



Netherlands Enterprise Agency

# Novel foods

ecosystem in  
the Netherlands  
and synergy with  
Singapore



RVO.nl, October 2023

Contact:

Thaïsa Pessanha (thaïsa.pessanha@rvo.nl)

Maaïke van den Berg (maaïke.vandenberg@rvo.nl)



## Content

This document comprises a desktop study exploring potential collaboration opportunities between Singapore and the Netherlands for enhancing the protein transition, specifically within the realm of novel foods. First, this report gives an introduction, outlining the purpose of the study. Next, it illustrated the bottlenecks and strengths of the Dutch ecosystem of novel foods. Subsequently, it elaborates on what the Netherlands can learn from Singapore, concluding on possibilities for cross-boundary collaborations.

1. Introduction
2. Current bottlenecks in the Dutch ecosystem
3. Strengths of the Dutch ecosystem- and strengths that can be further developed
4. Lessons from Singapore
5. The way forward: what are opportunities for collaborations between the Netherlands and Singapore?

List of abbreviations:

EFSA	European Food Safety Authority
EU	European Union
NFIA	Netherlands Foreign Investment Agency
NVWA	Netherlands Food & Consumer Product Safety Authority
SFA	Singapore Food Agency

## 1. Introduction

Over 250 companies, as well as public and not-for-profit stakeholders in the Netherlands, are working on the protein shift, creating alternative protein solutions with global impact. These alternative proteins are protein-rich sources, ingredients, intermediates, or final products that can be applied as variations on meat, dairy, fish and eggs. The three main sources are categorized as follows (for human consumption only) [ref 1]:

1. Proteins grown on land or in the sea, including plant-based proteins (beans, pulses, nuts, grains) and seaweed;
2. Proteins produced with the help of microbials, fungi (mycoprotein), algae, and/or cellular agriculture (cultured meat and dairy);
3. Insect-based proteins.

Compared to traditional meat and dairy products, alternative proteins have, in general, less negative impacts on the environment and therefore, they can tackle climate change effects in a growing global food system. The market of alternative protein production is rapidly expanding. It is estimated to reach USD 140 billion dollars until 2030, which is equivalent to 10% of the world's USD 1.4 trillion global meat sector [ref 2].

The Netherlands has accomplished great achievements in pioneering the production of alternative proteins. In July 2023, the Netherlands became the first country in the EU that allowed to test cultivated meat [ref 3]. The experience from a longstanding dairy market with extensive knowledge and technology provides a backbone for the development of alternative proteins. Knowledge advancements via pioneering universities is an additional attribute which contributes to a remarkable ecosystem of alternative proteins, as well as emerging business coalitions in this subject. Nonetheless, the Netherlands can learn from other pioneering countries on how to boost its novel food ecosystem to the next level.

One of the main pioneers in the novel food industry is Singapore. The country has a strong ambition, which contributes to a successful management of the protein transition.

This is realized by continuous interest from the government in learning with and from businesses, knowledge institutions and organizations, as well as by improving its regulatory system for novel foods. Reaching this step required vision and willingness to collaborate and providing the proper financial incentives.

Although these conditions also exist in the Netherlands, there are lessons to be learned from Singapore which can help further develop the alternative protein ecosystem in the Dutch context. For this reason, the Agricultural Advisor of the Dutch Embassy in Singapore has asked RVO to conduct a desktop study on opportunities for cooperation between Singapore and the Netherlands in accelerating the protein transition, with a focus on novel foods. The main aim of the study is to gain insight into **how the Dutch ecosystem in the field of alternative proteins can be better organized to accelerate the protein transition and not lose the Netherlands' position as a 'gateway' to Europe.**

In this report, the following sub-questions will be answered:

- What are the current bottlenecks in the Dutch ecosystem?
- What are the biggest strengths of the Dutch Ecosystem and strengths-to-be?
- What can The Netherlands learn from Singapore's best practices?
- What is the way forward for cooperation between The Netherlands and Singapore?

### **Notes:**

- Despite its relevance for the development of novel foods in the Netherlands, the EU-regulatory framework is not the focus of this study. The reason is the limited influence of the Netherlands on EU-regulatory adjustments. Throughout this report, however, EU-regulations are still mentioned as they were often brought up during the interviews.
- For this study, multiple interviews were realized with companies and organizations involved with the protein transition in Singapore and in the Netherlands. A literature study was also performed on the context of novel foods in both countries. The information in this report is, therefore, originated from the interviews, except when a source is indicated.

A list of the interviewed parties is given below:

- Revyve;
- Meatable;
- Sophie's BioNutrients;
- Mosa Meat;
- Kind Earth Tech;
- Good Food Institute Asia-Pacific;
- Netherlands Foreign Investment Agency.



Image source: SFA [\[link\]](#)



## 2. Current bottlenecks in the Dutch ecosystem

The key bottlenecks identified in this study for the ecosystem of novel food in the Netherlands are given below:

### 2.1. EU regulations

- Strict EU-regulations: producers of cultivated meat must first apply for a permit to market their product. They must go through the so-called '**novel food process**' of the European Food Safety Authority (EFSA), which **usually takes at least a year and a half**. This is only possible after the meat has been perfected in taste and structure after multiple tastings;
- Compared to other pioneering countries, the EU is lagging. Singapore is a testing market for cultivated meat, among other novel food techniques. The United States now has 2 companies which are permitted to produce and sell cultivated meat in the country. **The obstacles for the Netherlands are the fact that cultivated meat is not yet allowed in the EU, the admission process takes long and, consequently, successful Dutch producers move their business abroad.** This can also provide an additional incentive for innovation: companies can learn from this experience and join forces on hybrid business: combining technologies and methods results in tastier, safer and healthier food being created for consumers. An example is cellular meat with tasteful cultivated fat and the meat structure of mycelium. Facilitating investments and the permitting licensing for novel foods could stimulate further collaborations;
- Although EU-regulations are an obstacle, changes are slowly happening. As an example, in 2022, the EU changed the classification of a particular micro-algae to non-novel food. This means that these species are no longer 'strange' in the market and are more accepted and integrated in the ecosystem of alternative proteins. This is promising because, in a future scenario, lab-created meat can also become classified as non-novel foods. However, if different dosages of these algae are to be used as ingredients, the consultation with the European Food Safety Authority (EFSA) must re-start, which takes a long

time up to the moment the new product is approved and can be available in the market. This means that the **long bureaucratic process for approval of new products or partially new products is an obstacle for further improvement of a novel food composition for the benefit of the end consumer;**

- The extreme bureaucracy in the EU-regulatory framework and restricted financing in the Netherlands put a 'brake' on innovation and development of startups. In the Netherlands, there is support for startups at early stages. However, these face a challenge when they start the process of licensing, testing products and upscaling the production. Therefore, **many startups move abroad, such as to Singapore or to the United States.** This is often the case with companies involved with biotech or with precision fermentation. In this process, startups take their technological hub and R&D overseas for being able to further develop their product. Only at a later stage, when the product is consolidated and successfully upscaled, their market is extended to Europe. This means that the Netherlands has all the ingredients for being a 'cocoon' for startups, but the regulatory framework from the EU and the limited CAPEX-investments on startups force these businesses to move away for reaching success;
- Lastly, besides the EU, the Dutch regulation from the **NVWA** (Netherlands Food and Consumer Product Safety Authority) **can also delay research activities.** Since cultivated meat development is not yet included in the food category but rather in the laboratory animal category, acquiring permission from NVWA to obtain animals cells for meat development is a complicated procedure.

## 2.2. Access to finance and an unlevelled playing field

- Overall (not necessarily only in the Netherlands), a challenge in novel food development is small companies having to **'fight' major players** in the novel food market, making it an **unlevelled playing field**. The big companies have an efficient supply chain which is a major disadvantage to small companies. Competitiveness is difficult when value vs. cost is not paired. Big companies find ways, year after year, to make their products cheaper whereas the start-ups have problems growing further from the incubation phase;
- The level playing field is also visible in the broader market if we take the overall protein market into account. The subsidy that is currently available to novel food businesses in the Netherlands focuses on partially reducing its production costs and therefore prices of products. However, this **subsidy is very small compared to the funding and subsidies available for the production of traditional meat**. In addition, the costs for producing cultivated meat are still very high, and the subsidy provided cannot cover the gap between traditional meat prices and novel-food prices. When these costs are reduced and production can be upscaled, prices will reduce for the end consumer. There is, therefore, not yet a level playing field for novel foods in the market as there is a competition and scale disadvantage;
- The **taxation system can also be adjusted to the advantage of novel foods** and, most importantly, to healthy foods in general. For instance, many big producers of sugary foods pay less taxes, which illustrates the playing field for healthy foods is not leveled. An example from an interview states that the Dutch government can start by giving example where education begins, such as making fruits and vegetables free in schools and banning unhealthy snacks. Novel foods can here be introduced to children in the spectrum of sustainable and healthy foods;
- Looking at access to finance from a worldwide perspective, in the past 5 to 6 years, many changes took place regarding the development of novel food start-ups. However, since end of 2022, developments have reduced due to more **hesitation**

**from investors and funding possibilities.** This is an outcome from the Ukraine-Russia war and emerging economic uncertainty. Major banks, such as SVP (Silicon Valley Bank), invested in several startups and later went bankrupt. Many startups are (in) directly connected to the Swiss Bank, which almost collapsed. Overall, Investment risk is high at the moment which, in turn, might create a hesitance towards investments in new sectors. This situation could hold back the production of new proteins. One alternative for the Dutch government would be considering breaching the gap of funding and supporting banks on making their choice of what to invest in;

- Specifically for access to finance in the Netherlands, the Dutch government made a grant of EUR 60 million available in October 2022, which is promising for the future as a catalyst in the development of novel foods. However, **attention should be given to grants and subsidies being (more) accessible to, specifically, startups**. This is because of the pre-requisite of high level of financial capital and capacity for companies to apply for subsidies (a 'package' start-ups, initially, not necessarily have). In addition, the grant is not yet accessible to all categories of novel foods, an aspect which can be improved;
- Looking at international businesses, it is perceived that **international entrepreneurs have difficulty in obtaining investment from the Dutch government** and therefore look for private investors. A suggestion given by interviewees is policy adjustments for making such investments more easily accessible for international businesses in the wide range of novel foods (micro-algae, cell-based, among others). In addition, a clarification of all the different parties within the Dutch government that are engaging in the novel food sector and which can provide support to (inter)national companies would be helpful, since businesses find it difficult to figure out who to engage with;
- Another obstacle related to the investment climate is that **the Netherlands has relatively high-income taxes** (much higher than Singapore, for instance). This constitutes a significant obstacle for emerging startups.

### 2.3. Lack of infrastructure for upscaling

- Besides access to finance being an obstacle for smaller companies, a **lack of infrastructure and CAPEX-investment in production facilities is an additional hurdle**. In the Netherlands, startups receive more investments for R&D and technology, however relatively little for setting up factories. This becomes a limiting factor in the upscaling of their production. Small companies do not have sufficient capital to invest in factories for large scale production. An example from the interviews illustrates this: food brands may be willing to collaborate with small producers of novel ingredients; however, these often face the issue of not being able to produce the quantities required due to a lack of production facilities. In addition, startups often compete with large scale manufacturers, which compromises their competitiveness in the novel food market since they can't compete with the scale advantage of larger companies. This lack of infrastructure for scaling up is a potential spoiler for future growth of startups.



Image source: Invest In Holland [\[link\]](#)

### 2.4. Limited consumer uptake and consequently low demand

- Plant-based options have significantly developed in the past years. This is noticeable, for instance, in the supermarket, where a large variety of vegetarian burgers and alternative protein is available. However, **meat consumption in the Netherlands remains relatively high** and is not decreasing at the moment *[ref 4]*. Conversely, compared to the rest of EU, Dutch consumers eat more meat substitutes than other countries, which provides opportunities for the future when the market is able to increase *[ref 8 - ProVeg, 2021]*;
- The playing field level must be improved for novel food products, which receive less subsidies than traditional agricultural products. The playing field can also be more truthful by **providing consumers with accurate information about sustainability and by enhancing the marketing of products in line with genuine sustainability claims**;
- The Nutrition Center (Voedingscentrum) in the Netherlands can be more truthful when advising the population on what healthy foods are. This institution has much influence and a broad outreach to consumers. An interviewee suggested that the Center can make use of its platform to **promote more sustainable and conscious food consumption**.

On the following page, image 1 illustrates the bottlenecks for the ecosystem of novel foods in the Netherlands, as described above:

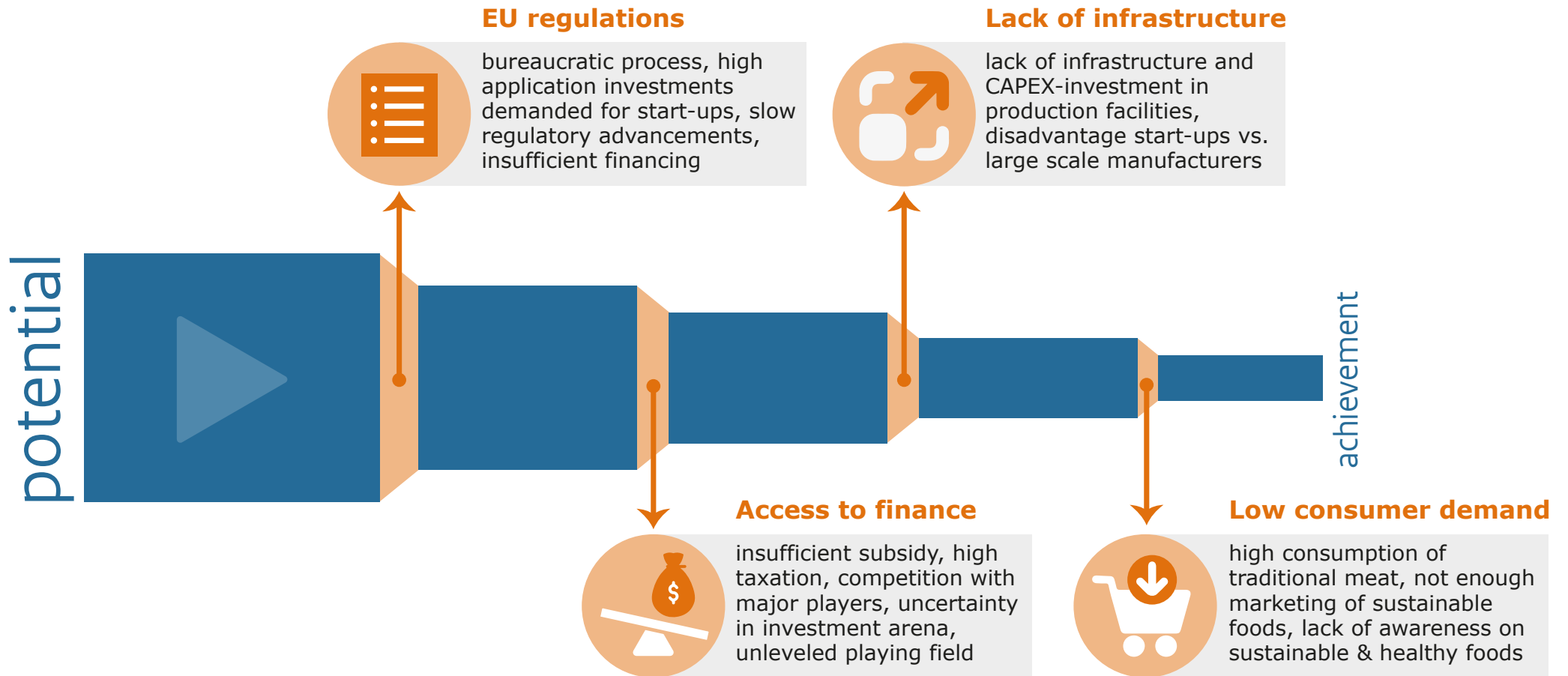


Image 01 – bottlenecks in the ecosystem of novel foods in the Netherlands



### 3. Strengths of the Dutch ecosystem- and strengths that can be further developed

The Netherlands is internationally known for its leading position in bioscience, food technology and food production system. The two main ingredients for developing new ideas (knowledge and technology) are present, as well as financial incentives and support from the government. However, these strengths can be increased further, for which recommendations made by practitioners within the sector have been included.

#### 3.1. Leading actor in dairy production

- The Netherlands is the largest protein producer in the world and has decades of experience with developing and optimizing dairy systems. This consists of a very strong backbone of protein development. The Dutch skillset includes protein production, processing, innovation and logistics, allowing the Netherlands to stimulate the shift towards a restored balance between animal- and alternative proteins. Companies well known, both nationally and internationally, are diversifying their production to include both dairy and plant-based products, such as Friesland Campina;
- The position of the Netherlands as second agricultural exporter in the world, also puts the country in the center of the EU-market regarding new protein technologies. The infrastructure, knowledge, human capital and global network built in the meat, dairy and fish sectors can be used and repurposed for future protein solutions. Besides the dairy-specific infrastructure, the following aspects make The Netherlands an interesting country to invest in the alternative protein sector:
  - available trade and infrastructure connectivity (port, railroads);
  - business culture (looking for a common solution in the 'poldermodel');
  - partnerships between public and private actors as well as start-ups and corporates.

- Examples of collaborative clusters in The Netherlands are Cellular Agriculture Netherlands, Cellular Agriculture Europe, Foodvalley NL, The Protein Community (TPC) and Protein Port [ref 8];
- Several international companies have collaborated with Dutch stakeholders or have settled in the Netherlands with production facilities or offices:
  - Beyond Meat (United States) selected the Netherlands in 2020 to open its first co-manufacturing facility in Enschede;
  - ENOUGH (a subsidiary of the Scottish 3FBIO) invested 42 million euros in a factory in Zeeland;
  - Meatless Farm (UK) collaborated with Van Loon Group to set up their factory in Almere;
  - Oatly (Sweden) selected the Netherlands as their first location outside of Sweden for a production facility in Vlissingen;
  - Proeon (India) chose the Netherlands as the location for their new research lab in Delft;
  - Redefine Meat (Israel) opened its factory in the Netherlands to print 3D plant-based meat for EMEA in Best;
  - Sophie's BioNutrients (Singapore) expanded to the Netherlands (Amsterdam). The company produces a pure protein flour from microalgae (fed off with food waste), used for any food application.
- The presence of these well-known companies in The Netherlands showcase how the position of leader in agricultural production can also contribute to the changing food system and a balance between traditional meat and dairy and plant-based alternatives.



Image source: UNSW Sydney [\[link\]](#)

### 3.2. Research institutions

Part of The Netherlands' leading position in agriculture derives from research on food safety and food technology, as well as on production strategies and consumer behavior. The Netherlands has multiple leading universities and research institutions involved with food technology and innovating alternative proteins. This also makes The Netherlands an interesting country for foreign companies to invest in, since there is a high-skilled workforce as well as a link between research and private sector through private research institutions. The Netherlands is known as a highly innovative country and ranks among the top 5 of global leaders in innovation *[ref 8 - Global Innovation Index, 2022]*.

Below are the universities & research institutions indicated *[ref 5]*:

- Wageningen University & Research (WUR): this Dutch university has a strong R&D department and research institutes specialized in plant-based alternatives, organic farming and recombinant proteins based on fungi, bacteria and yeast. WUR focuses on the whole value chain including research and development into plant breeding, food processing, policy, and consumer behavior;
- Maastricht University has a research focus on genetics and cell biology. The combination of genetic and cell biological approaches allows for synergy in functional understanding of genetic variations and rapid application of new knowledge into clinical practice. Maastricht University works closely together with Brightlands Greenport Campus Venlo, an open innovation community with over 30.000 innovative entrepreneurs, researchers and students working on healthy and safe nutrition, future farming and biocircular economy;
- Delft University of Technology is the oldest and largest Dutch technical university, with for example the Department of Biotechnology including the following research sections: biocatalysis, industrial microbiology and bioprocess engineering;
- The Biotech Campus Delft is the largest innovation campus in Europe focused on biotechnology, boosting the transition to a sustainable, bio-based economy;

- NIZO: research organization active in developing innovations in the sustainable food sector. Main areas of expertise are: applied protein technology, with a focus on plant-based proteins;
- Louis Bolk Institute: research institute on plant-based proteins;
- Delphy: consultancy involved with crop cultivation and sustainable production of food proteins;
- Utrecht University: this university takes part in a costumer study on the acceptance and expectations for alternative proteins and on the innovations behind the protein transition;
- Protein Competence Center (PCC): this center is a platform for connecting knowledge and research institutes with companies in the field of food proteins. In doing so, it has gained extensive technical and scientific knowledge on the topic;
- KeyGene: this Dutch molecular genetics R&D company is focused on innovation and pioneering technologies amongst which cell & tissue design and genomic breeding;
- Triskelion: this research entity provides a wide range of assessments on food quality and composition;
- Sustainable Food Initiative: this network organization focuses on sustainable food production and consumers' conscious consumption. They also consist of a platform for knowledge exchange and promoting awareness.

### ***What can be improved?***

The interviews informed that, although there are multiple leading knowledge institutions, support is needed for their entrepreneurship. Often students and academics have good ideas for starting businesses. However, they lack sufficient assistance and leadership for these developments. By improving the entrepreneurship of universities (and graduates) with proper guidance and advice, more startups are encouraged and the Dutch ecosystem of novel foods can be invigorated.

### **3.3. Financial incentives**

- Impact investors play a significant role for the development of startups in the novel food sector. These investors finance initiatives aimed at achieving positive social and environmental effects while generating financial returns. Sustainability and innovation are key features these investors look for in companies. One example in the Netherlands is the impact investor Invest-NL. With AgriFood as one of its focuses, Invest-NL supports startups working on the development of sustainable alternative protein sources [ref 6]. Business can acquire a funding ranging from EUR 5mi – EUR 50mi if complying to the requirements. Other examples are the European Investment Fund (EIF) and the EIT Food Impact Fund (co-founded by the EU), which provide financial support to entrepreneurs and startups in agrifood across the different development stages (launching, acceleration and upscaling) [ref 6];
- Aside from impact investors, grants are also available for startups. In October 2022, the Dutch government confirmed the allocation of EUR 60 million grant to support cellular agriculture, a cutting-edge technology that enables the production of animal-based products, such as meat and milk proteins, directly from animal and microbial cells. A EUR 25 million additional package is expected for co-financing [ref 6]. From many interviews, this was mentioned as unique in The Netherlands compared to other countries.

***What can be improved?***

- As mentioned above in the paragraph on knowledge institutions needing an entrepreneurial mindset, there is a need to increase financial investments for startups created in universities. There are great ideas that are developed and kept to academics, since academics are most often not engaged in entrepreneurship. They have extensive knowledge, also on opportunities and risks, and can do much more if they receive the proper financial incentives for taking the ideas further than the research stage;
- More support to accelerators is needed. Accelerators are programs crafted to facilitate the rapid expansion of established startups, often offering financial support in return for an ownership stake in the company. Their support could refer to capital investment, business cases, legal advice, entrepreneurship advice (e.g., on how to pitch, communicate with customers and content development). There are different categories of accelerators available. Those tied to universities are more accessible and understanding of startups originated by students. At this moment, the biggest investments in the alternative protein sector are done in larger companies that have already proven their concept. These are also the companies which have the capacity and financial capital for applying to the funding made available by the Dutch government. A suggestion from the interviews was that entrepreneurs applying for a grant only pay the application fee after their idea or business has proven successful after 5 to 10 years. In such a way, the funds would become more accessible for smaller, innovative companies;
- In general, an argument from multiple interviewees is that investment (financial support) is needed for venture capital. Here, Invest-NL plays a role. However, more financial support is needed to bring the sector to the next level.

**3.4. Support from government**

The Netherlands government is supportive of the development of the alternative protein sector. The Ministry for Agriculture, Nature and Food Quality has developed a protein strategy in 2021 and there are multiple government agencies working actively on promoting the sector (such as RVO, NVWA, NFIA, InvestNL and the Ministries of Agriculture, Nature and Food Quality and Economic Affairs and Climate Policy). These agencies aim to strengthen the sector in The Netherlands by providing support to businesses and research institutes, as well as to attract more foreign companies to invest in Dutch companies or to establish presence in the Netherlands.

***What can be improved?***

- A much-heard argument from the interviewees was that The Netherlands is lacking ambition. Looking at Singapore, the government set up a strategic agenda and made clear what they wanted to achieve in the shorter and longer term. The Netherlands needs to take interest and set an ambition and vision for novel foods, create a strategy and a supportive ecosystem. One interviewed company shared that every 2 weeks they have contact with the Singapore Food Agency (SFA), which is never the case with the Dutch Food Safety Agency (NVWA);
- What is needed therefore is to articulate an ambition at the highest level. Agrifood is a very political topic in the Netherlands. The country produces much more meat than it consumes, so the traditional meat market is very export-oriented and there are many issues related to that. As a result, discussions become highly political. The Netherlands therefore needs to decide which role the country wants to play (as a major exporter of meat or a supporter in the transition towards sustainable food solutions);
- Not all stakeholders understand which government agency can support them with international collaborations

and what the division of roles and tasks is between the different government agencies capable of assisting in promoting the sector. The communication of this structure can be improved;

- A strong country marketing strategy can combine the two points above: formulate a strong ambition and make it well-known which agencies are available to help at which stage of the process, both in the Netherlands and abroad. According to an interviewee, the United States and Singapore are excelling as innovation hubs, but the Netherlands possesses an extensive amount of knowledge on novel foods and should showcase this more. There is a need for the Netherlands to sell the story behind the Dutch approach to novel foods better;
- The Dutch government can collaborate more with other stakeholders which are ahead in novel foods. These are, for instance, NGO's, universities, and startups, which are already united within the collaborative clusters such as the Cellular Agriculture Netherlands, Foodvalley NL and other collaborative clusters. These parties already play a role in informing the public, sharing knowledge and innovation. Thus, being in sync with initiatives on the ground instead of doing it yourself as a government brings more chance of success.

The four key strengths elaborated above provide a substantiation of a Dutch diamond approach to the ecosystem of novel foods in the Netherlands. The approach acknowledges the added value from the collaboration between four key groups of stakeholders in achieving sustainable food development: **government, private sector, consumers and knowledge institutions**. Their main roles are indicated, as following, for the context of novel foods in the Netherlands:



**Knowledge institutions** contribute with their expertise (especially in regard to plant-based new proteins and cultivated meat), and with their academic network worldwide;



**Government** provides a regulatory guidance and financial contributions (limited, has potential for improvement);



**Private sector** contributes with its longstanding experience with protein management (from dairy industry) and its technological advancements within alternative protein development. Additionally, investors play a key role in enabling start-ups to enter markets and upscale productions;



**Consumers** play a key role in approving quality of new food products and setting up the demand level of commercialization. In the Netherlands, an increasing number of customers are seeking healthier and more sustainable foods, which increased the interest on and acceptance of alternative proteins. The higher prices of these products on market shelves, are, however, a disadvantage novel foods still face.

These 4 groups of stakeholders comprise the needed capabilities for the Netherlands to make a change in its food ecosystem. They are, therefore, the pillars for making the protein transition succeed. As previously mentioned, more can be done for making the Netherlands a welcoming market for the settling in and upscaling of novel food start-ups. Image 2 illustrates the Dutch ecosystem of novel foods framed into the Diamond Approach:

# Dutch diamond approach to novel foods

*What can be improved?*

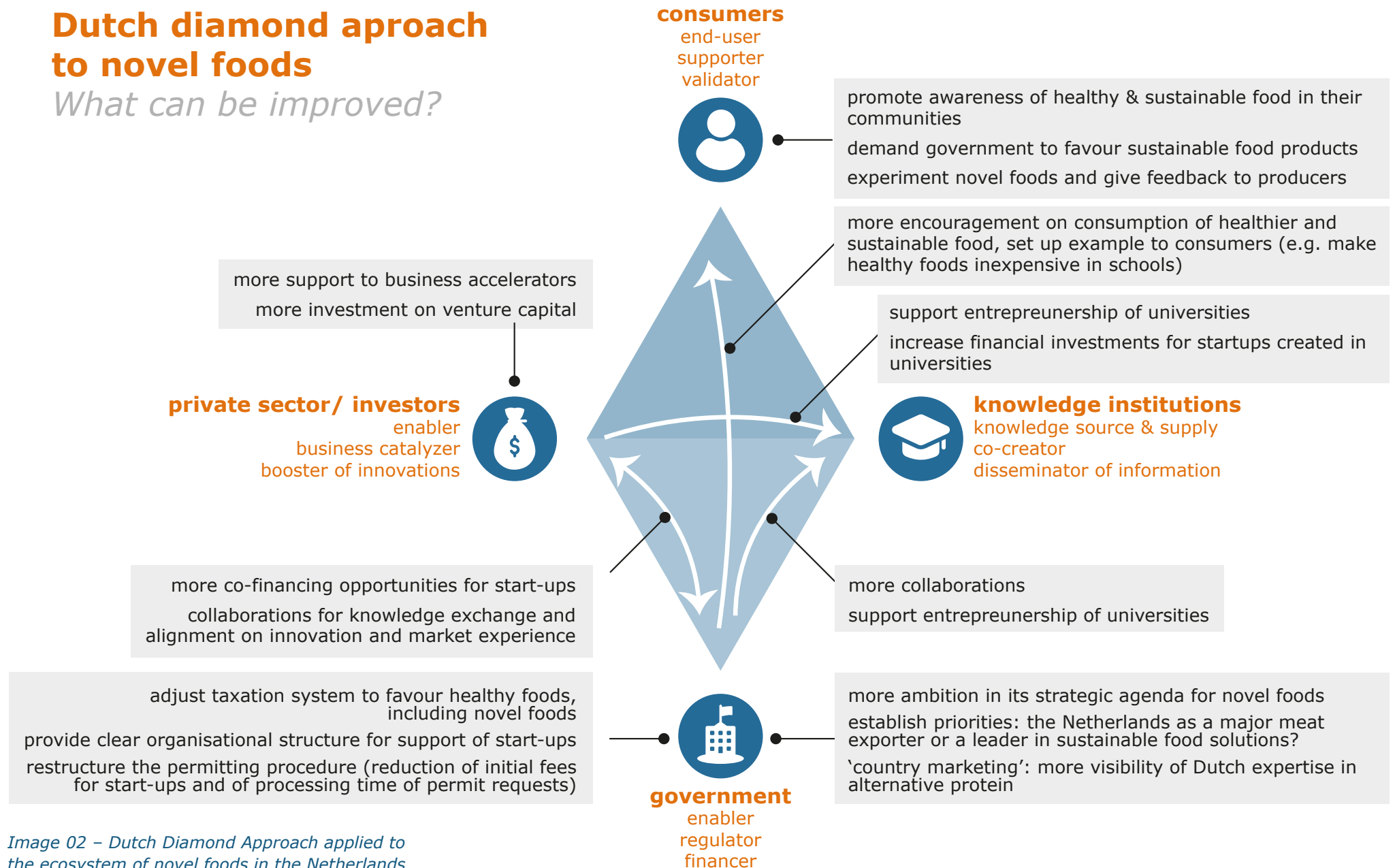


Image 02 – Dutch Diamond Approach applied to the ecosystem of novel foods in the Netherlands

## 4. Lessons from Singapore

### 4.1. Comparison table

Next is a comparison table given for the ecosystem of novel foods in the Netherlands and in Singapore. The goal is to give an objective overview of the current situation in both contexts. Input for the table below is obtained from the interviews realized and literature study.

Topic	Netherlands	Singapore
<b>Regulation</b>	EU has a conservative approach and EU-regulations are an obstacle to the development of the Netherlands in the novel food market. Hence, the Netherlands cannot make fast progress in novel foods due to the regulatory framework. Besides EU, also NVWA regulations complicate R&D.	The SFA has a regulatory framework for novel foods since 2019 for assuring food safety in the novel foods being developed.
<b>Market position</b>	The Netherlands is the world's second largest exporter of traditional agricultural products and a global frontrunner in the alternative protein sector and ranks 6th worldwide in biotech patents. Compared to other EU countries, the Netherlands is a frontrunner and known as the gateway to Europe.	Singapore is the first and only country in the world to have approved cultivated meat for sale in the world (in June 2022). In regard to the overall categories of novel foods, the country is also the pioneer in the Asian continent.
<b>Incentives</b>	There are many incentives in the Netherlands for novel foods and the ecosystem, including the government, which is very friendly and supportive of new businesses in this field. Business communities are also interested and can be of assistance to develop technologies. The Dutch government can still work on facilitating investments for novel food businesses, specially from abroad. At the moment, private investors are the main option for novel food start-ups.	Singapore provides a progressive regulatory environment and financial incentive for the development of novel foods in Singapore. The Economic Development Board (EDB), Enterprise Singapore (EnterpriseSG) and the Agency for Science, Technology and Research (A*STAR) are working together for providing support to startups in building up capacity and innovation towards upscaling phase.
<b>Funds and grants</b>	In October 2022, The Dutch government confirmed a grant of EUR 60 million support to developments in cellular agriculture. An additional EUR 25 million is expected in co-financing. Coordination will take place via the Cellular Agriculture Netherlands Foundation. In addition, the National Growth Fund is an initiative jointly created by the Ministry of Economic Affairs and Climate Policy and the Ministry of Finance, which allocates EUR 20 billion for project investments in the domains of knowledge development, R&D and innovation for the period between 2021 and 2025. European grants are also available, such as the EIC-grant (European Innovation Council Accelerator) from Horizon Europe.	The SFA has multiple funds available for the development of food technology (see below), being the most popular for novel foods the Agri-food Cluster Transformation (ACT) Fund. Singapore has also made available a budget of S\$ 144 million for R&D and innovation in the agrifood sector. The SEEDS Capital is an investment from Enterprise Singapore, which is available for early-stage technology startups based in Singapore and with potential of conquering the global market. Investments vary from S\$ 2 to S\$ 8 million.

Topic	Netherlands	Singapore
<b>Investment communities</b>	Investors in the Netherlands, especially after the Ukraine-Russia war, have doubts on investing in companies without headquarters in the Netherlands. So, the sentiment within investment communities is skeptical.	Investors in Singapore are quite prone to contribute to startups where technology and innovation in agrifood show potential for success in the global market.
<b>Taxes</b>	Tax rates in the Netherlands are very high, higher than in Singapore. This makes it difficult for international companies to partner up with Dutch companies and / or experts.	Singapore has relatively high tax rates but lower than in the Netherlands.
<b>Food technology</b>	The Netherlands is very strong in their food technology and food production system.	Singapore is very accepting of new food technologies amid the '30 by 30' ambition (Singapore wants to be able to internally produce 30% of the nutritional needs for its population by 2030).
<b>Sustainability</b>	EU is very conscious about sustainability initiatives and the Dutch government has made a statement in the Protein Strategy to work towards a more sustainable protein production industry.	Singapore sees novel foods as a part of a broad range of measures which contribute to mitigating climate change effects and as an investment on food security needed for its population in the short and long terms.
<b>Capacity</b>	Many technologies are using bio-manufacturing. This is also the case with cultured meat. The Netherlands has strong capacity due to the presence of qualified professionals, equipment, and knowledge institutions available to help develop technologies.	Biomanufacturing is currently one of the pillars in Singapore's economy. The Singapore Institute of Food and Biotechnology is responsible for many advances in research in alternative foods and the circular bioeconomy.
<b>Protein technology</b>	The Netherlands is a pioneer in dairy protein technology and production. This is a backbone for protein development, which puts the Netherlands in the center of the EU-market in regard to new technologies.	Singapore does not have enough qualified professionals for analyzing and developing protein structures.
<b>Governance</b>	The further development of the novel food ecosystem in the Netherlands is bounded to the EU which, in practice, comes down to long(er) process steps. In addition to this, the Netherlands have a bottom-up governance framework where a participatory approach is followed when making political choices and developing projects. This means more time is needed to create support for novel foods in the Dutch market.	Singapore is led by a strong mandate based on a top-down governance framework. Hence, the country was very fast in making advances in novel foods. This is a unique context which is not to be reproduced in the Netherlands.
<b>Impression of novel food ecosystem (according to interviewees)</b>	Currently the ecosystem in the Netherlands is good, but it can be improved. Interviewees are optimistic for the future as the EU slowly makes advances in regulations. Incentives can become more policy-friendly to entrepreneurs.	The ecosystem in Singapore is vibrant and knows high speed development, but is limited by production capacity (due to spatial limitations).



Singapore has made many advancements in the protein transition and novel foods, especially after COVID-19. The SFA actively works together with knowledge institutions and startups for getting up to speed and adjusting its regulatory framework as much as necessary for boosting this market. Singapore is an innovation and testing hub where national and international companies can obtain financial incentives. Additional remarks are:

- The ecosystem in Singapore is vibrant and interesting. Compared to the Netherlands it has the disadvantage of not having a large dairy industry to play a role in protein technology development. In addition, Singapore faces big challenges with cultivated meat. This includes the lack of space for scaling up production and creating the infrastructure needed for producing larger quantities. Here, a cross-country collaboration takes place between Singapore and neighboring countries for accommodating the facilities' demand. Thailand and Malaysia are countries with a well-established manufacturing industry and with space available for the facilities Singapore lacks. This provides opportunities for the Netherlands in the future, because the production capacity in the country is high;
- Singapore has progressed extensively in testing, regulating, and permitting novel foods in their market after Covid. This progress aligns with their '30 by 30' ambition<sup>1</sup>. As a consequence, their novel food ecosystem is well built, many universities are active and working together with the SFA, regulation is in place, investment funding for companies is available, as well as the infrastructure for manufacturing (such as bioreactors for cultivated meat and facilities for upscaling production). The only issue is the lack of land for expanding production further;
- According to interviewees, the process of obtaining approval for a novel food by the SFA (Singapore) takes approximately 8 months, while in Europe it could take up to 6 years. In addition, in the EU, information provided by startups in the application process can become publicly available (transparent process), which is not an advantage for a starting business aimed at

<sup>1</sup> In 2019, amid Covid crisis, Singapore established a '30 by 30' goal towards a more food-resilient food system. This means that, by 2030, Singapore wants to be able to internally produce 30% of its population nutritional needs [ref 7].

improving products, and which is not the case in Singapore.

Below are the learning points for the Netherlands summarized:

- The framework created by Singapore for assessing and permitting novel foods is a reference for the Netherlands. Singapore draws a strategy looking at what is needed for boosting the novel food market, provides required capacity, attracts companies and sets up a good regulation. Topsector Agri&Food can play a similar role in the Netherlands in this process;
- There is potential for improvement of the novel food market in the Netherlands through visionary policymaking and fostering entrepreneurship-friendly environments;
- Taking the example of Singapore, the Netherlands should secure a focus on boosting its novel food market and act on it. Criticism will be received and should be welcomed, as well as overcome so that the focus leads to prompt results (perhaps not too much 'poldering' but making a bold and clear choice);
- Following the example of Singapore, the Netherlands can be more available for startups and market development. This means being able to interact, ask questions and exchange knowledge and experience. The SFA asks many questions to companies and institutions involved with novel foods. As a result, they learn from companies, which makes the process evolve. Singapore's standards are therefore high. Every year, the SFA makes adjustments to its regulatory framework. This is not the ideal scenario for companies, but it is very positive for consumers.

One aspect is, however, not comparable between the two contexts:

- Governance: Singapore operates with a robust mandate for effective implementation, a governance model not easily transplantable to the Netherlands. Singapore took a top-down approach to boosting its novel food market. The Netherlands follows a more gradual, participatory, and bottom-up approach, leading to slower implementation. Conversely, Singapore's rapid political system enables swift changes, making it challenging for similar developments to occur as easy in other countries.



# GROWING OUR FOOD FUTURE



Image source:

SFA Annual Report 2020/21 [\[link\]](#)

## 4.2. Lessons learned from other countries

In the global market of novel foods, countries have different facets and incentives for attracting companies to innovate, produce and grow in their internal markets. Such facets, which also reflect the success of these countries in the field of alternative proteins, are indicated below according to the input provided by the interviewed companies for this study.

- **United States:** this is currently the largest market for new proteins and investors are more friendly in the United States than anywhere in Europe. However, competition within the country is also stiff, more challenging than in the EU, which makes it less attractive to small companies. In addition, the United States export their culture very easy to the world and therefore has international influence on overall consumers. With the market in Europe being perceived as 'old fashioned' and more conservative for international entrepreneurs, the United States becomes a focus country. Certainly, for cellular meat, as they have a regulatory system in place and an established market for this alternative. A company founded in the Netherlands would be prone to go to the United States;
- **Israel:** new protein technologies are being developed at a high speed in Israel. New proteins receive large investments in the country (from government, entrepreneurs, non-profit organizations etc.). In addition, Israel develop technologies much faster than other countries do. The country is very open minded and visionary towards novel foods. Entrepreneurship is much encouraged in Israeli culture. Communication is no barrier as English is well spoken. Israeli companies are open for collaboration and know they need to go abroad. For this, they look to partner up with international businesses in the field. Israel is not interesting, however, for cultivated meat from pork;
- **China:** the government is stimulating alternative proteins and the ecosystem is perceived as interesting for international businesses. Thinking of a future-proof food system, China will inevitably have a protein problem in the future seen its current population of almost 1,5bi people is still increasing. So, protein is expected to be one of main priorities for China in regard to food

security. Chinese population can also afford novel foods relatively well. Developments will depend on political developments in the country;

- **India:** Asia is one of the main priority markets, thinking of the future. Due to its large population, international entrepreneurs want to be well established on this continent. After China, India is an interesting country to focus on. Developments in this country will depend, however, on political developments;
- **Switzerland:** overall, Switzerland has a good ecosystem for novel foods and is quite advanced with technology and regulations, considering they do not have the EU-boundaries. Setting up an international company in Switzerland is relatively easy. Communication is easy as English is well spoken and banks are quite supportive. The key issues, in this case, are local labor and land costs;
- **France:** France has a regulation which allows small artisanal businesses to test their food products in initial stages and share with consumers. These artisanal products consist of high-quality products produced in small scale, by traditional methods and with local ingredients. For such products, EU-regulations are applied in proportion equivalent to the scale of the business. The approach of France to artisanal products can, therefore, create opportunities for novel foods to enter the local market. For instance, new food ingredients from micro-algae obtained from the country's marine life and via traditional fishing methods. This approach can serve as an inspiration for the Netherlands on how to find new ways for start-ups to comply with EU-regulations and still be able to test novel foods and create a consumer base;
- **Canada:** Canada is a large country and has plenty of room for new developments. The country is eager to do more with innovation in agriculture and has the goal of creating a completely new novel food ecosystem. In Canada, small companies have the opportunity to try and expand their business;
- **Countries in East / Southeast Africa:** many initiatives and investments are going to this region because of the focus on

food security. Novel foods and startups are, therefore, needed there as they offer alternatives to its population, which lacks sufficient protein sources;

- **Japan / Indonesia:** both countries can be interesting for startups because if a company proves success in these countries, it receives many incentives for upscaling.



Image source: Netherlands Foreign Investment Agency [doc]

## 5. The way forward: what are opportunities for collaborations between the Netherlands and Singapore?

### 5.1. Cross-country collaborations

Both the Netherlands and Singapore have strengths in the development of alternative proteins in regard to vision, regulations, technology, R&D and infrastructure. The previous chapters shows that Singapore is a pioneer in creating a favorable environment for novel food start-ups in the phases of product development, manufacturing and upscaling production. Key appealing features of Singapore are:

- Its enabling regulatory framework;
- The availability of accessible financial incentives to start-ups, and;
- A strong and visionary relationship between SFA, R&D institutions and businesses led by the urgency of expanding food supply and the market of sustainable foods in Singapore.

In regard to Dutch ecosystem of novel foods, the country excels in the fields of technology, innovation and R&D. From the Netherlands, the following aspects are significant:

- A longstanding history with protein development and manipulation (from its dairy industry);
- Well-established innovation in food systems from its agriculture-centered economy;
- Strong R&D sector with leading knowledge institutions working on plant-based alternatives;
- An agriculture-centered economy, which provides a base for the development of plant-based alternatives, and;

- A cultural innovative-forward thinking, from which start-ups push limits towards creating new technologies, hence the Netherlands' strong research and innovation capacity.

Based on these strong points, what are synergies between the two countries and where can collaborations be created? A first step is to investigate the existing collaborations between the two countries. These are indicated below:

- R&D on plant-based food products, such as the collaboration between the Wageningen University & Research (WUR) with the National University of Singapore (NUS) and Nanyang Technological University (NTU);
- Infrastructure for upscaling cultured-meat production: the laboratories and equipment used in biopharma have similarities to those needed for the production of cultivated meat. This equipment is high-technology and very expensive for start-ups to have access to. CDMO Pharma, a renowned company in Singapore with expertise in biopharmaceutical products and R&D, is repurposing part of its equipment to the development of cultivated meat. CDMO Pharma created a daughter-company called Esco Aster, which provides scaled-up facilities for cultivated meat start-ups in Singapore. Esco Aster has a partnership with Dutch companies through which Esco Aster provides them the best upscaling infrastructure. In return, the companies can more easily enter the market in Singapore and increase production seen that the SFA has already approved the manufacturing process and equipment of Esco Aster.

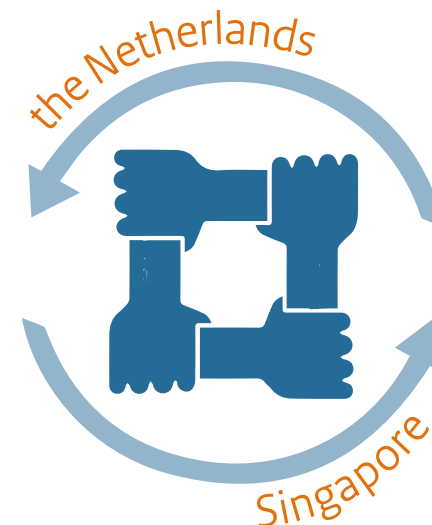
Concerning opportunities for the future, this study identified the following potential collaborations for the Netherlands and Singapore:

- **Create a roadmap for G2G collaborations between the two countries.** Overall, the Netherlands and Singapore, specifically the SFA and NVWA, can much learn from each other. Designing a roadmap with collective goals, initiatives and planning can assist on setting milestones for collaborations between the two countries;

- Singapore has proven to progress very quickly with adjusting its regulatory framework for accommodating and enhancing its novel food market. From the Singaporean's experience, the Netherlands and the EU can learn **optimal ways of timely assessing food technologies for food security and new sources of food**, therefore not losing the momentum for market opportunities. Other Asian countries are learning from Singapore on how to coordinate their protein transition. More dialogue between the Netherlands and Singapore can be, therefore, highly beneficial;
- **More B-to-B collaborations** for facilitating the manufacturing production to start-ups. The creation of a platform for start-ups in Singapore to connect with Dutch expertise can assist business finding the support they need. This cross-country platform also becomes a hub where knowledge and market experience are connected and through which business can find each other. These connections are a spin-off of innovation;
- **Strengthen the academic collaborations** between the two countries. There is still room for more joint studies and more long-term projects for the countries to learn from each other. The two governments have here an opportunity to co-fund multidisciplinary studies which can benefit cultivated meat, plant-based and fermented new proteins;
- **Strengthen collaborations between R&D institutes.** These institutes are ahead of the game in regard to knowledge and technology development. More collaboration between R&D institutes from the Netherlands and Singapore can optimize the breach of technology gap for overcoming challenges in novel foods. For instance, in the case of plant-based proteins, there is a wide range of products available in the market. Quantity is here not a problem, but quality is. The two countries have the opportunity to collaborate on exploring ingredients and the process for perfecting the quality of products according to consumer's preferences (which vary per country / context);
- **Realization of trade missions for exchange of high-level expertise and breaching lack of competences.** Singapore is resource limited. A bottleneck the country faces is the lack of

high-skilled labor for the increasing demand of work. Singapore is exploring possibilities of training its local work force and of transferring experts with similar technical requirements from other sectors to novel foods. For instance, experts in oil & gas are knowledge and equipped for purifying substances, which is also valuable for fermentation and cultivated meat. The Netherlands can also make use of the high-level expertise available in Singapore. The two countries have, therefore, the opportunity to create trade missions for exchanging expertise and learning 'best of both worlds';

- **Stimulate the development of hybrid businesses for the development of cutting-edge novel foods.** The market of novel foods is highly competitive and very segregated in the sense that companies are mostly fighting with each other to gain market space instead of working together. The three main categories of novel foods (fermentation, plant-based and cultivated meat) have each high-tech capabilities but are not yet working together. This provides an opportunity for these business categories to join forces in creating cutting-edge products. By combining technologies and methods, tastier, safer and healthier food for consumers can be created. For instance, cellular meat with tasteful cultivated fat and the meat structure of mycelium.



## 5.2. Next steps

The EKN located in Singapore can play a role in facilitating the collaboration between the Netherlands and Singapore. As an outcome, the ecosystem of novel foods in the Netherlands can benefit from this exchange and the country can take small steps towards ensuring its position in the European market.

Below is a list of recommended steps for the Netherlands in the way forward, to which the EKN in Singapore can give a contribution to:

1. Sharing information on contacts with businesses within the sector among Dutch government entities. The Netherlands Foreign Investment Agency, for instance, suggested to work together through the Achilles administrative system to more efficiently share contact details as well as to be able to help businesses from both countries with contacts at relevant Dutch government entities. There is already a lot of knowledge and network at EKN, RVO, NFIA and LNV, so its essential to tap into this more efficiently;
2. Assist on trade missions and other events for connecting Dutch and Singaporean companies;
3. As a step further from this study, request the development of a SWOT-analysis on the novel foods in the Netherlands (if not available) for specifying, in a higher detail level, which points can be improved and what unique selling points the Netherlands can offer to the international market;
4. Assist on the development of a handbook for novel-food businesses aiming and entering the Dutch and Singaporean markets. This handbook can provide the contact and information on regulatory entities, government programs, funding and financing possibilities, business accelerators, R&D and knowledge institutes;
5. Explore RVO-programs to assist Dutch start-ups in expanding their markets to Singapore, for instance, via the Partners for International Business (PIB);
6. Invest in the visibility of the Netherlands in Singapore by marketing the opportunities available in the Dutch ecosystem of novel foods. Goal is to attract interest of international companies to the Netherlands by promoting its market (and production) potential;
7. Contact the governments of the Netherlands and Singapore for pursuing and / or strengthening a G2G collaboration in the protein transition market;
8. The Dutch government lacks a strong vision and plan of action on transforming its internal novel food market into a more enabling environment for business growth. In other words, into an ecosystem which sufficiently serves as a 'cocoon' for start-ups and allows them to mature into manufacturing and upscaling phases. For achieving so, it is necessary to map out the actions and outcomes towards achieving this goal. For such, a next step for this study can be drawing a Theory of Change<sup>1</sup> for the ecosystem of novel foods in the Netherlands;
9. When further in-depth information is obtained, as suggested above, and the governments and respective regulatory entities (SFA and NVWA) are consulted, the EKN can assist in the development of a roadmap for a long-term collaboration plan between the two countries. RVO is also capable of assisting in this path.

<sup>1</sup> Theory of Change is a comprehensive description and illustration of how a desired change takes place in a specific context. It maps out long-term goals, steps and outcomes for ensuring goals are achieved.

## 6. References

[ref 1]

<https://rvs.rivm.nl/onderwerpen/voedsel/Nieuwe-voedingsmiddelen>

[ref 2]

[https://www.sfa.gov.sg/docs/default-source/default-document-library/factsheet-on-alternative-proteins-\(last-check-29-aug-22\)918e6e058386408ebf1401f311da060d.pdf](https://www.sfa.gov.sg/docs/default-source/default-document-library/factsheet-on-alternative-proteins-(last-check-29-aug-22)918e6e058386408ebf1401f311da060d.pdf)

[ref 3]

<https://www.rtlnieuws.nl/nieuws/politiek/artikel/5393618/kabinet-kweekvlees-proeverij-hamburger-stamcellen#:~:text=Het%20is%20een%20Nederlandse%20vinding,Prijkaartje%3A%20250.000%20euro>

[ref 4]

[https://d1s9filwltqj9.cloudfront.net/app/uploads/2022/10/12090906/WUR\\_2022-Vleesconsumptie-per-hoofd-van-de-bevolking-2005-2021.pdf](https://d1s9filwltqj9.cloudfront.net/app/uploads/2022/10/12090906/WUR_2022-Vleesconsumptie-per-hoofd-van-de-bevolking-2005-2021.pdf)

[ref 5]

[https://bigideaventures.com/dev/wp-content/uploads/2020/10/ESG\\_Foodvalley\\_NL\\_Protein\\_Shift\\_Innovation\\_Scan.pdf](https://bigideaventures.com/dev/wp-content/uploads/2020/10/ESG_Foodvalley_NL_Protein_Shift_Innovation_Scan.pdf)

[ref 6]

[https://european-union.europa.eu/institutions-law-budget/institutions-and-bodies/search-all-eu-institutions-and-bodies/european-food-safety-authority-efsa\\_en#:~:text=What%20does%20EFSA%20do%3F,risks%20in%20the%20food%20chain](https://european-union.europa.eu/institutions-law-budget/institutions-and-bodies/search-all-eu-institutions-and-bodies/european-food-safety-authority-efsa_en#:~:text=What%20does%20EFSA%20do%3F,risks%20in%20the%20food%20chain)

[ref 7]

[https://www.sfa.gov.sg/docs/default-source/publication/annual-report/sfa-ar-2021-2022.pdf?sfvrsn=3693d871\\_6Introduction](https://www.sfa.gov.sg/docs/default-source/publication/annual-report/sfa-ar-2021-2022.pdf?sfvrsn=3693d871_6Introduction)

[ref 8]

[https://www.sfa.gov.sg/docs/default-source/publication/annual-report/sfa-ar-2021-2022.pdf?sfvrsn=3693d871\\_6Introduction](https://www.sfa.gov.sg/docs/default-source/publication/annual-report/sfa-ar-2021-2022.pdf?sfvrsn=3693d871_6Introduction)

