Plant-based and solar protein: Is it really a new era of alternative diets?

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Agenda

1. **Introduction**
    - The importance of new protein alternatives
    - The demand for meat and fish
    - Meat alternatives
2. **Our horizon scanning methodology**
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    - **Step-2:** Market dynamics
    - **Step-3:** Market analysis
3. **Solar protein as the new meat alternative**
4. **Summary and take away points**

Why are new protein alternatives important?

Proteins are crucial to human dietary needs

The nutritional value of a protein is measured by the quantity of essential amino acids it contains.

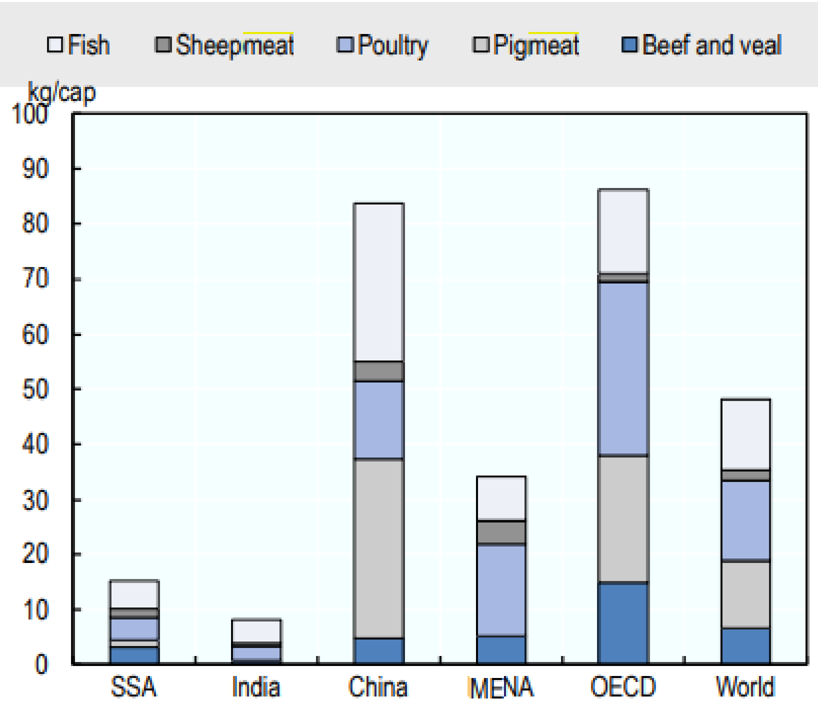
Each of these different sources contain different amounts of essential amino acids:

- Animal products
- Soy products, quinoa and the seed of a leafy green called amaranth
- Plant proteins

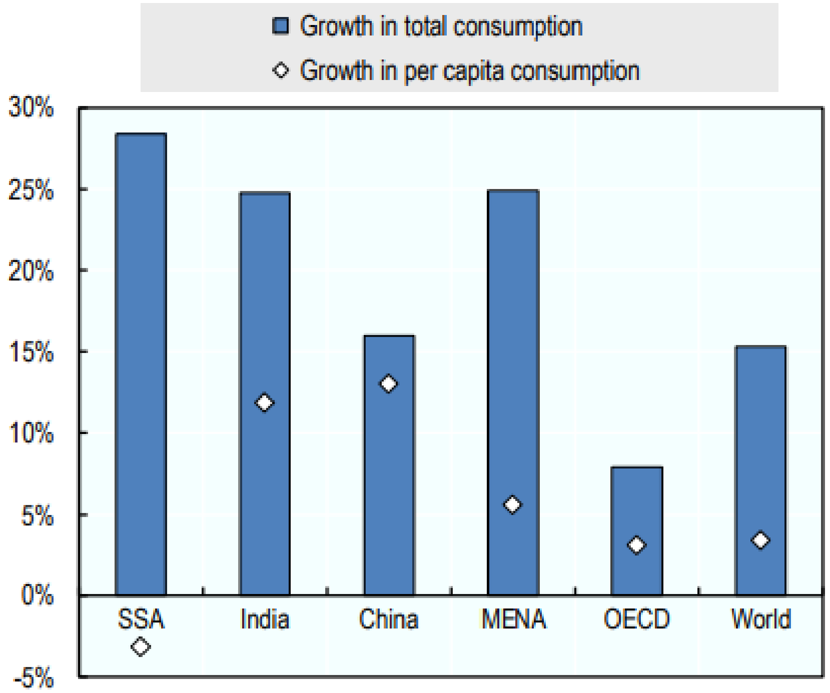
The demand for meat and fish is continuously rising

- Meat market will expand 15% by 2027
- Global demand for meat-based proteins is projected to double by 2050, dominantly in developing countries

(a) Per capita food consumption of meat and fish, by region and commodity, 2027



(b) Growth rates of per capita and total meat and fish consumption over the outlook period



Source: [OECD-FAO Agricultural Outlook 2018–2027](); [FAO's Animal Production and Health Division: Meat & Meat Products]()

What are the proposed alternative solutions?

There are five known alternatives

1) Plant-based foods
2) Insects
3) Edible algae
4) Culture-based protein
5) Solar protein

Reference: Tso et al. (2021) A Critical Appraisal of the Evidence Supporting Consumer Motivations for Alternative Proteins

Our horizon scanning process

A bespoke tool that empowers your team and provides clarity to internal stakeholders

Our horizon scanning process provides an auditable rationale that can be easily communicated to key stakeholders. Allowing you and your team to focus on changes most likely to significantly disrupt your business.

Step 1: Risk assessment

Risk assessment focussed on patterns, awareness and international connections

- Published regulation
- Government/ authority agenda
- International profile
- Industry status

Step 2: Market dynamics

Mapping the culture and influencers of regulatory change

- Associations
- Academics
- Authorities
- NGOs/ pressure groups

Step 3: Market analysis

Accessing the critical information

- Secondary horizon scanning
- Primary horizon scanning

Step 4: Recommendations

Tactical action plan to ensure compliance now and in the future

- **Compliance recommendations**
- **Influential connections**
- **Ongoing monitoring action plan**
- **Advocacy strategy**

To keep up to date their business strategies industry players must monitor and understand ever shifting regulatory trends and market dynamics

Step 1: Risk assessment

Strategies for plant-based meat alternatives around the world

A shift in National Dietary Guidelines

Herforth A. et al. (2019)

Half of all countries with protein messages included a quantitative message

The most common themes about protein:

- use of the term “lean meat” or suggesting removing fat from meat (34%);
- a positive message about consuming fish (27%);
- limiting or moderating meat consumption (23%).

Canada revised its Dietary Guidelines in 2019 with a specific emphasise on a shift towards a more ‘plant-based’ diet.

More plant-based nutrient sources

Less red and processed meat

Reference: A Global Review of Food-Based Dietary Guidelines. Herforth A. et al. (2019)

United Nations: 2021, a year to reconfigure the food system

Dietary habits are changing

Therefore,
- Gain insight
- Capture opportunities

References: Food system impacts on biodiversity loss | Chatham House – International Affairs Think Tank

National approaches are not harmonised

To stay in the game and be abreast of ever shifting policy changes industry players must monitor and understand evolving global trends and market dynamics

References: f2f_action-plan_2020_strategy-info_en.pdf (europa.eu); https://ec.europa.eu/info/system/files/sante_sp_2020_2024_en.pdf

National approaches are not harmonised

To address the challenges associated with today's protein production systems, regional and global innovation ecosystems and national approaches are critical.

Product developers should be aware of these divergences as well as authority positions.

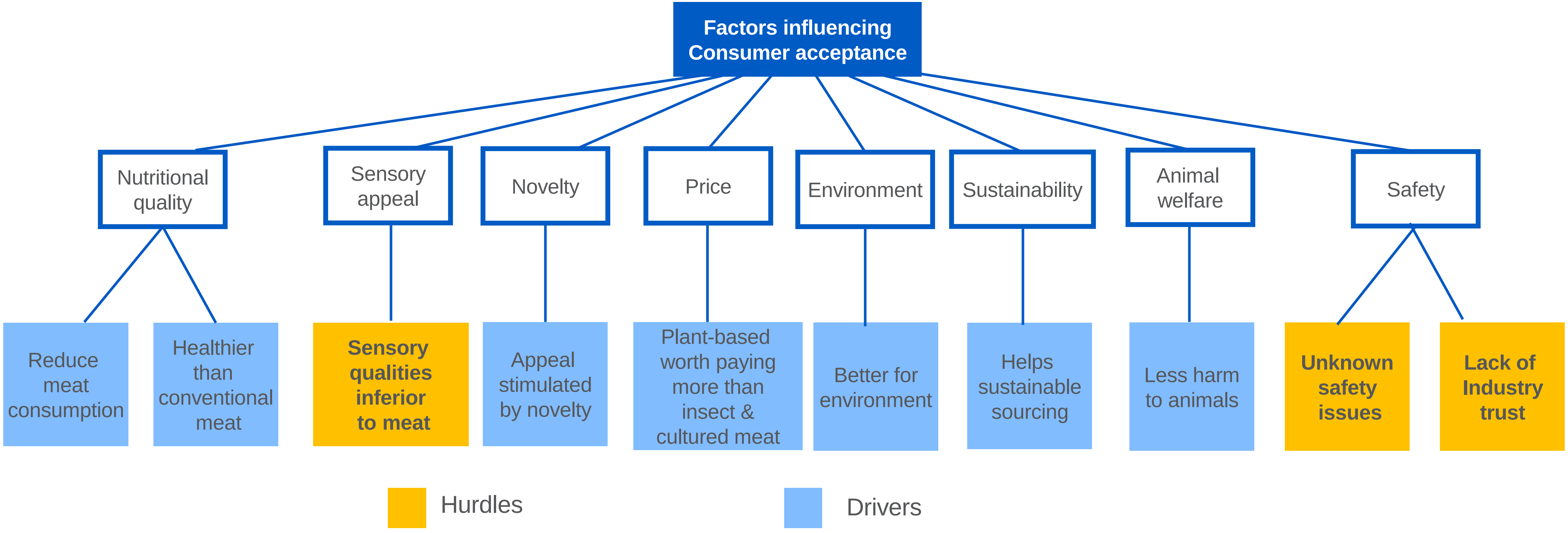
References: Future of Protein initiative of the World Economic Forum; [Chinese Dietary Guidelines Scientific Research Report]

Step 2: Market dynamics

Considering consumer perception when designing policy

Consumer acceptance plays critical role in policy design. Industry should also be aware of dynamics playing role in consumer perception while advocating for policy changes

Consumer acceptance for newer alternatives is not universal



References: Figure replicated from Tso et al. (2021) A Critical Appraisal of the Evidence Supporting Consumer Motivations for Alternative Proteins.

Bryant, et al. (2019). A Survey of Consumer Perceptions of Plant-Based and Clean Meat in the USA, India, and China;

Hoek, et al., (2011) Replacement of meat by meat substitutes. A survey on person-and product-related factors in consumer acceptance;

Vanhonacker et al., (2013) Flemish consumer attitudes towards more sustainable food choices.

Meat alternatives were viewed more negatively when compared with meat

Meat alternatives have the best chance of successfully replacing meat

They closely resemble highly processed meat products in taste and texture, and are offered at competitive prices

Results

- Meat is associated with many positive attributes, such as "delicious," "food," and "steak"
- Associations to meat alternatives: "tofu" (136 times), "vegan"(33 times) and "disgust" (29 times)
- Females associated meat more often with concerns related to animal welfare & environment
- Men mainly associated meat with positive, hedonic aspects of meat consumption

Participant profile

Characteristics		Omnivores (N = 764)	Flexitarians (N = 203)
Sex			
	Female	344 (45.0%)	138 (68.0%)
	Male	420 (55.0%)	65 (32.0%)
Mean age	(years)	46	45
Education			
	No (completed) educational attainment	0	1 (0.5%)
	Primary and secondary school	107 (14.0%)	22 (10.8%)
	High school	277 (36.3%)	57 (28.1%)
	Higher education entrance qualification	214 (28.0%)	63 (31.0%)
	University degree	166 (21.7%)	60 (29.6%)

Reference: Michel F.et al. (2021) Consumers' associations, perceptions and acceptance of meat and plant-based meat alternatives

Consumers' perception and opinion on replacing meat with other alternatives are heterogenous and varies from market to market

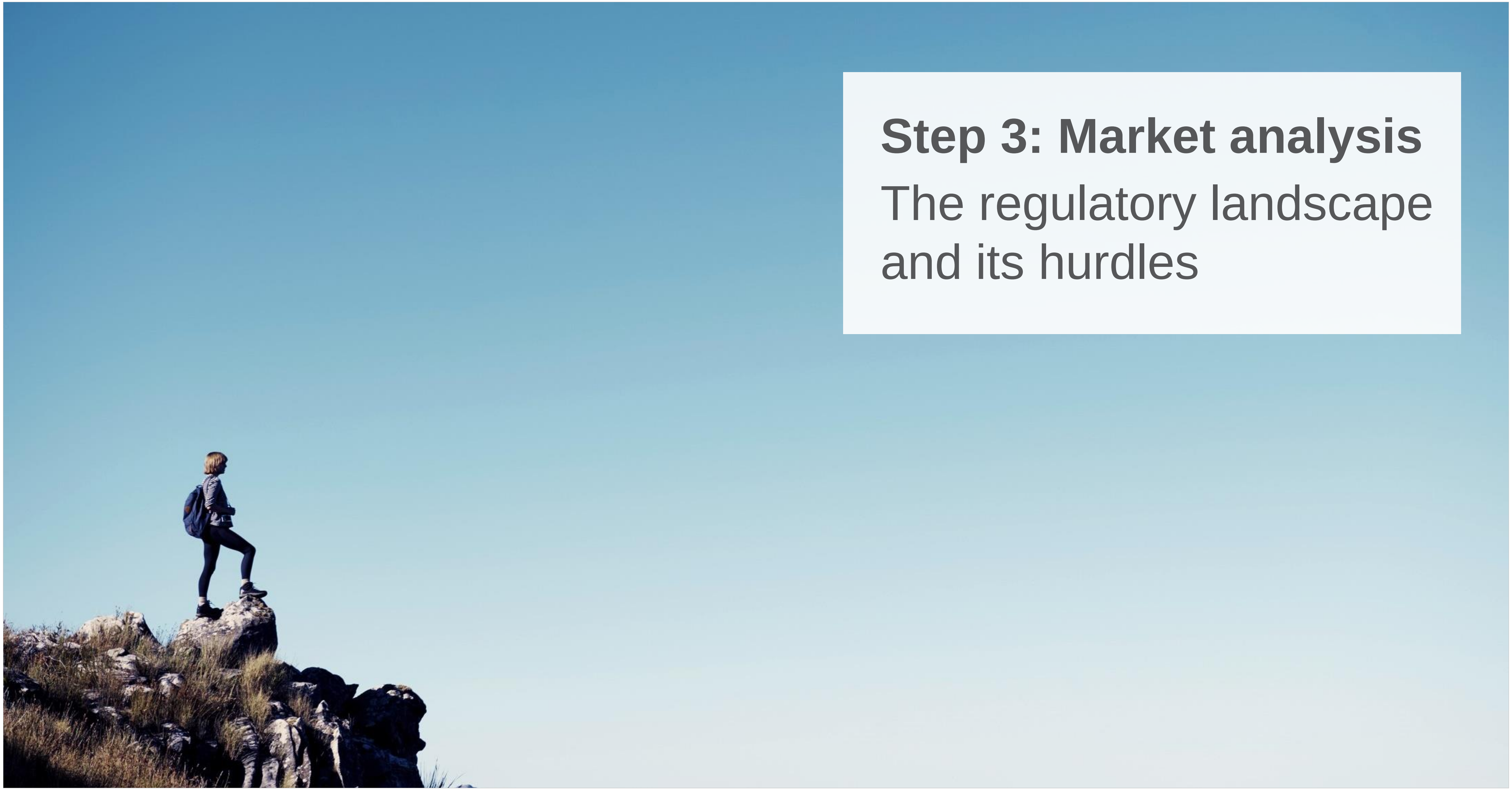
Bryant, C et al. (2019) – Consumer perceptions of plant-based and 'clean meat' in USA, China and India

- Urban, well-educated and high income consumers in India and China are more likely to purchase plant-based meat and cultured meat with compared to consumers in the USA
- India and China presents high-value opportunities for manufacturers of plant-based meat alternatives

Onwezen et al., 2021 – Review of consumer acceptance of plant-based meat alternatives

- Consumer acceptance varies considerably across the types of the alternatives
- Acceptance of meat alternatives: plant-based proteins are superior; insect are the least; cultured meat the second least popular
- Common drivers: taste, health, familiarity, attitudes, food neophobia and social norms

References: Bryant, C et al. (2019) A Survey of Consumer Perceptions of Plant-Based and Clean Meat in the USA, India, and China.
Onwezen M.C., et al. (2021) A systematic review on consumer acceptance of alternative proteins: Pulses, algae, insects, plant-based meat alternatives, and cultured meat.



Step 3: Market analysis

The regulatory landscape and its hurdles

The regulatory landscape for labelling and marketing plant-based meat alternatives is not harmonized and is ever evolving
The industry must be aware of ever shifting regulatory dynamics

US: On-going policy battle at the federal and state level

The Standard for the labelling of plant-based meat alternatives vs Real Marketing Edible Artificials Truthfully Act of 2019

Standard – allows the use of ‘*plant-based*,’ ‘*vegan*,’ ‘*meatless*’, ‘*meat-free*’, ‘ ‘*vegetarian*’, ‘*veggie*’ ‘*made from plants’.*

The Real Meats Act – defines ‘beef’ and ‘beef products’ on labels and requires the use of ‘*imitation*’ terminology on labels for plant-based meat alternatives.

EU: Unharmonised interpretations among Member States

Important unresolved and un-harmonised issues:

- **Non-vegetarian/Vegetarian/Vegan** definitions
- **Veggie Burger Ban**
- **Plant-based** definition

EU: Upcoming policy changes to speed up the transition from animal-based to plant-based

For transition from meat protein to plant-based alternatives within the industry and amongst consumers further policy changes are on their way:

- EU Parliament – Farm to Fork Strategy proposed to reduce VAT tariffs on organic fruit and vegetables to zero percent
- True Animal Protein Price Coalition proposed a higher VAT on meat
- UK is welcoming possible implementation of a carbon tax on meat and dairy in the UK
- In November 2021, COP26 climate summit will discuss carbon tax

Will solar foods be a game changer?

What is solar protein (solein)?

The technology uses electricity to produce hydrogen which is combined with carbon dioxide that is extracted from the atmosphere, water, vitamins and minerals to feed and grow a microbial biomass that can be used as edible protein. This protein is called **solein**.

Solein is defined as a **vegan single cell protein**

The finished product contains approximately:

- 65 % protein,
- 20–25 % carbohydrates and
- 5–10 % fats
- Small amounts of essential chemical elements, such as nitrogen, phosphorus & potassium

Advantages of solein

The company claims that the product will:

- Reduce agricultural nutrient pollution and subsequent water supply problems
- Require minimal land for production
- The land efficiency will be approximately 20,000 times greater than for conventional farming
- Be cheaper than animal protein
- Taste better with compared to plant-based meat and other protein substitutes such as pea protein and hemp

What is next?

Summary

Take away points

- Demand for meat is increasing
- Global policy strategies are evolving to enhance plant-based protein consumption and transition from animal-based protein
- Consumer perception is one of the pillars of the policy design
- Globally regulations related to plant-based proteins are not harmonised
- When using new protein alternatives businesses need to consider all of these complications in addition to authorising the use of the technology

Questions

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