

Business Model Innovation to Address Vegetable Supply Chain Issues: A Case Study of an Indian Startup

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Purpose: Agricultural supply chains witness several challenges, which result in increased cost of operations, high wastages, and low efficiency. In the case of vegetable supply chains (VSCs), the intensity of challenges is very high due to perishability. Literature suggests various operations research tools for supply chain management of perishables, but there is a paucity of research highlighting the real models adopted by real players in the market while making revenue. This paper investigates and presents how a startup can innovate its business model to meet the VSC issues by adopting a single case study methodology.

Design: The phenomenon was studied by convergent interviewing with the company's key personnel and gathering information from the company's key documents followed by content analysis.

Findings: The study shows real practices adopted by a startup to cater to the challenges of VSCs in India by incorporating various tools of productivity enhancement and waste reduction. It highlights the adoption of a traceability system, production planning mechanism, reduced food miles, and green initiatives contributing to an innovative business model. The study maps the business model of the startup with the business model concept provided by Lindgardt and colleagues [2009] and states two more dimensions, i.e. "Client relationship management" and "Sustainability activities" to expand the mentioned configuration.

Originality: The study is the first of its kind to highlight the Business Model Innovation of a startup to address the VSC challenges in the Indian context.

Practical contribution: The study has important managerial implications useful for finding our new value propositions in a VSC firm by shortening and effectively integrating the supply chain while minimizing information asymmetry to achieve economies and sustainability.

Theoretical contribution: This study has strengthened the methodological advances in the study of business models based upon earlier validated configurations. It contributes to the extant research by adding two more elements "Client relationship management" and "Sustainability activities" in a business model configuration.

Keywords: Business model innovation; vegetable supply chain; startup; supply chain integration; challenges.

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1. Introduction

The study of agricultural value chains denotes the flow of food commodities from farmers to end consumers. It explicitly means studying the relationship between all the value chain elements to identify the ways to increase efficiency. In 2013, OECD, WTO, and UNCTAD conducted a study on 250 firms in 79 countries to identify the challenges faced by suppliers in modern agricultural value chains in developing countries. According to this study, four significant obstacles are, in order of importance, high transaction costs, limited access to financial capital, lack of regulatory transparency, and issues with supply-chain governance. All these obstacles result in increased cost, complexity, exchange time, and uncertainty in the chain. Perishable food supply chains (PFSCs) are characterized by rising food quality and safety concerns [Ortega and Tschirley (2017)], alarming food wastages and losses [Ezekiel *et al.* (2021)], and poor economic sustainability [Kumar *et al.* (2020)]. Specifically, when the value chains of vegetables were studied, it was identified that the challenges are higher in intensity as the perishability of the produce is a significant constraint [Adepoju and Ologun (2020)]. Due to this constraint, larger value chains need stringent control and state-of-the-art infrastructure. In developing countries, the government and other parties are making efforts to strengthen the chains by improving the infrastructure, thereby enhancing its control. Also, the marketing of vegetables is complex due to their perishable nature, seasonality, bulkiness, and largely unorganized market channels [Ali (2014)]. A traditional supply chain is unstructured, inefficient, and unsustainable from farmers to consumers [Patidar *et al.* (2018)]. It requires an in-depth study and design to sustain the players (mainly farmers) in the chain [Naik and Suresh (2018)]. There is an abundance of literature available highlighting the challenges of the Vegetable Supply Chain (VSC) in different geographical contexts [Shukla and Jharkharia (2013); Raut *et al.* (2019); Surucu-Balci and Tuna (2021); Weerabahu *et al.* (2021)]. These studies suggest the ways to overcome these challenges by depicting different operations research tools to be adopted [Raut *et al.* (2019); Gardas *et al.* (2019); Yang *et al.* (2021)], but there is a paucity of research highlighting the real models adopted by real players in the market and exploring that how can a business be built around the solutions to the challenges of VSCs? Therefore, the study investigates and presents how a supply chain startup can innovate its business model to address the chain's challenges. This paper investigates ways to address the challenges of VSC by answering the following research question:

1.1. *How does Business Model Innovation (BMI) address VSC challenges?*

To answer this research question, we apply case study methodology by studying a startup, Farmers Fresh Zone (FFZ), integrating the VSC through an innovative business model. We mapped the business model of FFZ on Lindgardt's Business Model Configuration. The concept of a business model provides the ability to design and analyze the value a business is offering and delivering to its customers. Business

Model Innovation (BMI) as a tool allows firms in the VSC to optimize the values they are creating and delivering to their customers [Nosratabadi *et al.* (2020)]. Mapping of a business model over an earlier established configuration was treated as an effective way of understanding the BMI and its contribution to addressing various challenges of an industry [Franceschelli *et al.* (2018)]. A business model identifies the target market, defines the value proposition, finds out revenue streams, and decides upon the value chain's overall structure. Lindgardt and colleagues [2009] specify the value proposition and the operating model as two pillars of a business model. Here, the value proposition includes the target segment, product or service offered, and revenue model, and the operating model contains value chain, cost model, and organization.

The paper is organized as follows. First, we present the summarization of the BMI concept concerning VSC challenges as specified in the research done previously. In the next section, we present the research methodology and its significance. Afterward, we analyze FFZ's innovative business model to deal with VSC challenges. The next section highlights the theoretical contribution of the study and its practical implications.

2. Literature Review

A business model is an organization's way of creating and capturing value at a reasonable cost while generating revenue. The body of academic literature related to BMI research, which emphasizes innovation in business models, rather than processes or products, has grown recently [Shakeel *et al.* (2020); Breier *et al.* (2021); Haaker *et al.* (2021)]. The literature advocates that a business model can be innovated by challenging conventional wisdom with experimentation and relevant associations.

Amit and Zott [2010] highlighted innovating current activities or formulating new activities are the two methods of BMI. New enterprises can also create, implement, and validate their business models [Massa and Tucci (2013)]. BMI does not imply product or disruptive innovations; rather, it results in changes in the value generation, value appropriation, or value distribution roles, resulting in better value propositions [Sorescu (2017)]. Additionally, BMI may refer to both design of novel business models for new organizations (startups), and the reconfiguration of existing business models [Massa *et al.* (2017)].

Massa and Tucci [2013] identified BMI as a subset of "Business Model Design" (BMD) and "Business Model Reconfiguration" (BMR). They refer to the term "BMD" as the very first evidence of a new BM, which is usually associated with entrepreneurial activity. In many places in literature, BMI and BMD were used interchangeably in the context of new ventures for innovating the business model from the traditional way of capturing and delivering value in an industry regardless of the field, [Silva *et al.* (2020)] or technology-based industries [Rippa and Sacundo (2019)]. In the event of a crisis, BMI becomes critical since traditional techniques are inefficient, and it assists business owners in discovering the blue ocean [Kim and

[Mauborgne \(2014\)](#)]. It enables company owners to gain a competitive advantage by reinventing the way value is delivered to stakeholders. BMI, according to [Franceschelli and colleagues \(2018\)](#), is a useful possibility for small and medium-sized businesses with limits and limited resources. They emphasize that BMI enables food enterprises to flourish in today's competitive market or to build new markets in the absence of product innovation.

In agribusiness, farmers and consumers are equally important, and a BMI needs to maximize the value for both along with the business itself. In the VSC, an innovative way to deliver better value to farmers for their produce and provide quality vegetables to consumers at the right time, at the right price, and with the right quality may be termed as BMI [[Sharma *et al.* \(2019\)](#)]. [Wang *et al.* \[2021\]](#) highlighted the need to integrate production, supply, and selling functions in the VSC in China, which was achieved by establishing a cooperative structure in the country. They have identified food safety and security, lack of proper market access for reasonable prices, dependence upon weather, and financing as significant challenges of the VSC in China, which could be solved through supply chain integration. Hence, the BMI in the VSC is required to tackle the challenges of the chain. Perishability, safety and quality concerns, uncertain demand, and dependency on the weather make the fresh produce supply chain more complex than the non-perishable supply chain. Value proposition, consumer assurance, food quality, safety standards, supply reliability, and low cost are the crucial pillars of an organized food supply chain [[Flores *et al.* \(2019\)](#)], but it is challenging for businesses to work with small-scale farmers and provide the benefits of economies of scale, traceability, low prices, and advanced logistics at the same time.

[Shukla and Jharkharia \[2013\]](#) reviewed the VSC's complexity and highlighted four challenges, i.e. perishability, fluctuations in demand and supply, consumers' concerns for food safety, and dependence upon climatic conditions. Shorter supply chains [[Paciarotti and Torregiani \(2021\)](#)], consumption in the local market, robust traceability mechanism [[Dani \(2015\)](#); [Lenton \(2010\)](#)], and better production planning systems [[Routroy and Behera \(2017\)](#); [Ganeshkumar *et al.* \(2021\)](#)] along with supply chain integration [[Cooper *et al.* \(2021\)](#)] could address the reported challenges. There are three shortcomings with these studies concerning our aim of investigation, which are as follows:

- (a) All these solutions have been reported individually in the literature without reflecting any integration.
- (b) These studies report different operations research tools as the ways to tackle individual challenges but do not implement the solutions in real-world settings.
- (c) Few studies reported implementing the systems and mechanisms as cases without catering to a business aspect around it.

Hence, this research tries to focus on existing business models meeting the VSC's challenges with their BMI.

3. Research Methodology

The case study methodology was selected to answer the research question “How does BMI address VSC challenges?”

Yin [1994] suggested the adoption of case study research to answer the questions starting with “how” and “why.” As stated, “A how or why question is being asked about a contemporary set of events over which the investigator has little or no control” [Yin (1994)]. Yin [2002] argues that a case study is an empirical inquiry that investigates a contemporary phenomenon in depth and within its real-life context, especially when the boundaries between phenomenon and context are not clearly evident. In this study, the phenomenon and context are intertwined as we want to study the phenomenon of a BMI to address VSC challenges and the context of VSC. Grant and colleagues [2010] suggest developing a qualitative research base in the supply chain domain to investigate these complex contexts. Eisenhardt and Graebner [2007] believe in the suitability of a single case study in contributing to the literature in the context of unusual research areas. A startup case study was found suitable to relate the innovation in contemporary events with value creation that can encourage business owners and managers. Hence, we wanted to select a firm that would deal with all the challenges of VSC, as highlighted in the literature with its BMI.

Plenty of documents, including observations, interview transcripts, artifacts, and others, are generally used in case study research [Rowley (2002)]. At first, we extensively reviewed the literature to identify the challenges of VSC and their solutions. Next, we aimed to identify an enterprise’s working business model, preferably, the startup that would solve VSC’s problems highlighted in the literature review. Due to the paucity of studies done from a startup’s perspective, we chose to conduct an in-depth study to understand the subject area. Initially, before selecting the startup, the information was collected from secondary sources, including google search, databases like Traxcn, online startup magazines like Inc42 and Yourstory, and discussion with agribusiness and food-based incubators’ personnel (five incubators), which helped us shortlist 13 startups matching the theme of our research. Then, we gathered information about each startup based on meeting the challenges identified during the literature review. After this process, we selected FFZ as the representative case, which could do justice to the research aim. It is a successful startup case that depicted a trend of increasing revenue in their commercialization stage. It is an organization that was actively working during the COVID-19 pandemic and reached new heights by creating an impact. It implements an innovative business model that takes care of the Indian VSC’s four significant challenges. It works on its principal components of production planning, traceability, high-quality produce, and farmers’ socio-economic upliftment.

4. Data Collection and Analysis

The data were collected through the company’s internal documents and key informants’ interviews. The research flow is represented in Fig. 1.

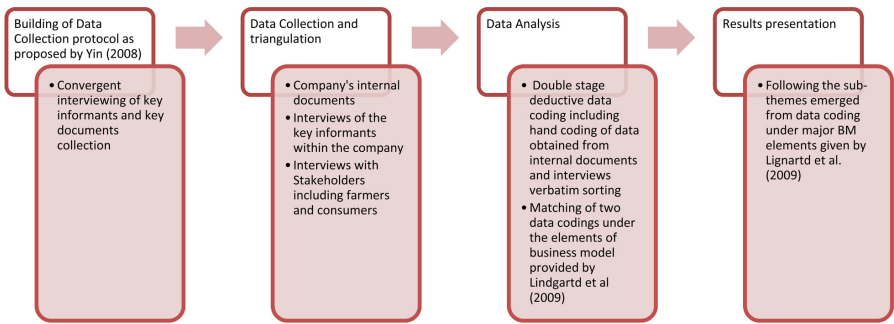


Fig. 1. Research protocol.

The interviewees were people at different hierarchical levels and handling various responsibility centers. They are said to be key informants as they have significant experience with the startup and can highlight different viewpoints about the context [Krause *et al.* (2017)]. The interviews were taken with a semi-structured questionnaire where detailed information about the business model and its elements was sought based upon the business model configuration given by Lindgardt and colleagues [2009]. The details of the interviews are presented in Table 1.

Yin [2002] emphasizes that the strength of a case study is in using a variety of evidence ranging from documents, reports, interviews, and observations. To strengthen our case study, we used a variety of evidence for data triangulation, which helped validate the information from the interviews [Farquhar *et al.* (2020)]. The data on the same aspects were collected from farmers and consumers, to get a holistic perspective of the BMI. The internal documents were also collected to triangulate the information given by key informants. The documents collected include the following:

- Farmers' databases and their information
- Vehicle routing schedule

Table 1. Interviews and Observations' details.

Function	Position	Interview duration
Overall Management	Founder	30 min + 1.5 h + 2 h
Managing operations at the front end	Operations head	1.5 h + 1 h
	Chief farming officer	2 h
	Lead Agripreneur	1 h + 43 min
	Supply chain manager	2 h + 2 h
	Data analyst	1 h
Transportation	Employee	22 min
Sorting and grading	Employee	35 min
	Farmer 1	48 min
	Farmer 2	1 h
	Consumer 1	15 min
	Consumer 2	12 min
Observations about the process		One complete year

Table 2. Data sources and selected coding indicators.

Elements	Interviewed Personnel who reflected upon these area	Internal documents referred	Selected coding indicators and examples
Target segment	Founder, Operations head, CFO, lead agripreneur, consumer 1 and consumer 2	Consumer orders, farmers' database and related information	(a) Urban working households: <i>"In most of the cases, we deliver orders in the evenings when they are at home"</i> ; Employee 2 (b) Farmers implementing safe to eat policy: <i>"They need it safe and free from chemicals so we thought of some measure to ensure this. In this process, we came across this policy of Kerala Government and we thought to go with this"</i> ; Founder
Product or service offering	Founder, Operations head, CFO	Quality policy and specifications for quality at reception, collection centers, delivery points, algorithms	(a) Fresh vegetables: <i>"we need them garden fresh on a daily basis and they provide the same day's harvest"</i> ; Consumer 1 (b) Traceable produce: <i>"I personally wanted to meet the farmers who produce the food that I eat, and they have arranged for it"</i> ; Consumer 2 (c) Better prices to farmers: <i>"I grow tomatoes and got 20 per cent more price than the tomatoes sold at Mandi"</i> ; Farmer 2
Revenue model	Founder, Operations head, Data Analyst, Consumer 1 and consumer 2	Financial statements and farmers' payment receipts	Digitized advanced payments: <i>"All our payments are advanced payments and ensures full transparency as per the government's norms"</i> ; Founder
Value chain	Founder, Operations head, CFO, Lead agripreneur, SCM Manager, Lead agripreneur, employee 1 and 2, farmer 1 and 2, consumer 1 and 2	Vehicle routing schedule, traceability algorithm information, demand and price forecasting algorithm information	(a) Same day delivery: <i>"The vegetables used to be very fresh and tender"</i> ; Consumer 2 (b) Sorted and graded produce: <i>"We sort the produce in three grades where only top grade is delivered to our customers"</i> ; Employee (Sorting and grading) (c) Subscription model: <i>"The monthly subscription helps us to plan the supplies in advance"</i> ; SCM Manager
Cost model	Founder, Operations Head, CFO, SCM Manager, Employee (transportation)	Vehicle routing schedule, farmers payments' receipts	Asset light model: <i>"We have outsourced the services and have lesser fixed assets"</i> ; Operations head

Table 2. (Continued)

Elements	Interviewed Personnel who reflected upon these area	Internal documents referred	Selected coding indicators and examples
Organization	Founder, Operations head, Farmer 1 and 2	Traceability algorithm information, demand and price forecasting algorithm information	(a) Production planning: “This year we got the information about how much to produce before the starting of the season. It actually worked so far for selling”: Farmer 1 (b) Traceability: “We introduced this to have our clients’ faith with us and we have 100 per cent repeats”: Operations Head
Client relationship management	Founder, Operations Head, CFO, SCM Manager, Lead agripreneur, farmer 1 and 2, consumer 1 and 2	Quality policy and specifications for quality at reception, collection centers, delivery points	(a) Transparency and reliability: “We have online ordering and feedback system to get real time and true information”: Founder (b) Grievance redressal mechanism: “If a consumer receives a defective order, we replace it and return the money back for that defective order”: Operations Head (c) Sense of belongingness: (1) “We organize frequent meetings between farmers and consumers to make them feel more connected”: SCM Manager (2) “They helped us to sell the extra produce to the mandi by giving their transportation on minimal charges”: Farmer 2
Sustainability activities	Founder, operations head, CFO, SCM Manager, employee 2	—	(a) Local transportation: “We are getting material from the nearby villages. We had been to a visit to them”: Customer 1 (b) Green packaging: “We pack vegetables in cloth bags earlier. Now we use biodegradable bags made with Tapioca or cassava starch mixed with sago starch, which is widely available in Kerala”: Employee (sorting and grading)

- Traceability algorithm information
- Demand and price forecasting algorithm information
- Audited financial statements
- Farmers payment receipts
- Copy of consumers orders
- Quality policy
- Specifications for quality at reception, collection centers, delivery points
- Complaints log and details

The interview transcripts (recorded versions as these were telephonic interviews) were converted to text and printed. All the transcripts were read by all three authors and hand-coding was done deductively by keeping six elements of the business model given by Lindgardt and colleagues [2009] as major themes. Hand coding of the internal documents was also done to match with the codes obtained from transcripts. Hand coding was proven successful for a small dataset by imbibing the very purpose of the research [Nelson *et al.* (2018)]. By doing coding in a certain way, with a certain purpose, it is essential to understand the decisions that are being made. Accordingly, the areas where different roads may be taken must be highlighted and consciously considered [Elliott (2018)]. In this study, new themes have also emerged during coding as they did not fall into those six elements. We have highlighted these new elements in the findings section. The list of codes with a few examples from translated interview transcripts is included in Table 2.

All three authors autonomously analyzed the transcripts [Noble and Heale (2019)] to reduce subjective bias. Afterward, individual interpretations were compared and merged. We tried to ensure the completeness and correctness of the information with its correct inferences by doing data and investigator triangulation [Roulston (2018)].

5. Findings

FFZ is procuring safe-to-eat vegetables from its registered farmers and provides doorstep delivery to consumers within 16 h of harvest. They are integrating the supply chain and ensuring traceability and transparency. This particular case is relevant for two reasons, which are (1) addressing consumers' concerns regarding food safety and (2) getting assured good margins to the farmers.

We summarize the process of BMI in FFZ's case as suggested by Lindgardt *et al.* [2009], which is divided into three parts, i.e. (1) uncovering opportunities, (2) implementing the business model, and (3) building the platform and skills. After discussing the process of BMI, we map the business model of FFZ on the six elements given in the business model configuration provided by Lindgardt *et al.* [2009].

1. Uncovering opportunities: The first step in the process of BMI is the identification of the loopholes in the current practice [Lindgardt *et al.* (2009)]. Here, the current practice may refer to the current business model of a firm or the general practice in the industry. As referred by Massa *et al.* (2017), a new enterprise can

create a new business model to cater to the needs of the industry. Hence, the loopholes/problems in the supply chain of fresh vegetables served as an opportunity for Pradeep P S, a software engineer turned entrepreneur, who wanted to improve the health and wellness standards of the consumers by providing them access to safe-to-eat, pesticide-free fruits and vegetables. He was also concerned about the lack of knowledge or awareness at the consumers' end about the origin of the food that they eat. Usually, they do not know the source, in what circumstances it is grown, and what inputs were used while growing it. Secondly, during his upbringing, he came to know about price fluctuations in the case of fresh vegetables along with other challenges during supply to the Mandi (vegetable market). He understood the pain points of farmers like his family itself was practicing farming in Kerala. Farmers used to sell their produce to local traders at low prices or else if they want to fetch a good price in the Mandi, a hefty transportation cost gets associated. In the supply chain of vegetables, uncertain demand is another challenge faced by farmers depicted by sudden drops or surges in the prices of the produce. Sometimes, Pradeep witnessed unsold produce returned to the farm due to a glut in the market. This also induces heavy losses of the produce. Loss of produce is also contributed by long transportation hours and lack of sorting and grading practices in the market. A higher number of food miles (1000 km on an average in India) disturbs the ecology by GHG emissions, yielding to a non-sustainable practice.

2. Implementing a new business model: The successful cases of BMI are not the originators of a new business model but the implementers [Lindgardt *et al.* (2009)]. Pradeep was working at an IT park and used to discuss the idea of selling safe-to-eat vegetables with his colleagues. He was able to create an interest in them and started to sell off to them. When he was well versed in the art of e-commerce, he and a few of his friends designed and developed a website. He asked a few farmers in his locality to farm vegetables for him. Before harvest, he listed the products on his website and spread the news among his friend's circles. He managed to get a few orders on the first day and surprisingly the numbers increased day by day. The timeline of FFZ's events is depicted in Fig. 2.

FFZ launched in 2016 with a mission to provide consumers, with safe-to-eat vegetables and small-scale farmers with better living standards by helping them get more value for their produce. The idea was to bridge the gap between farmers and consumers through unit-level traceability for all products. As time passed by, FFZ became an Agri tech, purely B2C-focused farm-to-fork supply chain player offering fresh, safe-to-eat fruits and vegetables to consumers supported by a strong technology backbone and a differentiated business model along with proven scalability across five main cities of South India. It tried to tap all the opportunities one by one and created a replicable business model. A comparison of the prevailing industry practices and FFZ's business practices is given in Table 3 with respect to challenges of the VSC. FFZ made its presence noteworthy during the crisis, i.e. the COVID-19 pandemic, and helped the supply chain be integrated with fresh home deliveries.

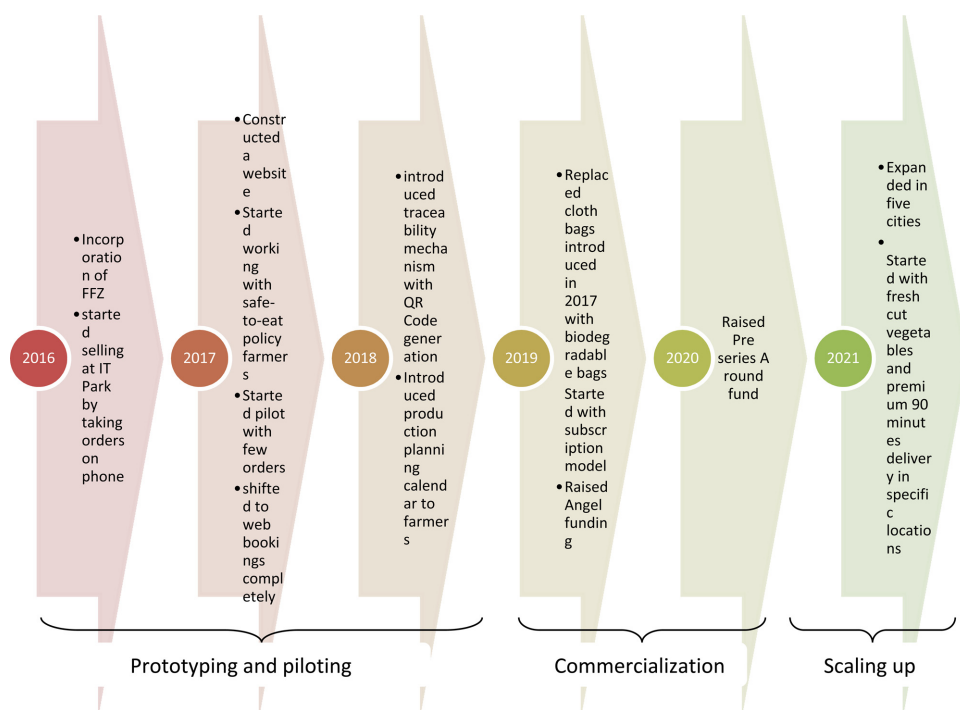


Fig. 2. FFZ's timeline of events with respect to venture growth stages.

Table 3. Comparison of VSC industry practices and FFZ's business model mapped on VSC challenges.

VSC challenges	Industry practice	FFZ's business model
Wastages due to perishability	Longer transportation hours, lack of sorting and grading mechanism	(1) Reducing the food mileage (2) Establishing sorting and grading component
Food safety	High usage of pesticides and chemicals	Associating safe-to-eat farmers and traceability mechanism
Lack of proper market access for farmers	(1) Selling to the local traders at a low price (2) Involvement of high cost of transportation to sell the produce in the nearby market (mandi)	Providing an assured market to farmers for their produce through production planning mechanism, cold storage and diversion of extra produce to other markets
Uncertain demand	Sudden price drops or hikes	By integrating the production planning mechanism

6. Building the Platform and Skills

The next step in the process of BMI is creating a platform to systematically manage the BMI process [Lindgardt *et al.* (2009)]. For this, Pradeep developed AI and ML-based capabilities in the system to rule out any diversions from the process. For example, he has put the names of the sellers on the website itself for each commodity and ensured that the vegetable ordered by the customer should be supplied by that

farmer only. This could be traced with the help of QR Codes pasted on each vegetable lot. He is adding more vegetables and sellers and is continuously updating the website for more transparent and beneficial engagement for the users. Secondly, he established cold storage near each city of operations, to meet any fluctuations in the demand and supply. He trained the employees and village entrepreneurs to carry out the operations in a uniform way with a better understanding of production planning, good agricultural practices (GAP), safe-to-eat policy and produce quality grades. He completely outsourced transportation and partially outsourced labor to keep the costs in check. He ensured to integrate online booking, advanced payment, and online grievance redressal mechanism to smoothen revenue inflow and manage customer relationships effectively. In 2021–2022, FFZ served more than 1 lakh happy customers across five cities with the goodness of natural fresh veggies same as handpicked from their kitchen garden. In this journey, they handheld 2000+ farmers and improved their livelihood. They are a focused farm-to-fork supply chain player offering fresh, safe-to-eat fruits and vegetables to consumers within 16 h of the harvest. They have their supply chain connecting farmers to end customers where their technology-driven operations and supply chain are supported to comply with the 16 h deadline.

“At the same time, the business’s economic aspects could not be neglected”. Pradeep PS, Founder, FFZ.

In pursuit of that, they started innovating on crucial new features that help to provide the customers with the better experiences they deserve. They generated a revenue of 2.5 Cr (25 Mn INR), 7.6 Cr (76 Mn INR), and 29 Cr (290 Mn INR) in the years 2019–2020, 2020–2021 and 2021–2022, respectively. They have raised their last round of pre-series A funds with 6 Cr (60 Mn INR) through existing investors. The round was led by Indian Angel Network (IAN), with participation from IAN Fund, Malabar Angel Network, and Native Angel Network. FFZ made its presence noteworthy during the crisis, i.e. the COVID-19 pandemic, and helped the supply chain be integrated with fresh home deliveries.

Next, we mapped the startup’s business model with the Business Model Configuration given by Lindgardt *et al.* [2009], and the findings are categorized as per the elements represented in the configuration.

1. Target segment: There are two customer segments targeted by FFZ, i.e. urban consumers and farmers. FFZ is directed toward the urban households who want to buy vegetables at the convenience of their home. These are the people who decide about their menu well in advance and accordingly identify their weekly vegetable requirements. The customers get fresh vegetables in the evenings that are harvested in the morning or at maximum within 16 h of harvest. FFZ also serves those farmers at the supply end who work on the safe-to-eat policy of the Kerala Government by providing them with better prices for their produce.

2. Product or service offering: FFZ ensures to work with only those farmers who follow the government’s safe-to-eat practices for cultivation. These practices indicate the appropriate use of fertilizers and scientific cultivation. It prohibits the use of

chemical pesticides. It is a general practice to claim the produce as organic as it fetches reasonable prices, but it is difficult to ensure its authenticity. FFZ works on the line of “Know your Farmers” to gain faith in the firm and address their concerns if any. Frequent testing of the produce is being done in the state agricultural laboratories for pesticide residues detection. The village entrepreneurs monitor each farm and bring malpractices to the notice of the startup. Such produce is being sent to the lab for quick testing, and if it is found problematic, the procurement gets stopped, and that farmer would be red-flagged. Village entrepreneurs also ensure to restrict postharvest malpractices, including coloring of vegetables. Hence, fresh, safe-to-eat, traceable vegetables are delivered to consumers. At the same time, farmers are being paid for their vegetables on alternate days at better prices than the regular market due to a reduction in the current supply chain intermediaries prevailing in the market. FFZ sets the base price for the produce based upon production cost to get the maximum value for the farmers out of the chain. This is being done with the help of an algorithm based upon the data provided by village entrepreneurs in consultation with farmers.

3. Revenue model: The revenue streams and payments are digitized by making the whole process transparent. The customers can either buy vegetables at random or can join the platform with a monthly subscription model based upon the family size.

4. Value chain: FFZ brings value to the chain by providing same-day delivery if ordered in the morning or within 16 h otherwise. The customers have the liberty to choose a monthly subscription model based upon the family size by setting delivery preferences. In this model, the produce could be picked up from several varieties in limited quantities to customize a bag. The wallet associated with the platform can be recharged or topped up based on weekly or monthly consumption. This has eased out the daily process of vegetable ordering for customers. FFZ provides sorted and graded produce from the farmers, which make it convenient to use and process.

5. Cost Model: The startup itself is doing the majority of the activities. The outsourced activities are transportation and contractual workforce for sorting and grading to achieve economies. The cost structure involves lesser costs as compared to the traditional supply chain of vegetables. Due to the reduced food mileage, transportation costs were reduced significantly. Due to integration of the chain, leakages of margins are omitted. The firm’s fixed cost components include only software. The distribution/collection centers and cold storage buildings are rented, reducing the costs in the initial phase. Outsourcing transportation and labor also reduced the costs dramatically. The variable cost of transportation was also reduced due to a mere 10 KM distance between the distribution center and consumers.

6. Organization: During the supply of produce, they started facing troubles due to a mismatch of demand and supply that invoked them into production planning from the very next season. They devised an algorithm for demand prediction and production planning in-house with the help of an IT consultant. From the next season onwards, they started assigning the type and quantity of vegetables to farmers to

meet the demand better every three months. To meet any exigencies in the actual demand or extra produce that could not be delivered due to particular reasons, the startup stores it in cold storage, which is a part of the traceability mechanism. The startup provides information to the farmers in advance regarding the quantity to be procured so that the excess produce could be diverted to another sale point. FFZ also associates each pack of produce with a QR code through which it could be traced back to its origin. It ensures transparency in the system.

7. Customer relationship management: The customers, who want freshly harvested vegetables and are digitally acquainted, tend to book their orders online. The customer relationship is more reliable and traceable due to digitized payments. The startup gets affordable and reliable feedback online for its services and improvements. They have a robust grievance redressing system where the unaccepted produce is replaced the same day or the next with refunds.

The startup also helps the farmers to sell the excess produce. Farmers have an opportunity to put their produce in the firm's cold storage too depending upon their choice. Generally, the startup procures complete produce from a two-acre farm. It ensures that the farmer gets a minimum of ₹10,000 per acre per month. FFZ also included the advisory component into its offering, where it organizes training and provides consultancy to its associated farmers regarding better cultivation practices that resulted in an aggregate rise of 20% in vegetable production at their farms as reported by farmers.

The startup is strengthening the relationship with farmers on mutual trust. No contract is forcing farmers to sell the produce to FFZ only. Once associated, the farmer does not leave the system due to many benefits, including a production planning calendar, farm advisory, and better prices. The payments to the farmers are made every alternate day.

Apart from this, the startup has a traceability mechanism to satisfy the customers regarding the origin of the produce. The customers can always trace back the chain up to the farmers. *"Building long-term relationships with clients on both ends of the chain is the motto behind FFZ's working"* — Founder, FFZ. The firm often organizes farmer–consumer meets to make both the parties understand each other's concerns. They both participate enthusiastically in these meets. These meets also ensure transparency in working at the startup's end and strengthening the client relationship.

8. Sustainability: In response to the growing concern due to geographical distance between food production and food consumption places, urban and peri-urban food supply chains are gaining importance due to their capacity to meet the demand for locally grown fresh produce and reduction in food mileage to ensure sustainable practices [Nakandala and Lau (2019)]. Short food chains are beneficial for consumers, producers, and humanity, too, as it aims to realize the goal of sustainable agriculture [Canfora (2016)]. The average food mileage is 1000 KM in India, and the startup is working in the vicinity of 250 KM only, leading to the achievement of sustainable agriculture. Also, the distance between the distribution centers to customers is less than 10 KM.

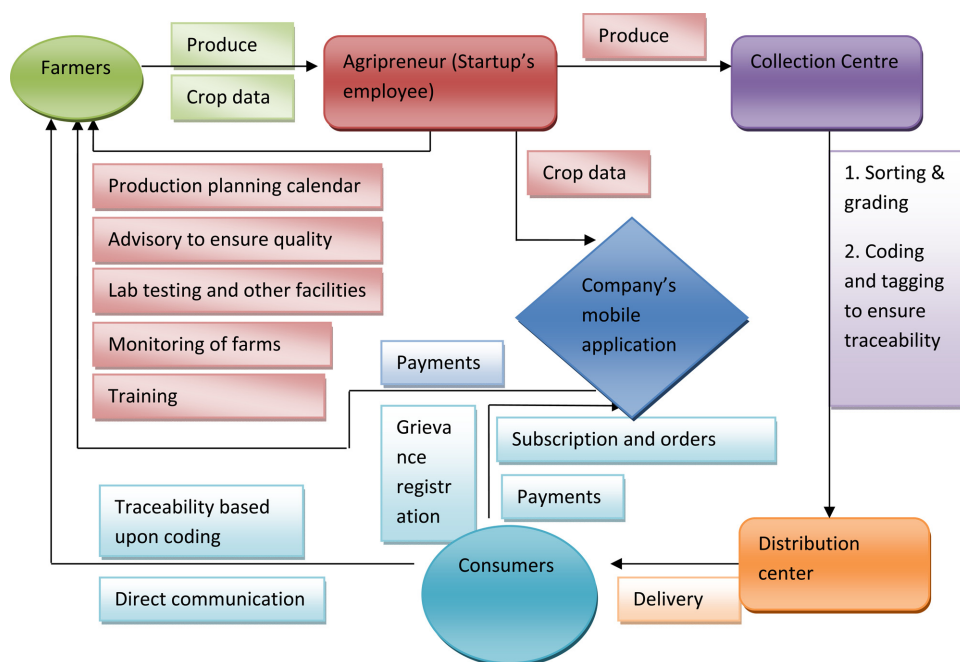


Fig. 3. Business Model of XYZ.

Earlier the produce was supplied to the customers in cloth bags, which were later on replaced with biodegradable bags made up of tapioca or cassava starch mixed with Sago starch. Nowhere does it use any plastic for the supply of the produce. Moreover, FFZ appointed village entrepreneurs in every village who provide authentic information about currently associated and prospective farmers and their

Table 4. Mapping of XYZ's business model on Lindgardt's business model canvas.

Elements	Description
Target segment	(1) Urban households who need the convenience of customized online fresh quality vegetable buying and can pay premium prices. (2) Vegetable farmers who are working on 'safe to eat' policy.
Product or service offering	(1) Delivery of freshly harvested safe-to-eat vegetables to the customers with a traceability mechanism. (2) Premium prices to the farmers for their vegetables and advisory, production planning system, and hassle-free pickup.
Revenue model	The revenue flows come exclusively from the credit card or other forms of online payments, making all of them traceable.
Value chain	Integrated chain for sourcing quality fresh vegetables from farmers, sorted, graded, and quick delivery to consumers at their doorstep. Transportation from farm to collection center and delivery resources is partially outsourced.
Cost model	Asset light model. Cost optimization was done by integrating the chain, thus reducing traditional chain margins.
Organization	Development of critical resources and activities for chain integration and sustenance.

farming practices after a careful inspection of their fields. As per safe-to-eat practices, no chemical pesticide can be used to grow crops. FFZ inhibits these malpractices by careful observation and red flagging of the guilty, ultimately promoting soil conserving farming practices.

In this way, FFZ has innovated a business model (depicted in Fig. 3) that takes care of all the major challenges, i.e. wastages due to perishability (by reducing the food mileage), food safety (by associating safe-to-eat farmers and traceability mechanism), lack of proper market access for farmers (by providing assured market to farmers for their produce) and uncertain demand (by integrating the production planning mechanism) of a VSC with profitable operations.

The summary of all the six elements of the business model [Lindgardt *et al.* (2009)] is highlighted in Table 4.

7. Discussion and Conclusion

Given the VSC's challenges, BMI was suggested as an essential method to meet them through new value propositions and better management practices. Even though there is a scarcity of interest in BMI research in the VSC industry, there are wide solutions reported in the literature to meet the VSC's challenges. However, no evidence exists regarding an existing innovative business model adopting these solutions and making profits simultaneously. The case represented in this study demonstrates the incorporation of ICT and IoT tools to devise maximum value out of the VSC for farmers and consumers. The integration of the supply chain with a better traceability mechanism, reduced food mileage, optimum production planning systems, and better client relationships were witnessed in the study. This study highlights that startups could create high impacts and solve real-world problems by innovating business models and integrating existing individual solutions. The winners of BMI are not necessarily the original innovators; more often, they are the ones who have successfully implemented the already originated ideas [Lindgardt *et al.* (2009)].

Accordingly, the study contributes to the literature in two ways. First, it modifies the business model configuration given by Lindgardt and colleagues [2009], specifically in the context of VSCs. Two more elements are needed to be included in the six elements matrix, i.e. "client relationship management" and "sustainability activities." The importance of client relationship management, which configures all of the firm's efforts to effectively and efficiently manage its clients in the longer term, is evidenced by the study. Both farmers and consumers are termed as clients in the supply chain business. Managing the long-term relationship with both ensures the firm's uninterrupted operations, thus enhancing the firm's credibility and profitability. Sustainability is being treated as a new frontier in the business model implementation [Parajuli *et al.* (2019)]. Reducing the food mileage, going green with packaging, and soil conservation practices are some of the sustainability efforts made by the startup studied in this case. Franceschelli and colleagues [2018] believe that innovation linked with sustainability is a great strategy to achieve success in a business, precisely when it is concerned with the food industry, closely related to

nature and human health. In VSC's context, it is thus suggested to map the business model on the sustainability aspects too. Secondly, there is a scarcity of evidence studying the business models based upon previously validated configurations. Franceschelli and colleagues [2018] have studied a firm's business model based upon Osterwalder's [2004] business model configuration. This study has also strengthened this methodological advancement in the study of business models based upon earlier validated configurations.

7.1. Practical implications

The agribusiness sector, particularly VSC, is very competitive, and difficult to develop or expand. However, well-known examples (such as Grofers, Amazon fresh and Ninjacart) show that the VSC players who have achieved national or worldwide success have done so by using a fundamentally different business model. The company in this case has created a business strategy centred on solving the VSC constraints, making it a one-of-a-kind example in India. This emphasizes the concept that agribusiness organizations may establish new markets or compete in the existing competitive climate by focusing on BMI rather than product innovation, which can be a great opportunity for small businesses with limited resources and restrictions. The study poses significant managerial implications useful for finding out new value propositions in a VSC business. The increase in demand for locally grown produce has opened new marketing avenues; as a result, small and medium farmers have gained importance in local and regional food systems related explicitly to fresh produce supply. The most important amongst all the implications is the shortening and integration of the supply chain to achieve economies and sustainability. Understanding how an enterprise fits into a market chain allows for more informed production decisions. It also highlights limiting the information asymmetry between farmers and consumers, thus ensuring a transparent process to increase the firm's credibility. This study depicts the fundamental real-time BMI, which can be improvised and modified as per the business requirements of different firms. At the same time, it provides a way for the business owners of VSCs to attract rural youth into agriculture, which is migrating tremendously. It highlights the BMI that allows the startup to employ villagers (as village entrepreneurs), making them understand profitable diversification from traditional rice cultivation, production planning, and advisory to reduce waste and ensure better prices. The study stresses that sustainability can also go hand in hand with profitability by creating a win-win situation for all the farmers and consumers (by reducing food mileage and going green with packaging), thus equipping managers with a sustainability perspective in their businesses.

7.2. Limitations and future research avenues

The study has some valid limitations, including the generalization of results, although a single case study can still be considered a viable avenue, according to Yin [2008]. The implications allow the following research avenues to be investigated:

- (a) There is a strong need to conduct a few more case studies to understand how firms address VSC's challenges with different BMIs. The elements of different real-time BMIs could be studied in greater depth to establish the most important elements and how they can contribute to theory building. Apart from this, certain comparative case studies could also be done to compare the various metrics achieved from BMI in different companies.
- (b) The strategic and managerial barriers to innovating a business model are covered in this study. It may be interesting to know why good supply chain practices are not being practiced in all VSC firms.
- (c) The external environment scanning and its impact on shaping the business model are not covered in the study. External environmental elements and their interaction with the BMI process could be studied by adopting a case study research methodology.
- (d) The contextual limitation poses the need to explore the topic in other contexts and industries where the researchers may analyze this with other methodological terms.

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