuture.org).

Appendix 1: Further Inquiry Questions

As part of our workshops and interviews in developing this initial Call for Action, participants raised a number of important additional questions that will be crucial to explore as part of the inquiry process.

How can we better understand critical challenges in the current regional protein landscape?

- How are protein entrepreneurs and actors experiencing the COVID pandemic? In what ways might it be enabling or disabling this shift to a just and regenerative protein system?
- Where is Intellectual Property enabling or preventing this transition to a just and regenerative protein system? How might its role need to shift?
- Land and tenure insecurity and other governance issues are a key barrier to achieving some of these shifts - who is best placed to tackle these issues? What is the role of financial institutions here, beyond small loans?

What are other considerations in shifting the goal to a just and regenerative protein system?

- Technology can play an important role, but what does that look like in a way that supports a just and regenerative protein system instead of entrenching the status quo?
- Does a just and regenerative system involve the localisation of diets and supply chains and what room is there for globalised food supply chains?
- Many of the existing visions for the future are focused on rural production areas. What does a just and regenerative system look like for urban centres?
- How does circularity in the food system relate to this wider vision of a regenerative protein system?

What might the transition to this future look like?

- We need to move away from an 'efficiency first' mindset. That said, what needs to hold true for a more decentralised supply chain to still be effective, avoid wastage and to produce food at the scale needed while being just? Where is aggregation still valuable? How can financial models support this?
- What's the financial model for enabling existing culinary heritage and mixed farming systems to thrive, rather than novel approaches and products?
- How do we avoid a scenario where aspects of this vision for the future are co-opted by the current system, rather than part of a deeper shift to a just and regenerative protein system? (E.g. a bit more agrobiodiversity being built into existing large-scale cropping systems)
- What are the likely transition impacts for society, for example a changing food production structure on communities living in proximity to current farms and manufacturing facilities? How can we manage those?

What is the role of financial actors and institutions in getting us there?

- In view of the paucity of data, how can we go a level deeper in understanding the current finance landscape for protein solutions in the region?
- What potential is there for stranded assets in the current protein system?
- Where might or where might not be financial actors be a lever for change in Southeast Asia?

- What assets do you need if you want a just and regenerative system and how might that be financed?
- What might be the role of insurance companies and banks (i.e. in areas such as fiduciary duty, sector policies for food and agriculture, company valuation, aggregation etc.)?
- Given limitations in ESG metrics, how might capital flows better differentiate between sustainable and unsustainable practices?
- Given that the VC space is relatively young and more firms are generalists in the region, how might thematic investments into the environmental and social aspects of protein be further promoted?
- How might the investment horizon for protein innovation need to shift to enable a more future-fit investment cycle? What are the levers and barriers in getting us there?
- There are already a number of current funding gaps that create bottlenecks across the supply chain. What range of funding approaches and investment vehicles will be needed to support the transition?
- Most protein-related innovations are supported by venture capital, which by design focuses on early stages of innovation. What happens when they mature and need broader funding? Are large institutional investors or pension funds equipped to bridge the gap?
- Smallholders might be at the core of the current food system but it is currently very hard for financial actors to support that segment. What new models and mechanisms might be needed going forward?

What might be the role of other actors in the protein ecosystem and how might financial actors work with them to create change?

- What's the role of governments in supporting and incentivising these changes and where are we already seeing this in Southeast Asia? (i.e. equitable distribution of protein, shifting harmful subsidy structures, open-access R&D)?
- Where and amongst which actors does trust and mutual reciprocity need to be most critically earned and built to enable a transition?
- What might the role of the smallholder farmer be vis-a-vis big corporate players?
- What might be the role of large meat, dairy and food companies which are seen to have vested interests limiting their willingness and ability to participate in the transition? How might we discern genuine willingness to engage?
- Many agree that civil society has a major role to play (i.e. demanding transparency, consumer behaviours, foregrounding affordability). Yet, there are increasing civil liberty restrictions and a disconnect between civil society voices and primary decision makers (governments, financial actors) in the region. How might this divide be bridged? How can civil society voices be listened to, such that they inform the future protein system?

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