CO-creating sustainable and competitive FRuits and vEgetableS' value cHains in Europe

Deliverable 5.4

Business model toolkit

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Abbreviations and Acronyms

Abbreviation / Acronym	Description
AAA	Adaptation, Aggregation, and Arbitrage
BM	Business model
BMC	Business Model Canvas
CP	Customer profile
GVCs	Global value chains
KER	Key Exploitable Result
P	Phosphorous
M	Month
N	Nitrogen
NGO	Non-profit organization
K	Potassium
KG	Kilograms
PGI	Protected Geographical Indication
SICO	Sustainable Innovation Collaboration Oriented
TRL	Technology Readiness Level
VP	Value Map

Table 1: Abbreviation and Acronyms

1. Executive Summary

The **CO-FRESH** project introduces a transformative deliverable, the "CO-FRESH Business Cases Toolkit" designed to elevate competitiveness and sustainability in the agri-food sector.

The essence of this **Business Model Toolkit** lies in its role as a comprehensive reference tool, benefiting a diverse spectrum of stakeholders along the agri-food value chain. These stakeholders encompass farmers, farmers' organizations, the food industry, food-related services, consumers, environmental and social non-governmental organizations (NGOs), as well as public authorities. Its primary objective is to facilitate the transition towards sustainability-driven cooperative business models.

Key components of this deliverable include the creation of a set of 7 "Package leaflets," developed in English and that will be translated and published in CO-FRESH's social networks and website before the end of the project (March 2024). These leaflets are intended to enhance accessibility and practicality for stakeholders and serve as practical guides for implementing CO-FRESH business cases. Furthermore, the toolkit incorporates a comprehensive suite of adjustments and instructions, termed "how-to" guidelines, which are meticulously tailored to cater to different agri-food sectors and regional specificities. These guidelines are strategically devised to promote best practices at a systemic level, streamlining the integration of these business models.

Lastly, a replicability potential plan is also developed through a structured questionnaire that will be conducted by the Bioeconomy Cluster (Slovakia) and Tecnoalimenti S.C.p.A. (Italy). This questionnaire will explore the potential for replicating CO-FRESH technologies, methodologies, and business models in various agri-food contexts. The insights gained from this survey will be publicly available on CO-FRESH website and will play a crucial role in understanding the adaptability and scalability of the project outcomes, allowing for the wider dissemination and adoption of these innovative approaches.

2. About CO-FRESH

The CO-FRESH project **(https://co-fresh.eu/)**, funded by the European Union, grant agreement ID: 101000852, is a comprehensive initiative aimed at revolutionizing the agri-food systems within Europe. By focusing on the entire value chain, from farming to consumers' plates, CO-FRESH brings various expertise for innovative and sustainable transformations of EU value chains. The key to this transformation lies in redefining the value chains associated with agri-food.

To achieve its objectives, CO-FRESH project will develop an array of techniques, tools, and insights centred around restructuring fruit and vegetable value chains for 7 pilot cases **(https://co-fresh.eu/pilotcases/)**. It boasts a dynamic consortium that unites farmers, cooperatives, consumers, along with experts in technology, the environment, and economics. This diverse group of stakeholders will collaborate to explore models of collective innovation actions within and across organizations.

The primary goal of the CO-FRESH project is to devise innovative systemic approaches to enhance the economic, social, and environmental performance of these value chains. The emphasis is on ensuring long-term sustainability through the intelligent integration of various innovations, both technological and non-technological.

CO-FRESH employs a CO-creation research approach to analyse models of collective innovation action within and between organizations. The project consortium brings together key players from pilot agri-food value chains, including associations representing farmers, food producers, cooperatives, and consumers. It also incorporates experts in technological solutions, both digital and otherwise, as well as specialists in non-technological facets, such as social, organizational, and institutional solutions. Moreover, it involves experts in environmental, social, and economic sustainability, and those focused on consumer acceptance.

CO-FRESH strives to improve the economic, social, and environmental efficiency of these value chains, thus making them more sustainable and adaptable to the evolving needs of European agriculture and consumers.

3. Context

Agri-food Value Chains are intended to boost competitive advantage by bringing together farmers, processors, marketers, food service firms, retailers, and supporting entities such as transporters, research groups, and suppliers. A Value Chain is a strategic alliance of interdependent organizations that work together to gradually build value for the eventual consumer, resulting in a collective competitive advantage.

Agriculture and food trade has evolved over time, with the food we eat and clothing we wear increasingly being delivered by global production systems that span multiple borders. Wheat grown in Australia and Ukraine, for example, is processed into flour in Indonesia and Turkey before being sold to China to manufacture noodles and bread in Africa and the Middle East. For agriculture and food sectors, participation in agri-food value chains helps enhance overall sector growth – improving the returns to farmers and food makers along the value chain. Making use of inputs from other countries to produce agri-food products, and having access to foreign consumers through these chains, has helped to grow agri-food sectors and increase the share of gains flowing to farmers and producers.

Considering this, governments and producers are becoming increasingly interested in how they might position their agricultural and food sectors to capitalize on the opportunities generated by agri-food GVCs. The nature of the products produced heavily influences how producers in different sectors participate in value chains, with fresh vegetables more likely to go relatively directly from producer to consumer via GVCs, compared to oilseeds, wheat, and many fibres such as wool and cotton, which feed into food and clothing manufacturing processes and can cross borders multiple times before reaching the end consumer.

3.1. Importance of sustainability is agrifood and agriculture sector.

Shifting food value chains in the EU towards sustainability is crucial to ensure a sustainable future for the planet. Currently, the food sector is responsible for around 30% of global greenhouse gas emissions[1] and is a major contributor to deforestation, water pollution, and biodiversity loss. In the EU, the food system accounts for 20-30% of the total environmental impact[2]. Furthermore, the EU is the world's second-largest importer of products associated with deforestation, such as soy and palm oil. It is estimated that by 2050, the world's population will reach 9.7 billion, and the demand for food will increase by 70%. Therefore, it is essential to shift food value chains towards sustainability to meet the growing demand while minimizing the environmental impact. By adopting sustainable practices, such as regenerative agriculture, reducing food waste, and promoting plant-based diets, the EU could reduce its greenhouse gas emissions from the food sector by up to 50%.

3.2. The role of business operators in innovation in the agrifood value chain

Innovations in the agrifood sector range from interventions in specific production chain processes to more integrated solutions aimed at organisational changes throughout the entire value chain. A definition drawn from the OSLO manual describes innovation as the implementation of 'a new or improved product or process (or combination thereof)'. Innovation is generally, although not exclusively, classified according to two general output types: new or improved products or services with implementation of an improved production or delivery process; and new business processes, including marketing methods with changes in design, packaging, promotion or market placement, and organisational methods concerning business practices, workplace organisation or external relations.

Innovations have recently been implemented at various stages of the food value chain by various business actors, including farmers, food processors, retailers, and food advisory service providers.

3.2.1 Farmers

Farmers are primary producers, including growers and breeders. Innovation regarding farmers concerns agricultural and breeding practices, from the growing of food products or animal feed to harvest, slaughter and primary transformation.

- ***Symbiotic and multi-layered agricultural practices*** are increasingly applied in farms and subject of research for improvement, especially concerning sustainable soil use and management. The intentional use of beneficial soil microbes in agricultural systems, with a particular focus on the functional diversity of mycorrhiza, as a promising practice in the early stage of application has been largely investigated[3]. Furthermore, it has been demonstrated significant reductions in the environmental impacts of agriculture [4] through the combination of livestock and crops, that is, the mixed use of land for orchards and grazing (such as olive groves with poultry). Combining livestock and crops can help to limit the overuse of nutrients. The most innovative applications in this field concern aquaponic systems. Also [5] aquaponics as 'the process of growing aquatic organisms and plants symbiotically' is considered a relevant innovation, given that the effluent of aquaculture is

[1] https://www.epa.gov/ghgemissions/global-greenhouse-gas-emissions-data
[2] https://www.fao.org/news/story/en/item/1379373/icode/
[3] Goss, M. J., Carvalho, M., & Brito, I. (2017). Functional diversity of mycorrhiza and sustainable agriculture: management to overcome biotic and abiotic stresses. Academic Press.
[4] Paolotti, L., Boggia, A., Castellini, C., Rocchi, L., & Rosati, A. (2016). Combining livestock and tree crops to improve sustainability in agriculture: a case study using the Life Cycle Assessment (LCA) approach. Journal of Cleaner Production, 131, 351-363.
[5] Yep, B., & Zheng, Y. (2019). Aquaponic trends and challenges–A review. Journal of Cleaner Production, 228, 1586-1599.

used as a source of nutrients for plant growth, and nutrient absorption from plants remediates water for aquaculture, thanks to the adoption of sensing, smart and IoT systems to monitor and control automated processes[6].

- **Digital agriculture concerns sensor-based monitoring systems** used to carry out precision agriculture and maximise efficiency and production yields. it is demonstrated that an efficient technological feeding and drinking method can contribute to improving the nutrition of cows and significantly increase milk production yields[7]. The development of affordable and effective agriculture robots is a complex issue that requires a multidisciplinary approach that draws on horticultural engineering, computer science, mechatronics, dynamic control, deep learning and intelligent systems, sensors and instrumentation, software design, system integration and crop management; nevertheless, results show that automated systems can optimise farming processes, and that, although entirely automated farming systems are a distant prospect, collaborative human-robot systems are a realistic short-term prospect for agricultural development. The implementation of digital farming and precision agriculture has been demonstrated to influence environmental performance in farming[8]- Effects in terms of reduction of inputs such as nitrogen, lime, manure, pesticide and herbicide, referring to several categories of impact and their implications on climate, soil, water and biodiversity have been reported.

3.2.2 Food processors

Food processors are companies that alter and package raw materials. These include both small-scale and large-scale processors, as well as manufacturers of typical dairy or meat products and other processed goods. Chefs and restaurateurs are examples of value chain actors. The most desirable innovations aimed at food processors concern various enhancements to the efficiency of operations conducted as well as the quality and sustainability of raw materials processed, and final products issued.

- ***Integrated measures to avoid food waste*** (around one-third of food production) is a critical issue for the efficiency and sustainability of food production chains. Although food loss occurs at all production stages and therefore involves all the actors in the value chain (including farmers, retailers and consumers), food processors have a key role in driving processes of food collection from suppliers, food treatment, storage, packaging and delivery to the market. Slow Food[9] presents an environmentally focused assessment of restaurants highlighting the role of chefs and demonstrating the effects of good practices; these include the selection of food suppliers belonging to the Slow Food system, the optimisation of logistics and transport, the valorisation of raw materials, the choice of a balanced menu (less meat), the utilization of meat cuts that make the most of all parts of animals, and the use of less-fresh but still edible vegetable products as bases for soups or plate decoration. The report describes the avoided environmental impact of a Slow Food restaurant, showing 2–4 times lower greenhouse gas emissions compared to conventional restaurants.
- **Circular economy** offers several options for innovation concerning the use of waste outputs from one process as inputs for new processes, such as energy or material co-production.

[6] Yanes, A. R., Martinez, P., & Ahmad, R. (2020). Towards automated aquaponics: A review on monitoring, IoT, and smart systems. Journal of Cleaner Production, 263, 121571.
[7] Akbar, M. O., Shahbaz khan, M. S., Ali, M. J., Hussain, A., Qaiser, G., Pasha, M., ... & Akhtar, N. (2020). IoT for development of smart dairy farming. Journal of Food Quality, 2020, 1-8.
[8] Medici, M., Pedersen, S. M., Carli, G., & Tagliaventi, M. R. (2019). Environmental benefits of precision agriculture adoption. Environmental Benefits of Precision Agriculture Adoption, 637-656.
[9] https://www.fondazioneslowfood.com/wp-content/uploads/2019/12/ENG_Indaco2_ristorante_LR.pdf

- **New food products** can be a promising source of calories and protein while reducing land use and greenhouse gas emissions. A critical barrier to this scenario is consumer perception of these products, while a consistent advantage is the ability of insects to convert agricultural by-products and food waste into food. Less innovative but still promising is food and feed production from micro-algae; for this and other sources of nutrients, trends show growing market opportunities with environmental benefits[10].

3.2.3 Retailers, distributors, and wholesalers

Food retailers are actors engaged in the distribution, storage, and retail sale of food products, whether fresh food and storable foodstuffs, including distributors, wholesalers, small and large retailers. Innovation concerning food retailing is expected to create more integrated and efficient networks by improving the exchange of information among suppliers, differentiating the system, for example by engaging smallholders as local food suppliers, and allowing for certified fair trade, ensuring fair remuneration to primary producers and attention to social issues. Standards of food sustainability and quality should be matched and made explicit through proper information systems addressing both operators and consumers.

Logistics in the agrifood chain must be improved to deal with perishable products, unpredictable supply variations and high rates of food waste, and to fulfil food safety and sustainability requirements. In order to remotely regulate the position and conditions of shipments and goods from production to the final consumer, Internet of Things (IoT)-based logistics information systems in agrifood supply chains[11] are considered a key aspect. Different models can be tailored for specific application scenarios, such as the automatic identification, tracking, and tracing of products along the entire supply chain, product labelling and registration for information delivery to consumers, as well as for rapid and high-precision product recall in the case of food-safety incidents. In particular, data generated and recorded through the sensor network can be advantageously used to predict the remaining shelf-life of perishable foods and drive pricing decisions; dynamic pricing strategy based on sensor data thus provides benefits to both food retailers and consumers[12].

Traceability of products responds to consumer demand for real-time updated information on foods via digital media.

3.2.4 Food advisory services

Food knowledge providers are agents engaged in value-added innovation capacity building activities targeted to value chain actors, and promotion, dissemination and education addressing external audiences and consumers. The value-enhancement of food products requires multiple competences regarding various aspects of the value chain. In this regard, food sustainability and quality are crucial market levers, potentially contributing to supporting local communities in rural areas, for example, through cooperative associations established around recognised Designations of Origin or environmental labelling.

- ***Life Cycle monitoring****: The identification and evaluation of sustainable agricultural production techniques that attempt to optimize processes to reduce or make up for environmental impacts depend on the life cycle monitoring of the agrifood value chain. This entails preventing soil*

[10] Vigani, M., Parisi, C., Rodríguez-Cerezo, E., Barbosa, M. J., Sijtsma, L., Ploeg, M., & Enzing, C. (2015). Food and feed products from micro-algae: Market opportunities and challenges for the EU. Trends in Food Science & Technology, 42(1), 81-92.

[11] Verdouw, C. N., Robbemond, R. M., Verwaart, T., Wolfert, J., & Beulens, A. J. (2018). A reference architecture for IoT-based logistic information systems in agri-food supply chains. Enterprise information systems, 12(7), 755-779.

[12] Li, D., & Wang, X. (2017). Dynamic supply chain decisions based on networked sensor data: an application in the chilled food retail chain. International Journal of Production Research, 55(17), 5127-5141.

degradation, the usage of synthetic chemicals and fossil fuels, and the depletion of natural resources. Farmers and other participants in the value chain are now more aware of the true environmental and social effects of their activities thanks to the use of monitoring techniques like the Life Cycle Assessment (LCA)[13] *as decision- and innovation-supporting tools. Beyond general characteristics and practices like "organic" or "natural," monitoring allows for the identification of hotspots and targeted interventions on particular chain processes.*

- ***Business models and organised clusters of value chain actors***, including smallholders, are expected to increase the efficiency and competitiveness of groups of agents, rather than individual enterprises. *Business models and organised clusters of value chain actors*, including smallholders, are expected to increase the efficiency and competitiveness of groups of agents, rather than individual enterprises.
- **Agricultural decision support systems (ADSSs)** have multiple applications to drive choices within the framework of Agriculture 4.0, it may help decision makers to achieve better performances in future tasks.

4. Business Model Toolkit

This section focuses on presenting the business model toolkit developed within CO-FRESH tailored to assist value chain actors engaged in the CO-FRESH sector. This innovative toolkit not only addresses the specific needs of CO-FRESH stakeholders but also holds the potential for broader applicability, offering a valuable resource for a diverse range of individuals and organizations seeking to navigate the ever-evolving landscape of fresh produce distribution and marketing. With a firm commitment to enhancing efficiency, sustainability, and profitability across the co-fresh value chain, this toolkit promises to be a game-changer in empowering industry players and fostering growth in this vital sector.

This toolkit comprises 7 essential components for strategic analysis and business model development. It includes a characterisation table to assess market dynamics, a 5 Porter analysis to evaluate industry forces, and Ghemawat's AAA framework for global strategy insights. Additionally, it offers business model instructions and templates for effective model development, along with a cost-benefit analysis tool for decision-making alignment with long-term objectives. This toolkit provides organizations with a structured approach to navigate complexities, enhance informed decision-making, and facilitate sustainable growth within their respective industries.

The business model toolkit is available in https://co-fresh.eu/publications/ to be used by various value chain stakeholders to enhance the sustainability of their businesses within EU value chains.

4.1 PORTER 5 Forces analysis guidelines

In 1980, the influential work "Competitive Strategy" by Michael Porter had a profound impact on the perspectives of both academics and managers (Crowther, 2008[14]; Magretta, 2012[15]). Among the fundamental concepts introduced in the first chapter was Porter's articulation of the "five forces" that mold the structure of industries and largely dictate the rules of competition and underlying profitability (Porter, 2008[16]). These forces encompass the threats posed by competitive rivalry, influential buyers, dominant suppliers, potential new entrants, and substitute products. As stated by Porter (1980), "the combined strength of these forces determines the ultimate profit potential within an industry." However, what particularly captivates Porter, as highlighted in his 2008 update of the

[13] Hagelaar, G. J., & Van der Vorst, J. G. (2001). Environmental supply chain management: using life cycle assessment to structure supply chains. The International Food and Agribusiness Management Review, 4(4), 399-412.
[14] Crowther, P. (2008), "The five competitive forces that shape strategy", Harvard Business Review, Vol. 86 No. 1, pp. 78-93, Editor's note, edited by M.E. Porter.
[15] Magretta, J. (2012), Understanding Michael Porter: The Essential Guide to Competition and Strategy, Harvard Business Review Press, Boston, MA.
[16] Porter, Michael E. "The five competitive forces that shape strategy." Harvard business review 86.1 (2008): 78.

five forces, is the ability to employ this framework to comprehend the strategic implications for individual firms operating within a specific industry.

The application of the 5 Forces analysis framework within CO-FRESH holds significant value for practitioners and stakeholders. By meticulously examining the five key forces that shape industry competition - namely, the bargaining power of suppliers, the bargaining power of buyers, the threat of new entrants, the threat of substitute products or services, and the intensity of competitive rivalry - this analysis offers a comprehensive view of the competitive landscape. It empowers practitioners with a multi-dimensional representation of stakeholder positions. This in-depth understanding enables more informed decision-making, as it helps identify areas of strength and vulnerability, uncover opportunities for collaboration, and develop strategies to navigate the intricacies of fresh produce distribution and marketing effectively. Ultimately, the 5 Forces analysis guidelines provide a robust framework for practitioners to optimize their competitive positioning and enhance their overall performance within CO-FRESH

Table 2. Threats of new entrants answer with specific data related to the innovation/your activity.

THREATS OF NEW ENTRANTS	**ANSWER WITH SPECIFIC DATA RELATED TO THE INNOVATION/YOUR ACTIVITY**
Evaluation of how the entry of new competitors in the market can influence the organization in relation to:	
Access to distribution channels and raw materials.	
Use and technological adaptations.	
Know How and patents.	
Brand image and product / service differentiation.	
Investment needs and adaptation costs.	
Regulatory requirements for new entrants.	
Bargaining power of suppliers	
Evaluation of the bargaining power of suppliers for the following aspects:	
Degree of dependence of the supplier or in relation to the exclusivity in the supply.	
Inherent costs of change of supplier.	
Quantity of suppliers that meet the requirements.	
Degree of flexibility in the negotiation of payment terms.	
Degree of vendor prioritization for order processing in case of product shortage or inventory reduction.	
Regularity of delivery times.	
Bargaining power of buyers	
Evaluation of the influence of customers in relation to aspects:	
Perception of product quality in relation to possible substitutes or competitors.	
Price strategy in comparison to other alternatives offered by the market.	
Requirements regarding flexibility of payment and delivery deadlines.	
Relative costs for companies to change customers VS costs for customers to switch products.	
Degree of differentiation and brand of the product perceived by the client in relation to the competitors.	
Threats of substitutes	

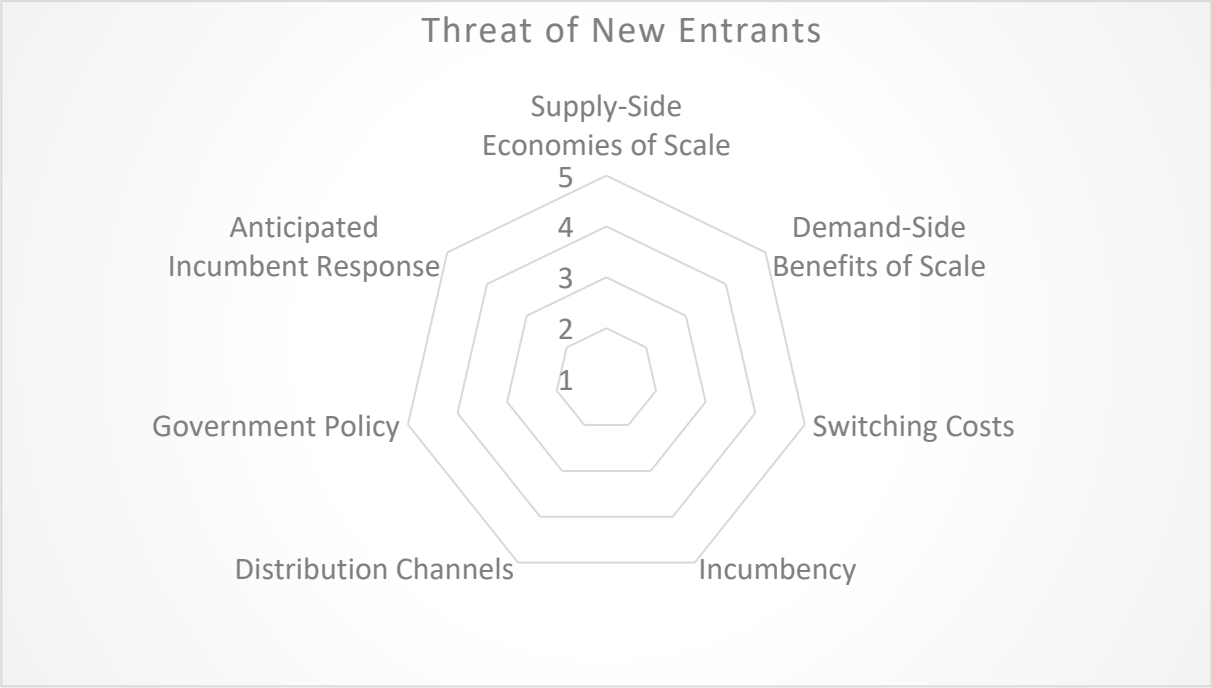
Evaluation of the possibilities and trends of substitution of the product or service:	
Assess the risk of substitution of the product or service and estimated time frame for this.	
Measure the costs of changing factors of production, development and technologies to carry out the substitution.	
Perception of customers' willingness to research, evaluate and purchase substitute products.	
Projection of the product or service life cycle and adaptations according to the real demand and market dynamics.	
Industry rivalry	
Direct evaluation of influence among competitors:	
Evaluate market share VS annual growth rates VS industry growth.	
Comparison of fixed costs VS variables and simulation of possible changes of growth and adequacy to variation of demand.	
Differentiation of product / service from competitors.	
Exit barriers in relation to legal, social, strategic relations and costs.	
Evaluate the quantity VS diversity VS degree of influence of competitors.	
Funding power and potential of competitors for investments in innovation and efficiency.	

Following the compilation of the Table 2, a Likert scale evaluation will be employed for each segment of the 5-Porter analysis. This evaluation method will enable the quantification and visualization of strengths, weaknesses, threats, and opportunities within the respective sections, presented through spider diagram.

Table 3.Likert scale evaluations of the 5 Forces of Porter

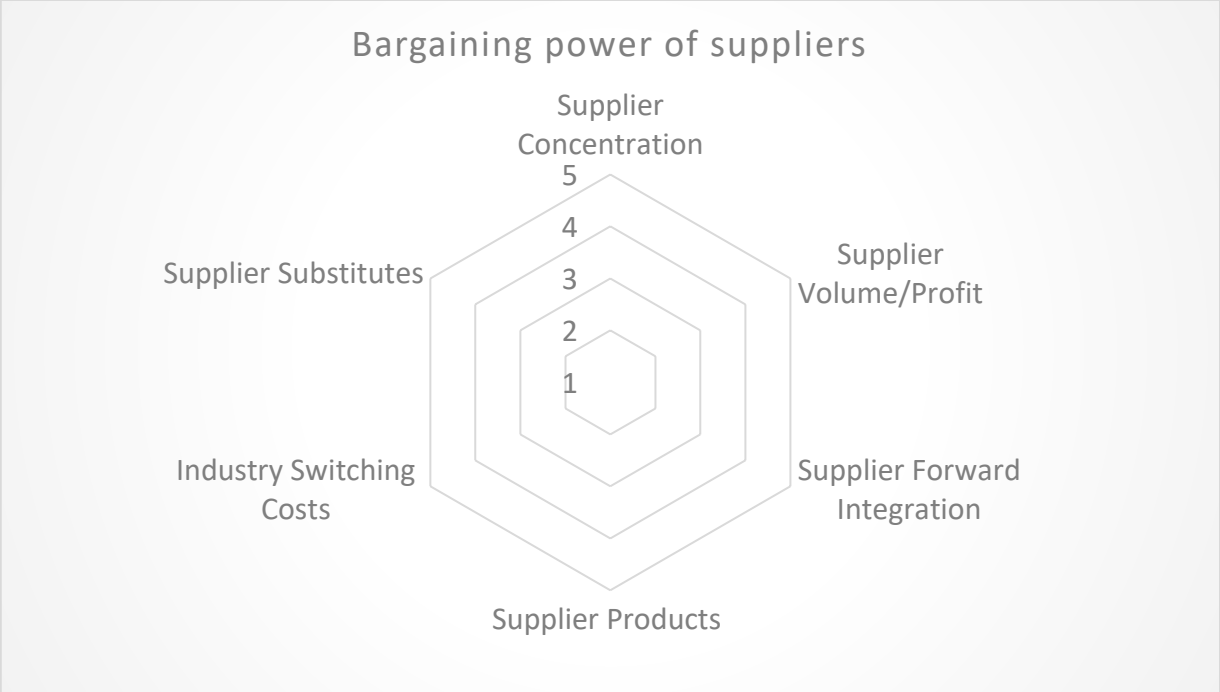
Threat of New Entrants				
Supply-Side Economies of Scale				
Low				**High**
Demand-Side Benefits of Scale				
Low Network Effects				**High Network Effects**
Switching Costs				
Low				**High**
Capital Requirements				
Low				**High**
Incumbency				
Low				**High**
Distribution Channels				
Limited access				**Easy access**
Government Policy				
Subsidies				**regulations**
Anticipated Incumbent Response				
Welcoming				**Retaliatory**

PS: the spider diagrams are formatted from 1 to 5, with 1 representing the lower end of the spectrum and 5 representing the highest one.



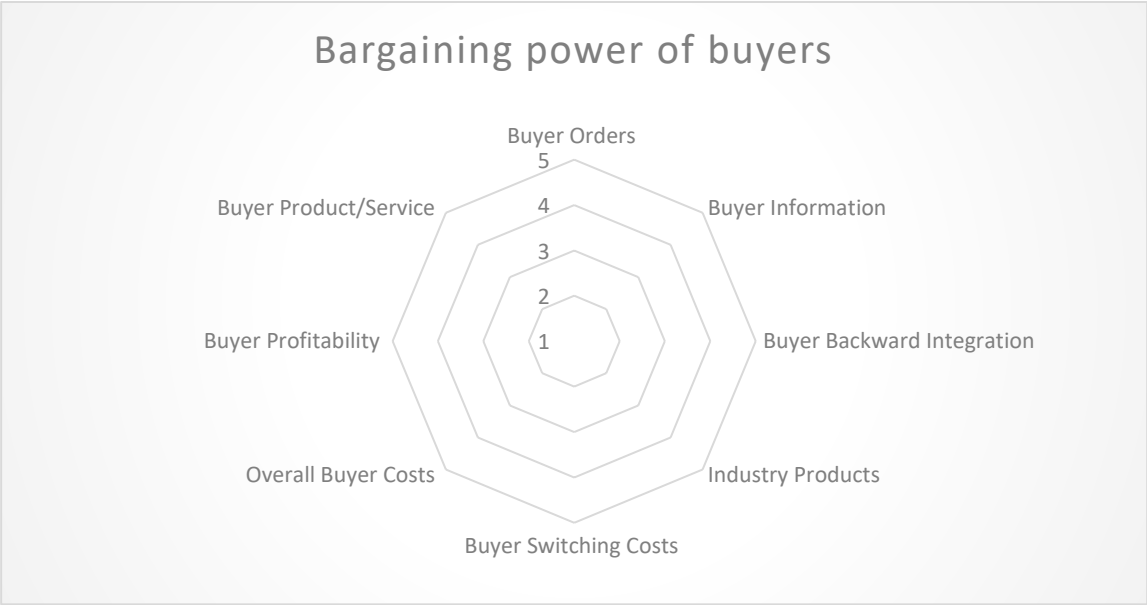
Bargaining power of suppliers				
Supplier Concentration				
Few organizations				**Many organizations**
Supplier Volume/Profit				
Low percentage				**High percentage**
Supplier Forward Integration				
Not Feasible				**Credible Threat**
Supplier Products				
Standardized				**Highly Differentiated**
Industry Switching Costs				
Low				**High**
Supplier Substitutes				
No Viable Options				**Many Viable Options**

PS: the spider diagrams are formatted from 1 to 5, with 1 representing the lower end of the spectrum and 5 representing the highest one.



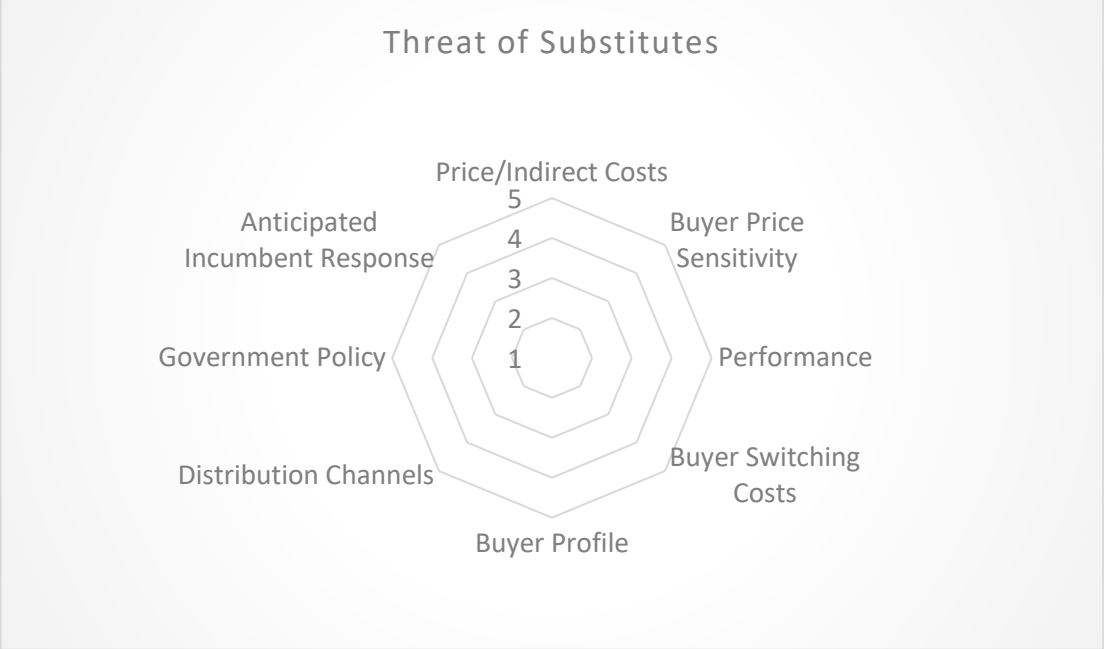
Bargaining power of buyers				
Buyer Orders				
Single/Few				**Large Volumes**
Buyer Information				
Low				**High**
Buyer Backward Integration				
Not Feasible				**Credible Threat**
Industry Products				
Standardized				**Highly Differentiated**
Buyer Switching Costs				
Low				**High**
Overall Buyer Costs				
Low %				High %
Buyer Profitability				
Operating Losses				**High Profits**
Buyer Product/Service				
Low impact				**High impact**

PS: the spider diagrams are formatted from 1 to 5, with 1 representing the lower end of the spectrum and 5 representing the highest one.



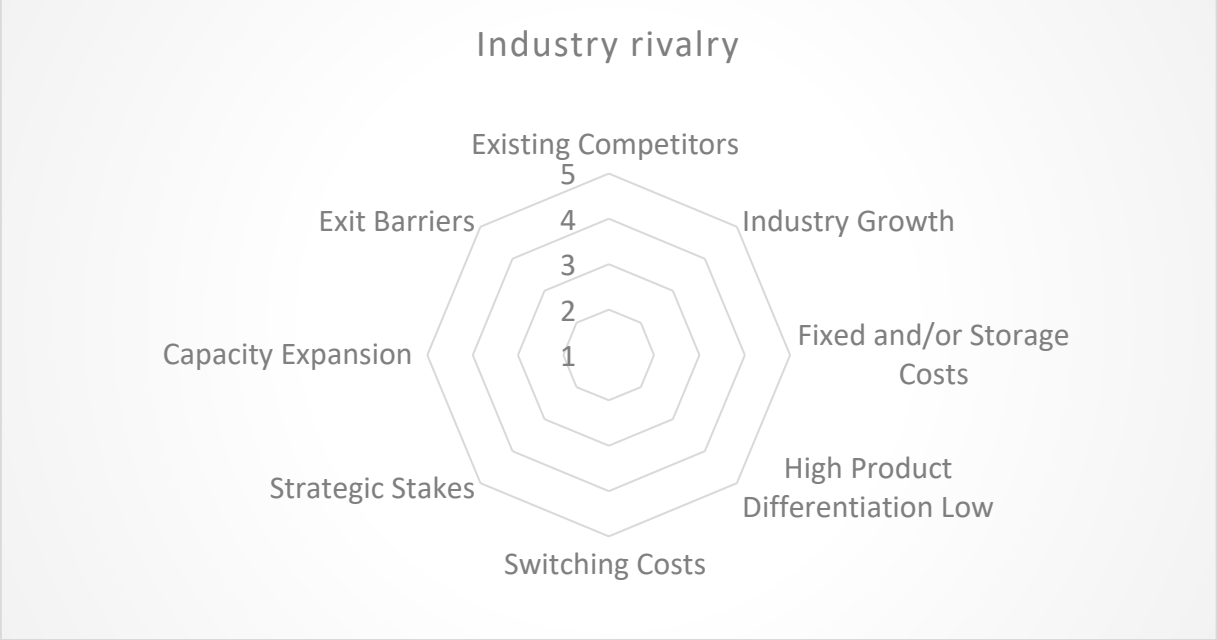
Threat of Substitutes				
Price/Indirect Costs				
Less expensive				**More expensive**
Buyer Price Sensitivity				
Low				**High**
Performance				
Lower				**Higher**
Buyer Switching Costs				
Low				**High**
Buyer Profile				
Risk seeking				**Risk avoidance**
Distribution Channels				
Limited access				**Easy access**
Government Policy				
Subsidies				**regulations**
Anticipated Incumbent Response				
Welcoming				**Retaliatory**

PS: the spider diagrams are formatted from 1 to 5, with 1 representing the lower end of the spectrum and 5 representing the highest one.



Industry rivalry				
Existing Competitors				
Few/Leader				**Numerous/Balanced**
Industry Growth				
Slow/Negative				**High**
Fixed and/or Storage Costs				
Low				**High**
High Product Differentiation Low				
Low				**High**
Switching Costs				
Low				**High**
Strategic Stakes				
Low				**High**
Capacity Expansion				
Small Increments				**Large Increments**
Exit Barriers				
Low				**High**

PS: the spider diagrams are formatted from 1 to 5, with 1 representing the lower end of the spectrum and 5 representing the highest one.



4.2 Ghemawat's AAA Framework

Ghemawat so-called AAA framework [17] offers three generic approaches to global value creation. Adaptation strategies seek to increase revenues and market share by tailoring one or more components of a company's business model to suit local requirements or preferences[18]. Aggregation strategies focus on achieving economies of scale or scope by creating regional or global efficiencies; they typically involve standardizing a significant portion of the value proposition and grouping together development and production processes[19]. Arbitrage is about exploiting economic or other differences between national or regional markets, usually by locating separate parts of the supply chain in different places.

By considering the *Adaptation*, *Aggregation*, and *Arbitrage* dimensions of the AAA framework, companies can develop a comprehensive market positioning strategy. They can identify opportunities to differentiate their offerings, optimize their operations, and capitalize on market variations to enhance their competitiveness. The framework prompts companies to analyse the specific market context and craft strategies that align with the unique needs and dynamics of target markets, leading to improved market positioning and sustainable business success.

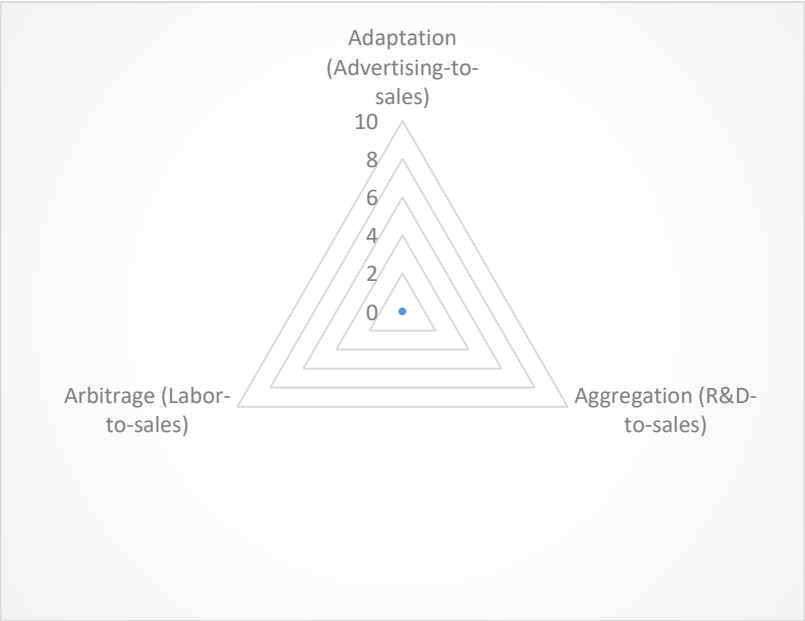
The AAA framework is particularly useful for those who have their innovation/result in a very advanced TRL (Technology Readiness Level) higher than 7

[17] Ghemawat, Pankaj. "Managing differences: The central challenge of global strategy." Harvard business review 85.3 (2007): 58-68.
[18] Nel, Jessica Jane. "AAA framework-Adaptation, Aggregation and Arbitrage."
[19] Berry, Heather, and Aseem Kaul. "Disaggregating Multinationality: An Empirical Examination of Aggregation, Adaptation, and Arbitrage Activities by US Multinational Corporations." Strategy Science 7.2 (2022): 90-105.

Table 4.Depiction of the AAA framework

	ADAPTATION	AGGREGATION	ARBITRAGE
Competitive Advantage Why should we globalize at all?	To achieve local relevance through national focus while exploiting some economies of scale	To achieve scale and scope economies through international standardization	To achieve absolute economies through international specialization
Configuration Where should we locate operations overseas?	Mainly in foreign countries that are similar to the home base, to limit the effects of cultural, administrative, geographic, and economic distance		In a more diverse set of countries, to exploit some elements of distance
Coordination How should we connect international operations?	By country, with emphasis on achieving local presence within borders	By business, region or customer, with emphasis on horizontal relationships for cross-border economies of scale	By function, with emphasis on vertical relationships, even across organizational boundaries.
Controls What type of extremes should we watch for?	Excessive variety or complexity	Excessive standardization, with emphasis on scale	Narrowing spreads
Change Blockers Whom should we watch out for internally?	Entrenched country chiefs	All powerful unit, regional, or account heads	Heads of key functions
Corporate Diplomacy How should we approach corporate diplomacy?	Address issues of concern, but proceed with discretion, given the emphasis on cultivating local presence.	Avoid the appearance of homogenization or hegemonism (Especially in US companies); be sensitive to any backlash.	Address the exploitation or displacement of suppliers, channels, or intermediaries, which are potentially most probe to political disruption
Corporate Strategy What strategic levers do we have?			

The AAA Triangle serves as a kind of strategy map for managers. The percentage of sales pent on advertising indicates how important adaptation is likely to be for the company; the percentage spent on R&D is a proxy for the importance of aggregation; and the percentage spent on labour helps gauge the importance of arbitrage.



4.3 Characterization table guidelines and template

Understanding the intricacies of pains, gains, pain relievers, gain relievers, and the added value associated with a solution or innovation is paramount in the realm of strategic decision-making and problem-solving. These elements provide a comprehensive view of the challenges and opportunities inherent in each context. By deciphering the pain points, organizations can pinpoint areas that require immediate attention and improvement. Conversely, recognizing the gains sheds light on what stakeholders truly value and desire. Pain relievers and gain relievers serve as essential tools to address these concerns effectively, offering tailored solutions to alleviate pain and enhance gains. Moreover, assessing the added value of a proposed solution or innovation is crucial in determining its potential impact and acceptance in the market. Filling out this template constitutes the primary step in the development of the business model for the solution, marking a fundamental milestone as a key exploitable result in the process.

Table 5 below depicts how to fill it up with a brief explanation to guide end users on how to effectively compile this template.

Table 5.Characterization table

Choose a customer segment.	
Identify their jobs and prioritize them according to how important they are to your customer.	
Identify pains and prioritize them (3-5)	a. b. c.
Identify their gains and prioritize them (3-5)	a. b. c.
Pick the top 3-5 most important pains and gains that relate to the most important jobs.	a. b. c.

List all the benefits of your product or service (3-5)	a. b. c.
List all pain relievers (3-5) PS: List them from the most important to least important.	a. b. c.
List of gain creators. PS: List them from the most important to least important.	
Pick 3-5 of the gain creators and pain relievers, that make the biggest difference to your customer. PS: List them from the most important to least important.	
Link the pain relievers, gain creators and product benefits to the pains, gains and jobs they solve.	
Define how you're better than the competition.	

The template also incorporates clear instructions, ensuring that end users can effortlessly complete it. Figure 1 details the instructions.

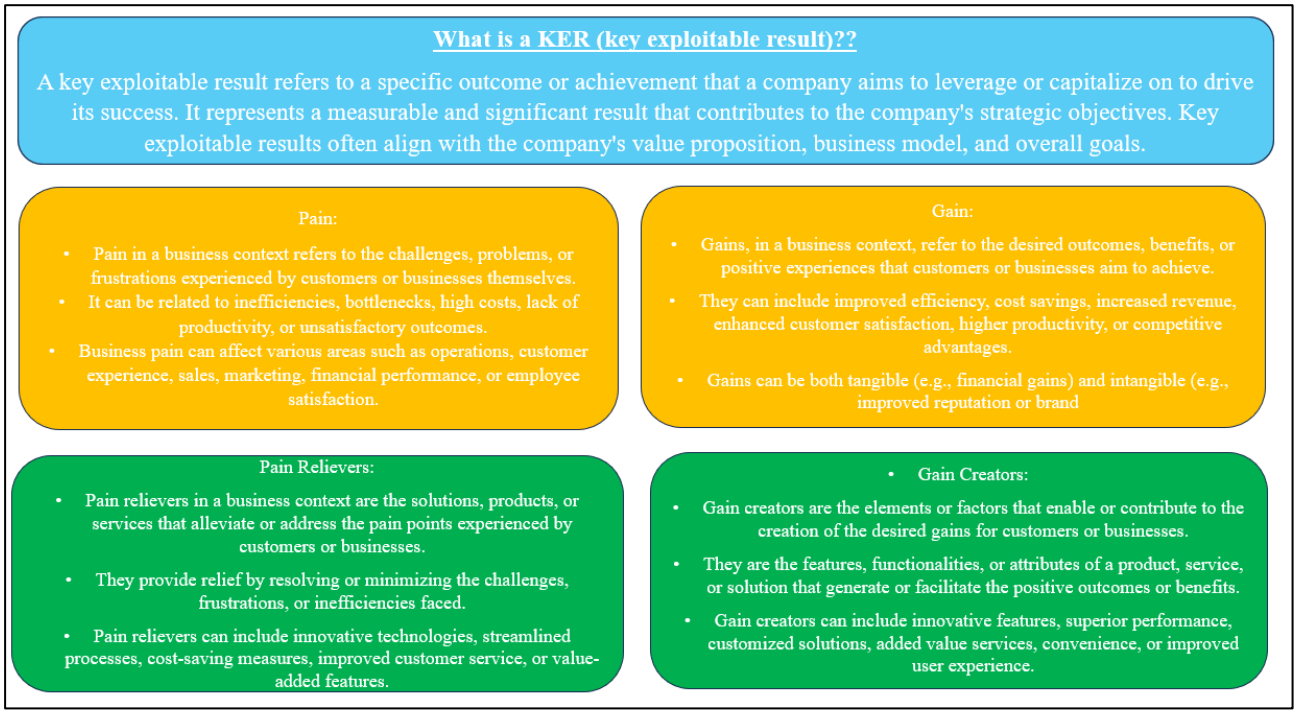


Figure 1: Instructions to complete the characterization table.

Then, a Unique Value Proposition Map and Customer profile were identified for each Key exploitable result. On one hand, the **value proposition map** describes the benefits customers can expect from your products and services. The Value Map describes:

- A list of all the Services and Products a value proposition is built around (physical/tangible, intangible, digital, financial).
- Gain creators that describe how your products and services create customer gains.
- Pain Relievers that describe how your products and services alleviate customer pains.

On the other hand, the **Customer Segment Profile** describes a specific customer segment in the business model in a more structured and detailed way:

- **Gains:** describe the outcomes customers want to achieve or the concrete benefits they are seeking (required gains (most basic functional gains), expected gains, desired gains, unexpected gains)
- **Pains:** describe bad outcomes, risk, and obstacles related to customer jobs (undesired outcomes, problems, and characteristics (functional, emotional, ancillary), obstacles, risks)
- **Customer jobs:** describe what customers are trying to get done in their work and in their lives, as expressed in their own words. The jobs could be **functional** (Trying to perform specific tasks), **social** (trying to achieve/retain status or reputation), personal**/emotional** (trying to achieve a specific emotional state such as feeling good or peace of mind) or **supporting** (customers also perform supporting jobs in the context of purchasing and consuming value either as consumers or as professionals).

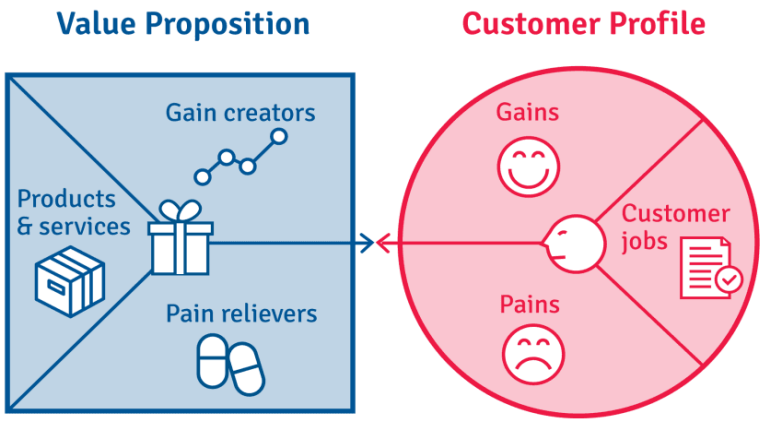


Figure 2: Value proposition and customer profile template

4.4 Business Model Canvas template

The Business Model Canvas is a powerful strategic tool that provides organizations with a structured framework to visualize, analyse, and develop their business models. Comprising nine essential building blocks, it enables businesses to systematically examine key elements such as customer segments, value propositions, channels, customer relationships, revenue streams, key resources, key activities, key partnerships, and cost structure. By leveraging the Business Model Canvas, companies can gain a holistic understanding of their business and market dynamics, identify areas for innovation and optimization, and ultimately design sustainable and competitive business models that respond to ever-changing market demands. Whether for startups, established enterprises, or organizations seeking to pivot and adapt, the Business Model Canvas serves as a versatile and invaluable tool for strategic decision-making and business model design.

Key components of a business model include:

Value Proposition: The unique benefits and value that a company offers to its customers, solving their problems or fulfilling their needs.

Customer Segments: The specific groups of customers or market segments that a company targets with its products or services.

Revenue Streams: The sources of revenue generated by the company, such as product sales, subscriptions, licensing fees, or advertising.

Cost Structure: The expenses incurred by the company to operate its business, including costs associated with production, marketing, distribution, personnel, technology, and infrastructure.

Key Activities: The primary actions and processes that a company undertakes to deliver its value proposition and maintain its operations.

Key Resources: The essential assets, capabilities, and resources required to deliver the value proposition and support the business activities effectively.

Channels: The distribution channels and methods through which a company delivers its products or services to customers.

Customer Relationships: The strategies and approaches employed by a company to build and maintain relationships with its customers, ensuring their satisfaction and loyalty.

Partnerships and Key Stakeholders: The external entities, organizations, or individuals that a company collaborates with to enhance its capabilities, expand its reach, or leverage shared resources.

When filling in the Business Model Canvas, it's essential to follow a systematic approach to ensure a comprehensive and well-structured representation of your business. Here are some guidelines to help you navigate each of the nine building blocks.

1. Customer Segments: Identify and define your target customer groups based on their distinct needs and characteristics. Consider demographics, psychographics, and behaviour to create precise segments.

2. Value Propositions: Clearly articulate the unique value your product or service offers to each customer segment. Focus on what problems you solve or benefits you provide.

3. Channels: Determine how you will reach and interact with your customers. Explore various distribution channels, digital platforms, sales teams, or partnerships that align with your business model.

4. Customer Relationships: Define the type of relationships you want to establish with your customers. Consider personal assistance, self-service, automated services, or community engagement, depending on your customer segments.

5. Revenue Streams: Specify the pricing mechanisms and revenue sources for each customer segment. Assess which pricing strategies, such as one-time sales, subscriptions, or licensing, are most suitable.

6. Key Resources: Identify the essential assets, infrastructure, and capabilities your business requires to deliver your value proposition. This may include intellectual property, physical resources, or strategic partnerships.

7. Key Activities: List the critical tasks and operations necessary to execute your business model effectively. Highlight activities that create value and contribute to your competitive advantage.

8. Key Partnerships: Identify external entities, suppliers, or strategic alliances that can enhance your capabilities and extend your reach. Consider how partnerships can optimize your resources.

9. Cost Structure: Outline the fixed and variable costs associated with your business operations. Distinguish between costs essential for value creation and those that can be optimized.

Table 6. BUSINESS MODEL CANVAS template

<table>
<tr>
<td rowspan="2">8 KEY PARTNERS
Who are your key partners/suppliers and Which key activities do partners perform?</td>
<td>7 KEY ACTIVITIES
What key activities does your value proposition require, deliver to your customer experience?

What activities are the most important for your distribution channels, customer relationships, revenue streams etc?</td>
<td rowspan="2">2 VALUE PROPOSITION
What core value do you deliver to your audience?

What pains do they experience when trying to achieve their goals?

How does our product/service help them achieve their goals/relief pains?</td>
<td>4 CUSTOMER RELATIONSHIP
What relationship does the target audience expect you to establish and maintain with them?</td>
<td rowspan="2">1 CUSTOMER SEGMENTS
What are our most important customers?

Why?

What differentiates our customer segments?

What opportunities are there to reach new customers segments?</td>
</tr>
<tr>
<td>6 KEY RESOURCES
What key resources does your value proposition require?

What key resources do you need for distribution?

What key resources do you need for customer relationship management?</td>
<td>3 CHANNELS
Through which channel does your audience want to be reached?</td>
</tr>
<tr>
<td colspan="3">9 COST STRUCTURE
Determine the costs involved in running your food business. (In general, a separate template for the cost benefit analysis will allow you to detail all costs related to your innovation)</td>
<td colspan="2">5 REVENUE STREAM(S)
Identify the various sources of revenue generation for your food business. Examples: Product sales, subscription fees, catering services, licensing, or franchise fees.</td>
</tr>
</table>

4.5 Cost-Benefit Analysis

Cost-Benefit Analysis (CBA)[20] is a systematic and widely used decision-making tool that holds great significance in evaluating the feasibility and potential of proposed projects, policies, or investments. CBA essentially involves the comprehensive assessment of both the costs and benefits associated with a given initiative, allowing organizations and decision-makers to make informed choices. By meticulously quantifying and comparing the positive and negative consequences, CBA aids in determining whether a project or policy is economically viable, socially beneficial, and aligned with overarching objectives. This analytical framework not only provides a structured approach to assess resource allocation but also plays a pivotal role in optimizing the allocation of resources and ensuring that investments generate favourable returns, making it an indispensable tool in the realms of economics, public policy, and strategic planning.

The Cost-Benefit Analysis (CBA) developed within the CO-FRESH initiative is structured as a comprehensive Excel file consisting of three distinct sheets. The first sheet serves as a succinct summary, meticulously collating all associated costs related to the initiative. The second sheet takes a more granular approach, categorizing these costs while concurrently defining the benefits stemming from the innovation, often referred to as the Key Exploitable Result (KER). Finally, the third sheet provides a comprehensive visualization, offering an overarching perspective of the overall benefits, return on investment (ROI), and various financial metrics. This organized and systematic approach to CBA not only enhances clarity but also facilitates robust decision-making and ensures the thorough assessment of the innovation's economic viability and potential impacts.

QUANTITATIVE ANALYSIS	YEAR 1	YEAR 2	YEAR 3	YEAR 4	YEAR 5	TOTAL
BENEFITS						
COST SAVINGS	0,00 EUR	0,00 EUR	0,00 EUR	0,00 EUR	0,00 EUR	0,00 EUR
COST AVOIDANCE	0,00 EUR	0,00 EUR	0,00 EUR	0,00 EUR	0,00 EUR	0,00 EUR
REVENUE	0,00 EUR	0,00 EUR	0,00 EUR	0,00 EUR	0,00 EUR	0,00 EUR
OTHER	0,00 EUR	0,00 EUR	0,00 EUR	0,00 EUR	0,00 EUR	0,00 EUR
TOTAL BENEFITS	**0,00 EUR**	**0,00 EUR**	**0,00 EUR**	**0,00 EUR**	**0,00 EUR**	**0,00 EUR**
COSTS						
NON-RECURRING	0,00 EUR	0,00 EUR	0,00 EUR	0,00 EUR	0,00 EUR	0,00 EUR
RECURRING	0,00 EUR	0,00 EUR	0,00 EUR	0,00 EUR	0,00 EUR	0,00 EUR
TOTAL COSTS	**0,00 EUR**	**0,00 EUR**	**0,00 EUR**	**0,00 EUR**	**0,00 EUR**	**0,00 EUR**
NET BENEFIT OR COST	0,00 EUR	0,00 EUR	0,00 EUR	0,00 EUR	0,00 EUR	0,00 EUR
Return On Investment (ROI)	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
Cumulative ROI	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!

Cost Data and pareto chart | Cost Benefit Analysis | Analysis Summary

Figure 3: Visualization of the Cost-benefit analysis

[20] Layard, R., & Glaister, S. (Eds.). (1994). Cost-benefit analysis. Cambridge University Press.

5. Exploitation strategy

In this part, details regarding the exploitation of the KERs are going to be detailed. For each KER, a commercialisation strategy has been identified according to the various stakeholders needs and the usability of the results in the current food market. At this stage of the project, **30 KER (**Key Exploitable Results) were identified by the various partners, among which 7 were selected to develop the Business Model Toolkit to serve as a reference tool for players and actors all along the agrifood value chain to support them to switch to more sustainable oriented business models. In the table below, the 30 KERs identified so far are listed and the 7 selected KER for the Business Model Toolkit are highlighted in green colour.

Table 7: List of the key exploitable results of CO-FRESH project

KER #	RESULT DESCRIPTION	Partner(s) involved
1	Certification Mark of food products with a mitigated unintentionally release of microplastics	• TECNOALIMENTI S.C.P.A.
2	Business Model Toolkit	• ENCO Srl
3	SICO Framework	• WAGENINGEN UNIVERSITY
4	Policy Brief	• UNIVERSITEIT GENT • WAGENINGEN UNIVERSITY • KISLÉPTÉC • BIOECONOMY CLUSTER • ALMA MATER STUDIORUM UNIVERSITA' DI BOLOGNA.
5	CO-creation Methodology (WP2)	• CENTRE DE RECERCA EN ECONOMIA I DESENVOLUPAMENT AGROALIMENTARI-UPC-IRTA (CREDA)
6	New biodegradable / compostable materials for Fresh food products (New Service)	• CENTRO NACIONAL DE TECNOLOGIA Y SEGURIDAD ALIMENTARIA (CNTA)
7	Diverse scientific knowledge: Foodtech; ICT….	• Various partners
8	Evaluation of agrifood subproducts for valorisation (New Service)	• CENTRO NACIONAL DE TECNOLOGIA Y SEGURIDAD ALIMENTARIA (CNTA) • ALMA MATER STUDIORUM UNIVERSITA DI BOLOGNA.
9	New packaging materials for fresh food products (New Service)	• CENTRO NACIONAL DE TECNOLOGIA Y SEGURIDAD ALIMENTARIA (CNTA)
10	Plant-based products development (New Service)	• CENTRO NACIONAL DE TECNOLOGIA Y SEGURIDAD ALIMENTARIA (CNTA)
11	Smart Irrigation System	• FUTURE INTELLIGENCE • TERRE DI ZOE.
12	Communication campaign related to the peculiarities of clementine	• TERRE DI ZOE
13	New beverage from clementine juice for other consumption moments including ingredients produced from Clementine juice subproducts	• TERRE DI ZOE. • ALMA MATER STUDIORUM UNIVERSITA' DI BOLOGNA.
14	Valorisation of Clementine residues: production of bioactive ingredients	• ALMA MATER STUDIORUM UNIVERSITA' DI BOLOGNA.
15	Sustainable and Active packaging films that extend product's shelf life	• CENTRO NACIONAL DE TECNOLOGIA Y SEGURIDAD ALIMENTARIA (CNTA)

		• FLORETTE IBERICA SL.
16	Digitization of services for the use of fertilisers according to online measurements (N, P, K) and soil needs (pH)	• FUTURE INTELLIGENCE • FLORETTE IBERICA SL.
17	Reutilization of washing water	• CENTRO NACIONAL DE TECNOLOGIA Y SEGURIDAD ALIMENTARIA (CNTA) • FLORETTE IBERICA SL.
18	Development of a new meat analogue with faba beans from the Netherlands: Frozen Burger	• STICHTING FOOD VALLEY
19	Development of a new meat analogue with faba beans from the Netherlands: Do it yourself kit	• STICHTING FOOD VALLEY
20	Development of a new meat analogue with faba beans from the Netherlands: Fermented meat alternative product (Tempeh)	• STICHTING FOOD VALLEY • CENTRO NACIONAL DE TECNOLOGIA Y SEGURIDAD ALIMENTARIA (CNTA)
21	Traditional dry product, 100% pork fed with local vegetable proteins	• CHAMBRE REGIONALE D'AGRICULTURE DES PAYS DE LA LOIRE
22	Improvement of Carcass selection	• CHAMBRE REGIONALE D'AGRICULTURE DES PAYS DE LA LOIRE
23	PGI Governance tool	• CHAMBRE REGIONALE D'AGRICULTURE DES PAYS DE LA LOIRE
24	Online shop and web promotion of organic apples	• EKOOWOC
25	Loss minimisation system - waste composting in each orchard and inferior fruit valorisation into apple cider / vinegar	• EKOOWOC
26	New recipes and processed food for Horeca, i.e. oyster mushroom beefsteak	• PILZE-NAGY • CENTRO NACIONAL DE TECNOLOGIA Y SEGURIDAD ALIMENTARIA (CNTA)
27	Brand management – feedback from buyers + Responsible mushroom consumption campaign with the Horeca sector	• PILZE-NAGY
28	Low carbon packaging technology for fresh mushrooms	• PILZE-NAGY • CENTRO NACIONAL DE TECNOLOGIA Y SEGURIDAD ALIMENTARIA (CNTA)
29	Include a QR code, to provide information on products and producers	• ASOCIACION DE ORGANIZACIONES DE PRODUCTORES DE FRUTAS Y HORTALIZAS DE ALMERIA (COEXPHAL) • GRUPO UNICA • UNIVERSITY OF ALMERÍA
30	Zero Waste Healthy Box	• ASOCIACION DE ORGANIZACIONES DE PRODUCTORES DE FRUTAS Y HORTALIZAS DE ALMERIA (COEXPHAL) • GRUPO UNICA • UNIVERSITY OF ALMERÍA

In the following sections, our goal is to detail how and throughout which solutions the CO-FRESH project can support the transition of food value chains towards a sustainable path, implementing more efficient and sustainable food systems.

At this stage of the project, the selection of the results for the business models and to create the leaflets was driven by their marketability potential in comparison to other expected outcomes from the CO-FRESH project. These KERs were identified as particularly promising and well-aligned with our strategic goals. Moreover, these seven KERs serve as the foundational pillars upon which we intend to construct the Business Model Canvas. Their inclusion in this crucial stage of our project underscores their significance in shaping our business development endeavours. In the next sections, the goal is to look beyond spreadsheets, market research and financial projections. It is interesting to note that although the main focus of the BMC is to establish the foundation of your business model, it also helps in enhancing businesses as they evolve and promote new innovations.

6. Preliminary market analysis

6.1 Smart irrigation system

The smart irrigation system market is growing rapidly due to increased awareness of water conservation, climate change concerns, and the need for efficient agricultural practices. Climate change affects water management in multiple ways, it is almost impossible to deny that also at the EU level we are facing an increasing water management problem. As an example, the dramatic dryness faced by Spain in the 2023 summer caused a reduction in olive oil production of about 56% compared to 2022. As a result, the price olive oil prices have surged almost 60% since June 2022.

In Global, resource scarcity compels governments and companies to look for new solutions to address the water crisis. The Mediterranean climate featuring scant and uneven precipitation results in excess water resource pressures and impacts on natural ecosystems.

Smart irrigation technology uses weather data or soil moisture data to determine the irrigation need of the landscape. Smart irrigation systems consist in the combination of advanced technologies and are the key component of precision agriculture. The global smart irrigation market size was valued at $1.44 billion in 2020 and is expected to reach $5.57 billion by 2030[21].

Farmers will benefit from smart irrigation during harvesting, it has been estimated that on an average the yield maxima could be 8-12% higher than normal. In addition, input resource optimization helps in saving 10% of total supplies like water, fertilizer, energy etc.

Advances in sensor technology, IoT (Internet of Things) connectivity, and data analytics were leading to the development of more sophisticated and efficient smart irrigation systems. Despite the growth opportunities, challenges such as high initial costs, interoperability issues, and the need for skilled technicians to install and maintain these systems needed additional improvement and studies.

[21] Global Smart Irrigation Market by Application, Component, System - Industry Revenue Estimation and Demand Forecast to 2030

6.2 New beverage from clementine juice for other consumption moments including ingredients produced from Clementine juice subproducts.

The fruit juice market saw growth particularly alternative fruit juices are commercialized as functional beverages, offering additional health benefits beyond basic nutrition.

As the market grew, competition increased, leading to innovation in product formulations and packaging designs to stand out in a crowded market.

In this context, Clementine juice was gaining popularity due to its sweet and refreshing taste. Consumers appreciated its natural sweetness and the absence of seeds, making it a convenient choice for those looking for a quick and easy source of vitamin C. Clementines are known for their high vitamin C content, and clementine juice is associated with as a healthy beverage option. It is often associated with immune system support and was positioned as a nutritious choice for breakfast or as a snack.

In addition, Clementines production is growing in various regions around the world, with Spain, Morocco, and the United States being significant producers. At the time, there is a growing interest in healthier beverage options, with consumers seeking out natural and minimally processed juices. This trend can favor clementine juice, which is often perceived as a healthier alternative to sugary soft drinks.

6.3 Valorisation of Clementine residues: production of bioactive ingredients

Bioactive ingredients derived from fruit residues refer to valuable compounds extracted from the byproducts or waste generated during fruit processing. These bioactive ingredients often have functional or nutritional properties that can be used in various applications, including food, pharmaceuticals, cosmetics, and dietary supplements. Utilizing fruit residues in this manner not only reduces waste but also adds value to the fruit processing industry.

Clementine residues, which include peels and seeds, can also yield various bioactive components that have potential applications in different industries. The peel of clementines, like other citrus fruits, contains bioactive compounds such as flavonoids, phenolic acids, and limonoids. These compounds have antioxidant properties and can be extracted for use in dietary supplements, nutraceuticals, and functional foods and beverages.

Clementine peel contains essential oils rich in compounds like limonene and myrcene. These essential oils are used in the fragrance and flavor industry, as well as in cosmetics, perfumes, and aromatherapy products. Additional bioactive compounds from clementine residues can be incorporated into functional foods and beverages to provide health benefits, including antioxidant support and immune system enhancement. The global functional food and beverage market is expected to grow from $281.14 billion in 2021 to $529.66 billion in 2028. In addition, extracting bioactive components from clementine residues contributes to waste reduction in the fruit processing industry and aligns with sustainability goals.

6.4 Digitalization of services for the use of fertilizers according to online measurements (N,P,K) and soil needs (pH)

The consumption of fertilizers has grown nearly six-fold between 1961 and 2015 (from 32 to 184 million nutrient tonnes), to keep up with a population expanding from 3.1 billion to 7.4 billion during the same period[22]. Today, fertilizers feed about 50% of the world's population which amounts to around 20 billion

[22] https://www.google.com/url?sa=t&rct=j&q=&esrc=s&source=web&cd=&cad=rja&uact=8&ved=2ahUKEwjb753Ci7uBAxVLS_EDHRZWA6sQFnoECAkQAQ&url=https%3A%2F%2Fagfundernews.com%2Fhow-fertilizer-companies-are-using-technology-to-stay-relevant&usg=AOvVaw1PZN_umwDr6_HbU_eBLfU_&opi=89978449

meals per day. In 2014, the combined value of the production of nitrogen, phosphate and potash raw materials was estimated to be $302 billion, while the sales value of products sold by fertilizer companies was $172 billion. Fertilizers are by far the largest sector of the input market, compared to estimated current sales volumes of global crop protection at around $60 billion, crop seed and biotech at $45 billion, and biologics at $5 billion. The environmental footprint of fertilizers – both in terms of production as well as application – must shrink, but this cannot happen at the expense of higher agricultural yields, considering that we may have close to 10 billion people to feed by 2050.

Although there are many digital tools for nutrient management available on the market, the uptake rate of these tools is still very low in Europe (EIP AGRI, 2016[23]). Farmers, currently, do not seem to consider data sharing and control as a priority when they decide on which digital nutrient management tools to use. In the near future, this will be a key aspect, since the tools are getting more complex and require more data, which can create a heavy burden for the farmer due to the lack of data exchange across platforms and databases. Future digital tools for sustainable nutrient management should also focus on the environmental aspects of nutrient management. Agriculture's climate impact is notable and evident, with significant consequences for the global climate. The primary sources of Green House Gas (GHG) emissions are land clearing and tilling, livestock breeding, application of fertilisers and fossil fuel use for production of inputs. Agriculture can also be a significant carbon sink. There are many possibilities to develop appropriate tools to reduce the carbon footprint of plant nutrition but more research and practical testing is needed. Currently, there is no tool on the market that would provide a complete solution. As more requirements for digital tools for nutrient management are defined, more sophisticated and complex tools will be developed, which results in a need for more data and, eventually, the increase of the technical knowledge required for their operation. To engage farmers in the use of these tools a balance between a comprehensive approach and operational feasibility needs to be found. Tools need to focus on critical aspects, while equally respecting both environmental and economic ambition.

6.5 Development of a new meat analogue with faba beans from the Netherlands: Frozen Burger

In The Netherlands, plant-based meat had a 7% market share of the total retail pre-packaged meat category (2022). Plant-based meat is the most developed of all plant-based categories, with a sales value of 221M in 2022. The value of plant-based meat sales increased by 2% between 2020 and 2022, while total unit sales for plant-based meat increased by 5%. Refrigerated plant-based meat makes up the majority of the category by sales value in 2022, representing 93% of total plant-based meat sales, whereas frozen and shelf-stable plant-based meat makes up 5% and 2% respectively. The most popular plant-based meat formats are pieces (making up 24% of sales value), followed by schnitzel (17%), burgers (14%) and meatballs (11%). (Source: GFI EUROPE / Netherlands: Plant-Based Foods Retail Market Report (2020-2022), based on Nielson data).

For this innovation it was decided to develop a plant-based burger for frozen storage. This fits with the proposition of a clean label product and reduction of food spoilage. The foreseen customer are caterers and the out of home category (snack bars), where frozen formats are commonly used. Trends in this category are offering more plant-based products and the use of local, transparent ingredients and products (story-telling). Relational and cultural aspects are known to be drivers of consumers preference for local products[24].

[23]https://ec.europa.eu/eip/agriculture/sites/default/files/eip-agri_ws_digital-tools-nutrient-management_final-report_2022_en.pdf_0.pdf

[24] Chicoine, M., Rodier, F., & Durif, F. (2022). Local food: a constellation of perceived proximity. *British Food Journal*, *124*(12), 4755–4768. https://doi.org/10.1108/BFJ-11-2021-1252

Therefore, next to geographical and carbon footprint information, traditional communication/marketing tools (like story-telling) can be used to valorize locally-sourced products, to convey a perception of proximity and authenticity to customers.

The competitive advantages of this innovation therefore are the use of Dutch (local) faba bean flours as key ingredients, which can be traced back to the faba bean farmers. Given the joint forces of protein farmers in the Netherlands, there is guaranteed supply of this Dutch produce. In addition, the products are minimally processed, which doesn't only lower emissions during production, but also lowers the ingredient price with about 50%, and thereby product price.

6.6 Development of a new meat analogue with faba beans from the Netherlands: Do it yourself kit

The consumer interest in powder mixes is growing and on average consumers are positively surprised about the taste and texture of Easy to Mix (DIY) products, showing repeat purchase of nearly 50% at one of the biggest suppliers in The Netherlands. Also, horeca and chefs see the benefits of experimenting with the dry mixes, with the ability to give their own twist to.

Next to a good taste and quality, variation is key to support volume growth. This mix can easily be tweaked with additional and/or other flavors, to develop a high-quality product portfolio. The competitive advantage to fresh products is its long shelf life, at ambient temperatures and lower weight, with potential applications in meal boxes.

In addition, the Dutch market has no dry-mix based on local bean ingredients yet, tapping into the trend of local, transparent food chains. Due to usage of local, minimally processed beans, commercial product price (EUR/KG) on shelf is estimated to be on par or lower vs. competitor product (in market).

6.7 Development of a new meat analogue with faba beans from the Netherlands: Fermented meat alternative product (Tempeh)

Yearly volumes of wholesalers is around 15.000KG, selling to customers in horeca (consuming 2-30KG week), catering (around 4KG per week) and toko's (largest volume driver). Newly developed (flavored) tempeh is introduced in the Dutch retail channel, showing the growing interest in minimally processed, tasty, and easy to prepare bean protein consumer products. Traditional tempeh is based on soy beans. The advantage of moving to tempeh based on Dutch faba beans are linked to the allergenicity of soy beans and the trend toward more local ingredients. Price point is expected to be around 10-20% higher than (imported) soy-based tempeh. This is explained by the higher land and personel costs in The Netherlands. Different from the other faba bean innovations, this production process is the same as for soy tempeh (fermentation). Therefore the higher raw material prices cannot be compensated by a less expensive production process. Taste is a crucial factor in the switch from (cheaper) soy to faba bean tempeh, and results on willingness to pay for local products will be conducted In the remaining period of the project consolidating the marketing strategy for this innovation.

7. IPR strategy

The protection of the intellectual property rights (IPR) is crucial for the CO-FRESH exploitation and dissemination.

Intellectual Property (IP) is the general term to the output of certain types of intellectual and creativity type. It comprises inventions, designs, music, literary and artistic works, technical drawings, and specialist know-how and business goodwill.

Creators of IP can claim certain Intellectual Property Rights (IPRs). These include patents for inventions, trademarks for logos, names, slogans and product shapes, copyright for original literary and artistic works and registered designs for the shape or appearance of a product. Some rights (such as copyright) are automatic. Others, including patents and trademarks, have to be applied for and they must pass certain tests before they are granted.

There are reasons to believe that the enforcement of IPRs has a positive impact on growth prospects. On the domestic level, growth is spurred by higher rates of innovation—although this result tends to be insignificant until countries move into the middle-income bracket. Nonetheless, across the range of income levels, IPRs are associated with greater trade and foreign direct investment (FDI) flows, which in turn translate into faster rates of economic growth. The IPR strategy will support key stages in innovation to create and exploit valued project outcomes while securing growth and wide adoption of the optimised technologies and methodologies in the agri-food sector across Europe and beyond the project boundaries.

The CO-FRESH IPR strategy is focused and specific in order to protect the innovation and knowledge generating during the project from attacks by competitors.
The IPR strategy has been defined based on the CO-FRESH project Consortium Agreement, and establishes rules for the use of background, foreground, and side ground knowledge and its distribution within the project as well as rules for handling sensitive or confidential information.

“Background” is referred to information and knowledge (including inventions, databases, etc.) held by the partners prior to their accession to the Horizon grant agreement, as well as any intellectual property rights which are needed for carrying out the project or for using foreground held by the consortium, or indeed by third parties- is defined in the proposal preparation phase (pre-Grant Agreement). In addition, the background of a partner is not confined to the information it owns, but also extends to any knowledge or IPR which it holds.
The current status of the Background and foreground being brought to the project by the consortium is listed in **Table 8**: Background per partner. Access to Background that is, or will be found to be, necessary for the implementation of the project will be granted royalty free and background needed to use the results of the project will be provided either royalty free or under fair and reasonable conditions.

Table 8: Background and foreground for each Innovation

NO.	Result	Partner(s) involved	BACKGROUND	FORGROUND
1	Smart irrigation system	- FINT is planning to protect this result, which is being tested in Le Terre di Zoe.	Data was collected by the time of the interview (June 2023): data, temperature, and images of plants, leaves,…, as refrence to compare once the innovation (smart irrigation system) is implemented. The system was ready in order to provide advice in terms of irrigation, but it was raining and the system was still not implemented.	FINT is using different equipment (sensors and IoT devices) which is already protected by IPR (provided by a third party), as well as the software (based in open source with customization, with modules built specifically for this case) FINT will protect the system that enables analysis, evaluation and advice customers on a more efficient use of irrigation. FINT can sign a contract with ZOE and other potential customers if they are interested

NO.	Result	Partner(s) involved	BACKGROUND	FORGROUND
			The innovation will enable FINT to exploit this project result as a new service to improve sustainability in terms of water use in irrigation systems The initial TRL is 7	in keeping the system, FINT will be in charge of the maintenance of the system. ZOE is the case study to test this system but will not be part neither of the ownership of the result, nor the exploitation. The final TRL can be expected to be 9
2	New beverage from clementine juice for other consumption moments including ingredients produced from Clementine juice subproducts	- ZOE - UNIBO - CNTA - TCA	STILL IN NEGOCIATION	STILL IN NEGOCIATION
3	Valorisation of Clementine residues: production of bioactive ingredients	- ZOE - UNIBO - CNTA	Combine the production of value-added functional ingredients produced from by-products from Clementine Juice production process with the development of a new beverage based on Clementine juice for other consumption moments than the typical ones of the Clementine Juice. This innovation can be defined as a *"well characterised ingredient and protocol for its production at lab level"* thanks to a process based on selected *GRAS yeasts and lactic acid bacteria*, belonging to the Industrial Culture Collections of UNIBO and CNTA. The initial TRL can be defined 5/6	It expeted to complete most of the work by the end of august. By then UNIBO will be interested in patent the result (stain + process to produce a new beverage). ZOE, CNTA and UNIBO need to agree on the percentage of each partner in this patent, depending on the most promising strains selected. Another organization in charge of communication and marketing that might be involved in the exploitation of this potential new product but it is still not defined, not in the ownership of the patent, but in the future of the final product. Final TRL is expected to be 7
4	Digitization of services for the use of fertilisers according to online measurements (N, P, K) and soil needs (pH)	FLORETTE FINT	Internet of Things (IoT) technologies and innovative sensors that enable farmers to monitor in real-time and remotely the Nitrogen (N), phosphorus (P) and Potassium (K) conditions of their land. To add, an online pH sensor will be deployed. Sensors are produced by a third party and FINT develops a new solution with a sensor system Initial TRL5/6	IoT solution is defined as a sensor system that could be eventually protected as a specific solution that increases sustainability in the agri-food sector, as a service to improve the use of fertilizers and understand soil needs in a more complete wey (NPK and soil PH data). The use of NPK or soil pH data right after fertilisation or in general, if only reliable, can adjust the plan/ recipes of chemical additions to the soil according to specific needs. Service consists in the provision of advice in the more sustainable war of using fertilizers. End of august/beginning of September will be a new round of testing that will help to validate this innovation. FINT will be the owner of the innovation and FLORETTE is acting as a case study. In

NO.	Result	Partner(s) involved	BACKGROUND	FORGROUND
				case of interested, FINT could provide manteinance services for the IoT use and advice on the effective use not only with fertilizers but also irrigation systems. Final expected TRL 8/9
5	Development of a new meat analogue with faba beans from the Netherlands: Frozen Burger	- Gerd (FoodValley partner, owner of the flour recipe and the burger) - Factory for industrial production which may need to adapt recipe and burger production process and, therefore, become part of the ownership - FoodValley, eventually will play a role in the commercialization of the final product	Cocreation process led to this innovation based on a recipe owned by Gerd, for the production of flour, as the base of a burger, as a new meet-analogue product also owned by Gerd. The initial TRL is 3/4	The burger needs further ingredients in order to be produced and commercialized. By July 2023, there was a factory doing trials for industrial production and commercialization, in September 2023 this factory is not interested in this product anymore. FoodValley and Gerd are looking for another factory at this stage of the project. Ownership agreements need to be reached in order to define rights on the recipe, the industrial production and for the future commercialization of the burger. FoodValley might be interested in the protection for the product itself in collaboration with Gerd, and make it available to partners or to the market. FoodValley has been suggested to do so and develop a communication campaign, so that it contributes to project C&D and impact. Final TRL be expected to be 8.
6	Development of a new meat analogue with faba beans from the Netherlands: Do it yourself kit	- Gerd as owner of the flour - FoodValley owner of the recipe - 3rd party still to be defined who is interested in the exploitation of the recipe	Dry powder based in the Faba bean flour (owned by Gerd) combined with other ingredients (recipe owned by FoodValley) as the result of a co-creation process where other partners involved in the PCWG have proposed alternatives to produce the falafel. Dry blending process simulation is one of the easiest food processes to scale up. Once formulation is defined process scale up and technoeconomic feasibility analysis require only simple calculations.	PCWG decided that the most appropriate option was the flour recipe from Gerd among the options tested. By September 2023 FoodValley is offering its partners the opportunity to exploit this innovation (IP assignment of the recipe), still not agreed who will exploit this innovation. FoodValley explores the option to protect this recipe with high potential for future commercialization and offer members the possibility of agreements for exploitation. FoodValley identifies an opportunity to provide a service to its members. Final TRL: 7
7	Development of a new meat analogue with faba beans from the Netherlands: Fermented meat alternative product: Tempeh	- CNTA - FoodValley	Microbial challenges have blocked the testing and production process. Still at kitchen/lab level, very low TRL 3-4.	Innovation has received contributions by FoodValley and CNTA in all stages of the product, which is still undergoing. FoodValley is waiting for results in order to make decisions about IPR protection and find partners for future exploitation. Expected final TRL is 7

8. Business cases value proposition and customer profile

8.1 Smart irrigation system

The smart irrigation system centers around delivering cutting-edge smart irrigation systems tailored to a diverse customer profile, including industrial facilities, farmers, cooperatives, landscaping businesses, and municipalities. This system addresses crucial operational tasks, chiefly optimizing water usage for irrigation purposes, effectively managing natural resources to reduce water consumption, monitoring water usage and costs, and efficiently overseeing irrigation schedules and equipment. The most pressing pain points within this spectrum encompass overwatering and water wastage, inefficient water usage resulting in lower crop yields, increased labour and equipment costs due to manual irrigation practices, adverse environmental impacts such as soil erosion and water pollution, regulatory compliance challenges, and the critical issue of crop health and yield optimization. The smart irrigation system developed within CO-FRESH provides a comprehensive set of gains, ranging from significant water conservation achieved through advanced sensor technology and real-time data analysis to substantial cost savings stemming from reduced water bills and minimized maintenance expenses. Furthermore, our systems are designed to improve crop yields by ensuring precise water delivery at the right time, thereby enhancing plant health, and reducing water stress. The automation of irrigation processes not only saves time but also contributes to environmental benefits by reducing water waste and pollution. The customization aspect enables tailored irrigation practices, while real-time data and insights empower users to make informed decisions and optimize their operations. Finally, our technology leads to the technological modernization of companies, reinforcing their competitive edge.

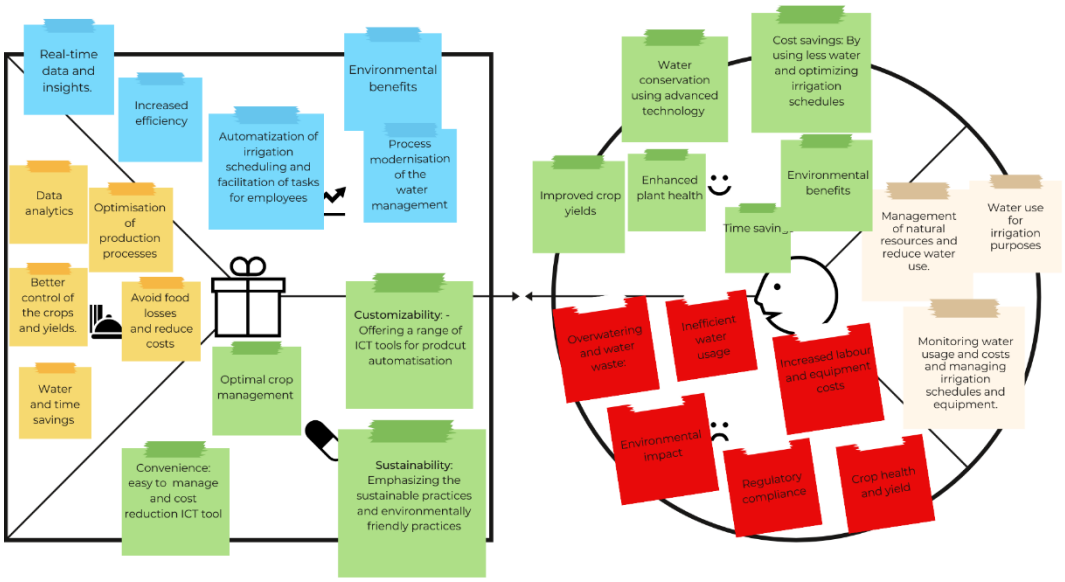


Figure 4: Value proposition and customer profile for the smart irrigation system

Exploitation Possibilities: The smart irrigation systems opens up several avenues for exploitation. By continually innovating and customizing solutions for different crops, soil types, and weather conditions, we can expand our market penetration. Emphasizing our environmental sustainability credentials positions us as a preferred partner for markets that prioritize eco-friendly practices, leading to enhanced partnerships and contracts.

Market Growth Possibilities: With the global shift towards sustainable and efficient agriculture, the smart irrigation system aligns perfectly with market trends. The potential for significant market share growth is evident, as users increasingly seek water-saving and environmentally responsible irrigation solutions. Through diversifying our product range and maintaining competitive pricing, we are poised to capture a

substantial share of this burgeoning market, significantly impacting agrifood value chains by reducing water wastage and improving crop yields.

8.2 New beverage from clementine juice for other consumption moments including ingredients produced from Clementine juice sub-products.

The New beverage from clementine juice centres on the creation of a novel beverage derived from clementine juice, utilizing ingredients produced from clementine juice by-products. The primary customer segment comprises food companies engaged in the processing of clementine fruits, transforming them into juice, and distributing these products to stores and retailers. In addressing the pains and priorities of our customers, we recognize several key challenges. Foremost among these is the issue of food waste reduction, as clementine by-products, typically discarded during juice extraction, result in significant waste. Additionally, the limited product offerings in the beverage market present a challenge, leading to consumer fatigue and a lack of choice. Environmental sustainability is another critical concern, with the disposal of clementine by-products contributing to landfill waste and greenhouse gas emissions. Finally, intense competition within the beverage industry poses a pain point, with limited options for product differentiation. On the gains side, the innovation promises substantial value creation, sustainability benefits, a healthier product offering, market differentiation, and increased consumer appeal and engagement. Cost optimization is another gain, further enhancing the attractiveness of our solution. The top priorities align with addressing the most important pains and gains related to essential jobs, which encompass the need for greater product diversity in retail, sustainable resource utilization, production cost optimization, and value creation. By addressing these challenges and capitalizing on the gains, we deliver a multitude of benefits to our customers, including expanding their market offerings, diversifying their healthy product range, enhancing consumer appeal, improving customer satisfaction, generating additional revenue, and fostering employee engagement. The pain relievers, including convenience, flavour innovation, nutritional benefits, social impacts, and sustainable production systems, address critical aspects of our customers' concerns. Additionally, our gain creators emphasize the community impact of supporting local farmers and communities engaged in clementine production, fostering health and wellness benefits, achieving brand differentiation, and driving novelty and innovation in the beverage industry.

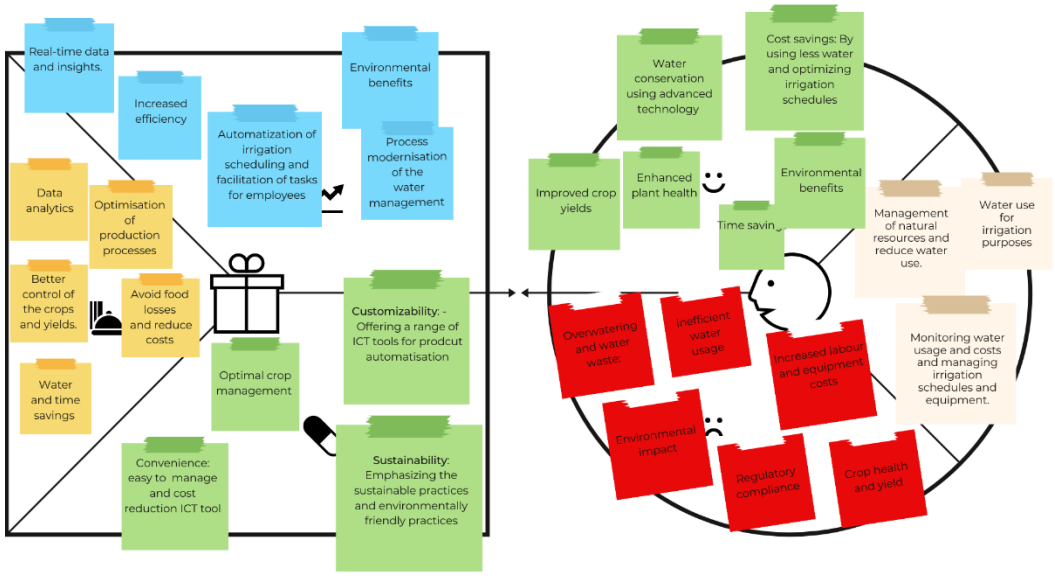


Figure 5: Value proposition and customer profile for new beverage from clementine juice

Exploitation Possibilities: The innovative clementine-derived beverage opens doors to multiple exploitation opportunities. By continuously expanding our product portfolio and leveraging the sustainability angle, we can increase our market presence. Establishing strong partnerships with local farmers and communities

involved in clementine production can create a positive social impact, generating consumer goodwill and brand loyalty.

Market Growth Possibilities: The value proposition aligns perfectly with market trends emphasizing sustainability, health, and product diversity. As consumers increasingly seek eco-friendly, healthier, and more diverse beverage options, our innovative approach positions us for substantial market growth. Moreover, our efforts to reduce food waste contribute to a more sustainable agrifood value chain, aligning with broader industry goals.

8.3 Valorisation of Clementine residues: production of bioactive ingredients

The initiative revolves around the valorisation of clementine residues, unlocking their untapped potential to yield bioactive ingredients. Within the diverse customer base, which encompasses food and beverage manufacturers and agricultural and biotechnology companies, critical tasks such as production, processing, packaging, and ensuring food safety, quality control, and regulatory compliance take precedence. These essential responsibilities are often accompanied by significant pains, including the daunting challenges of waste management, optimizing storage and preservation methods for clementine by-products, and achieving efficient extraction of valuable components. Additionally, innovative product development and navigating complex regulatory landscapes pose substantial hurdles. Our tailored solution is designed to alleviate these pains comprehensively, offering a sustainable pathway to transform clementine residues into valuable bioactive ingredients, thus mitigating waste and environmental concerns. Moreover, the solution delivers a spectrum of gains that resonate deeply with our customers. By repurposing clementine residues, bioactive ingredients derived from clementine by-products offer health and wellness promotion possibilities, including potential antioxidant and anti-inflammatory properties, contributing to overall well-being. Our solution also fosters expanded product ranges, reduced waste and pollution, and nutritional enrichment, thereby aligning with the growing consumer demand for natural, sustainable, and functional ingredients. To address these pains and deliver these gains, we offer an array of pain relievers and gain creators. Pain relievers include the valorisation of clementine by-products as sources of bioactive compounds with potential analgesic properties, sustainable waste valorisation, and enhanced extraction efficiency to maximize yields of bioactive compounds. On the other hand, gain creators encompass waste-to-value conversion, revenue diversification, market differentiation, cost savings through waste reduction, and increased profitability through premium pricing for products incorporating bioactive ingredients. This unique value proposition positions us as a catalyst for transformative change within the agrifood industry, fostering innovation, economic growth, and sustainable practices, thereby reshaping the future of resource-conscious, environmentally responsible, and economically thriving agrifood value chains.

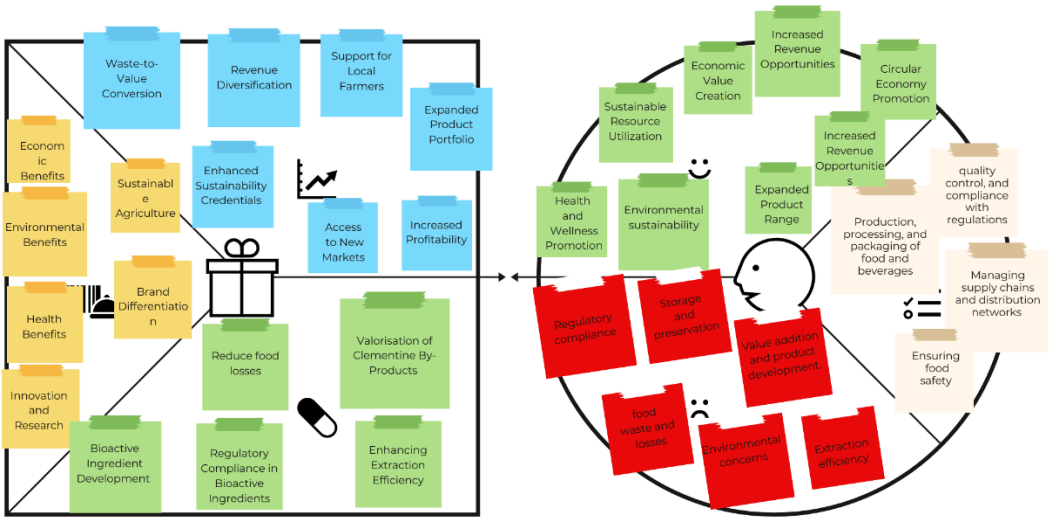


Figure 6: Value proposition and customer profile for Valorisation of Clementine residues: production of bioactive ingredients

Exploitation Possibilities: The valorisation of clementine residues to produce bioactive ingredients presents a myriad of exciting exploitation possibilities. Firstly, these bioactive compounds have the potential to be integrated into various industries, including the pharmaceutical, nutraceutical, and cosmetics sectors. For example, the development of dietary supplements enriched with bioactive components derived from clementine residues can tap into the growing health-conscious consumer market. Furthermore, these ingredients can find application in natural skincare products, capitalizing on the trend towards organic and sustainable beauty solutions. Secondly, the clementine bioactive ingredients can serve as valuable components in the food and beverage industry. They offer opportunities to enhance nutritional profiles, improve taste and texture, and introduce functional attributes to a wide range of products. The versatility of these ingredients allows for innovation in the development of natural flavourings, preservatives, and antioxidants, meeting the ever-evolving demands of consumers for healthier and more sustainable food and beverage options.

Market Growth Potential: The market growth potential associated with the valorisation of clementine residues into bioactive ingredients is substantial. As consumer preferences continue to shift towards eco-friendly, sustainable, and natural products, the demand for such bioactive ingredients is expected to rise significantly. This trend aligns with the global movement towards healthier lifestyles and environmental consciousness. Moreover, the valorisation process promotes a circular economy, which is gaining traction as a responsible and resource-efficient approach across industries. Embracing circular economy principles enhances the market's appeal to environmentally conscious consumers, further driving growth. Additionally, the economic benefits generated by this valorisation process, such as revenue diversification and job creation, stimulate economic growth within the agricultural and biotechnology sectors. This, in turn, contributes to the overall expansion of the market and fosters innovation in the field.

8.4 Digitization of services for the use of fertilisers according to online measurements (N, P, K) and soil needs (pH)

The digital services for the use of fertilisers and soil needs caters to a diverse customer segment, including farmers, agronomists, agricultural researchers, and more, seeking to revolutionize their approach to soil fertility management and fertilizer application. Recognizing the primary jobs and pains of our customers, we prioritize providing real-time monitoring, data-driven insights, and personalized recommendations to ensure that the most critical aspects of soil health and crop nutrition are addressed efficiently. For farmers, our platform offers a comprehensive toolkit for monitoring and managing soil fertility, fine-tuning fertilizer application, and adjusting soil pH with precision. By addressing their initial investment concerns through affordable and accessible technology, we empower small-scale and resource-constrained farmers to adopt these transformative practices, unlocking the potential for cost savings and improved crop quality. Agricultural professionals, including advisors and consultants, benefit from advanced analytics, predictive insights, and the ability to remotely support their clients. This not only enhances their efficiency in serving a broader clientele but also ensures compliance with evolving regulations while alleviating concerns related to data privacy and security. The added value of the solution lies in its potential to catalyse the transformation of the agrifood value chain. With precision agriculture, sustainable practices, and reduced environmental impact at the forefront, we envision a future where farmers can optimize resources and maximize yields, ultimately contributing to food security. The scalability and compatibility of our platform ensure broad adoption across diverse agricultural settings, thus opening vast market growth possibilities. By aligning with evolving industry trends and sustainable agricultural practices, our solution promises to reshape the agrifood value chain by promoting resource-efficient, environmentally conscious, and data-driven farming practices.

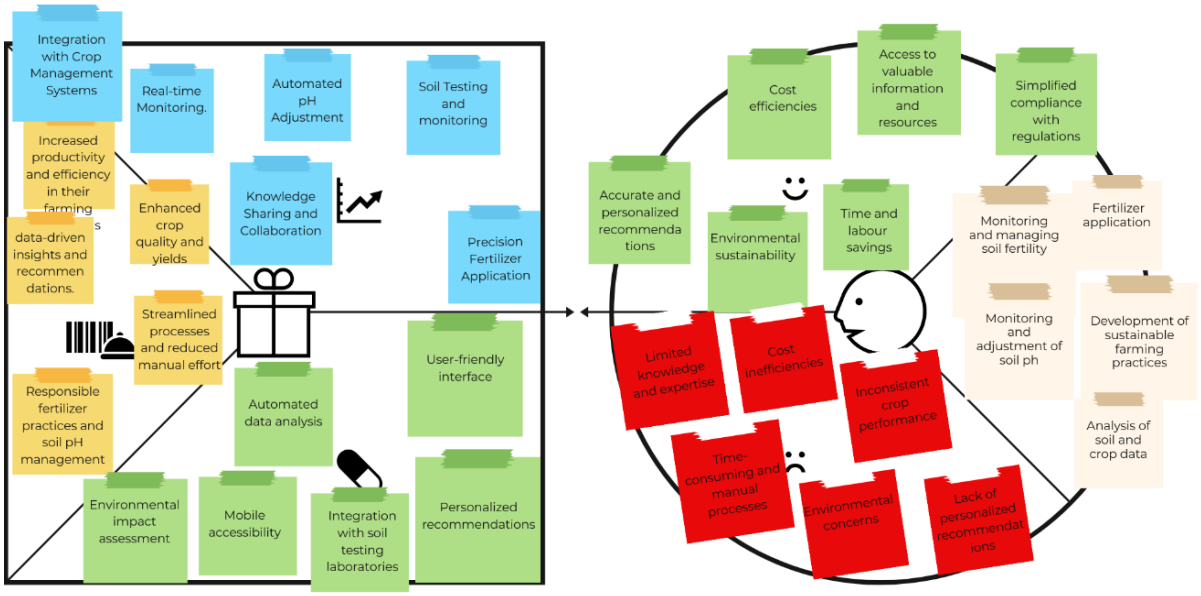


Figure 7: Value proposition and customer profile for Digitalization of services for the use of fertilizers and soil needs.

Exploitation Possibilities: The digitalization of services for fertilizers and soil pH management represents a transformative force within the agriculture sector, offering numerous exploitation possibilities. Firstly, the integration of real-time monitoring and automated alert systems can significantly enhance precision agriculture. This technology not only optimizes resource use but also reduces waste, potentially leading to increased crop yields. Moreover, the wealth of data generated by digital tools presents opportunities for analytics companies to develop innovative insights and decision-support systems, further augmenting the value proposition for farmers and agricultural professionals. Additionally, as sustainability becomes a central concern, digitalization can empower eco-conscious practices, creating a niche market for environmentally friendly agricultural technologies and services. These exploitation possibilities not only drive technology adoption but also stimulate new business models and collaborations across the agrifood value chain.

Market Growth Potential: The market growth potential for digital services in soil fertility and pH management is substantial. Agriculture, as a critical sector for global food production, is under pressure to increase efficiency and sustainability. Digital tools offer solutions to these challenges, making them attractive investments. The market is expected to expand as more farmers and agricultural professionals recognize the tangible benefits of cost savings, enhanced crop quality, and sustainability. Moreover, the scalability and compatibility of digital solutions enable their adoption across diverse agricultural settings, from small family farms to large commercial operations. With advancements in technology, increased data accessibility, and evolving regulatory environments, the market growth trajectory is poised to continue. The fusion of digitalization with agriculture not only modernizes farming practices but also contributes to the resilience and productivity of the entire agrifood value chain.

8.5 Development of a new meat analogue with faba beans from the Netherlands: Frozen Burger

Low processed faba bean burgers cater to a specific customer segment, primarily food enterprises seeking to bolster their competitive edge in the plant-based product market. Anchored in robust consumer demand analysis, we deliver a technologically advanced product: low-processed Faba bean burgers. The offering is tailored to address pivotal operational jobs, encompassing product transformation and storage, seamless factory-to-customer distribution, and the intricate logistics of transporting, distributing, and selling to various customer points. Alleviating significant industry pains, our solution targets food losses, nutritional quality erosion, and concerns regarding product quality. Simultaneously, it combats the prevailing issue of highly processed plant-based alternatives, empowers small and medium-sized enterprises (SMEs) to compete effectively against larger counterparts, and promotes sustainability in food production.

Pain relievers encompass a multifaceted approach, encompassing flavour and texture optimization to cater to diverse consumer preferences, customizability to satisfy an array of formulation requirements, nutritional enhancement to meet health-conscious consumer demands, and sustainability integration to align with eco-conscious consumer preferences. Convenience and avoidance of product losses and returns further solidify our pain-relieving capabilities. In terms of gain creation, we emphasize competitive pricing strategies to attract price-sensitive consumers and ensure availability to cultivate customer loyalty. Offering allergen-free options caters to specific dietary needs, while ensuring taste and texture consistency bolsters customer trust.

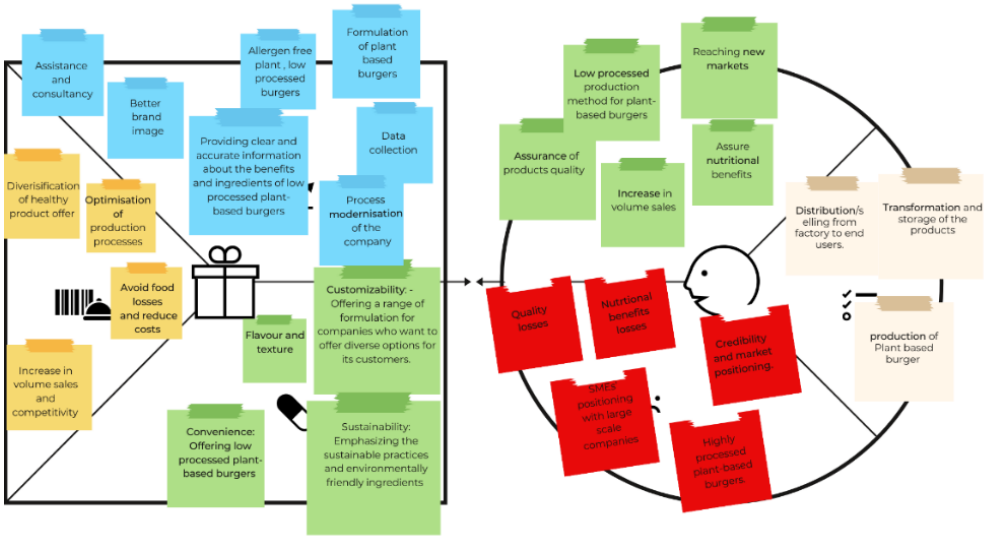


Figure 8: value proposition and customer profile for low processed Faba bean burgers

Exploitation Possibilities: Low processed Faba beans burgers offering provides a platform for various exploitation avenues. The continuous development of new low-processed plant-based products, customized to evolving consumer preferences, opens the door for expanded market penetration. Furthermore, leveraging our sustainability credentials can position us as a preferred supplier in markets focused on environmentally responsible products, leading to enhanced partnerships and contracts.

Market Growth Possibilities: With the increasing shift towards plant-based diets and sustainable food options, our value proposition aligns with a substantial market trend. The potential for exponential growth in market share is evident, as consumers increasingly seek healthier, environmentally friendly, and customizable food alternatives. By further diversifying our product range and maintaining competitive pricing, we are poised to capture a significant share of this expanding market.

8.6 Development of a new meat analogue with faba beans from the Netherlands: Do it yourself kit

Faba bean Falafel caters to food manufacturers, plant-based and vegetarian/vegan food companies, restaurants, and health food stores seeking to diversify their offerings and meet the demands of an evolving consumer landscape. The primary jobs we address are sourcing high-quality Faba beans, achieving recipe perfection, and navigating fluctuating ingredient costs and availability. Our premium-quality Faba beans ensure a delightful taste and texture, aligning with health-conscious consumers' preferences for plant-based and nutritious options. By offering Faba bean Falafel, businesses can differentiate themselves in the market, expand their customer base, and enhance their brand image as eco-friendly and health focused. Moreover,

this innovative menu item appeals to a broader target market, including vegetarians, vegans, and those seeking alternative protein sources, driving increased revenue and customer loyalty.

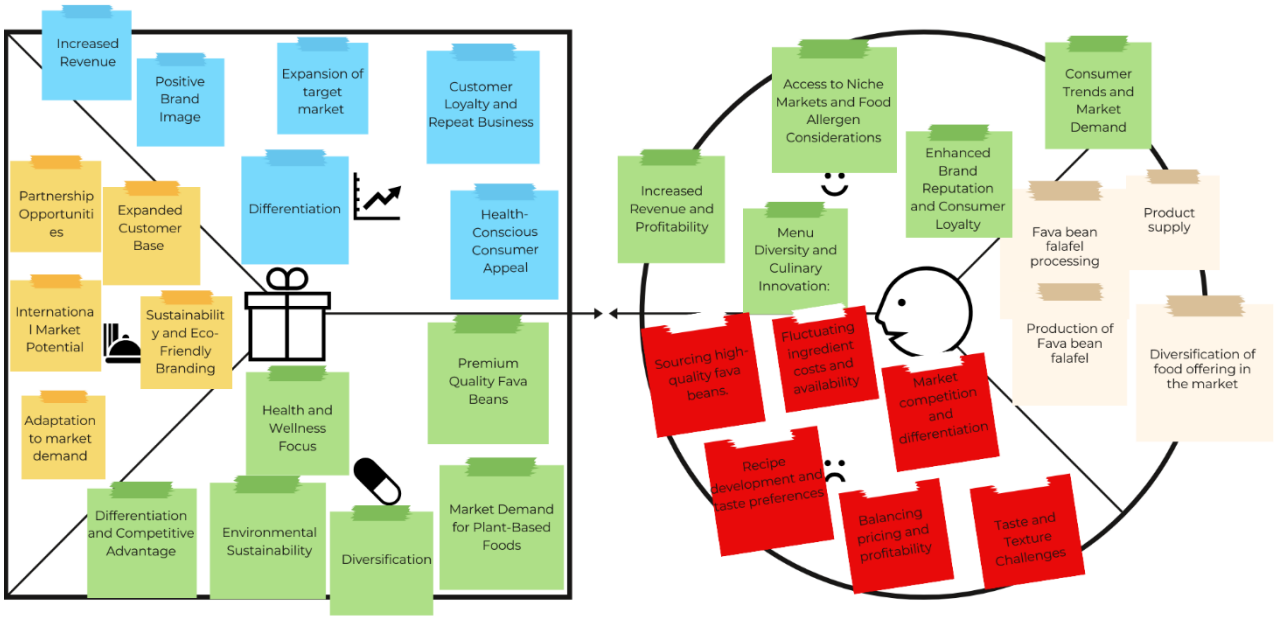


Figure 9: Value proposition and customer profile for Faba bean falafel

Exploitation possibilities: The introduction of Faba bean Falafel presents numerous exploitation possibilities that can benefit businesses across the food industry. Firstly, collaborating with local farmers for a stable supply of Faba beans can promote regional agriculture and strengthen local supply chains, fostering economic development in communities. Secondly, by aligning with sustainability goals and eco-friendly branding, businesses can attract environmentally conscious consumers, positioning themselves as leaders in sustainable food practices. Additionally, exploring international markets holds significant potential, as global interest in plant-based products continues to rise. Exporting Faba bean Falafel can lead to expanded market reach, global brand recognition, and increased revenue streams. Furthermore, partnering with other entities in the vegetarian/vegan food sector can result in joint marketing initiatives, cross-promotion, and shared resources, amplifying brand exposure and further accelerating growth.

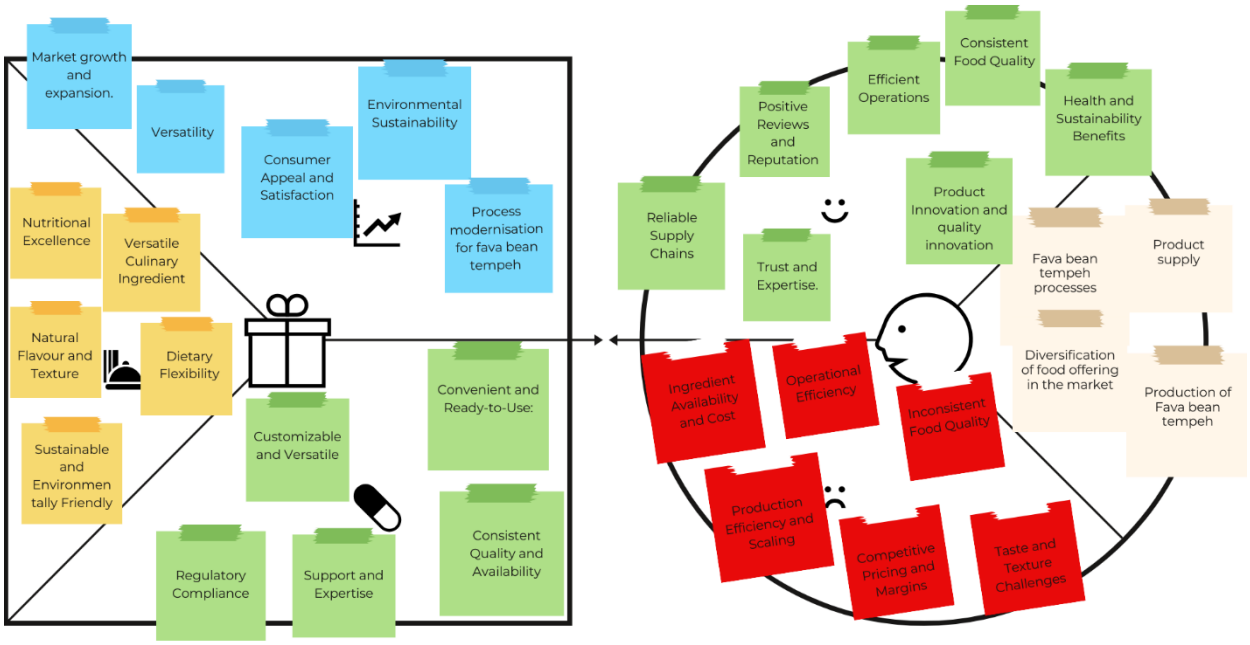
Contribution to market Growth: Faba bean Falafel taps into an ever-expanding market segment driven by evolving consumer preferences. The demand for plant-based and vegetarian options is on the rise, and by offering this innovative product, businesses can access a broader customer base, including vegetarians, vegans, and health-conscious individuals. This expansion of the target market translates into increased revenue and profitability. Moreover, Faba bean Falafel's alignment with health and wellness trends positions it as a nutritious choice in the eyes of consumers seeking balanced and wholesome food options. Its premium quality and unique taste set it apart from competitors, creating differentiation and a competitive advantage. As businesses adopt this culinary innovation and prioritize high-quality ingredients, they not only meet consumer demands but also contribute to a more sustainable and health-focused agrifood market.

8.7 Development of a new meat analogue with faba beans from the Netherlands: Fermented meat alternative product (Tempeh)

The Fababean Tempeh designed to meet the demands of food manufacturers, processors, plant-based food companies, restaurants, and specialty markets, delivers a sustainable and versatile solution in the plant-based food sector. Addressing the critical issues of inconsistent food quality and ingredient availability it ensures operational efficiency during peak hours, aligning with the priority jobs of product supply and tempeh processing. Meanwhile, it expands the menu offerings of restaurants and foodservice providers, alleviating the pain of limited product selection, and enhancing customer appeal and satisfaction. In health

food stores and specialty markets, our product augments product portfolios with innovative and sustainable protein sources, creating market differentiation. The pains of maintaining consistent food quality and production efficiency are assuaged as our Faba bean tempeh offers consistent quality with each batch and a reliable supply chain. With its nutritional excellence, culinary versatility, and dietary flexibility, it caters to various dietary preferences and contributes to sustainability. Moreover, it bolsters environmental sustainability, reducing the carbon footprint, and promises to influence agrifood value chains towards sustainable ingredient sourcing and waste reduction, aligning with global sustainability objectives.

Figure 10:Value proposition and customer profile for Faba bean tempeh



Exploitation Possibilities: The potential for exploiting the Faba bean tempeh extends beyond its immediate use in the food industry. With its nutritional excellence and sustainability benefits, it can serve as a valuable ingredient for other food innovations, such as snacks, ready-to-eat meals, and food supplements. Collaborations with research institutions and culinary experts can lead to the development of new tempeh-based recipes and products, expanding its reach and applicability. Additionally, partnerships with agricultural cooperatives and farmers can promote the cultivation of Faba beans, fostering a more sustainable and diversified crop landscape. Furthermore, our commitment to regulatory compliance ensures that our tempeh aligns with evolving food safety standards, making it an attractive choice for businesses seeking innovative and compliant ingredients.

Contribution to Market Growth: Faba bean tempeh has the potential to catalyse market growth in the plant-based food sector. By addressing the pains of inconsistent food quality, limited product offerings, and environmental concerns, it opens doors to new consumer segments and market niches. The innovative use of Faba beans as a protein source can pave the way for a broader acceptance of plant-based diets, thus contributing to the expansion of the vegetarian and vegan food market. As consumers increasingly seek healthier and sustainable food options, our tempeh stands at the forefront of meeting these demands. Its versatility in culinary applications positions it favourably for use in various cuisines, creating opportunities for culinary innovation. Moreover, the focus on environmental sustainability aligns with the growing interest in eco-friendly and ethical food choices, driving consumer preferences and market growth in the plant-based food industry.

9. Business models

9.1 Smart irrigation system

The smart irrigation business model offers an innovative solution for efficient and sustainable water management across agriculture, landscaping, and industry. It uses technology to adjust watering schedules based on real-time data, saving water and optimizing crop health. The model serves diverse customers such as farmers, landscapers, and industrial facilities, providing services from installation to ongoing support.

1. Value Proposition: Our core value lies in delivering a Smart Irrigation System that harnesses weather and soil sensor data to automatically adjust watering schedules, leading to optimized water productivity. Our comprehensive offering includes Smart Irrigation Controllers, Soil Moisture Sensors, installation and setup services, cloud-based monitoring, weather data integration, regular maintenance and support, and customizable control options.

2. Customer Segments: Our system caters to diverse customer segments, including industrial facilities, farmers, cooperatives, landscaping businesses, and municipalities. Each segment benefits from sustainability, cost savings, improved plant health, time efficiency, environmental advantages, enhanced control, and integration with other smart technologies.

3. Customer Relationships: We establish and maintain strong relationships by directly engaging with customers, offering installation and maintenance services, and providing ongoing customer support and technical assistance. Customer Relationship Management: Efficient customer relationship management is facilitated through contact management, client interaction tracking, database management, knowledge management, and security management. Distribution: We require human resources and equipment maintenance to ensure the seamless distribution of our Smart Irrigation System

4. Channels: We reach our audience through various channels, including partners' networks, participation in trade shows, and direct marketing to end users.

5. Key Resources: Our value proposition thrives on a skilled engineering and software development team, state-of-the-art manufacturing facilities and equipment, strategic partnerships, and financial resources for market research and marketing.

6. Key Activities: The success of our value proposition relies on pivotal activities like ongoing research and development of cutting-edge irrigation technology and software, efficient design and manufacturing of ICT equipment and sensors, strategic sales and marketing efforts, seamless installation, maintenance services, and intelligent data analysis to optimize irrigation schedules. These activities drive distribution, customer relationships, and revenue streams.

7. Key Partners: Our collaborative efforts extend to landscaping and lawn care companies, government agencies promoting water conservation, auditors ensuring quality control, and research and development organizations contributing to crop yield optimization. From these partners, we gain agronomic expertise, compliance with hygiene standards, and essential components for our irrigation system.

8. Cost Structure: The most significant cost involves personnel expenses for hardware and software engineers. While predominantly fixed, these costs align with our continuous commitment to system upgrades, research and development, versioning, and support. We allocate costs across various projects, harness economies of scale, focus on accessible markets, and maintain cost-effective service delivery.

9. Revenue Streams: Our revenue streams encompass Product Sales, Licensing and Subscriptions, Installation and Maintenance Services, Customization and Integration projects, Consulting and Training services, and Data Analytics and Reporting tools. This diversified revenue model ensures financial sustainability and caters to the diverse needs of our customers.

Table 9. BUSINESS MODEL CANVAS for the Smart irrigation system

<table>
<tr>
<td rowspan="2">KEY PARTNERS
Who are your key partners/suppliers?
Landscaping and lawn care companies, Auditors
-Research and development organizations,
Which key resources are we acquiring from partners?
-Agronomic knowledge about crop water requirements.
-Compliance with laboratory hygiene norms.
- hydraulic/ electric parts of the core irrigation system
Which key activities do partners perform?
-Auditing.
-Technical maintenance of the hydraulic and electric part
- water stress evaluation</td>
<td>KEY ACTIVITIES
What key activities does your value proposition require, deliver to your customer experience?
– Research and development of new irrigation technology and software, Design and manufacturing of irrigation ICT equipment and sensors, Sales and marketing to promote and sell products, Installation and maintenance services for customers, Data analysis and optimization of irrigation schedules.
What activities are the most important for your distribution channels, customer relationships, revenue streams etc?
-Market research.
-Client acquisition.
-Targeted advertisement campaigns.
-Regular maintenance and system calibration.</td>
<td rowspan="2">VALUE PROPOSITION
What core value do you deliver to your audience?
Smart irrigation system that automatically adjusts watering schedules and amounts based on weather and soil sensor data, resulting in optimised water productivity.
What bundles of product/services are we offering to each customer segment?
- Smart Irrigation Controller, Soil Moisture Sensor, Installation and Setup: Provide installation services and assistance in setting up the smart irrigation system to ensure proper functioning, Cloud-based monitoring, Weather-based Data Integration, Regular Maintenance and Support: Provide ongoing maintenance services, system updates, and technical support to ensure optimal performance, Customizable Control and Access: Provide options for different user roles and permissions to allow multiple stakeholders to access and control the irrigation system as needed.
What pains do they experience when trying to achieve their goals? High Water Bills, Overwatering or Underwatering: Inaccurate watering practices, Complex System Management: Managing multiple irrigation zones and maintaining consistent schedules can be complex and time-consuming for commercial property managers, Lack of Remote Management of irrigation cycles.
How does our product/service help them achieve their goals/relief pains? Water Conservation, Convenience and Time Savings, Efficient and effective Water Management, Proactive Maintenance and Issue Detection, Optimal crop growth, Compliance and Sustainability.</td>
<td>CUSTOMER RELATIONSHIP
What relationship does the target audience expect you to establish and maintain with them?
– Direct sales and marketing to customers.
– Offering installation and maintenance services.
– Providing ongoing customer support and technical assistance.</td>
<td rowspan="2">CUSTOMER SEGMENTS
What are our most important customers?
Industrial facilities, farmers, cooperatives, landscaping businesses, and municipalities.
Why?
–In agriculture, Farmers and agricultural businesses that rely on irrigation to grow crops are a key customer segment for smart irrigation systems. These systems can help farmers optimize water usage and improve crop yields
–Landscaping: landscaping businesses, and municipalities that need to maintain lawns, gardens, parks, and other green spaces can benefit from smart irrigation systems.
–Industrial: Industrial facilities that require water for manufacturing processes or cooling systems can also benefit from smart irrigation systems.
Why?
Sustainability, cost Savings, Improved Plant Health, Time and Effort Savings, Environmental Benefits.
Enhanced Control and Monitoring, Customization and Flexibility, Integration with Other Smart Technologies.
What differentiates our customer segments?
-Sustainable businesses ,-Better water management, Guarantee same product quality with low environmental impacts.
What opportunities are there to reach new customers segments? Small-Scale Urban agriculture and Community Gardens, Small-Scale Urban Gardens and Community Garden, Corporate Sustainability Initiatives, Water Utilities and Conservation Organizations, Retrofit Solutions for Existing Irrigation Systems.</td>
</tr>
<tr>
<td>KEY RESOURCES
What key resources does your value proposition require?
– Skilled engineering and software development team, Manufacturing/production facilities and equipment, Partnerships with key stakeholders like B2B agreements and traders, financial resources for market research, and marketing.
What key resources do you need for distribution?
-Human resources, Equipment maintenance.
What key resources do you need for customer relationship management? Contact management, Client interaction tracking, Database management, Knowledge management. Security management.</td>
<td>CHANNELS
Through which channel does your audience want to be reached?
-Partners' channels.
- trade shows.
-Direct marketing to end users.</td>
</tr>
<tr>
<td colspan="3">COST STRUCTURE
Personnel Costs: hardware and software engineers for system development and maintenance.
Manufacturing and Equipment: Costs associated with producing irrigation controllers, sensors etc.
Marketing and Sales: Expenses related to advertising, promotion, and sales efforts.
Installation and Maintenance Services: Costs of providing installation and ongoing system maintenance.
Customization and Integration: Expenses for tailoring solutions to unique customer requirements.
R&D and Technology: Investment in research and development for system improvements.</td>
<td colspan="3">REVENUE STREAM(S)
–Product Sales, Licensing and Subscriptions, Installation and Maintenance, Customization and Integration, Consulting and Training, Data Analytics</td>
</tr>
</table>

9.2 New beverage from clementine juice for other consumption moments including ingredients produced from Clementine juice subproducts.

1. Value Proposition:

The value proposition centers on delivering an innovative and sustainable beverage, Clementine Juice, meticulously crafted from clementine by-products. We offer a spectrum of core values that appeal to health-conscious consumers and environmentally aware businesses alike. Our commitment to environmental sustainability is evident through the repurposing of clementine by-products, contributing significantly to waste reduction and resource efficiency. By minimizing the need for additional raw materials through responsible sourcing practices, we are not only promoting eco-consciousness but also demonstrating our dedication to minimizing the environmental footprint of our operations. Furthermore, our beverage isn't merely refreshing; it's a potential source of added health benefits. Clementine by-products, rich in valuable nutrients and antioxidants, enable us to offer a unique and wholesome product that encourages healthier choices and overall wellness. This innovative approach allows businesses to diversify their product portfolios, potentially increasing income through product innovation. Beyond these facets, our business model strongly supports local economies, fostering sustainability and growth within communities.

2. Customer Segments:

The primary customer segments encompass food companies and retailers, both drawn to our business model for several compelling reasons. These include the undeniable appeal of sustainability, a key aspect in today's eco-conscious market. Additionally, our offering brings potential cost savings, making it an attractive choice for businesses aiming to enhance profitability while aligning with growing consumer demands for environmentally responsible products. The substantial environmental benefits our product delivers further amplify its appeal in the market.

3. Key Partners:

Key partners are the linchpin of our business model, playing pivotal roles in ensuring seamless operations and product excellence. Our collaboration with a Food Scientist/Product Development Manager focuses on formulating the beverage using clementine by-products while adhering to stringent technical aspects. The Supply Chain Manager plays a critical role in ensuring a continuous and high-quality supply of clementine by-products, fundamental for seamless production processes. Meanwhile, the Research and Development (R&D) Manager oversees the technical aspects, providing crucial guidance for innovation and optimization. The Quality Assurance Manager diligently ensures that our beverage consistently meets industry standards in terms of taste, safety, and quality. The Marketing Manager crafts robust marketing strategies to effectively promote the product, capturing its essence and unique value proposition. The Packaging Designer combines visual appeal with functional practicality to create packaging that not only stands out but also protects the product. Sales Representatives act as the face of our brand, actively engaging in promotional and sales activities to ensure our product reaches the intended market. The Operations Manager supervises production, ensuring efficiency and cost-effectiveness throughout. Last but not least, the Sustainability Manager continually integrates sustainable practices into every aspect of production and distribution, reinforcing our commitment to eco-consciousness.

4. Key Activities:

The core activities are grounded in the pursuit of excellence. We invest heavily in research and development, fine-tuning the formulation of the beverage to attain optimal quality and taste. A comprehensive approach to consumer research guides us in understanding market demands, allowing us to tailor our offering to consumer preferences. Sales and marketing activities are essential to effectively communicate the unique value proposition of our product, ensuring it resonates with our target audience.

Equipment installation and maintenance are critical to maintaining production efficiency and product quality, guaranteeing that our product consistently meets the high standards we set.

5. Customer Relationship:

The business model places a strong emphasis on direct customer relationships. We forge these connections through a multifaceted approach that includes extensive sales and marketing efforts aimed at ensuring our product is accessible to consumers. Furthermore, our commitment extends beyond the point of sale, as we offer installation and maintenance services to ensure our product remains operational and accessible. Ongoing customer support and technical assistance reinforce these relationships, addressing any issues promptly and maintaining customer satisfaction.

6. Key Resources:

To deliver the value proposition effectively, we rely on an array of key resources, each contributing to the success of our venture. Skilled food scientists with expertise in formulation and food processing form the core of our human resources. State-of-the-art manufacturing facilities, equipped for beverage production, ensure the consistent production of high-quality products. Valuable partnerships with research labs and universities keep us at the forefront of innovation, driving continuous improvement in our product. Substantial financial resources are dedicated to comprehensive market research and effective marketing campaigns, elevating our brand and product presence.

7. Channels:

Our multichannel approach ensures that we reach our target audience effectively. We leverage partner channels to expand our reach, collaborating with like-minded organizations to amplify our market presence. Participation in industry-specific trade shows allows us to showcase our innovative product to a diverse and engaged audience. Direct marketing initiatives aimed at end-users serve as a direct line of communication, educating consumers about the unique qualities and benefits of our beverage, fostering a loyal customer base.

8. Cost Structure:

The cost structure is a comprehensive representation of the resources allocated to maintain the excellence of our product. Personnel costs encompass skilled staff, ensuring that every aspect of production, from formulation to quality control, is executed with precision. Manufacturing and equipment costs are vital for the continuous production of our beverage, maintaining the machinery and technology needed for efficiency and consistency. Marketing and sales expenses are essential for promoting the product effectively, ensuring that it reaches its intended audience. Installation and maintenance costs guarantee the operational accessibility of our product, reflecting our commitment to customer satisfaction. Research and development investments are allocated for ongoing formulation improvements and product quality enhancements, maintaining our competitive edge. These costs, in conjunction with other operational expenses, are meticulously managed to maintain efficiency and cost-effectiveness.

9. Revenue Streams:

The revenue streams are diversified, ensuring a robust financial foundation. The primary source of revenue is the sales of Clementine By-Product Juice, reflecting the core of our value proposition. However, our innovative approach allows us to offer customization options for specialized beverages, catering to unique consumer preferences and expanding our revenue streams. This diversification not only enhances our financial stability but also demonstrates our adaptability and commitment to meeting the evolving demands of the market.

Table 10. BUSINESS MODEL CANVAS: New beverage from clementine juice for other consumption moments including ingredients produced from Clementine juice subproducts

<table>
<tr>
<td rowspan="2">KEY PARTNERS
Who are your key partners/suppliers?
-Food Scientist/Product Development Manager, Supply Chain Manager,
- Research and Development (R&D) Manager, Quality Assurance Manager Marketing Manager, Packaging Designer, Operations Manager, Sustainability Managers
Which key resources are we acquiring from partners?
-Development of new production process.
-Compliance with laboratory hygiene norms and quality.
- Development of a marketing strategy, packaging supply and logistics
Which key activities do partners perform?
- Auditing.
- Packaging and supply chain management.
- Processing and Extraction.
- Formulation and Recipe Development.
- Packaging and Labelling.
- Regulatory Compliance.</td>
<td>KEY ACTIVITIES
What key activities does your value proposition require, deliver to your customer experience?
– Research and development of a new beverage using clementine by-products.
– Consumer research on the willingness to drink clementine by-products.
– Sales and marketing to promote and sell products.
– Installation and maintenance services for equipment.
– What activities are the most important for your distribution channels, customer relationships, revenue streams etc?
-Market research.
-Client acquisition.
-Targeted advertisement campaigns. .</td>
<td rowspan="2">VALUE PROPOSITION
What core value do you deliver to your audience?
- Environmental Sustainability, - Responsible Sourcing, - Health and Nutrition, - Innovation and Creativity, Local Sourcing and Support.
What bundles of product/services are we offering to each customer segment?
- Clementine By-Product Juice, Subscription Plan, Clementine By-Product Juice, Customization Options.
What pains do they experience when trying to achieve their goals?
- Limited Healthy Beverage Options.
- Limited Sustainable Options.
- Beverage Variety and Differentiation.
- Food waste and loss.
- Loss of nutritional benefits of clementine
How does our product/service help them achieve their goals/relief pains?
- Sustainable and Eco-Friendly products.
- Ethical Sourcing.
- Market Relevance.
- Diverse and Unique Beverage Options
- Sustainability-Focused Offerings.</td>
<td>CUSTOMER RELATIONSHIP
What relationship does the target audience expect you to establish and maintain with them?
– Direct sales and marketing to customers.
– Offering installation and maintenance services.
– Providing ongoing customer support and technical assistance.</td>
<td rowspan="2">CUSTOMER SEGMENTS
What are our most important customers?
–Food companies, retailers.
Why?
-Sustainability.
-Cost Savings.
-Improved market offer and alignment with consumer needs.
-Environmental Benefits.
What differentiates our customer segments?
-Sustainable businesses
-Better waste management.
- Increased competitiveness in the market.
-Involvement in the circular economy movement.
What opportunities are there to reach new customers segments?
- Showcase the unique and sustainable aspect of the clementine by-product juice
- Target health food stores, organic markets, and specialty retailers that focus on natural and sustainable products. Position the clementine by-product juice as a premium and health-conscious beverage that aligns with their product offerings and appeals to their customer base.
- Collaborative Partnerships using partnerships with other food and beverage brands that align with the values of the target audience.</td>
</tr>
<tr>
<td>KEY RESOURCES
What key resources does your value proposition require?
– Skilled food scientists and consumer behaviour analysts.
– Manufacturing facilities and equipment
– Partnerships with research labs and universities.
– Financial resources for market research, , and marketing.
What key resources do you need for distribution?
-Human resources.
-Equipment maintenance.
- logistics.
What key resources do you need for customer relationship management?
- Customer Database.
- Customer Relationship Management (CRM) software.
- Communication Channels.
- Loyalty Programs and customer feedback mechanisms.
-Data analytics.</td>
<td>CHANNELS
Through which channel does your audience want to be reached?
-Partners' channels.
- trade shows.
-Direct marketing to end users.</td>
</tr>
<tr>
<td colspan="3">COST STRUCTURE
Personnel Costs (Food Scientists, Analysts, etc.)
Manufacturing and Equipment Costs
Marketing and Sales Expenses
Installation and Maintenance Costs
Research and Development Investment</td>
<td colspan="3">REVENUE STREAM(S)
– Sales of Clementine By-Product Juice
– Customization Options for Specialized Beverage</td>
</tr>
</table>

9.3 Valorisation of Clementine residues: production of bioactive ingredients

1. Value Proposition: The core value proposition is multi-faceted and caters to various stakeholders in different ways. Firstly, we offer a sustainable and eco-friendly solution to produce bioactive ingredients by valorising clementine residues. This approach not only reduces waste but also aligns with the global emphasis on sustainability. It turns what would otherwise be discarded or treated as waste into valuable resources, resulting in cost savings and increased profitability for our partners. Moreover, the bioactive compounds found in clementine residues, such as flavonoids, phenolic acids, and limonoids, have demonstrated significant health benefits. This makes them highly desirable for industries like food, pharmaceuticals, and cosmetics, where consumers increasingly seek natural and functional ingredients. By developing innovative processes for extracting bioactive ingredients from clementine residues, we provide businesses with a competitive advantage. They can meet the growing consumer demand for natural and functional ingredients while differentiating themselves in the market. Furthermore, the market for bioactive ingredients is experiencing steady growth, with a strong emphasis on sustainable and plant-based sources. By capitalizing on valorising clementine residues, businesses can tap into this expanding market and enhance their product offerings. Lastly, embracing sustainable production aligns with the increasing consumer preference for environmentally friendly and socially responsible products. This presents businesses with an opportunity to differentiate their brand and attract conscious consumers.

2. Customer Segments: The customer segments encompass a diverse range of industries, each with unique motivations and requirements. Firstly, food and beverage manufacturers are looking for natural and sustainable ingredients to meet the growing demand for clean-label products. Pharmaceuticals companies leverage our bioactive compounds for health and wellness products, tapping into the increasing interest in natural remedies. The cosmetics and personal care industry benefits from the demand for natural ingredients in formulations, where our bioactive ingredients find applications. Lastly, agricultural and biotechnology companies are exploring sustainable practices, and our solutions align with their goals of waste reduction and resource optimization.

3. Channels: We reach our audience through multiple channels, ensuring that our message and products reach the right stakeholders. Partners' channels and collaborative networks play a crucial role in expanding our reach and visibility. Industry-specific publications and trade publications are valuable platforms for targeted exposure to our customer segments. Participation in trade shows and industry events allows us to showcase our innovative solutions to a broader audience. Additionally, direct marketing to end-users ensures that we engage directly with potential customers and promote the value of our bioactive ingredients.

4. Customer Relationships: Building and maintaining strong customer relationships are essential to our success. We engage directly with customers through direct sales and marketing efforts. We go beyond traditional transactions by offering proactive value-addition, continuously improving our products and processes based on customer feedback. Trust and reliability are foundational in our relationships, and we build them through consistent product quality and responsiveness. Additionally, our commitment to sustainability and social responsibility resonates with customers who seek eco-friendly and socially conscious products. We provide ongoing customer support and technical assistance, ensuring that our customers have the resources and guidance they need for seamless integration of our bioactive ingredients into their products and processes. Responsive communication is a key component of our customer relationships, as we prioritize timely responses to inquiries and concerns.

5. Revenue Streams: The revenue streams are diverse, reflecting the value we offer to our customers and partners across various industries. These revenue sources include bioactive ingredient sales, subscription-based models for ongoing supply, support and maintenance services, consultancy services for sustainable practices, customized product development, licensing of intellectual property, and value-added services such as training programs and educational resources. By diversifying our revenue streams, we create a robust and sustainable business model that can adapt to the evolving needs of our customers and the market, while also mitigating risks associated with relying solely on one source of income.

6. Key Resources: The ability to deliver on our value proposition hinges on several key resources. Firstly, the raw materials, the clementine residues and by-products sourced from our partners, are the foundation of our operations. Production facilities and equipment, including specialized machinery and infrastructure, are essential for the extraction process. Technological tools and software, encompassing both hardware and software for data analysis, quality control, and product development, form a significant part of our resource pool. Our research and development capabilities, including personnel, equipment, and materials, enable us to innovate and stay at the forefront of extraction technology. An efficient supply chain network, encompassing logistics, transportation, and storage facilities, ensures the timely availability of raw materials. Finally, financial resources provide the capital required for our daily operations and investments in growth and innovation.

7. Key Partners: Collaboration is at the heart of our operations. We forge crucial partnerships with a diverse range of stakeholders to ensure the success of our mission. Clementine suppliers or citrus farms play a pivotal role by providing us with a consistent supply of clementine by-products—the raw materials required for our bioactive ingredient extraction process. Additionally, our partnerships with research and development institutions grant us access to scientific expertise, advanced technology, and research capabilities. Such collaborations support our ongoing innovation in extraction methods and formulation optimization. Moreover, we work closely with extraction technology providers who bring expertise and equipment for efficient extraction, purification, and concentration of bioactive compounds. Quality control and testing laboratories are essential partners in guaranteeing the safety, purity, and quality of our bioactive ingredients through rigorous testing and analysis. Manufacturing partners, depending on our business model, facilitate large-scale production and packaging. Lastly, distribution and sales partners expand the reach of our bioactive ingredients to a broader customer base, making these products accessible to those who need them.

8. Key Activities: The daily activities revolve around several key areas that enable us to deliver our value proposition effectively. The core of our operations lies in continuous product development and innovation. We are committed to consistently improving extraction methods, optimizing formulations, and identifying new bioactive compounds. Quality assurance and control are paramount, ensuring that the safety and purity of our bioactive ingredients meet the highest standards. We also provide comprehensive customer service and support, including training programs, to empower our clients in utilizing our bioactive ingredients optimally. Managing our supply chain efficiently, encompassing logistics, transportation, and storage facilities for clementine by-products, is a key activity that ensures a seamless flow of materials. Our marketing and communication efforts are geared towards creating awareness and educating the market about the value of our products. Finally, we maintain a strong focus on continuous improvement, incorporating feedback from customers and partners into our operations to drive ongoing enhancements.

9. Cost Structure: The cost structure encompasses various elements that contribute to the sustainability and success of our operations. Firstly, raw material costs are incurred in sourcing clementine by-products, the foundation of our products. Investment in production facilities and equipment, including specialized machinery and infrastructure, is essential to our extraction processes. Technological tools and software, such as software licenses and hardware, facilitate data analysis, quality control, and product development. Research and development (R&D) efforts, including innovation and experimentation, are fundamental to our continuous improvement and innovation. Managing our supply chain efficiently, including logistics, transportation, and storage, incurs associated costs. Marketing and communication expenses are essential for promoting our products and raising awareness. Continuous improvement efforts, driven by feedback from customers and partners, ensure that we enhance our products and processes continuously. We allocate resources to provide excellent customer support and training, ensuring that our customers receive the assistance they need. Administrative and overhead costs, including general operational expenses, support our daily operations. Sales and distribution expenses are incurred in our sales efforts to reach customers effectively.

Table 11. BUSINESS MODEL CANVAS Valorisation of Clementine residues: production of bioactive ingredients

<table>
<tr>
<td rowspan="2">KEY PARTNERS
Who are your key partners/suppliers and Which key activities do partners perform?
Clementine suppliers, Research and development institutions, Extraction technology providers, Quality control and testing laboratories, Manufacturing and production partners, Distribution and sales partners, Regulatory and legal experts.</td>
<td>KEY ACTIVITIES
What key activities does your value proposition require, deliver to your customer experience?
– Product development and innovation.
– Quality assurance and control.
– Customer service and support.
– Supply chain management.
– Marketing and communication.
– Continuous improvement and feedback integration.
What activities are the most important for your distribution channels, customer relationships, revenue streams etc?
- Distribution Channels: channel selection and management, logistics and fulfilment, and channel marketing and promotion.
- Customer Relationships: customer engagement and communication, customer support and after-sales service, and relationship management and loyalty programs.
- Revenue Streams: pricing strategy and management, sales and business development, and diversification and innovation.</td>
<td rowspan="2">VALUE PROPOSITION
What core value do you deliver to your audience?
– Valorisation of Clementine residues offers businesses a unique opportunity to tap into a sustainable and eco-friendly solution to produce bioactive ingredients.
– Turning waste materials into valuable resources.
– The bioactive compounds present in Clementine residues, such as flavonoids, phenolic acids, and limonoids, have demonstrated significant health benefits, making them highly desirable for industries like food, pharmaceuticals, and cosmetics.
– A process for extracting bioactive ingredients from Clementine residues.
– tapping into expanding market and enhance their product offerings.
– Alignment with the increasing consumer preference for environmentally friendly and socially responsible products, presenting businesses with an opportunity to differentiate their brand and attract conscious consumers.
What pains do they experience when trying to achieve their goals?
– Waste management, Storage and preservation, extraction efficiency.
– How does our product/service help them achieve their goals/relief pains?
– Valorisation of Clementine By-Products as Sources of Bioactive Compounds with Analgesic Properties, sustainable Waste Valorisation, enhancing Extraction Efficiency, regulatory Compliance in Bioactive Ingredients.</td>
<td>CUSTOMER RELATIONSHIP
What relationship does the target audience expect you to establish and maintain with them?
– Direct sales and marketing to customers.
– Proactive value-addition.
– Trust and reliability.
– Providing ongoing customer support and technical assistance.
– Responsive communication.
– Sustainability and social responsibility.</td>
<td rowspan="2">CUSTOMER SEGMENTS
What are our most important customers?
Food and beverage manufacturers, agricultural and biotechnology companies
Why?
Sustainability and waste reduction, Natural and clean label trends Health and wellness benefits, Market differentiation and innovation, Cost savings and efficiency
What differentiates our customer segments?
– Commitment to sustainability.
– Innovation and product differentiation.
– Consumer demand and market trends.
– Supply chain and sourcing considerations.
– Regulatory compliance readiness.
– Cost-effectiveness and economic viability.
What opportunities are there to reach new customers segments?
– Sustainable and natural products, Circular economy practices, Functional food and nutraceutical sectors, Natural cosmetics and personal care products, Innovation and novel applications</td>
</tr>
<tr>
<td>KEY RESOURCES
What key resources does your value proposition require?
- Raw materials, Production Facilities and Equipment, Technological Tools and Software, - Research and Development Capabilities, Supply Chain Network, Financial Resources.
What key resources do you need for distribution?
-Human resources.
-Equipment maintenance.
- Raw material supply.
What key resources do you need for customer relationship management?
- Customer Database, Customer Relationship Management (CRM) Software, Communication Channels, Customer Support Resources, Customer Feedback Mechanisms.</td>
<td>CHANNELS
Through which channel does your audience want to be reached?
– Partners' channels.
– Industry-specific publications.
– Trade shows.
– Direct marketing to end users.</td>
</tr>
<tr>
<td colspan="3">COST STRUCTURE
Raw Material Costs, Production Facilities and Equipment: Investment in facilities and equipment for the extraction, purification, and concentration of bioactive compounds from clementine by-products, Investment in research and development capabilities to innovate extraction methods, optimize formulations, and identify new bioactive compounds, costs associated with supply chain management.</td>
<td colspan="3">REVENUE STREAM(S)
-Bioactive Ingredient Sales, supply Chain Services, consultancy Services: Offering consultancy services in sustainable waste valorisation and bioactive ingredient development, assisting organizations in implementing similar processes and strategies.</td>
</tr>
</table>

9.4 Digitization of services for the use of fertilisers according to online measurements (N, P, K) and soil needs (pH)

The Digitalization of services for the use of fertilizers and soil needs (pH) will revolutionize modern agriculture with its innovative digital solution. This solutions' business model centers around optimizing soil management practices through the integration of soil sensors and IoT technology. By offering precise insights into soil conditions, nutrient levels, and pH values, this innovation empowers farmers to make data-driven decisions, reduce resource waste, and enhance crop yields. Here's a comprehensive breakdown of FINT's business model canvas.

1. Value Proposition: The digital solution, at its core, offers precision and efficiency in fertilizer application and soil pH control through cutting-edge technology. This technology optimizes nutrient distribution, significantly reducing waste and improving resource efficiency. Data-driven decision-making is facilitated by real-time monitoring and analysis of soil parameters, empowering farmers with a wealth of data for informed choices about nutrient application and soil management. Sustainability and environmental impact mitigation are achieved by minimizing overuse or underuse of fertilizers, ensuring that only necessary nutrients are applied, thereby contributing to environmental conservation. Cost-effectiveness is driven by resource optimization and reduced fertilizer wastage, leading to substantial cost savings for farmers and enhancing overall profitability. Additionally, remote monitoring and automation features allow farmers to efficiently manage their fields from anywhere, reducing the time and effort traditionally required for manual monitoring and adjustments.

2. Customer Segments: The digital solution caters to diverse customer segments, starting with farmers who seek sustainable agricultural practices, improved operational efficiency, and enhanced crop yields through data-driven insights. Agronomists and crop consultants benefit from the platform by gaining access to comprehensive, real-time data, enabling them to optimize farming practices and provide valuable insights to their clients. Agricultural input suppliers find value in the solution as it aids in cost reduction and enhances their return on investment through more efficient fertilizer use.

3. Channels: To effectively reach its audience, the digital solution utilizes multiple channels. Partnerships with agricultural organizations, cooperatives, and industry networks provide access to a wide customer base. Participation in industry-specific trade shows and exhibitions serves as a platform to showcase the technological advancements and solutions offered. Furthermore, direct marketing efforts target farmers and end-users, educating them about the benefits of the digital solution and its potential to revolutionize their farming practices.

4. Customer Relationships: Customer relationships are nurtured through responsive communication, ensuring timely responses to customer inquiries, and addressing concerns promptly. The support provided is personalized, offering tailored guidance and recommendations to address unique challenges and objectives. Educational resources such as tutorials, webinars, and workshops are made available to empower customers with the knowledge and skills required for effective use of the digital solution. Trust and reliability are maintained through consistent performance, adherence to commitments, and delivering on the promises made to customers.

5. Revenue Stream(s): The digital solution generates revenue through various channels. Hardware sales involve selling soil sensors and related components, ensuring farmers have access to the necessary equipment for data collection. Subscription-based models offer flexibility with subscription plans or licensing fees for access to the digital solution, catering to various customer preferences. Support and maintenance services generate revenue by providing ongoing assistance, ensuring the continuous functionality of the platform. Additionally, the provision of digital transformation consultancy services to organizations looking to adopt digital technologies in agriculture contributes to revenue.

6. Key Resources: Key resources include cutting-edge technological tools and software that form the backbone of the digital solutions, enabling real-time data collection and analysis. Robust research and development capabilities drive continuous innovation and refinement, ensuring seamless integration with

third-party soil sensors and enhancing the platform's capabilities. A well-established supply chain network ensures the timely availability of hardware components and resources. A dedicated team handles distribution, ensuring efficient and timely delivery of equipment and support services. Essential equipment maintenance ensures uninterrupted service, while access to raw materials is essential for manufacturing sensor components. Partnerships with organizations specializing in agricultural data analysis enhance data accuracy and reliability, further enriching the platform's resource base.

7. Key Partners: Key partners play pivotal roles in the success of the digital solution. Collaborations with agricultural input suppliers ensure a stable supply of essential resources for effective soil management. Partnerships with sensor and technology providers guarantee that farmers have access to state-of-the-art soil sensors and data collection technologies, driving the platform's data accuracy and reliability. Engagement with agricultural retailers leverages established distribution networks, making the digital solution readily accessible to farmers. Collaboration with research institutions, universities, and agronomists validates the solution's effectiveness through scientific validation and field testing. Partnerships with experts in fertilizer management ensure dynamic strategies for optimized fertilization, aligning with evolving agricultural practices. Finally, collaborations with data providers and soil scientists bolster data accuracy, offering customers reliable insights into soil conditions and nutrient management.

8. Key Activities: Key activities encompass critical aspects such as research, design, and development, with investments aimed at seamless integration of third-party soil sensors into the IoT platform. Data collection and analysis are at the core of the value proposition, with real-time monitoring of soil composition, nutrient levels, crop characteristics, and environmental factors. Continuous data quality validation against traditional lab analyses ensures measurement accuracy, necessitating sensor recalibration as needed. Decision support tools empower farmers to make informed choices regarding fertilizer application and soil pH management, enhancing their efficiency and yield. Remote accessibility and control through digital platforms or mobile applications ensure ease of management, reducing the time and effort required for manual monitoring and adjustments.

9. Cost Structure: The cost structure encompasses various operational expenses vital for the platform's functionality and growth. Research and development expenses are allocated to drive ongoing innovation, ensuring the platform's competitiveness. Hardware production costs cover the manufacturing of sensor components required for data collection. Software development and maintenance costs ensure the functionality, security, and continuous improvement of the digital platform. Sensor calibration and maintenance expenses are essential for maintaining data accuracy. Customer support and training costs are allocated to provide timely assistance and educational resources to users. Distribution costs encompass expenses associated with delivering the solution, ensuring efficient equipment deployment. Data analysis and storage costs manage the vast amount of agricultural data generated. Continuous improvement and updates are vital to keep the platform current and competitive. Administrative and overhead expenses cover general operational costs. Sales and distribution expenses encompass costs associated with sales efforts and expanding the platform's market reach. Legal and regulatory compliance costs ensure adherence to industry regulations and standards, safeguarding the platform's integrity and legal compliance.

Table 12.BUSINESS MODEL CANVAS: Digitization of services for the use of fertilisers according to online measurements (N, P, K) and soil needs (pH)

<table>
<tr>
<td rowspan="2">KEY PARTNERS
Who are your key partners/suppliers?
- Agricultural Input Suppliers, Sensor and Technology Providers,
Agricultural Retailers,
Research Institutions and Experts,
Nutrient-dosing/Recipes' modelling Development Partners,
Data Providers/ soil scientists.
Which key resources are we acquiring from partners?
-Technology and Hardware, Expertise and Knowledge, Distribution Channels:
Which key activities do partners perform?
- Supplying Agricultural Inputs.
- Developing and Providing Technology Solutions.
- Contributing Expertise and Knowledge.
- Sharing Data and Information (e.g. end users/ farmers) .
- Supporting Distribution Channels.</td>
<td>KEY ACTIVITIES
What key activities does your value proposition require, deliver to your customer experience?
Research, Design and Development of hardware and software, Data Collection and Analysis,
Data quality validation, Decision Support and Guidance, Remote Accessibility and Control, Continuous Improvement and Adaptability.
What activities are the most important for your distribution channels, customer relationships, revenue streams etc?
- Collaborating with agricultural retailers and suppliers to distribute the digital solution to farmers.
– Leveraging online platforms and marketplaces for direct distribution and customer access.
– Providing personalized support and assistance to farmers through dedicated customer service channels.
Offering training programs and educational resources to help farmers maximize the benefits of the digital solution.
Data collection, analysis, and insights generation for accurate fertilizer input and soil pH control recommendations.</td>
<td rowspan="2">VALUE PROPOSITION
What core value do you deliver to your audience?
FINT builds, tests and hopefully plans to bring to market an IoT solution equipped with innovative soil sensors that can drive more dynamic fertilisation management strategies.
- Precision and Efficiency, Data-Driven Decision Making, Sustainability and Environmental Impact: Cost-Effectiveness, Remote Monitoring and Automation.
What pains do they experience when trying to achieve their goals?
- Lack of Information, Over- or Under-Application, Inefficient Resource Allocation, Time, and Labour Intensiveness,
Limited Monitoring and Feedback.
How does our product/service help them achieve their goals/relief pains?
-Access to Comprehensive Information, Resource Optimization, Time and Labor Efficiency, Continuous Feedback and Adaptability.</td>
<td>CUSTOMER RELATIONSHIP
What relationship does the target audience expect you to establish and maintain with them?
– Responsive Communication, personalized Support, training and Education, trust and Reliability, continuous Improvement.</td>
<td rowspan="2">CUSTOMER SEGMENTS
What are our most important customers?
Farmers, Agronomists and Crop Consultants, Agricultural Input Suppliers.
Why?
– Environmental sustainability.
– Innovation and Technological Advancement.
– Access to Data-Driven Insights.
– Cost reduction and return on investment.
– Improved Crop Yield and Quality.
– Efficiency and precision.
What differentiates our customer segments?
– Adaptability to sustainable path.
– Optimization of fertilization system and soil protection.
– Geographic Location and Climate.
– Technological Adoption and Digital Readiness.
– Regulatory and Certification Requirements.
What opportunities are there to reach new customers segments?
– capture a larger share of the market and establish themselves as leaders in the space.
– Cross-promotion with complementary products.
– Differentiation and innovation.
– Trade partnerships and distribution agreements.</td>
</tr>
<tr>
<td>KEY RESOURCES
What key resources does your value proposition require?
- Technological Tools and Software.
- Research and Development Capabilities.
- Supply Chain Network.
- Financial Resources.
What key resources do you need for distribution?
-Human resources.
-Equipment maintenance.
- Raw material supply.
What key resources do you need for customer relationship management?
- Customer Database.
- Customer Relationship Management (CRM) Software.
- Communication Channels.
- Customer Support Resources.
- Customer Feedback Mechanisms.</td>
<td>CHANNELS
Through which channel does your audience want to be reached?
-Partners' channels.
- trade shows.
-Direct marketing to end users.</td>
</tr>
<tr>
<td colspan="3">COST STRUCTURE
Research, design, and testing of sensors, technologies, and software, Manufacturing, assembly, quality control, and testing, Sensor Maintenance: Calibration and upkeep, Data Infrastructure costs, Security Compliance: Data security and privacy, Ongoing Research: Continuous development.</td>
<td colspan="3">REVENUE STREAM(S)
– FINT offers a suite of HW and SW products.
– HW selling.
– Support and maintenance after guaranteed expiration.
– Digital transformation consultancy.</td>
</tr>
</table>

9.5 Development of a new meat analogue with faba beans from the Netherlands: Frozen Burger

In the pursuit of culinary innovation and sustainability within CO-FRESH, a business model was conceptualised to address specific risks and acquire more information about competitors, costs, customer segments or a market niche. In this part, the main goal is to break the business model down into easily understood segments: **Key Partners, Key Activities, Key Resources, Value Proposition, Customer Relationships, Channels, Customer Segments, Cost Structure, and Revenue Streams.**

1. Value Proposition: The core value proposition revolves around offering delicious, all-natural, minimally processed Faba bean Burgers that serve as a healthier and sustainable alternative to traditional beef burgers. Utilizing cutting-edge technology, we replicate the taste and texture of real beef without negative health and environmental impacts. Our burgers are devoid of artificial flavours and preservatives, low in gluten, and rich in fibre and protein, catering to health-conscious consumers.

2. Customer Segments: Caterers and Restaurants: Recognizing the sustainability, health benefits, and versatility of our products. Food Producers: Embracing the opportunity to diversify their offerings with locally produced, low-processed, vegan, and healthy food options.

3. Customer Relationships: Improving Market Offer: Ensuring our products meet and exceed market expectations. Enhancing Quality and Nutritional Value: A commitment to continuous improvement. Establishing Long-term Customer Relationships: Fostering recurring interactions. Increasing Availability of Local Bean-Based Plant-Based Burgers: Addressing growing demand.

4. Channels: Partners' Channels: Leveraging synergies with key partners.

Trade Shows: Active participation to showcase our innovations.

Ingredients: Variable cost tied to production volume.

Processing: Combining fixed and variable costs.

Packaging: Adapting to production volume and sustainability goals.

Marketing and Sales: Essential for customer acquisition and revenue generation.

Human Resources: Primarily fixed costs.

Factory: Covering rent, utilities, and maintenance.

Licensing Fees: A potential revenue source through licensing to other businesses.

5. Key Resources: Our key resources include state-of-the-art food processing facilities equipped with cutting-edge technology to optimize production efficiency. A skilled and dedicated workforce covers various facets from production to marketing, and our customer recruitment strategies are vital for establishing lasting relationships. A specialized production factory forms the nucleus of our operations, complemented by product developers and a robust marketing and sales team driven by innovation and customer engagement.

6. Key Activities: Our key activities are centred on optimizing the production process to maintain naturalness and enhance efficiency continually. We employ a forward-thinking approach to reduce risk and uncertainty, while our consultancy services provide valuable insights into marketing and precise product positioning.

7.Key Partners: We collaborate with auditors to ensure strict adherence to quality control regulations and meticulous documentation of lab activities. Ingredient suppliers play a pivotal role by providing essential components for our burgers, including Faba beans, plant proteins, and natural flavors. Research and development organizations are key partners, enabling us to harness expertise in product development,

recipe testing, and insights into emerging trends. We also collaborate with distribution and logistics companies to ensure efficient and effective market reach.

8. Cost Structure: The cost structure encompasses variable costs related to ingredients, combining fixed and variable costs for processing, packaging costs adapted to production volume and sustainability goals, essential marketing and sales costs for customer acquisition and revenue generation, primarily fixed costs associated with human resources, factory costs covering rent, utilities, and maintenance, and potential revenue sources through licensing fees to other businesses.

9. Revenue Streams: The revenue streams primarily derive from product sales, generating income through the sale of our Low Processed Faba bean Burgers to caterers, restaurants, and food service providers. Additionally, we expand revenue by licensing our production process to like-minded enterprises and earn income through consultancy services related to marketing, product positioning, and expertise in food quality and nutritional values.

Table 13. BUSINESS MODEL CANVAS for the Development of a new meat analogue with faba beans from the Netherlands: Frozen Burger

<table>
<tr>
<td rowspan="2">KEY PARTNERS
Who are your key partners/suppliers?
-Auditors, Ingredient suppliers, development organizations, Distribution and logistics companies:
Which key resources are we acquiring from partners?
- Sourcing of ingredients
- Production & packing of the product
-Expertise for quality control and reliability of measurement.
-Compliance with laboratory hygiene norms.
- Distribution and logistics of products.
- Preservation of the cold (frozen) chain.
- Product positioning
Which key activities do partners perform?
-Optimisation of production process and preserve naturalness of the product.
-Reduction of risk and uncertainty.</td>
<td>KEY ACTIVITIES
What key activities does your value proposition require, deliver to your customer experience?
-Market growth/ sustainability: customers
-Consultancy services for marketing and product positioning.
What activities are the most important for your distribution channels, customer relationships, revenue? streams etc?
- Processing factory, Customers acquisition, Targeted advertisement campaigns.</td>
<td rowspan="2">VALUE PROPOSITION
What core value do you deliver to your audience?
Our Faba bean Burgers are a delicious, minimally processed, and sustainable alternative to beef burgers. They mimic the taste and texture of real beef using advanced technology, without any artificial additives. Low in gluten and high in fiber and protein, they cater to health-conscious consumers and the growing demand for eco-friendly, locally produced food.
What bundles of product/services are we offering to each customer segment?
-Production process of low processed Faba beans-based burgers
- Expertise in food quality and nutritional values
-Support companies in increasing their competitivity.
-Technological and ingredient innovation.
What pains do they experience when trying to achieve their goals?
- Quality and nutritional value losses, Expensive products, on-going changes in consumer’s needs and requisitions.
How does our product/service help them achieve their goals/relief pains?
- To sell products that fit with their mission
-Diversification of food options, Avoid products waste</td>
<td>CUSTOMER RELATIONSHIP
What relationship does the target audience expect you to establish and maintain with them?
-Improve market offer.
-Improve quality and nutritional value properties.
-Establishment of long-term customer relationship, Interaction on a recurring basis.
-Increase plant-based burgers made of local beans availability.</td>
<td rowspan="2">CUSTOMER SEGMENTS
What are our most important customers?
- caterers or restaurants
- Production of the products.
Why?
Sustainability, Health benefits, Consumer demand, versatility.
What differentiates our customer segments?
-Sustainable businesses, guarantee regarding freshness and nutritional benefits, Guarantee low processed plant-based burgers.
What opportunities are there to reach new customers segments?
Shor term (2023 to 2026): The growing consumer awareness and popularity of plant-based products are fuelling the adoption of plant-based burgers in this time. The rising concerns regarding animal cruelty is a further driver for market growth.
Medium term (2026 to 2029): The increase in advanced technologies, urbanization, and health freaks. These factors are propelling market growth.
Long term (2029 to 2033): Rising research and development activities, new product launches, product innovations, government supports, and key players are advancing the market opportunities.</td>
</tr>
<tr>
<td>KEY RESOURCES
What key resources does your value proposition require?
-Food processing.
-Customer recruitment
What key resources do you need for distribution?
-Human resources.
-Factory
What key resources do you need for customer relationship management?
-Product developer
- Marketing & Sales</td>
<td>CHANNELS
Through which channel does your audience want to be reached?
-Partners’ channels.
- trade shows.</td>
</tr>
<tr>
<td colspan="3">Cost structure:
Ingredients: sourcing high-quality Faba beans, plant proteins, and natural Flavours.
Processing: Costs associated with the manufacturing process, including labour, equipment maintenance, and utilities. These costs can be both fixed and variable, with some expenses, like labour, being semi-variable based on production levels.
Packaging: materials for the plant-based burgers.
Marketing and Sales: Expenses related to marketing campaigns, advertising, and sales efforts.
Human Resources: Salaries and benefits for employees involved in product development, customer relationship management, and marketing and sales.
Factory: Costs associated with maintaining and operating the processing facility.
Licensing Fees: Costs related to obtaining and maintaining licenses for the production process.</td>
<td colspan="3">REVENUE STREAM(S)
Product Sales: Revenue generated from selling our low-processed Faba bean-based burgers to caterers, restaurants, and other food service providers.
Licensing: Revenue generated by licensing our production process to other businesses interested in producing similar plant-based products, creating an additional income stream.
Services Revenues: Revenue generated through consultancy services related to marketing, product positioning, and expertise in food quality and nutritional values.</td>
</tr>
</table>

9.6 Development of a new meat analogue with faba beans from the Netherlands: Do it yourself kit

1. Key partners: The success relies on key partnerships across various facets of our operations. We collaborate closely with reliable Faba bean suppliers, ensuring a consistent and sustainable source of high-quality Faba bean flour, the primary ingredient for our Faba bean falafel production. Research and development laboratories are instrumental partners, contributing scientific expertise and innovation to continually enhance our products. Equipment manufacturers provide specialized machinery, essential for falafel production, including mixing, grinding, and packaging equipment. Packaging suppliers offer eco-friendly containers, labels, and packaging solutions to maintain product freshness and regulatory compliance. Certification and compliance partners assist us in obtaining necessary certifications for food safety, quality standards, and organic labeling. Financial partners, when needed, provide essential funding, capital, or business loans to support our growth initiatives, research and development efforts, and expansion plans. Finally, marketing and branding partners play a pivotal role in developing strategies, creating compelling packaging designs, and effectively promoting our Faba bean falafel products to the target market.

2. Key Resources: The value proposition hinges on a range of key resources. We secure high-quality raw materials, including clementine by-products, to extract bioactive ingredients. Our production facilities and equipment investments encompass specialized machinery and infrastructure essential for efficient extraction processes. Technological tools and software, such as data analysis, quality control, and innovation, aid in product development. Our supply chain network ensures a streamlined logistics, transportation, and storage process. Human resources provide the necessary workforce for various operational roles, from production to quality control. Marketing and promotion efforts require resources for campaigns, branding, and promotion. Research and development investments fuel ongoing product innovation and recipe development. Certification and compliance entail costs associated with obtaining essential certifications and ensuring quality standards. Finally, distribution and sales efforts necessitate resources to reach our target audience effectively.

3. Key Activities: The value proposition drives a range of key activities. Research and development are central, continuously improving our products and keeping them at the forefront of innovation. Supply chain management ensures the efficient sourcing of raw materials and logistics. Production and quality control maintain the high standards of our falafel products. Technical support and consultation are offered to assist partners and customers. Training and education initiatives ensure the proper preparation and handling of our products. Customer segmentation informs our sales and marketing strategies, allowing us to target the right audience effectively.

4. Value Proposition: The core value proposition offers a multitude of benefits to our audience. Firstly, we bring differentiation and innovation to the table, setting businesses apart from competitors by introducing Faba bean falafel, a unique and locally sourced alternative to traditional chickpea-based falafel. Secondly, we cater to the growing demand for healthier food choices with Nutriscore A-rated falafel, rich in fiber and protein while low in salt. Additionally, we provide an allergen-friendly solution, accommodating customers with chickpea allergies or dietary restrictions, thereby enhancing satisfaction and loyalty. Our commitment to sustainable and responsible sourcing aligns with environmentally conscious consumers and supports Dutch farmers, bolstering brand reputation. Lastly, our falafel offers culinary versatility, allowing businesses to create a variety of menu options and cater to diverse customer preferences.

5. Customer Segments: The most important customers encompass food manufacturers and processors, plant-based and vegetarian/vegan food companies, restaurants and foodservice providers, health food stores, and specialty markets. These customer segments are vital due to the significant increase in plant-based and vegetarian/vegan diets, diverse dietary preferences and allergies, health-conscious consumers seeking nutrient-dense options, and the constant demand for innovative and sustainable plant-based products.

6. Customer Relationship: The target audience expects us to establish and maintain direct sales and marketing relationships with them. We provide ongoing customer support to ensure their needs are met, questions are answered, and any issues are promptly addressed.

7. Channels: The audience prefers to be reached through partners' channels and trade shows, which allows us to showcase our innovative products to industry professionals and potential partners effectively.

8. Cost Structure: The cost structure encompasses various elements, including raw materials, production facilities and equipment, technological tools and software, human resources, supply chain network, marketing and promotion, research and development, certification and compliance, and distribution and sales expenses.

9. Revenue Streams: The revenue streams come from sales of bioactive ingredients to various industries, product sales to consumers, licensing and partnerships with companies interested in our extraction methods, potential subscription or membership fees, online sales, and bulk or B2B sales to businesses such as restaurants, cafeterias, and food manufacturers.

Table 14.BUSINESS MODEL CANVAS: Development of a new meat analogue with faba beans from the Netherlands: Do it yourself kit

<table>
<tr>
<td rowspan="2">KEY PARTNERS
Who are your key partners/suppliers?
-Faba bean suppliers
-Research and development laboratories
- Equipment Manufacturers
- Packaging Suppliers
- Certification and Compliance Partners
- Financial Partners, Marketing and Branding Partners.
Which key resources are we acquiring from partners?
- Raw Materials, Equipment and Machinery, - Expertise and Knowledge, Distribution Network.
Which key activities do partners perform?
- Supplying Raw Materials, Equipment Provision and Maintenance, Research and Development Collaboration, Distribution and Logistics, Certification and Compliance Support, Financial Support and Investment.</td>
<td>KEY ACTIVITIES
What key activities does your value proposition require, deliver to your customer experience?
– Research and development
– Supply Chain Management.
– Production and Quality Control.
– Technical Support and Consultation.
– Training and Education.
– Customer segment.
– Sales & Marketing
What activities are the most important for your distribution channels, customer relationships, revenue streams etc?
– Distribution Channels.
– Customer Relationships.
– Revenue Streams.
– Marketing and Promotion.
– Collaboration and Partnerships.</td>
<td rowspan="2">VALUE PROPOSITION
What core value do you deliver to your audience?
- Differentiation and Innovation
- Health and Wellness Appeal
- Sustainable and Responsible Sourcing
- Culinary Versatility and Menu Flexibility
What pains do they experience when trying to achieve their goals?
- Sourcing and Supply Chain Challenges.
Recipe Development and Standardization.
Operational Adjustments.
Customer Education and Market Acceptance.
-Meeting Dietary and Allergen Requirements.
How does our product/service help them achieve their goals/relief pains?
- Diversify menu offerings.
- Meet dietary preferences and restrictions.
- Health-focused branding.
- Differentiation in the market.
- Family activity</td>
<td>CUSTOMER RELATIONSHIP
What relationship does the target audience expect you to establish and maintain with them?
– Direct sales and marketing to customers.
– Providing ongoing customer support</td>
<td rowspan="2">CUSTOMER SEGMENTS
What are our most important customers?
Food manufacturers and processors, Plant-based and vegetarian/vegan food companies, Restaurants and foodservice providers, Health food stores and specialty markets. With a link with e-commerce. Or meal box providers.
Why?
– Growing demand for plant-based and vegetarian/vegan options.
– Diverse dietary preferences and allergies
– Health-conscious consumers
– Market trends and consumer preferences:
– Environmental sustainability: What differentiates our customer segments?
– Quality, Flavour and Texture, Packaging and Presentation, Certifications and Labels, Sustainability and Sourcing, Menu Versatility, convenience, Distribution and Accessibility, Branding and Marketing, Customer Education and Engagement, Low waste, low LCA / footprint
What opportunities are there to reach new customers segments?
– Collaborations with restaurants and foodservice providers, Bulk supply for cafeterias and institutional catering.
– Specialty food stores and health food retailers, Online marketplaces and food delivery platforms, Cross-promotion with complementary products, Product differentiation and innovation, Trade partnerships and distribution agreements.</td>
</tr>
<tr>
<td>KEY RESOURCES
What key resources does your value proposition require?
-Raw materials, Production Facilities and Equipment, Technological Tools and Software., Supply Chain Network.
What key resources do you need for distribution?
-Human resources.
- Raw material supply.
What key resources do you need for customer relationship management?
- Customer Support Resources.</td>
<td>CHANNELS
Through which channel does your audience want to be reached?
-Partners' channels.
- trade shows.</td>
</tr>
<tr>
<td colspan="3">COST STRUCTURE
Raw Materials, Technological Tools and Software, Human Resources, Marketing and Promotion, Research and Development, Certification and Compliance, Distribution and Sales.</td>
<td colspan="3">REVENUE STREAM(S)
– Sales of Bioactive Ingredients, Product Sales, Licensing and Partnerships, Subscription or Membership Fees</td>
</tr>
</table>

9.7 Development of a new meat analogue with faba beans from the Netherlands: Fermented meat alternative product (Tempeh)

This Faba bean tempeh business model is designed to harness the potential of Faba beans and transform them into a versatile and nutritious protein source: Faba bean tempeh. As we explore the nine key elements of the Business Model Canvas, you'll gain insights into how our business operates, from key partnerships and resources to value proposition, customer segments, revenue streams, and cost structure. Let's delve into the details.

1. Value Proposition: Faba bean tempeh stands out due to its exceptional characteristics in the plant-based protein market. It boasts a remarkable protein content, with a concentration of essential amino acids suitable for human nutrition. Furthermore, our tempeh is rich in vital nutrients such as iron, calcium, and B vitamins, making it a well-rounded and nutritionally dense choice. It also caters to consumers with allergies as it is devoid of common allergens like soy and gluten. Beyond its nutritional profile, Faba bean tempeh offers a distinct flavour profile characterized by nutty and earthy notes, accompanied by a hearty, firm texture. This versatility extends to various culinary applications, from grilling and sautéing to blending into protein-rich smoothies and soups. Our primary goal is to meet the increasing demands of health-conscious consumers who are actively seeking innovative and sustainable sources of plant-based protein.

2. Customer Segments: The primary customer segments encompass a diverse range of businesses, each with specific requirements. Food manufacturers and processors value Faba bean tempeh as an ingredient to enhance the protein content and nutritional quality of their products, including meat alternatives and baked goods. Plant-based and vegetarian/vegan food companies leverage our tempeh to craft protein-packed, plant-based offerings. Restaurants and foodservice providers integrate Faba bean tempeh into their menus to cater to the growing demand for plant-based options among diners. Health food stores and specialty markets benefit from offering Faba bean tempeh as a unique and nutrient-rich product, aligning with the preferences of their health-conscious customer base.

3. Channels: The strategy for reaching customers involves multiple channels. We collaborate with partners, such as food distributors and ingredient suppliers, to ensure widespread availability of our Faba bean tempeh. Participation in industry-specific trade shows and exhibitions allows us to showcase our product to a broad audience of potential customers. Additionally, we employ direct marketing approaches, including online marketing campaigns and sales efforts, to engage with businesses and individuals interested in our tempeh**.**

4. Customer Relationship: Maintaining strong customer relationships is pivotal to our success. We engage directly with our customers through a combination of direct sales and marketing initiatives. Furthermore, our commitment to customer-centricity extends to product development. We actively gather and analyze customer feedback to fine-tune our product formulations, ensuring they align with evolving market preferences. Moreover, our dedicated technical support team is readily available to address any inquiries or technical challenges customers may encounter.

5. Revenue Streams: The KER generates revenue through a variety of streams. Firstly, we derive income from sales of our Faba bean tempeh, catering to the demand from food manufacturers, restaurants, and retailers. We also offer starter kits and ingredient supply packages, facilitating the production of tempeh by other businesses. Another revenue source stems from providing consulting services focused on optimizing the tempeh production process for our clients. Quality assurance and testing services contribute to revenue, ensuring the consistency and safety of our products. Lastly, our expertise in recipe development and product innovation is monetized through consulting and licensing agreements, offering customized solutions to meet the unique needs of our partners.

6. Key Resources: Critical resources underpinning our operations include a consistent and sustainable supply of high-quality Faba beans, the core raw material for our tempeh production. We maintain state-of-the-art production facilities equipped with specialized machinery to ensure efficient and standardized production processes. Technological tools and software support our research and development efforts, enabling us to

continually enhance product quality and efficiency. Our dedicated research and development team plays a pivotal role in innovation and quality improvement. A well-established supply chain network facilitates the timely procurement of essential resources. We also allocate significant financial resources to support our growth. Furthermore, human resources for production, equipment maintenance, and the reliable supply of raw materials are integral aspects of our resource allocation.

7. Key Activities: The key activities encompass a range of technical processes and strategic initiatives. Research and development efforts are ongoing to enhance the quality, nutritional content, and production efficiency of our Faba bean tempeh. Efficient supply chain management ensures a seamless flow of raw materials and resources. Production and quality control processes are meticulously executed to maintain product consistency and safety. Technical support and consultation services offer guidance to our partners, ensuring successful tempeh production. We also prioritize training and education to equip our customers with the knowledge and skills needed for optimal product utilization. Market research and promotional activities help us identify trends and reach a wider audience, while collaboration and partnerships fuel innovation and expansion.

8. Key Partners: The key partners are instrumental in various aspects of our operations. Faba bean suppliers form a foundational partnership, ensuring a consistent and sustainable source of high-quality beans. Research and development laboratories collaborate with us to continuously improve our product through scientific analysis and innovation. Equipment manufacturers provide specialized machinery crucial for our production processes. Packaging suppliers contribute to our sustainability efforts by providing eco-friendly packaging solutions. Certification and compliance partners aid in obtaining necessary certifications, validating our commitment to quality and safety. Additionally, financial partners support our growth initiatives, enabling us to expand our production capacity and market presence. Marketing and branding partners play a pivotal role in promoting our products effectively, enhancing our market visibility, and reaching a broader audience.

9. Cost Structure: The cost structure encompasses various components necessary for our operations. A significant portion of our expenses is attributed to the procurement of raw materials, primarily Faba beans. Production facilities and equipment maintenance costs are vital to ensure the continuous operation of our facilities. Investment in technological tools and software drives research and development efforts and maintains our competitive edge. Supply chain management costs ensure the efficient flow of resources. Financial resources are allocated to research and development initiatives and scaling up production capabilities. Human resources are essential for production, equipment maintenance, and managing the supply chain. Furthermore, the ongoing supply of raw materials, customer database management, CRM software, communication channels, customer support resources, and mechanisms for gathering and analysing customer feedback collectively contribute to our cost structure.

Table 15. BUSINESS MODEL CANVAS: Development of a new meat analogue with faba beans from the Netherlands: Fermented meat alternative product (Tempeh)

<table>
<tr>
<td rowspan="2">KEY PARTNERS
Who are your key partners/suppliers?
-Faba bean suppliers, Research and development laboratories, equipment Manufacturers packaging Suppliers, certification, and Compliance Partners, financial partners, Marketing and Branding Partners.
Which key resources are we acquiring from partners?
- Raw Materials.
- Equipment and Machinery.
- Expertise and Knowledge.
- Distribution Network.
Which key activities do partners perform?
- Supplying Raw Materials-
- Equipment Provision and Maintenance.
- Research and Development Collaboration.
- Distribution and Logistics.
- Certification and Compliance Support.
- Financial Support and Investment.</td>
<td>KEY ACTIVITIES
What key activities does your value proposition require, deliver to your customer experience?
– Research and development
– Supply Chain Management.
– Production and Quality Control.
– Technical Support and Consultation.
– Training and Education.
– Training and Education.
– Customer segment.
What activities are the most important for your distribution channels, customer relationships, revenue streams etc?
- Distribution Channels
- Customer Relationships.
- Revenue Streams.
- Marketing and Promotion.
- Collaboration and Partnerships.</td>
<td rowspan="2">VALUE PROPOSITION
What core value do you deliver to your audience?
- High protein content.
- Nutritional profile
- Unique Flavour and Texture
- Versatile Cooking Applications
-Faba bean Tempeh Starter Kit
-Ingredient Supply Package:
-Quality Assurance and Testing:
-Recipe Development and Product Innovation.
What pains do they experience when trying to achieve their goals?
- Difficulty in finding reliable suppliers.
-Process Optimization and Quality Control.
-Scaling Production and Operational Efficiency.
- Market Awareness and Positioning.
How does our product/service help them achieve their goals/relief pains?
- Provide access to a reliable supply chain of high-quality Faba beans specifically suited for tempeh production and offer guidance and support in sourcing other necessary ingredients and packaging materials, streamlining the procurement process.
-Offer expertise, knowledge, and guidance on Faba bean tempeh production techniques, and quality control protocols.
- Provide recommendations and guidance on scaling up production processes and optimizing operational efficiency.
- Provide knowledge and guidance on food safety regulations, labelling requirements, and nutritional information guidelines specific to Faba bean tempeh.</td>
<td>CUSTOMER RELATIONSHIP
What relationship does the target audience expect you to establish and maintain with them?
– Direct sales and marketing to customers.
– Adapting product formulation according to end users' feedback.
– Providing ongoing customer support and technical assistance.</td>
<td rowspan="2">CUSTOMER SEGMENTS
What are our most important customers?
Food manufacturers and processors, Plant-based and vegetarian/vegan food companies, Restaurants and foodservice providers, Health food stores and specialty markets.
Why?
-Sustainability, Cost Savings, Improved Plant based diet products, Environmental Benefits, EU self-sufficiency / sustainable portfolio, Local products, Customization and Flexibility, Innovation and differentiation.
What differentiates our customer segments?
-Sustainable businesses, Better water management, Guarantee same product quality with low environmental impacts.
What opportunities are there to reach new customers segments?
- Corporate Sustainability Initiatives.
- Market research
- Product diversification and customization:
- Geographic expansion.</td>
</tr>
<tr>
<td>KEY RESOURCES
What key resources does your value proposition require?
-Raw materials, production Facilities and Equipment, technological Tools and Software, research and development capabilities, supply Chain Network, financial resources.
What key resources do you need for distribution?
-Human resources, equipment maintenance, raw material supply.
What key resources do you need for customer relationship management?
Customer database, customer relationship management software, communication channels, customer support resources, customer feedback mechanisms</td>
<td>CHANNELS
Through which channel does your audience want to be reached?
-Partners' channels.
- trade shows.
-Direct marketing to end users.</td>
</tr>
<tr>
<td colspan="3">COST STRUCTURE
What are the most important costs?
Raw Materials, production facilities and equipment, technological tools and software, research and development capabilities, supply chain network, staffing costs. equipment maintenance.</td>
<td colspan="3">REVENUE STREAM(S)
– Faba bean Tempeh Sales.
– Production Process Optimization: Income from consulting services.
– Quality Assurance and Testing.
– Recipe Development and Product Innovation.</td>
</tr>
</table>

10.Project presentation to potential users

On November 2022, Tecnoalimenti organized a virtual workshop in collaboration with the CLAN (National Agrifood Cluster) and a physical presentation at Unione Industriali Napoli. During both dissemination events a general overview of the CO-FRESH project was presented, outlining its primary objectives in revolutionizing agri-food value chains for enhanced economic, social, and environmental sustainability. The focal point was the adoption of the Co-creation Methodology as a crucial strategy, emphasizing its role in:

- fostering innovation: collaborating with diverse stakeholders generates innovative solutions.
- customer-centric solutions: placing customers at the core ensures products meet their needs.
- agility: co-creation embraces continuous feedback, allowing for quick adjustments.
- stakeholder engagement: involving stakeholders builds ownership and commitment.
- risk mitigation: early feedback reduces the risk of launching unsuccessful products or services.

During the events, three standout results from the CO-FRESH project were spotlighted. The attention was directed toward these three out of the seven selected results based on their promising nature at this stage of the project, serving as notable illustrations for each of the three key areas where the co-creation process was applied.

- Process Innovation: Introduction of smart irrigation systems for water conservation.
- Product Innovation: Development of frozen burgers using faba beans as meat analogs.
- Conceptual Innovation: Creation of a Certification Mark addressing microplastic release mitigation along the food value chain.

The workshops successfully engaged a total audience of 50 individuals from the Agrifood sector. Furthermore, the results of the CO-FRESH project found a platform at the CIBUSTEC fair in Parma, contributing to the project's wider impact.

11. Business model leaflets

This section serves as a scholarly exploration into the nuanced development of seven designed business model leaflets within the context of the CO-FRESH project. These leaflets aim to publicize commercially viable solutions advancing sustainable EU value chains. Each leaflet dissects the unique business model crafted to harmonize with the ethos of Co-Fresh. Through visual aids, and structured information, these leaflets aim to demystify complex business models. Clear and intelligible language is employed to enhance accessibility, ensuring stakeholders comprehend intricate concepts effortlessly. Infographics and diagrams further illuminate key components, fostering a visual understanding of the business models. Ultimately, these leaflets serve as navigational tools, offering stakeholders a transparent and comprehensive insight into the commercially viable solutions championed by the CO-FRESH project.


BUSINESS
MODEL
Leaflets
This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 101000852
@COFRESH_H2020
/company/co-fresh
Introduction
The CO-FRESH project proposes a portfolio of 7 innovative, sustainable, and competitive business models in agri-food value chains, considering the three pillars of successful companies' value creation and capture strategies:
a) value proposition,
b) collaboration dynamics, and
c) firms' dynamic capabilities.
These business models were selected based on their commercial potential and opportunity to enhance EU value chain resilience.


Smart irrigation system
The smart irrigation business model offers an innovative solution for efficient and sustainable water management across agriculture, landscaping, and industry. Centered around a Smart Irrigation System, it uses technology to adjust watering schedules based on real-time data, saving water and optimizing crop health. The model serves diverse customers such as farmers, landscapers, and industrial facilities, providing services from installation to ongoing support.
Researchers, IT developers, and farmers are apart of this innovation
Our core value is a Smart Irrigation System that optimizes water use with weather and soil data. We provide controllers, sensors, setup, monitoring, and support for effortless, efficient irrigation.
Customer segmentss
Industrial facilities
Farmers
Cooperatives, landscaping businesses, and municipalities
Market Channels
Direct marketing to end users.
Partners' channels
Trade shows
Key activities
Research and development of new irrigation technology and software
Design and manufacturing of irrigation ICT equipment and sensors
Sales and marketing to promote and sell products
COLLABORATIONS
Our collaborative efforts extend to landscaping and lawn care companies, government agencies promoting water conservation, auditors ensuring quality control, and research and development organizations contributing to crop yield optimization. From these partners, we gain agronomic expertise, compliance with hygiene standards, and essential components for our irrigation system.
Key ressources
Contact management
Client interaction tracking
Database management
Knowledge management. Security management
Customers relationships
- Direct sales and marketing to customers.
- Offering installation and maintenance services.
- Providing ongoing customer support and technical assistance.
REVENUE STREAMS
Revenue streams encompass Product Sales, Licensing and Subscriptions, Installation and Maintenance Services, Customization and Integration projects, Consulting and Training services, and Data Analytics and Reporting tools. This diversified revenue model ensures financial sustainability and caters to the diverse needs of our customers.
COST STRUCTURE
The most significant cost involves personnel expenses for hardware and software engineers. While predominantly fixed, these costs align with our continuous commitment to system upgrades, research and development, versioning, and support. We allocate costs across various projects, harness economies of scale, focus on accessible markets, and maintain cost-effective service delivery.


New beverage from clementine juice for other consumption moments including ingredients produced from Clementine juice subproducts
This innovation is all about Clementine Juice, a sustainable beverage created from clementine by-products. It's eco-friendly, nutritious, and supports local communities, making it a unique and valuable choice for both consumers and businesses.
Researchers, FOOD labs, and farmers are apart of this innovation
Experience our innovative and sustainable Clementine Juice, crafted from by-products. We're eco-friendly, nutritious, and community-focused
Customer segmentss
Industrial facilities
Food companies
Retailers
Market Channels
Direct marketing to end users.
Partners' channels
Trade shows
Key activities
Research and development of a new beverage using clementine by-products.
Consumer research on the willingness to drink clementine by-products.
Sales and marketing to promote and sell products.
- Installation and maintenance services for equipment.
COLLABORATIONS
Key partners include a Food Scientist, Supply Chain Manager, R&D Manager, Quality Assurance Manager, Marketing Manager, Packaging Designer, Sales Representatives, Operations Manager, and Sustainability Manager, all vital for our seamless clementine beverage production and promotion.
Key ressources
Contact management
Client interaction tracking
IPR management
Knowledge management. Security management
Customer relationships
Direct sales and marketing
Offering consualtancy and communication services.
Providing customers with new products .
REVENUE STREAMS
Revenue streams are diversified, with the core coming from the sales of Clementine By-Product Juice. We also offer customization options for specialized beverages, catering to unique consumer preferences and expanding our income sources, demonstrating our adaptability and commitment to market demands.
COST STRUCTURE
The cost structure includes personnel, manufacturing, equipment, marketing, sales, installation, maintenance, and research and development expenses. These resources are managed efficiently to uphold our product excellence and competitiveness.


Valorization of Clementine residues: production of bioactive ingredients
Our value proposition is threefold: sustainable clementine residue utilization reduces waste and boosts profitability; bioactive compounds cater to health-focused industries; and eco-friendly production aligns with growing consumer demand for sustainability and social responsibility
Researchers, labs, and food-industries are apart of this innovation
Unlocking the hidden treasures of clementine residues: Boost profits, health benefits, and sustainability all in one package. Join us in the eco-friendly revolution that turns waste into wonders, sets your brand apart, and satisfies conscious consumers
Customer segmentss
Food and beverage manufacturers
Agricultural and biotechnology companies
Market Channels
Direct marketing to end users.
Partners' channels
Trade shows
Key activities
Product development and innovation.
Quality assurance and control.
Customer service and support.
Supply chain management.
Marketing and communication.
COLLABORATIONS
Key partners drive our mission's success. Clementine suppliers provide raw materials, R&D institutions offer expertise, tech providers assist with extraction, quality control labs ensure safety, manufacturing partners support production, and distribution/sales partners broaden our reach
Key ressources
Raw materials
Production Facilities and Equipment
Technological Tools and Software
Supply Chain Network
Financial Resources.
Customers relationships
Responsive Communication
Personalized Support
Training and Education
Trust and Reliability
REVENUE STREAMS
The revenue streams are diverse, reflecting the value we offer to our customers and partners across various industries. These revenue sources include bioactive ingredient sales, subscription-based models for ongoing supply, support and maintenance services, consultancy services for sustainable practices, customized product development, licensing of intellectual property, and value-added services such as training programs and educational resources. By diversifying our revenue streams, we create a robust and sustainable business model that can adapt to the evolving needs of our customers and the market, while also mitigating risks associated with relying solely on one source of income
COST STRUCTURE
The cost structure encompasses various elements that contribute to the sustainability and success of our operations. Firstly, raw material costs are incurred in sourcing clementine by-products,which are essential to extraction processes. Technological tools and softwar facilitate data analysis, quality control, and product development. Research and development (R&D) efforts are fundamental to the continuous improvement and innovation. Managing our supply chain efficiently, including logistics, transportation, and storage, incurs associated costs. Marketing and communication expenses are essential for promoting products and raising awareness. Continuous improvement efforts ensure the enhancement of processes.


Digitization of services for the use of fertilisers according to online measurements (N, P, K) and soil needs (pH)
Revolutionize agriculture with our digital solution: Soil sensors and IoT technology empower farmers to make data-driven decisions, optimize resources, and boost crop yields. Explore FINT's game-changing business model
Researchers, labs, ICT enginneers and farmers are apart of this innovation
Our cutting-edge digital solution optimizes fertilizer use and soil pH control for efficiency and sustainability. Real-time data empowers smart decisions, reduces waste, and boosts profitability. It's agriculture, reimagined.
Customer segmentss
Industrial facilities
Farmers
Retailers
Agronomists and Crop Consultants
Market Channels
Direct marketing to end users.
Partners' channels
Trade shows
Key activities
Research, Design and Development of hardware and software,
Data Collection and Analysis,
Data quality validation
Decision Support and Guidance
Remote Accessibility and Control
Continuous Improvement and Adaptability.
COLLABORATIONS
Key partners are vital to our success. We work with input suppliers, tech providers, retailers, research institutions, and data experts to ensure a stable supply, cutting-edge technology, wide accessibility, scientific validation, and data accuracy for effective soil management
Key ressources
Technological Tools and Software.
Research and Development Capabilities.
Supply Chain Network.
Financial Resources.
Customers relationships
Responsive Communication
Personalized Support
Training and Education
Trust and Reliability
REVENUE STREAMS
The solution generates revenue through various channels. Hardware sales involve selling soil sensors and related component. Subscription-based models offer flexibility with subscription plans or licensing fees for access to the digital solution. Support and maintenance services generate revenue by providing ongoing assistance. The provision of digital transformation consultancy services to organizations looking to adopt digital technologies in agriculture contributes to revenue.
COST STRUCTURE
The cost structure includes expenses for research and development, hardware production, software development, sensor maintenance, customer support, distribution, data management, updates, administrative overhead, sales efforts, and legal compliance


Development of a new meat analogue with faba beans from the Netherlands: Frozen Burger
Low processed fababean burgers caters to a specific customer segment, primarily food enterprises seeking to bolster their competitive edge in the plant-based product market. Anchored in robust consumer demand analysis, we deliver a technologically advanced product: low-processed Favabean burgers.
Researchers, raw matrial suppliers, food developers are apart of this innovation
Discover our Fava Bean Burgers: A delicious, sustainable, and healthy alternative to beef. Packed with flavor and nutrition, they're perfect for eco-conscious foodies.
Customer segmentss
Caters
Restaurants
Small local organic stores
Wholesalers
Market Channels
Direct contacts
Partners' channels
Trade shows
Key activities
Processing factory
Customers acquisition
Targeted advertisement campaigns
COLLABORATIONS
The collaboration with auditors to ensure strict adherence to quality control regulations and meticulous documentation of lab activities. Ingredient suppliers play a pivotal role by providing essential components for our burgers, including fava beans, plant proteins, and natural flavors. Research and development organizations are key partners, enabling us to harness expertise in product development, recipe testing, and insights into emerging trends. We also collaborate with distribution and logistics companies to ensure efficient and effective market reach.
Key ressources
Food processing.
Customer recruitment
Human resources.
Customers relationships
Improving Market Offer: Ensuring our products meet and exceed market expectations.
Enhancing Quality and Nutritional Value: A commitment to continuous improvement.
Establishing Long-term Customer Relationships: Fostering recurring interactions.
Increasing Availability of Local Bean-Based Plant-Based Burgers: Addressing growing demand.
REVENUE STREAMS
Revenues primarily comes from product sales of our Low Processed Fava Bean Burgers to caterers, restaurants, and food service providers. We also generate income by licensing our production process and offering consultancy services related to marketing, product positioning, and food quality expertise
COST STRUCTURE
The cost structure encompasses variable costs related to ingredients, combining fixed and variable costs for processing, packaging costs adapted to production volume and sustainability goals, essential marketing and sales costs for customer acquisition and revenue generation, primarily fixed costs associated with human resources, factory costs covering rent, utilities, and maintenance, and potential revenue sources through licensing fees to other businesses.


Development of a new meat analogue with faba beans from the Netherlands: Do it yourself kit
This Fava bean falafel business model is designed to harness the potential of fava beans and transform them into a versatile and nutritious protein source: fava bean falafel. As we explore the nine key elements of the Business Model Canvas, you'll gain insights into how our business operates, from key partnerships and resources to value proposition, customer segments, revenue streams, and cost structure. Let's delve into the details.
Researchers, labs, and food-industries are apart of this innovation.
Unlock the power of fava beans with us! Dive into our business model to see how we create versatile, nutritious fava bean tempeh that's changing the game
Customer segmentss
Food manufacturers
Agricultural and biotechnology companies
farmers
Restaurants and foodservice providers
Market Channels
Direct marketing to end users.
Partners' channels
Trade shows
Key activities
Product development and innovation.
Quality assurance and control.
Customer service and support.
Supply chain management.
Marketing and communication.
COLLABORATIONS
Our success is built on key partnerships: suppliers for high-quality beans, R&D labs for innovation, equipment manufacturers, eco-friendly packaging suppliers, certification partners, financial backers for growth, and marketing experts to boost visibility.
Key ressources
Raw materials
Production Facilities and Equipment
Technological Tools and Software
Supply Chain Network
Financial Resources.
Customers relationships
Responsive Communication
Personalized Support
Training and Education
Trust and Reliability
REVENUE STREAMS
Income derives from sales of our fava bean falafel , catering to the demand from food manufacturers, restaurants, and retailers. We also offer starter kits and ingredient supply packages, facilitating the production of tempeh by other businesses. Another revenue source stems from providing consulting services focused on optimizing the tempeh production process for our clients. Quality assurance and testing services contribute to revenue, ensuring the consistency and safety of our products. Lastly, our expertise in recipe development and product innovation is monetized through consulting and licensing agreements, offering customized solutions to meet the unique needs of our partners
COST STRUCTURE
A significant portion of expenses is attributed to the procurement of raw materials, primarily faba beans. Production facilities and equipment maintenance costs are vital to ensure the continuous operation of facilities. Investment in technological tools and software drives research and development efforts and maintains our competitive edge. Supply chain management costs ensure the efficient flow of resources. Human resources are essential for production, equipment maintenance, and managing the supply chain. The ongoing supply of raw materials, customer database management, CRM software, communication channels, customer support resources, and mechanisms for gathering and analysing customer feedback collectively contribute to our cost structure.


Development of a new meat analogue with faba beans from the Netherlands: Fermented meat alternative product (Tempeh)
Our Fava Bean Tempeh business thrives on the potential of fava beans, offering a versatile and nutritious protein source. Explore our key elements, from partnerships to profits. Let's get started
Researchers, FOOD labs, and farmers are apart of this innovation.
Elevate your protein game with our exceptional fava bean tempeh —packed with nutrients, allergen-free, and bursting with a nutty, versatile flavor for health-conscious consumers seeking innovation and sustainability
Customer segmentss
Industrial facilities
Food companies
Retailers
Restaurants and foodservice providers
Market Channels
Direct marketing to end users.
Partners' channels
Trade shows
Key activities
Research and development of a new prodcut.
Consumer research on the willingness to eat plant-based prodcuts.
Sales and marketing to promote and sell products..
COLLABORATIONS
Our success relies on key partners who ensure top-quality fava beans, drive innovation, supply essential equipment, eco-friendly packaging, certification support, financial backing for growth, and effective marketing to reach a wider audience.
Key ressources
Raw materials.
Production Facilities and Equipment.
Technological Tools and Software,
Research and development capabilities.
Supply Chain Network, financial resources.
Customers relationships
Direct sales and marketing to customers.
Offering installation and maintenance services.
Providing ongoing customer support and technical assistance.
REVENUE STREAMS
The innovation generates revenue through a variety of streams. Firstly, income derives from direct sales. Another revenue source stems from providing consulting services focused on optimizing the tempeh production process for our clients. Quality assurance and testing services contribute to revenue, ensuring the consistency and safety of our products. Lastly, the expertise in recipe development and product innovation is monetized through consulting and licensing agreements, offering customized solutions to meet the unique needs of our partners.
COST STRUCTURE
The cost structure includes expenses for raw materials (faba beans), production facilities and equipment maintenance, research and development, supply chain management, financial resources, human resources, and various operational needs

12.Replicability potential plan of CO-FRESH results and solutions

A survey to test value chain stakeholders' willingness to adopt and to pay for the CO-FRESH solutions have been developed by ENCO. The questionnaire will be administrated by Tecnoalimenti and Bioeconomy Cluster, and ENCO will take care of data analysis and interpretation. To provide a solid theoretical basis for examining the adoption of CO-FRESH solutions. The questionnaire provided below has been prepared, and we are in the process of gathering descriptions for all innovations scheduled for completion by M39. Subsequently, the survey will be distributed, and the collected data will be analysed and incorporated into Deliverable 5.8.

QUESTIONNAIRE

ACCEPTANCE AND REPLICABILITY OF CO-FRESH RESULTS AMONG VALUE CHAIN STAKEHOLDERS

The main objective of this survey is to investigate value chain stakeholders' willingness to incorporate new technologies, tools and methodologies from CO-FRESH for sustainable EU value chains.

Thanking you for your interest, we ask you to read the questions carefully and answer truthfully, reminding you that there are no right or wrong answers.

We remind you that the information collected will only be used in aggregate and anonymous form.

The data collected will be processed in aggregate in accordance with the Privacy Act (European Regulation 2016/679).

Thank you in advance for your collaboration.

1. *Please, Provide a score from 1 to 7 about the importance of this list of CO-FRESH innovations to your business (1 = not important, 7 = very important) (Likert scale format)*

KER #	Title
1	Certification Mark of food products with a mitigated unintentionally release of microplastics
2	Business Model Toolkit
3	SICO Framework
4	Policy Brief
5	CO-creation Methodology (WP2)
6	New biodegradable / compostable materials for Fresh food products (New Service)
7	Diverse scientific knowledge: Foodtech; ICT….
8	Evaluation of agri-food subproducts for valorisation (New Service)
9	New packaging materials for fresh food products (New Service)
10	Plant-based products development (New Service)

11	Smart Irrigation System
12	Communication campaign related to the peculiarities of clementine
13	New beverage from clementine juice for other consumption moments including ingredients produced from Clementine juice subproducts
14	Valorisation of Clementine residues: production of bioactive ingredients
15	Sustainable and Active packaging films that extend product's shelf life
16	Digitization of services for the use of fertilisers according to online measurements (N, P, K) and soil needs (pH)
17	Reutilization of washing water
18	Development of a new meat analogue with faba beans from the Netherlands: Frozen Burger
19	Development of a new meat analogue with faba beans from the Netherlands: Do it yourself kit
20	Development of a new meat analogue with faba beans from the Netherlands: Fermented meat alternative product (Tempeh)
21	Traditional dry product, 100% pork fed with local vegetable proteins
22	Improvement of Carcass selection
23	PGI Governance tool
24	Online shop and web promotion of organic apples
25	Loss minimisation system - waste composting in each orchard and inferior fruit valorisation into apple cider / vinegar
26	New recipes and processed food for Horeca, i.e. oyster mushroom beefsteak
27	Brand management – feedback from buyers + Responsible mushroom consumption campaign with the Horeca sector
28	Low carbon packaging technology for fresh mushrooms
29	Include a QR code, to provide information on products and producers
30	Zero Waste Healthy Box

2. **State one from the list of innovations that interests you the most: ……**

3. Please, provide a score from 1 to 7 about your agreement with the following statements (1 = strongly disagree, 7 = strongly agree) (Likert scale format)
   - **I think that I would like to use this system frequently.**

4. Please, provide a score from 1 to 7 about your agreement with the following statements (1 = strongly disagree, 7 = strongly agree) (Likert scale format).
   - **I find the system unnecessarily complex.**
5. Please, provide a score from 1 to 7 about your agreement with the following statements (1 = strongly disagree, 7 = strongly agree) **(Likert scale format)**
   - **I Think the system will be easy to use.**
6. Please, provide a score from 1 to 7 about your agreement with the following statements (1 = strongly disagree, 7 = strongly agree) **(Likert scale format)**
   - **I think that I would need the support of a technical support to be able to use/implement this system.**
7. Please, provide a score from 1 to 7 about your agreement with the following statements (1 = strongly disagree, 7 = strongly agree) **(Likert scale format)**
   - **I find the various functions in this system well integrated.**
8. Please, provide a score from 1 to 7 about your agreement with the following statements (1 = strongly disagree, 7 = strongly agree) **(Likert scale format)**
   - **I thought there was too much inconsistency in this system.**
9. Please, provide a score from 1 to 7 about your agreement with the following statements (1 = strongly disagree, 7 = strongly agree) **(Likert scale format)**
   I would imagine that most people would learn to use this system very quickly.
10. Please, provide a score from 1 to 7 about your agreement with the following statements (1 = strongly disagree, 7 = strongly agree) **(Likert scale format)**
    - **I think the system will be cumbersome to use.**
11. Please, provide a score from 1 to 7 about your agreement with the following statements (1 = strongly disagree, 7 = strongly agree) **(Likert scale format)**
    - **I felt very confident using the system.**
12. Please, provide a score from 1 to 7 about your agreement with the following statements (1 = strongly disagree, 7 = strongly agree) **(Likert scale format)**
    - **I need to learn a lot of things before I could get going with this innovation.**
13. How important is for your company's activity adopting the above selected innovation?
    Likert scale from 1 (Not important at all) to 5(Extremely important).
14. How important is to your activity to be able to use this innovation?
    Likert scale from 1 (Not important at all) to 5 (Extremely important).
15. How important to you to your customers to adopt this innovation?
    Likert scale from 1 (Not important at all) to 5 (Extremely important).
16. What tools, methods do you currently use to address the needs that the selected innovation offer? (Open question)
17. How willing are you to adopt the CO-FRESH innovation in your production process.
    Likert scale from 1 (Not willing at all) to 5 (Extremely willing).
18. Compared to your actual costs for performing/controlling the activities that the innovation that you selected adresses. Are you willing to: (single choice question)
    - Pay more to have access to innovative solutions. (1)
    - Pay less to have access to innovative solutions. (2)
    - Pay the same amount to have access to innovative solutions(3)
    - Not willing to change my current practices. (4)
19. How much more or less in percentage are you willing to pay to have access to the CO-FRESH innovation system? (Please do not to put a negative sign in case your previous answer was pay less) (open question)

Socio demographic characteristics

20. **Please indicate gender:**
    - Male
    - Female

21. **Please indicate your age**
    - Open answer.
22. **What is your level of education?**
    - Secondary school diploma.
    - Diploma.
    - Degree.
    - Master's degree.
    - PHD.
23. **Occupation**
    - High level managers.
    - Intermediate level managers.
    - Supervisory.
    - Skilled manual laborers
    - Government officials.
    - If Other, please specify:
24. **Firm name (optional):**
    - Open answer.
25. **Location of the firm (optional):**
    - Open answer.
26. **Sector of activity (optional):**
    - Open answer.
27. Are you interested in the participation to a presentation where you will know more about the project (yes or no)
28. **E-mail address of the respondent:**
    - Open answer.

13.General conclusions

The development and implementation of the innovative business cases toolkit within the CO-FRESH project represents a significant milestone towards enhancing competitiveness and sustainability in the agri-food sector.

The business cases toolkit serves as a pivotal reference tool for a diverse range of stakeholders across the entire agri-food value chain, encompassing farmers, farmers' organizations, the food industry, food-related services, consumers, environmental and social NGOs, as well as public authorities. This toolkit is specifically designed to facilitate the transition towards sustainability-oriented cooperative business frameworks. Moreover, CO-FRESH business model toolkit is highly adaptable to all stakeholders involved in the agri-food value chain. This adaptability stems from its comprehensive coverage of analytical aspects that are of paramount interest to a wide range of stakeholders. Whether you are a farmer, part of a farmers' organization, a player in the food industry, a provider of food-related services, a concerned consumer, an environmental or social NGO, or a representative from public authorities, the toolkit offers valuable insights and tools to bolster the sustainability of your businesses.

A key outcome of this document is the creation of at least seven "Package leaflets," meticulously crafted in English and various partner languages. These leaflets not only enhance accessibility but also serve as practical guides for implementing the CO-FRESH business cases, thereby increasing their adoption potential. Moreover, a comprehensive set of adjustments and instructions tailored to different agri-food sectors and regional nuances is provided. These guidelines, referred to as "how-to" instructions, are intended to promote best practices at a systemic level, smoothing the path for the integration of these business models.

Importantly, this toolkit is not confined to the project's boundaries but aims to extend its impact and replicability to a wider audience. To achieve this, Tecnoalimenti and Bioeconomy Cluster, as part of their industrial networks, will actively explore replication opportunities with industries interested in the project's results and technologies throughout a questionnaire. Each interested industry will benefit from tailored presentations of the project's outcomes, customized to their specific sectoral needs. These efforts culminate in practical testing of the project's results within the industrial context.

In summary, the CO-FRESH project's business cases toolkit is a comprehensive and technical deliverable that plays a pivotal role in securing the replicability of project outcomes. It equips stakeholders with the necessary tools, knowledge, and guidance to transition toward sustainable cooperative business models, thereby contributing to the transformation of regional and local food systems across the European Union and beyond. This toolkit not only makes the project's results reproducible but also ensures their operability in diverse contexts, thereby fostering sustainability and competitiveness in the agri-food sector.