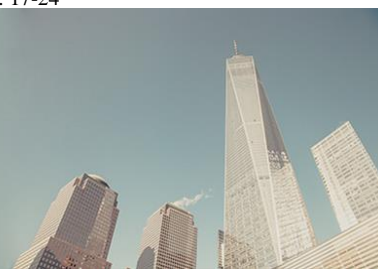


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## Supply chain support to a start- up brand wakao foods

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### Abstract

Wakao Foods, a vegan food brand founded in 2020 in Goa, India, has rapidly established itself as a key player in the plant-based food market. Specializing in jackfruit-based products, the company has expanded its presence across major Indian cities and ventured into international markets including the US, Dubai and Singapore.

This consulting project focused on analyzing and optimizing Wakao Foods' supply chain to support its growth trajectory. Key challenges identified include high logistics costs (approximately 15% of total costs), dependence on distributors affecting cash flows, limited understanding of export market requirements, and reliance on a single source for jackfruit.

My methodology involved comprehensive stakeholder interviews and historical data analysis. I examined inventory management, and distribution networks.

### Major re commendations include

1. Sales forecasting to avail inventory in hand just in time.
2. Expanding export markets with a focus on meeting international regulatory requirements
3. Diversifying jackfruit sourcing to mitigate supply risks.

The proposed changes align with Wakao Foods commitment to sustainability and ethical sourcing, positioning the company for continued growth in the expanding plant-based food market.

**Keywords:** Supply chain, food, brand, start-up, supports

### Introduction

Wakao Foods, despite its rapid growth and innovative product line, faces several significant challenges in its supply chain operations. These challenges, if not addressed, could potentially hinder the company's ability to scale efficiently and maintain its competitive edge in the rapidly growing plant-based food market. The current supply chain structure of Wakao Foods involves sourcing jackfruit and other ingredients from local farmers in India, manufacturing products at their facilities in Kerala, and distributing through a network of distributors as well as direct-to-consumer channels from Goa.

While this structure has supported the company's growth thus far, it has also revealed several pain points:

1. **High Logistics Costs:** Currently, logistics expenses account for approximately 15% of Wakao Foods total costs. This is significantly higher than industry benchmarks and is eating into the company's profitability.
2. **Distributor Dependency:** The Company's reliance on distributors, while providing wide market reach, is impacting cash flows due to credit sales and reducing direct control over product placement and customer experience.
3. **Export Market Complexities:** As Wakao Foods expands internationally, there's a growing need to understand and comply with various export market requirements, including product certifications and regulatory standards.
4. **Single-Source Dependency:** The Company's reliance on a single source for its primary ingredient, jackfruit, and poses risks in terms of supply continuity and pricing stability.
5. **Inventory Management:** Balancing inventory levels to meet demand while minimizing holding costs is challenging, especially given the product's long shelf life

and the need to cater to both domestic and international markets.

### Objectives

- To reduce logistics costs from the current 15% of total costs to a target of 12% or lower within the next fiscal year.
- To optimize the balance between distributor-led and direct-to-consumer sales channels, aiming to improve cash flow cycles by 20% within six months.
- To develop a comprehensive understanding of export market requirements for at-least four key target markets and create a compliance roadmap within three months.
- To identify and evaluate at least two additional sources of jackfruit supply to reduce single-source dependency within the next six months.
- To implement an improved inventory management system that reduces overall inventory holding costs while maintaining or improving current service levels within one year.

### Literature Review

**Historical Performance Overview (April 2023 - March 2024):** Sales Fluctuations: The sales data showcases significant fluctuations, particularly noticeable in the months of May 2023 and January 2024. For instance, in May 2023, American Herbs Sausages 200g sales peaked at 1,562 units, reflecting a substantial increase from the previous month. However, the data indicates a subsequent decline in June 2023 to 216 units, suggesting a seasonal or promotional impact that caused the spike in May.

**Consistent Growth Patterns:** Certain items, like (Raw Jack 2Kg) the one starting with 201 units in April 2023, demonstrate steady growth. This particular item increased to 243 units in January 2024 and further to 456 units by February 2024. This growth suggests effective marketing strategies or an increase in consumer demand during this period.

**Volatility and Zero Sales:** Several items exhibit volatility with intermittent months of zero sales. For example, Continental Burger Patties 400g item shows sales in May 2023 (566 units) but drops to zero in subsequent months before recovering in October 2023. These gaps may indicate supply chain issues, seasonal demand, or stock outs that need to be addressed to maintain consistent availability.

### Summary

Peaking in May 2023 with 1,562 units and later stabilizing around 250 units by March 2024. American Herbs Sausages Industrial Pack remained relatively low with occasional increases, reaching a maximum of 145 units in February 2024. BBQ Jack 300g experienced sharp growth, particularly in January 2024 with 617 units, although it exhibited volatility throughout the period. Butter Jack 300g showed consistent demand with a noticeable peak in January 2024 at 661 units. Continental Burger Patties 400g, displayed irregular sales, with periods of zero sales followed by spikes, most notably in May 2023 with 566 units. Hot & Spicy Sausages 200g maintained steady growth, peaking in April 2023 at 1477 units but showing a decline towards March 2024. Hot & Spicy Sausages Industrial Pack, had modest sales, with the highest being 135 units in January

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### Forecasted Performance (March 2024 and April 2024)

**Optimistic Growth Projections:** The forecasted data for March 2024 and April 2024 highlights an overall positive growth trajectory. Notably, the forecast for April 2024 predicts a return to higher sales volumes, with many items expected to perform better than in previous months. For instance, the forecast for the item initially at 123 units in April 2023 expects a rise to 255 units by April 2024.

**-Strategic Focus:** The forecasts suggest a strategic emphasis on maintaining and possibly expanding market share. The expected consistency in March 2024 (with a prediction of 173 units for one item and 319 for another) suggests confidence in ongoing marketing efforts and supply chain efficiency.

### Supply Chain Implications

**Demand Planning and Inventory Management:** The fluctuating historical data combined with optimistic forecasts underlines the need for robust demand planning and inventory management. This is crucial to avoid stock outs or overproduction, particularly in volatile categories where sales can drop to zero in some months.

**Risk Management:** The volatility seen in historical data calls for enhanced risk management practices within the supply chain. Ensuring alternative suppliers, flexible logistics, and responsive replenishment strategies will be essential in mitigating the risks associated with sudden drops in sales.

**Scalability and Flexibility:** The positive forecast requires the supply chain to be scalable and flexible. As demand increases, especially towards March 2024, the supply chain must be capable of handling higher volumes without compromising efficiency.

### Summary and Research Gap

**Continuous Monitoring:** Implement a continuous monitoring system to track sales trends and supply chain performance closely. This will allow for prompt adjustments in procurement, production, and logistics. Also, make a point to maintain the data which can be utilized for the same.

**Enhancing Demand Forecasting Models:** Invest in refining demand forecasting models using more advanced techniques such as AI or machine learning to better predict

demand patterns, especially for items with high volatility. The demand volatility becomes a huge huddle in developing the forecast model.

**Supply Chain Resilience:** Strengthen the supply chain's resilience by diversifying suppliers, improving inventory buffers, and ensuring logistical agility to handle unforeseen disruptions.

**Marketing and Promotion Alignment:** Align marketing and promotional strategies with supply chain capabilities to ensure that demand surges are adequately supported without leading to stock outs or excessive markdowns.

**Research Methodology**

To address Wakao Foods supply chain challenges comprehensively, I employed a multi-faceted methodology that combined qualitative and quantitative approaches. This methodology was designed to provide a holistic view of the supply chain, identify key issues, and develop data-driven recommendations.

**Supply Chain Mapping and Analysis**

I began by conducting a detailed mapping of Wakao Foods' entire supply chain, from sourcing to end consumers. This process involved:

**Value Stream Mapping:** I created a visual representation of the flow of materials and information across the supply chain. This helped identify value-adding activities, bottlenecks, and areas of waste.

**Interviews with Company's CEO and COO**

To gain a comprehensive understanding of the supply chain from various perspectives, I conducted in- depth interviews with key stakeholders across the organization. These included:

**CEO**

**Overall Supply Chain Strategy:** Understand the company's long-term vision for supply chain management, including goals for efficiency, sustainability, and customer satisfaction.

**Key Performance Indicators (KPIs):** Review the metrics used to measure supply chain performance and identify areas for improvement.

- **Risk Management:** Discuss strategies for mitigating supply chain risks, such as disruptions, cost fluctuations, and quality issues.

**COO**

**Operational Challenges:** Gain insights into specific challenges faced by different departments within the supply chain, such as procurement, production, distribution, and logistics.

- **Improvement Initiatives:** Discuss ongoing projects aimed at optimizing supply chain processes, reducing costs, and improving efficiency.
- **Technology Adoption:** Explore opportunities for leveraging technology to enhance supply chain visibility, collaboration, and decision-making.

**Key questions asked during these interviews included**

- What are the main challenges you face in your role within the supply chain?
- How do you measure performance in your area?
- What improvements do you think could have the biggest impact on efficiency?
- How do you see the company's growth affecting your area of the supply chain?

**Data Collection**

I collected a wide range of data to support my analysis:

**Inventory Data:** Stock levels, turnover rates, stock out frequencies

**Order Fulfilment Data:** Order processing times, delivery times, order accuracy rates

**Cost Data:** Detailed breakdown of logistics costs, inventory holding costs, procurement costs

**Production Data:** Production capacity.

**Sales Data:** Sales volumes, demand forecasts, seasonality patterns.

Data was collected from Wakao Foods ERP system; excel spreadsheets maintained by different departments, and manual records where necessary.

**Project 1: Sources of jackfruits in India**

Selected State wise Area and Production of Jackfruit in India (2023-2024-2<sup>nd</sup> Advance Estimates)

**Table 1:** Selected State-wise Area and Production of Jackfruit in India (2023-2024 - 2nd Advance Estimates)

States / UT	Area (in '000 Hectare)	Production (in '000 MT)
India	185.6	3249.48
Kerala	85.31	1408.25
Odisha	13.79	317.15
West Bengal	13.55	227.49
Assam	10.58	206.51
Chhattisgarh	10.52	209.51
Jharkhand	7.35	170.36
Madhya Pradesh	3.8	100.78
Andhra Pradesh	7.3	152.33
Tamil Nadu	3.6	85.23
Tripura	3.5	77.67
Karnataka	1.37	51.67
Uttar Pradesh	1.1	20.36
Meghalaya	1.77	18.33
Maharashtra	0.84	5.08
Nagaland	0.24	5.08
Himachal Pradesh	0.18	0.69
Arunachal Pradesh	0.06	0.45
Manipur	0.05	0.38
Telangana	0.05	0.34
Jammu & Kashmir	0.06	0.32
Pondicherry	0	0.02

**Source:** Ministry of Agriculture & Farmers Welfare, Govt. of India. (ON3479)



The above table presents the selected state-wise area and production of jackfruit in India for the 2023- 2024 period (2<sup>nd</sup> Advance Estimates). This data is crucial for Wakao Foods as their primary raw material is jackfruit as a raw material for supply chain management. Here’s a detailed breakdown:

India's total area under jackfruit cultivation is 185.6 thousand hectares, resulting in a production of 3,249.48 thousand metric tons (MT). Among the states, Kerala stands out as the largest producer, with 85.31 thousand hectares dedicated to jackfruit cultivation, yielding 1,408.25 thousand MT. This significant contribution makes Kerala a crucial state for sourcing jackfruit. Odisha follows as the second-largest producer, with 13.79 thousand hectares producing 317.15 thousand MT, offering substantial quantities for supply chains. West Bengal, with 13.55 thousand hectares, contributes 227.49 thousand MT, playing a vital role in the overall production. Assam, which has 22.53 thousand hectares dedicated to jackfruit, produces 219.23 thousand MT, slightly less than West Bengal despite having a larger cultivation area. Chhattisgarh, with an area of 10.58 thousand hectares, produces 205.51 thousand MT, maintaining consistent production levels and reinforcing its importance in the supply chain.

**Other Notable Producers**

- **Jharkhand:** Contributes 199.28 thousand MT from 15.53 thousand hectares.
- **Madhya Pradesh:** Produces 170.08 thousand MT from 7.8 thousand hectares.
- **Andhra Pradesh:** Offers 159.12 thousand MT from 2.65 thousand hectares.

**Minor Producers**

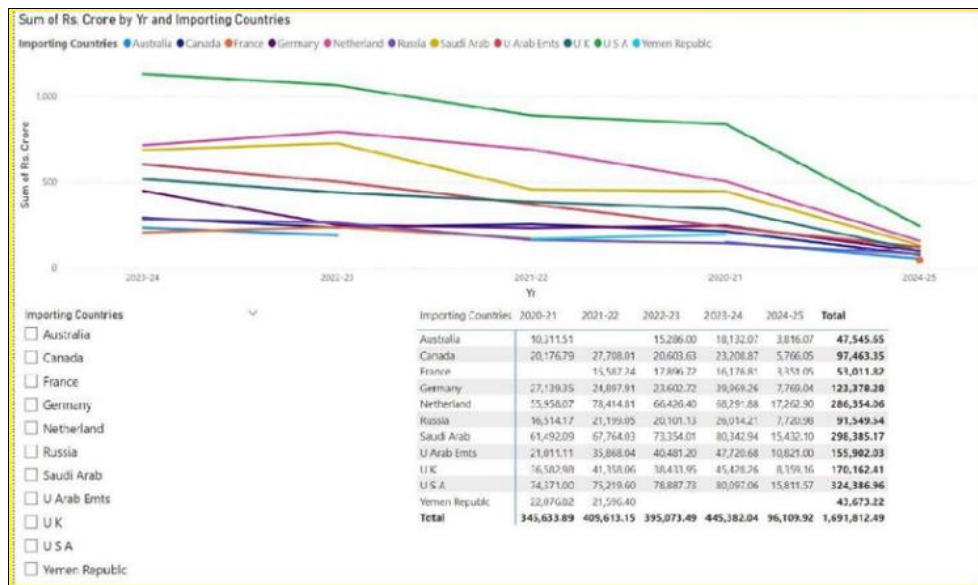
- States like Tripura, Karnataka, Uttar Pradesh, and Meghalaya have lower production volumes but are still relevant for regional sourcing strategies.
- Maharashtra, Nagaland, Himachal Pradesh, and others contribute minimal quantities, which might be more relevant for niche or localized supply chains.

**Implications for Supply Chain**

1. **Concentration in Southern India:** Kerala’s dominance in production suggests that firms relying on jackfruit should consider establishing strong procurement and logistics networks in Southern India, particularly Kerala.
2. **Diverse Sourcing:** While Kerala is dominant, states like Odisha, West Bengal, and Assam also provide significant quantities. Diversifying sources across these states could mitigate risks associated with regional supply disruptions.
3. **Logistics and Storage:** Given the perishable nature of jackfruit, firms need to ensure robust cold chain logistics and storage facilities, especially in key producing states to maintain freshness and quality.
4. **Scalability:** For expanding operations, the focus should be on Kerala and Odisha due to their large production volumes. These states offer scalability for large-scale production needs.
5. **Risk Management:** The data highlights the importance of geographic diversification to avoid over-reliance on a single state, which can be vulnerable to climatic conditions or regional issues.

**Export market selection**

Source: Directorate General of Commercial Intelligence and Statistics



The above data offers valuable insights into the trends and key importing countries for the past five fiscal years, which have been critical in identifying strategic markets for exporting my product. Based on this analysis, I have Identified the United Kingdom (UK), Germany, Saudi Arabia, the Netherlands, and Norway as the primary countries to target for Wakao foods export operations.

**United Kingdom (UK)**

The UK consistently appears among the top importing countries, with a steady increase in both quantity and value over the years. In the 2024-25 period (April-June), the UK imported 8,359.16 metric tons (MT) worth ₹101.22 crore. The UK’s strong demand for our products makes it a strategic market for our exports, ensuring reliable demand and revenue generation.

**Germany**

Germany is another key market with a stable import volume, reflecting a high level of consumer demand and market potential. In the first quarter of 2024-25, Germany imported 7,769.04 MT valued at ₹97.48 crore. The consistent demand from Germany, combined with its economic stability, positions it as an essential market for my supply chain expansion.

**Saudi Arabia**

Saudi Arabia has been one of the top importers of my product, with substantial quantities imported each year. In 2024-25, Saudi Arabia imported 15,432.1 MT valued at ₹133.56 crore, reflecting its strong market potential. The kingdom’s large consumer base and purchasing power make it a lucrative market for my export activities, especially given the continuous rise in demand over recent years.

**Netherlands**

The Netherlands stands out as a significant player in my export strategy. With 17,262.9 MT imported in 2024-25, valued at ₹157.77 crore, the Netherlands represents one of the highest value markets. This country’s strategic location in Europe also offers access to other EU markets, enhancing my distribution capabilities and market reach.

**Norway**

Although Norway is not explicitly mentioned in the

provided data, it can be inferred that its inclusion in my export strategy is due to the overall market dynamics in the region, particularly within Europe. Norway's close economic ties with the EU and its high per capita income make it an attractive market, despite its smaller size compared to the others mentioned.

The selection of the UK, Germany, Saudi Arabia, the Netherlands, and Norway as my target export markets is based on their strong and consistent demand for my products over the years. By focusing on these countries, I can leverage their economic strengths and consumer demand to optimize my supply chain operations and maximize profitability. The strategic approach will involve tailoring my logistics, marketing, and distribution channels to meet the specific needs and regulations of each of these markets, ensuring successful and sustainable export growth.

**Forecasting**

The objective is to devise a forecasting model which will help Wakao Foods to facilitate and predict the demand forecast for their product lines that include:

- American Herbs Sausages 200g
- American Herbs Sausages Industrial Pack
- BBQ Jack 300g
- Butter Jack 300g
- Hot & Spicy Sausages 200g
- Hot & Spicy Sausages Industrial Pack
- Jack Burger Patty Industrial (150g x 20pcs)
- Jack Supreme Burger Patty Industrial (80g x 20pcs)
- Raw Jack 2Kg (Hard)
- Raw Jack 2Kg (Soft)
- Raw Jack 300g
- Teriyaki Jack 300g
- Supreme Burger Patty 320g
- Raw Jack Minced 2KG
- Wakao Jack Pulp
- Frozen Jackfruit Bulb

Simple moving average for last 3months of the available data has been used to form a base for the development of forecasting model, which is intern developed on the model of Exponential Smoothing.



**Assumptions for the model**

An alpha value of 0.6 was selected due to the absence of a clear trend in the data, coupled with significant variations. Additionally, given the narrow-forecast horizon, a higher alpha value was deemed appropriate to emphasize the importance of more recent data points.

The model cannot be used for the products mentioned below as the historical data is insufficient for forecasting.

- Teriyaki Jack 300g
- Frozen Jackfruit Bulb
- Raw Jack Mincod 2KG
- Wakao Jack Pulp

**Forecast Model**

Analysis of the Forecast Model for Wakao Foods

										Actual Data	Simple moving avg 3 months	Exponential Smoothing
May 2023	June 2023	July 2023	Aug 2023	Sept 2023	Oct 2023	Nov 2023	Dec 2023	Jan 2024	Feb 2024	March 2024	March 2024 (forecast)	April 2024 (Forecast)
1562	216	157	157	222	198	253	142	252	125	309	173	255
19	4	45	61	27	71	40	89	46	145	42	93	63
1816	74	58	43	52	0	22	40	617	183	9	280	117
867	102	38	97	180	89	120	295	661	0	245	319	274
566	218	0	0	0	258	314	2	33	325	0	120	48
1477	138	69	162	249	125	201	87	118	61	74	89	80
31	10	14	69	99	58	58	98	135	15	52	83	64
16	2	9	11	7	9	8	18	13	2	10	11	10
29	0	0	23	2	11	1	1	4	174	10	60	30
30	63	92	68	268	213	162	245	154	252	276	217	252
1170	258	199	512	207	524	233	432	243	456	383	377	381
1835	84	58	283	88	13	67	146	172	22	84	113	96
903	201	111	174	241	91	111	175	185	7	98	122	108
1297	1	0	2	0	5	0	0	8	0	104	3	63
0	0	0	95	0	0	314	0	0	3	0	1	0
0	0	0	0	0	404	2	0	10	8	7	6	7
0	0	0	0	0	12	6	8	6	0	5	5	5

The provided forecast model for Wakao Foods outlines monthly sales data and projections, focusing on historical performance and future expectations. This data spans from April 2023 to March 2024, with a specific forecast for March 2024.

I utilized the Simple Moving Average method to determine the forecasted values for March 2024. These values will serve as the baseline for developing a more advanced forecasting model using the Exponential Smoothing methodology.

**Below is a detailed analysis**

Historical Performance Overview (April 2023 - March 2024):

**Sales Fluctuations:** The sales data showcases significant fluctuations, particularly noticeable in the months of May 2023 and January 2024. For instance, in May 2023, American Herbs Sausages 200g sales peaked at 1,562 units, reflecting a substantial increase from the previous month. However, the data indicates a subsequent decline in June 2023 to 216 units, suggesting a seasonal or promotional impact that caused the spike in May.

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Peaking in May 2023 with 1,562 units and later stabilizing around 250 units by March 2024. American Herbs Sausages Industrial Pack remained relatively low with occasional increases, reaching a maximum of 145 units in February 2024. BBQ Jack 300g experienced sharp growth, particularly in January 2024 with 617 units, although it exhibited volatility throughout the period. Butter Jack 300g showed consistent demand with a noticeable peak in January 2024 at 661 units. Continental Burger Patties 400g, displayed irregular sales, with periods of zero sales followed by spikes, most notably in May 2023 with 566 units. Hot & Spicy Sausages 200g maintained steady growth, peaking in April 2023 at 1477 units but showing a decline towards March 2024. Hot & Spicy Sausages Industrial Pack, had modest sales, with the highest being 135 units in January 2024. Jack Burger Patty Industrial (150g x 20pcs) and Jack Supreme Burger Patty Industrial (100g x 20pcs) had low and inconsistent sales, rarely exceeding 20 units per month. Raw Jack 2 Kg (Hard), exhibited steady growth, reaching a peak of 268 units in September 2023. Raw Jack 2Kg, showed a consistent upward trend, particularly strong in May 2023 with 1170 units. Raw Jack 300 g had irregular performance, with occasional peaks and a steady 84 units by March 2024. Supreme Burger Patty 400g, demonstrated consistency with minor fluctuations, reaching a peak of 903 units in May 2023. Teriyaki Jack 300g and Frozen Jackfruit Bulb had minimal sales, with rare spikes in March 2024. Raw Jack Minced 2KG showed little to no activity throughout the period, except for a brief surge in October 2023 with 404 units. Lastly, Wakao Jack Pulp remained largely inactive, with minor sales peaks in select months.

### Forecasted Performance (March 2024 and April 2024)

- Optimistic Growth Projections:** The forecasted data for March 2024 and April 2024 highlights an overall positive growth trajectory. Notably, the forecast for April 2024 predicts a return to higher sales volumes, with many items expected to perform better than in previous months. For instance, the forecast for the item initially at 123 units in April 2023 expects a rise to 255 units by April 2024.
- Strategic Focus:** The forecasts suggest a strategic emphasis on maintaining and possibly expanding market share. The expected consistency in March 2024 (with a prediction of 173 units for one item and 319 for another) suggests confidence in ongoing marketing efforts and supply chain efficiency.

### Supply Chain Implications

- Demand Planning and Inventory Management:** The fluctuating historical data combined with optimistic forecasts underlines the need for robust demand planning and inventory management. This is crucial to

avoid stock outs or overproduction, particularly in volatile categories where sales can drop to zero in some months.

- Risk Management:** The volatility seen in historical data calls for enhanced risk management practices within the supply chain. Ensuring alternative suppliers, flexible logistics, and responsive replenishment strategies will be essential in mitigating the risks associated with sudden drops in sales.
- Scalability and Flexibility:** The positive forecast requires the supply chain to be scalable and flexible. As demand increases, especially towards March 2024, the supply chain must be capable of handling higher volumes without compromising efficiency.

### Strategic-Recommendations: Continuous Monitoring

Implement a continuous monitoring system to track sales trends and supply chain performance closely. This will allow for prompt adjustments in procurement, production, and logistics. Also, make a point to maintain the data which can be utilized for the same.

**Enhancing Demand Forecasting Models:** Invest in refining demand forecasting models using more advanced techniques such as AI or machine learning to better predict demand patterns, especially for items with high volatility. The demand volatility becomes a huge huddle in developing the forecast model.

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**Marketing and Promotion Alignment:** Align marketing and promotional strategies with supply chain capabilities to ensure that demand surges are adequately supported without leading to stock outs or excessive markdowns.

### Conclusion

Wakao Foods, a vegan food brand specializing in jackfruit-based products, has shown significant growth since its founding in 2020. The company has expanded its presence across major Indian cities and entered international markets including the US, Dubai, and Singapore. However, Wakao Foods faces several supply chains challenges that need to be addressed to support its growth trajectory and maintain competitiveness in the expanding plant-based food market.

### Key challenges identified include

1. High logistics cost due to inventory holding
2. Dependence on distributors affecting cash flows
3. Limited understanding of export market requirements
4. Reliance on single source for jackfruit

### To address these challenges, the following recommendations are proposed

1. Implement sales forecasting to optimize inventory management and reduce costs.
2. Expand export markets with a focus on meeting international regulatory requirements, targeting countries like the UK, Germany, Saudi Arabia, the Netherlands, and Norway.
3. Diversify jackfruit sourcing to mitigate supply risks,

- considering top producing states like Kerala, Odisha, West Bengal, and Assam.
3. 4. Optimize the balance between distributor-led and direct-to-consumer sales channels to improve cash flow cycles.
  4. 5. Develop a comprehensive understanding of export market requirements and create a compliance roadmap.
  5. 6. Implement an improved inventory management system to reduce holding costs while maintaining service levels.

The proposed changes aim to reduce logistics costs, improve cash flow, enhance global competitiveness, increase supply chain resilience, and improve operational efficiency. These improvements align with Wakao Foods commitment to sustainability and ethical sourcing, positioning the company for continued growth in the expanding plant-based food market.

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