Supply chain modelling in organic farming for sustainable profitability

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Abstract: Globally, people started gravitating toward organic food as health consciousness rose. From the farm to the consumer's fork, organic food is produced using a comprehensive method. Organic farming has provided farmers and producers with many opportunities, but there are still difficulties concerning the cost of production and distribution. Due to environmental sustainability challenges, climate change, soil fertility, biological assortment, and consumer well-being, organic farming is attracting more attention than conventional farming. Organic farming can be done using standardised methods and has many common issues with conventional farming. Organic farming has some unique problems as well. With the right strategies, careful planning, and government assistance, many difficulties faced by farmers can be addressed. The downstream material flow of the supply chain, and in particular demand estimation, market price, and identifying customer segments, has been identified as a significant problem in organic farming. Massive losses have been incurred along with the entire supply chain a due to the inadequate demand estimation that has caused surpluses and shortages in the produce. A few farmers have resolved the cash flows and material information controlling problem. This article proposes various related hypotheses associated with identifying customer segments, forecasting demand for the product, and profitability as market price changes in the crop.

Keywords: customer segment; demand estimation; downstream supply chain; market price; sustainable profit

The pandemic's aftershocks have had a significant impact on the organic food industry and the environment. According to a report by Research and Markets, the organic food market in India is anticipated to increase from 177.14 million USD in FY2020 to 553.87 million USD in FY2026, with a compounded annual growth rate (CAGR) of 21.0% (Shivranjini 2021). India's agricultural history dates back more than 4 000 years, and organic farming has been practised there since the Vedic era. Organic farming is an approach to cultivation using farming inputs that are biodegradable and generated from natural sources, even the inputs that are strictly not natural have to be naturally biodegradable. Fertilisers and pesticides are prohibited throughout the entire agricultural cycle, which begins with the texture of the soil, seeds, and manure added, the crops processed, and the final crops harvested, handled, and delivered. Despite the advent of agricultural automation technologies, improved hybrid seeds, and more extensive access to fertilisers and pesticides, farmer profitability

has decreased in recent decades (Nemes 2009). This illustrates how contemporary agricultural techniques only pay attention to the operational parts of farming while ignoring its financial viability and sustainability.

Organic farming uses many methods. Modern organic farming tends to be external input dependent. The basic philosophy many organic farmers follow is to replace conventional inputs with organic ones. Often these organic inputs are many times more expensive than conventional inputs. This leads to a higher cost of production in organic farming. Another issue is the recovery time for the soil. Many organic methods work on slow soil recovery methods, meaning the soil only gives appropriate yields once the soil recovers, which typically could be two or three years. During the intermediate period, the farm's financial viability is at risk, and the farmers would have to depend on alternate incomes to sustain their families. Also, organic farming often depends on locally available materials and cannot be copied by different farmers in different climatic zones, with differing cultural practices. These factors have resulted in the slow growth and popularisation of organic farming in general. For it to become a large-scale movement, it needs to be standardised and based on locally available, recyclable farm wastes so that the cost of production drops to negligible levels.

The cost of organic food is a significant drawback compared to conventional farming. Organic farms must go through rigorous certification procedures. Additionally, a certain certification amount is involved. It is required to adhere to organic standards. If an organic farm doesn't adhere to these requirements, it could suffer the consequences. Organic farming cannot meet the world's need for food to survive.

The alternative supply chain for agriculture. Agricultural supply chain must flow smoothly from the farm level to the consumer, with manufacturing going to farmers, farmers to intermediaries, and intermediaries to customers (Roekel et al. 2002). It is divided into three segments: upstream, downstream, and midstream. Upstream includes machinery manufacturing, fertiliser and pesticide manufacturing, hybrid seed suppliers, and electricity and fuel providers (Abrudan et al. 2022). Customers are in the downstream segment, while intermediaries comprise the midstream segment (Burch and Lawrence 2005). Despite the economic activity, the share of agricultural output to the GDP has decreased to less than 20%. This paradox is made more problematic because more than 55% of the labour force in India still works in agriculture and connected sectors (Kundu and Das 2019). The downstream sector's

supply chain was restructured using the techniques for restructuring chain flow and inventory position (Shah 2009). For farmers to sustain themselves and supply goods to consumers through intermediaries, Priya and Vivek (2016) suggested restructuring the supply chain. Farmers are using this technique to sell their products to consumers. Tracing the actions and values taken by farmers committed to practising sustainable agriculture is the greatest way to study any new business model for agricultural practices. Their knowledge of the subject and their clarity of expression are helpful hints for developing new agricultural theories. Organic farming agriculture should be economically, environmentally, and socially sustainable for the long term.

Economic sustainability. Organic farming using very little external inputs can lower production costs to very low levels. But this would require a change of mindset toward how the farm is run. It would invest in methods to recycle existing crop residue back into the soil. It could also consider using farm animals that use these residues as fodder, and their manure could go back to the soil, thus completing the circularity of the material flow. Organic methods must be adapted to this end, and everything on the farm will revolve around this principle. This discourages the practice of buying exotic external inputs for growing crops.

Environmental sustainability. The biggest problem with conventional farms, crops, and animals, is the issue of effluents from the farm. Animal farms are a huge contributor to the emission of methane, a greenhouse gas. Agrochemical runoffs, too, are a considerable pollutant that finds its way into streams, lakes, ponds, and even aquifers. This has resulted in damaging many fragile ecosystems in the countryside. Many organic farms do not devote adequate attention to this issue. A sustainable organic farm ideally will be zero discharge. All its wastes will be recycled and sent back to the soil to regenerate it. Further, since organic farming generally operates on inputs that do not harm the environment and are biodegradable, they tend to preserve ecosystems for many generations.

Social sustainability. Conventional farming tends to have a factory mindset and is a linear system. It focuses solely on increasing output and does not bother about the impact on the lives of people around it. Many toxic farm inputs are causing huge health issues for both the farmers and the consumers. Degenerative diseases like cancer, kidney disorders, and other allergies have a considerable contribution from these harmful chemicals that are indiscriminately being used on farms and not being adequately degraded. And there is no policy

or plan of action from the government or the local leadership on dealing with this problematic issue that threatens to damage the lives of future generations. This is the one central point where organic farming makes a significant difference to the stakeholders. The farm produce is not only non-toxic but also creates a better tasting and nutritious food item for humans and animals depending on it. For many generations, the soil will continue to function without being degraded.

MATERIAL AND METHODS

This research adopts a case study-based descriptive research. Since a fundamental and straightforward hypothesis is being proposed, this study uses three cases to derive the propositions for the model. The three cases have been selected based on differences in land, farming methods, differing crops, and different business strategies. Multiple data collection methods have been used: unstructured interviews, observation, and examination of records on production, expenses, photographs, etc. These methods were used to generate appropriate information on the various dimensions and propositions by summarising and combining the facts collected. The unstructured interviews were administered to identify the proper dimension and their interrelations as perceived by the farmer [see Appendix 1 in the Electronic Supplementary Material (ESM)]. These propositions were then observed on the field and matched with the available record with the farmer. This rigorous process was used repeatedly to arrive at the proposed theoretical framework in this paper.

Research gap. Several studies have been carried out in the field of organic farming. Most of these studies focus on various field trials that study productivity (Watson et al. 2008; Forster 2013). However, very few studies have focused on improving the farmers' profitability. There has been very little complete literature that shows a comprehensive theoretical model to explain the list of factors that influence profitability and their interrelationships. Our research aims are: *i*) to identify various factors affecting sustainable profitability in agriculture; *ii*) to identify the interrelationships between these factors leading up to sustainable profitability.

Culmination of ideas. Most people consider farming as a substandard business proposition. This is because of unpredictable net returns and a total lack of control over the outcomes. This study identifies the major influencing factors, which, if dealt with appropriately, can consistently result in adequate profitability to rival the best industries in the marketplace.

RESULTS AND DISCUSSION

Sourcing efficiency. Agriculture resources such as natural materials and manpower are essential for successful organic farming (Terziev and Arabska 2016). Some farmers (Suh 2018) make their own organic fertilisers, while others source from external organisations. Collecting organic and native seeds is another challenge (Kruk and Trzaskowska 2021) and using machinery such as tractors is unavoidable (Akram et al. 2020). Small farmers can hire tractors on an hourly or daily rental basis (Omulo 2022).

Identifying the growing season. The growing season is when crops can be grown under the best possible conditions, such as temperature and precipitation. Farmers may better manage their agricultural output and better understand how climatic variability influences their ability to plant, grow, and harvest particular crops by knowing when these growth phases occur. To maximise profits and productivity, farmers must determine the crop's growing and selling seasons based on climatic conditions.

Multi-cropping and intercropping. Multi-cropping and intercropping have become increasingly popular among farmers due to increased yield, weed, insect, and disease control, effective resource use, and better soil health (Li et al. 2013). In the multi-cropping technique, farmers also use companion crops for better results. Companion crops are sown with another crop to gain some primary advantage in yield or crop protection from pests (Marzani 2023). Increased productivity and net returns are the main factors encouraging the adoption of the integrated cropping system. Intercropping also offers a significant method for lowering soil erosion, fixing atmospheric N_2, reducing the risk of crop failure or disease, and enhancing soil efficiency (Wang et al. 2014). However, the exciting investigation is that companion cropping is used in many developed countries' farms to identify the right multi-crops and minimise the destructive effects of diseases, resulting in better productivity and cost-reduction yield (Crutcher 2022). Intercropping methods have improved nutrient uptake and overyielding and have been stable over time (Wang et al. 2015). In all these types of cropping techniques, the farmers' knowledge of the respective seasons plays a pivotal role (Grabber et al. 2014). Especially the knowledge of companion cropping growing season can help the farmers to identify the right multi-cropping product. Farmers can reduce resource usage through this identification. and deliver very effective results (Markinde et al. 2022).

Zero Budget Natural Farming uses free resources such as cow manure, urine, green chillies, neem pulp, and neem leaves as fertilisers (Priya and Vivek 2016), resulting in increased root networks and more effective resource use (Ehrmann and Ritz 2014). Even though the farmers adhere to every organic farming rule in the book, they still have to dump all their products and suffer significant losses. Farmers use trial and error to find the demand season for vegetables and other crops, leading to a multi-cropping design. Hence, the following hypotheses are proposed.

H_1: Systematic sourcing of all required resources leads to the efficient execution of crop plans.

H_2: Knowledge of the growing season of companion crops leads to correct planning of multi-cropping.

Soil productivity. Organic farming strengthens the health of the soil by preventing erosion, boosting organic matter in the ground, restoring and preserving nutrients to plants, and fostering healthy soil structure (Homolka 2003). Farmers experience pest management challenges and decreased yields throughout the transitional phase, lasting more than two years before the soil becomes fertile. Crop rotation, cover crops, and insect traps are pest control strategies to improve soil quality and boost crop productivity (Chou et al. 2022). The significant advantage of companion cropping is the reduction of soil erosion which helps the farmers to use the land for better multi-cropping and cost reduction (Adarsh et al. 2019). The improved soil physical properties like soil aeration, aggregate stability, and infiltration rate may lead to the generation of degraded topsoil, producing more stable aggregates (Hombegowda et al. 2022). This stability can be one of the favourable situations for higher productivity in any cropping technique (Hombegowda et al. 2020).

Better yield. Crop yield is a measure of the number of seeds or grains produced on a land plot. It is the most critical indicator of a farmer's success because it captures the outcome of all the resources and labour used by agrarians to develop plants in their fields. It is achieved through organic farming practices that maintain soil fertility, consider crop rotation, and use the best knowledge and tools (De Ponti et al. 2012).

As a result, constant intercropping increases output and maintains the soil's chemical composition and enzyme activity for at least ten years (Wang et al. 2015). Farmers can increase their yield and net income by using multi-cropping techniques to grow various food crops. Farmers still receive a higher yield from other crops even if one crop fails (Paudel 2016). Intercropping is the best cropping strategy for long-term

sustainability because it uses the fewest resources and provides farmers with a higher yield (Vaidya 2020). Companion cropping helps the farmers understand the nature of the soil in a highly productive way which helps the farmers to avoid the wrong combinations of multi-cropping (Pramanik 2022). This decision reduces the loss and ensures better soil quality, yielding better crops (Bamboriya et al. 2022). The following hypotheses are formed based on the discussion:

H_3: The use of multi-cropping and intercropping practices enables improving the primary productivity of the soil.

H_4: Multi-cropping and intercropping strategies reduce the chances of crop failure due to mutual support, and hence yield increases.

Soil productivity is a key factor in crop production, determined by three soil properties: porosity, water-holding capacity, and nutrition (Querejeta 2017). Dabholkar (1998) divided productivity into two groups: Primary productivity, which measures the soil's innate ability to produce an output, and Secondary productivity, which gauges the volume of outside resources needed to sustain crop yield. Organic farming increases yield while fostering healthy soil and a toxic-free atmosphere. Research (Wani et al. 2021) has shown that improper fertiliser use has reduced soil quality, which results in low production and nutrient deficiencies. Low labour costs, family involvement, long-term productivity, consumer demand for organic food, market opportunities, and considerable revenue are the reasons for continuing organic farming. Organic farming creates a micro-climate on the farm that is partially insulated from external climate exchange. Another unique feature of organic farming is the creation of suitable farm structures to mitigate the impact of excess sun, wind, rain, floods, etc. The following hypothesis is formed based on the discussion:

H_5: Crop yields can be increased by both primary and secondary productivity improvement measures.

Sustainable profits. Sustainable profit is the ability to make money without causing the environment, this concept has become a competitive advantage for the farmer community in the agricultural sector; moreover, multi-cropping and intercropping can improve yield (Sushil and Patra 2000). Consumers increasingly consider sustainability in their purchasing decisions, especially in agricultural products. Supply chain activities also contribute to sustainable profit in the agricultural sector (Vrabcová and Urbancová 2023).

The fertility and texture of the soil have a direct impact on crop yield, also, the yield and profitability from organic farming practices should be equal to or

higher than those of conventional farming. Organic farming practices a sustainably have higher profitability due to natural manure and fertile soil (Mahoney et al. 2004). If the farmers get lower yields, the profitability still increases due to lower external input costs. Nevertheless, the interesting observation is that the quality of the land remains the same even after higher productivity. Because of the high-density planting in companion cropping, the effective usage of water and land is increased, the production cost is minimised, and no land damage (Van Bruggen et al. 2019). However, the significant outcome of this process is that the land becomes suitable for organic farming systems because of the mitigation of chemical usage. These practices will create environmentally firm soil which produces top-quality crops. There is a massive demand for such quality crops, and the farmers reach a better profit-cost ratio (Hossard et al. 2022).

H_{12}: Organic farming ensures a majority of the crops give above-average yields while conserving the environment leading to sustainable profits.

Identifying selling season. The sales of any product depend on factors like demand, product features, and demographical factors. However, the time or season is a pivotal part of the selling process of any product, more importantly, agricultural products (Taylor and Xiao 2010). In agriculture, a particular season is known for specific crops, and the market demand and customer preference entirely drive it (Živělová and Crhová 2013). The identification of the selling season is determined by farmers using various factors like experience, knowledge, farming income, land size, land status, seed quality, and capital (Agussabti et al. 2020; Bonuedi et al. 2022). But still, the farmers identify and prefer specific seasons for certain product cultivations for various natural reasons (Xing et al. 2018). This process utilises natural sources, seasonal product demands, and customer base for better price and profit (Kourentzes and Petropoulos 2016). However, some farmers are earning losses due to the selling season demands and the wrong customer base (Gupta et al. 2021). Farmers should focus on the middle-class and upper-class for organic products, as they are willing to pay a higher price during the off-season due to low yield and production costs. Products that assist family farms, the environment, agricultural open space preservation, or some other end-benefit will command a higher price (Curtis and Allen 2018). The right time to sell to the right customers in the agricultural industry is a colossal challenge for farmers (Vaarst et al. 2019) when the market characteristics like awareness level, knowledge of agricultural products, willingness to pay, immediate demand, positive customer attitude are at the mature level about the particular products that is the perfect time for the farmers to push the products to end customers which reduce the marketing costs (Robina et al. 2020). This context has been making a viable impact on agricultural products recently because of customer trends and attitudes (Wen 2007). Changing consumer trends towards organic farming products, customers changing habits, and a better understanding of the market, consumer demand, and seasonal requirements will help the farmers identify the good selling season.

Demand forecasting. Strategy, skill, and technology are required to effectively forecast the future and survive this era of economic predators (Gupta et al. 2021). Accurate projections are essential for making good production and marketing decisions (Yasir 2022), and reasonable inventory is needed to meet demand in the future due to uncertainty. Demand management comprises demand forecasts, order management, and customer relationship management.

Choosing customer segment. Marketing knowledge will help the farmers to understand the gap in the market. Nevertheless, this gap identification leads to choosing the appropriate segment in the new market or the existing market (Musayeva 2022). In this process, farmers should use demographic factors such as age, gender, education level, family size, and income are determined the appropriate segment (Gil et al. 2000). The interesting observation in the agriculture industry is customer knowledge and attitude toward organic food and their demographic profile help the marketer to identify new segments (Ghosh et al. 2016). Each segmentation had specific characteristics that contributed to the demand of the particular selling season and attractiveness towards the new unexplored markets, especially in the agricultural sector (Iossa and Selberg 2022). A new segment in an emerging market is organic products, However, these new segments and delivering organic products must coordinate with the back-end supply chain management process, as organic food supply chains are complex and volatile (Darkow et al. 2015). Supply chain integration and efficiency can address the specific segment's needs, which might lead to the identification of gaps in the respective segment (Van der Vaart and Van Donk 2008) which will result in identifying the new segment.

Market price estimation. Farmers have adopted new techniques to increase their income and standard of living but face the issue of price fixation and the right price for crops, which leads to price volatility (Semenova 2013).

Unpredictable events play an essential role in the price estimation of agricultural products and their supporting supply chain activities. Agricultural commodities prices are affected by the factors like crop diseases, infrastructure storage systems, demand forecasting tools, etc. Climate change and government policies on distribution channels help reduce cost pressure on farmers.

Specific seasons are identified as more productive because the demand for certain agricultural products produces a better profit range than other seasons. Changing consumer trends towards organic farming products, customers changing habits, and a better understanding of the market, consumer demand, and seasonal requirements help farmers identify the excellent selling season. Accurate demand forecasting helps the agriculturalist match customer expectations and create new segments. Matopoulos et al. (2015) discussed the relationship between segmentation strategies and supply chain integration. Organic food markets are not highly price-sensitive by nature, but depending on the selling season and demand, the price might vary across the market (Rajeswari et al. 2018). The following research hypothesis proves these relationships.

H_6: Knowledge of the selling season allows us to estimate the demand forecast of the sales volume accurately

H_7: Better knowledge of the selling season leads to choosing the appropriate customer segment

H_8: Knowledge of the selling season enables us to estimate the selling price of the produce accurately.

Downstream supply chain efficiency. The term 'downstream supply chain' refers to actions after 'production', i.e. getting the product to the consumer. Ainapur et al. (2011) proved that supply chain activity optimisation is crucial for all businesses since it boosts profits by reducing costs, increasing throughput, reducing inventory levels, and increasing revenues. The success of sustainable profitability in organic farming depends on the efficiency of the downstream supply chain because the items are perishable. Due to a lack of or limited direct marketing alternatives for farmers, the supply chain for agricultural products is difficult at present. Local producers make the majority of organic products in supply chains designed specifically for food in an effort to appeal to a variety of consumers. (Tundys and Rzeczycki 2015). Supply chain costs include transportation, storage, wastage, labour expenses for loading and unloading the produce, and commission charges (Shukla et al. 2011). Most of the time, farmers must rely on middlemen, who purchase goods from them at a discount and then resell them on the market for a higher price.

Demand forecasting provides forecast and customer order data to sales and operations planning (S&OP) and the master schedule. Various production resources like materials, labour, equipment, technology, and other fundamental facilities should be available for production and distribution in an efficient way is called the supply function. Artificial intelligence (AI) is one of the technologies that is highly beneficial and efficient in allowing automated computerised systems to become increasingly personalised to meet human demands. Forecasting the demand of the particular market will help the farmers identify the market gap which can convert into a new segment. Supply chain integration is one of the key strategies for reducing the cost structure of any form of business. In Agriculture, sector price estimation and fixation depend on integrating value chain activities. Price estimation is not only dependent on the cultivation process. Beyond this, so many supply chain activities take place to yield a better profit (Pantazi et al. 2016). Various analytical techniques like time series, machine learning, and deep learning are used to predict agricultural product market prices (Rajeswari et al. 2018). Besides, some online platforms provide valuable inputs for the farmers' price estimation. Still, not much research and application of how price estimation leads to backward or forward integration of the supply chain management activities. Based on the discussions, we propose that:

H_9: A correct sales volume estimate will ensure a complete sale of the products without leaving behind any unsold stocks and reduce stock levels in the downstream supply chain, leading to improved efficiency here.

H_{10}: Choosing the correct customers ensures customer offtake of the products at the proper velocity leading to higher efficiency in the downstream the supply chain.

H_{11}: There is a positive association between market price estimation factors and downstream the supply chain efficiency.

The proposed model will eliminate commission, as well as farmers who are supplying their produce to a nearby location and will incur only transport costs. Mostly logistics costs are bared by customers themselves as they collect from farmers directly. Since the farmers can identify market segments and forecast the demand with the correct pricing, they can reduce wastage. Farmers who are self-sustaining over some time can get more yield and prompt delivery without compromising quality and price and can realise higher returns. Input cost is low in organic farming when

compared with the conventional method. Therefore, profitability is maximised. Based on the above discussion, we propose that.

H_{13}: As downstream supply chain efficiency improves, the profitability of the agri venture also improves.

Research model – based on the extension of reviews. Most agricultural models discuss the growing season, soil conditions, new methods, new technology, etc. On the demand side, most research focuses on risk reduction due to price volatility using storage technologies and food preservation. None of the research has focused on identifying the correct selling season before finalising the growing plan. This paper also uniquely considers both price and volume fluctuations at the selling point and not only one of the variables, as is the case with most research papers on this topic. Most organic farming research focuses on the quality of the product, the taste, the lower damage caused, etc. But this paper extends all of that to create a financially viable and profitable venture around organic farming as a profession. Also, this is the first comprehensive model proposed for a profitable organic farming venture.

There are eleven variables in this model: sourcing efficiency (SE) – ξ_1; identifying growing season (IGS) – ξ_2;

identifying selling season (ISS) – ξ_3; multi-cropping and intercropping (MCIC) – η_1; demand forecasting (DF) – η_2; choosing customer segment (CCS) – η_3; market price estimation (MPE) – η_4; soil productivity condition (SPC) – η_5; better yield (BY) – η_6; downstream supply chain efficiency (DSCE) – η_7; and sustainable profits (SP) – η_8. SE, IGS, and ISS are regarded as independent (exogenous) variables, and all others are dependent (endogenous) variables.

The general equation model relating the above, latent exogenous and endogenous variables is Equation (1):

$$\eta = \beta\eta + \gamma\xi + \zeta \tag{1}$$

where: η – (8×1) vector of the latent endogenous variable; ξ – (3×1) vector of the latent exogenous variable; γ – (8×3) vector of coefficients relating the 3 exogenous variables to the 8 endogenous variables; β – (8×8) matrix of coefficients of relating the 8 endogenous variables to one another; ζ – (8×1) vector of errors in the equations.

The 13 hypotheses proposed are represented by the 13 causal relationships in the model. H_1 is represented in Figure 1 by the relation-
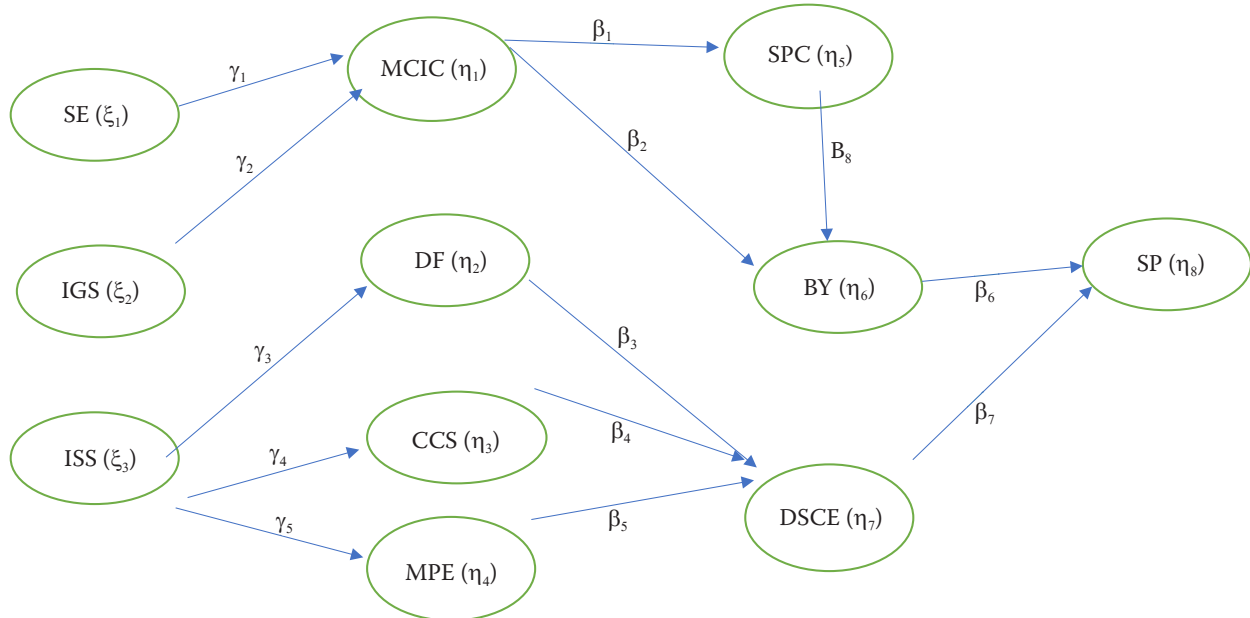

Figure 1. Organic farming supply chain business model for sustainable profitability

SE – sourcing efficiency; MCIC – multi-cropping and intercropping; SPC – soil productivity condition; IGS – identifying growing season; DF – demand forecasting; BY – better yield; ISS – identifying selling season; CCS – choosing customer segment; DSCE – downstream supply chain efficiency; MPE – market price estimation; SP – sustainable profits; η – (8×1) vector of the latent endogenous variable; ξ – (3×1) vector of the latent exogenous variable; γ – (8×3) vector of coefficients relating the 3 exogenous variables to the 8 endogenous variables; β – (8×8) matrix of coefficients of relating the 8 endogenous variables to one another; ζ – (8×1) vector of errors in the equations
Source: Authors' own elaboration

ship γ_1 (SE → MCIC); H_2 is represented by the relationship γ_2 (IGS → MCIC); H_3 is represented by the relationship β_1 (MCIC → SPC); H_4 is represented by the relationship β_2 (MCIC → BY); H_5 is represented by the relationship β_8 (SPC → BY); H_6 is represented by the relationship γ_3 (ISS → DF); H_7 is represented by the relationship γ_4 (ISS → CCS); H_8 is represented by the relationship γ_5 (ISS → MPE); H_9 is represented by the relationship β_3 (DF → DSCE); H_{10} is represented by the relationship β_4 (CCS → DSCE); H_{11} is represented by the relationship β_5 (MPE → DSCE); H_{12} is represented by the relationship β_6 (BY → SP); H_{13} is represented by the relationship β_7 (DSCE → SP).

The research model presented postulated: multi-cropping and intercropping are related to sourcing efficiency and identifying the growing season [casual path represented in Equation (2) below]; demand forecasting is related to identifying selling season [casual path defined in Equation (3) below]; identifying customer segment is related to identifying selling season [casual path represented in Equation (4) below]; market price estimation is related to identifying selling season [casual path represented in Equation (5) below]; soil productivity condition is related to multi-cropping and intercropping [casual path represented in Equation (6) below] better yield is related to multi-cropping and intercropping and soil productivity condition [casual path represented in Equation (7) below]; downstream supply chain efficiency is related to demand forecasting, choosing customer segment and market price estimation [casual path defined in Equation (8) below]; sustainable profits is linked to better yield and downstream supply chain efficiency [casual path represented in Equation (9) below].

$$\eta_1 = \gamma_1\xi_1 + \gamma_2\xi_2 + \zeta_1 \tag{2}$$

$$\eta_2 = \gamma_3\xi_3 + \zeta_2 \tag{3}$$

$$\eta_3 = \gamma_4\xi_3 + \zeta_3 \tag{4}$$

$$\eta_4 = \gamma_5\xi_3 + \zeta_4 \tag{5}$$

$$\eta_5 = \beta_1\eta_1 + \zeta_5 \tag{6}$$

$$\eta_6 = \beta_2\eta_1 + \beta_8\eta_5 + \zeta_6 \tag{7}$$

$$\eta_7 = \beta_3\eta_2 + \beta_4\eta_3 + \beta_5\eta_4 + \zeta_7 \tag{8}$$

$$\eta_8 = \beta_6\eta_6 + \beta_7\eta_7 + \zeta_8 \tag{9}$$

The farmers will also recognise when to sell their crops to improve their yield, price, profitability, and standard of living. By lowering costs and increasing yield on a small plot of land, efficient sources can help the farmers make more money. Finding the right segment results in better pricing, reaching the right customers, having more options, and expanding the market base. Farmers can meet consumer demands with productivity and a proper supply chain by choosing the appropriate growing and selling seasons. The model also suggests that farmers with effective sourcing and knowledge of the growing season could optimise cropping patterns to get higher yields and thus obtain sustainable profits. Additionally, if the farmers know the best times to sell their products, they can gauge demand quickly, select their target market, and set prices for an efficient flow of goods to the final consumers.

Organic farming practices improve consumers (Figure 2) by providing healthier and more nutritious foods
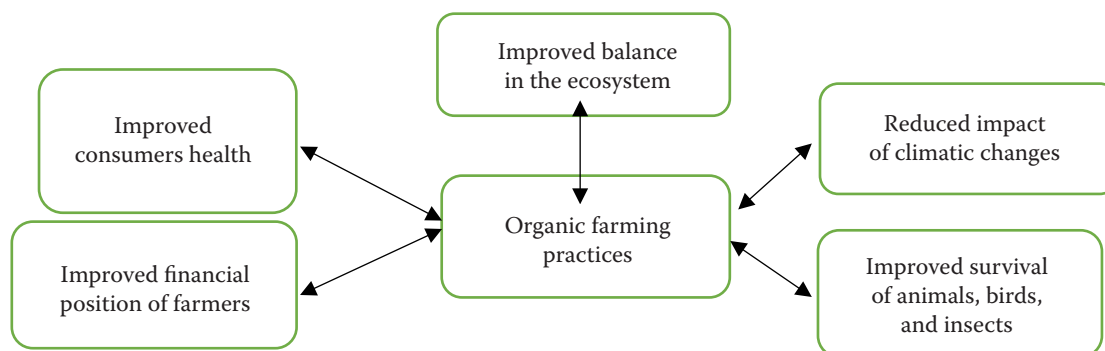

Figure 2. Impact on stakeholders and their influence on sustainability

Source: Authors' own elaboration

that are authentically produced locally and with greater consideration for ecology. Since consumers are shifting to organic foods, this, in turn, encourages more farmers to practice organic farming sustainably. Due to crop rotation and improved soil qualities, organic farming is less harmful to the environment and better at sustaining biodiversity. Increased biodiversity, in turn, leads to higher profitability in organic farming, serving as an incentive to keep up this initiative. The profit generated by organic produce has made organic farming a growing economic sector, encouraging more farmers to practice organic farming (Das et al. 2020). As organic farming becomes more efficiently practised, the profits earned by the farming community in general also tend to increase substantially. Organic farming restores the nourishment of soils by restoring the vital elements of the soil, the microorganisms that emancipate, convert, and reposition nutrients. Soil organic entities contribute to good soil composition and water-holding capacity. Organic farmers feed soil edaphon and build soil microorganisms with vermicompost, and biologically based soil supplements, thereby producing healthier plants that can better resist disease and insect attacks. The prime strategy in organic farming is pest control and disease deterrence through good plant nutrition and management. Carbon dioxide emission is much less than farming methods comparatively. Organic agriculture can assist in confronting climate change by downsizing greenhouse gas emissions. These farming methods minimise energy consumption by 30–70% per unit of land by eliminating the energy needed to manufacture chemical fertilisers and help reduce global warming by storing carbon in the soil. As a corollary, increased climate change will necessitate farmers to try out organic farming as means of survival because of the ability of natural farming to create microclimates which will increase the survival and yield chances of the crops. Organic livestock systems are based on the land. Breed selection is influenced by species-specific animal husbandry, nutrition, and requirements for animal welfare are generally higher than those of comparable conventional systems. Changes in habitat structure and field care have led to increased and more varied flora, insect, and bird populations (Stockdale et al. 2001). Since animals are integral parts of farms, their presence and health is a an important of healthy farming practices. The larger the number of livestock, the greater the need to greed them in an eco-friendly and natural manner.

CONCLUSION

Organic farming in India is still nascent in many states, and farmers have much scope to improve their net revenue. Organic farming can give similar or more yields when compared to conventional farming. Organic farming can be more profitable than conventional farming. Even though a relatively small portion of land is currently being farmed organically, organic farming has received widespread recognition for its environmental benefits, which help to promote biodiversity. Natural manure and fertile soil reduce production costs and increase profit. To increase production and profitability for farmers, an integrated crop management strategy that includes fertile soil, water, weed insect control, and post-harvest processing is essential. Farmers forecast demand, choose customer segments, and estimate the market price and would be able to do the supply chain process efficiently. The success of sustainable profitability in organic farming depends on the downstream supply chain's efficiency. To be profitable, organic farming needs to follow a comprehensive big-picture framework philosophy. The proposed model is widely open for research and can be validated through a structured questionnaire, or an observation method.

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