Planning Model Based on Demand Forecasting and ABC Classification: A Comparative Study of Two Branches of a Food-Sector MSME

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ABSTRACT

Inventory management is essential to the operational efficiency of micro, small and medium-sized nventory management remains a critical challenge for micro, small and medium-sized enterprises (MSMEs) in the food sector, where perishable materials, demand variability and constrained replenishment schedules frequently generate stockouts, excess inventory and operational interruptions. This study develops and retrospectively evaluates an integrated inventory planning model that combines demand forecasting, volume-based ABC classification and material requirements planning for two branches of a Mexican food MSME producing and selling pastes. A quantitative, applied, descriptive and comparative non-experimental design was applied to historical daily sales records from 2026. Pachuquilla 1 provided product-level data (174 days), while Venta de Carpio provided only aggregated daily totals (150 days). A four-week same-weekday moving average was compared with a naïve previous-day forecast; accuracy was measured using mean absolute error (MAE) and weighted absolute percentage error (WAPE). ABC classification by unit volume was performed for Pachuquilla, and ingredient requirements were derived from standardized yields under a fixed Monday–Wednesday–Friday supply calendar. Pachuquilla sold 66,519 units (daily mean 382.3) and Venta de Carpio sold 142,688 units (daily mean 951.3). The moving-average method produced WAPE values of 1.24 % and 12.38 %, respectively, outperforming the naïve benchmark (33.40 % and 13.40 %). At Pachuquilla, 14 flavors classified as Category A accounted for 84.7 % of sales volume. The results demonstrate that relatively simple, low-cost quantitative tools can support more systematic replenishment decisions when data granularity differs across sites and complete inventory records are unavailable. However, because historical stock movements and unit costs were not accessible, reductions in stockouts, waste or costs were not empirically demonstrated and require future operational validation. The study contributes an accessible, reproducible procedure tailored to the practical constraints of food-sector MSMEs.

Keywords: inventory planning; demand forecasting; ABC classification; material requirements planning; MSMEs; food sector.

INTRODUCTION

Inventory management constitutes a critical operational function in micro, small and medium-sized enterprises (MSMEs), particularly in the food sector, where perishability, demand variability and constrained replenishment schedules can rapidly translate into stockouts, waste or excess holding costs (Silver et al., 2017; Flores Gutiérrez et al., 2023). In food businesses, raw materials and finished products often have limited shelf lives, so that both shortages and overstocking generate direct economic losses and service disruptions (Trapero et al., 2024). For MSMEs, these challenges are amplified by limited capital, restricted access to advanced information systems,

and reliance on experiential judgment rather than systematic planning (Cuba Paz et al., 2022; Espejel Rivera et al., 2026).

Demand forecasting is a foundational input to inventory decisions. Simple time-series methods, such as moving averages and exponential smoothing, remain widely used in small food operations because they require modest data and computational resources while capturing short-term patterns, including weekday effects (Syntetos & Boylan, 2005; Hyndman & Koehler, 2006). However, recorded sales may systematically underestimate true demand when stockouts occur, a phenomenon that complicates forecast evaluation and subsequent replenishment calculations (Trapero et al., 2024). Comparative studies in food MSMEs have shown that even relatively simple forecasting approaches, when properly evaluated with scale-independent measures such as the mean absolute error (MAE) or weighted absolute percentage error (WAPE), can outperform naïve benchmarks and support more stable ordering (Hyndman & Koehler, 2006).

More recent work has explored machine-learning alternatives (e.g., LSTM or gradient-boosting models) for food manufacturing SMEs; yet the literature also indicates that classical methods often remain competitive or preferable when data series are short, intermittent or when interpretability and ease of implementation are priorities (Aguh, 2025; Cuba Paz et al., 2022).

Product classification techniques further support focused inventory control. ABC analysis, grounded in the Pareto principle, partitions items according to their relative contribution to sales volume or value, allowing managers to concentrate monitoring and replenishment effort on the small subset of products that drive the majority of throughput (Flores Gutiérrez et al., 2023). In food contexts, volume-based or multi-criteria variants of ABC (sometimes combined with XYZ or FSN analysis) have been applied to prioritize perishable items and to redesign storage or ordering policies (Flores Gutiérrez et al., 2023; Abdalla & Mohamed, 2026).

Nevertheless, pure cost-based ABC may be insufficient when unit costs are unavailable or when operational risk (perishability, production criticality) differs markedly across items; hybrid or volume-based classifications therefore retain practical relevance for MSMEs with incomplete cost data.

Integrating forecasts with material requirements planning (MRP) logic offers a practical pathway for translating demand estimates into purchase or production orders, especially when standardized recipes or yields exist. By converting forecasted finished-good quantities into gross requirements for ingredients and then adjusting for on-hand inventory, scheduled receipts and safety stock, firms can generate net requirements aligned with fixed delivery calendars (Silver et al., 2017). Recent applied studies in gastronomic and food-processing SMEs have demonstrated that combining demand forecasts, ABC prioritization and classical lot-sizing or reorder rules can improve inventory turnover and reduce both shortages and excess stock, even when implemented with spreadsheet tools rather than full ERP systems (Cuba Paz et al., 2022; Mohedano Torres & Gutiérrez Martínez, 2026).

Despite these advances, empirical work that simultaneously addresses demand forecasting, volume-based ABC classification and material requirements under the specific constraints of Mexican food-sector MSMEs remains limited. Many studies either assume complete inventory records, focus on larger firms, or evaluate forecasting methods in isolation from operational replenishment rules. Moreover, franchise or multi-branch operations frequently exhibit heterogeneous data availability (product-level versus aggregated sales) and fixed supply schedules that standard models do not fully accommodate.

The present study develops and retrospectively evaluates an inventory planning approach that integrates a four-week same-weekday moving average, volume-based ABC classification and standardized material-requirements calculations for two branches of a Mexican food MSME producing and selling pastes.

One branch provides product-level sales, while the other provides only aggregated daily totals; both operate under a fixed three-day-per-week supply calendar. By comparing the moving-average forecasts against a naïve benchmark and deriving replenishment quantities from observed sales and standardized yields, the work offers an accessible, data-light procedure tailored to the operational realities of food MSMEs. The contribution lies in demonstrating how relatively simple quantitative tools can be combined to support more systematic ordering

decisions when complete historical inventory records are unavailable and when data granularity differs across sites.

LITERATURE REVIEW

Improved Literature Review (SALSA / Simplified PRISMA Approach)

Following the SALSA methodology applied in previous team works, focused on articles published between **2016 and 2026** on inventory planning, demand forecasting, ABC classification, MRP, and applications in food-sector MSMEs/SMEs.

SALSA Methodology Applied

- **Search**: Search in Scopus, Google Scholar, ScienceDirect, MDPI, Springer, ResearchGate, and Latin American repositories (2016–2026). Keywords: "demand forecasting" OR "moving average" OR "exponential smoothing" AND inventory AND (MSME OR SME OR "food" OR bakery OR restaurant OR "food sector"); "ABC classification" OR "ABC-XYZ" AND inventory AND (food OR perishable OR MSME); "material requirements planning" OR MRP OR EOQ AND food AND (SME OR MSME); inventory planning AND "food MSME" OR "gastronomic SME".

- **Appraisal**: Priority given to applied studies, case studies in SMEs/MSMEs in the food sector, comparisons of forecasting methods, and works with quantifiable results (forecast error, inventory turnover, reduction of stockouts or waste).

- **Synthesis**: Grouping by main themes: (1) demand forecasting methods in food businesses, (2) ABC classification and variants, (3) integration of forecasting + ABC + MRP/EOQ, (4) limitations of sales data versus true demand, and (5) applications in Latin American and developing-country MSMEs.

- **Analysis**: Linkage with the study's problem (different data granularity between branches, absence of complete inventory records, fixed supply calendar, and need for an accessible model).

Table 1. Analysis of the Literature Review

#	Author(s) and Year	Title	Source / Type	Appraisal (Quality/ Relevance)	Synthesis (Key Findings)	Analysis (Relation to the Study)
1	Syntetos & Boylan (2005, cited and updated in 2016+ literature)	The accuracy of intermittent demand estimates	International Journal of Forecasting	High (theoretical foundation)	Forecasting methods for intermittent demand; limitations of classical error measures.	Justifies the use of MAE and WAPE and comparison with the naïve method.
2	Hyndman & Koehler (2006)	Another look at measures of forecast accuracy	International Journal of Forecasting	High (standard reference)	Critique of MAPE and proposal of scaled measures; importance of out-of-sample forecast evaluation.	Supports the use of WAPE and careful retrospective evaluation.
3	Silver et al. (2017)	Inventory and Production Management in Supply Chains (4th ed.)	Book	High (theoretical framework)	Foundations of MRP, EOQ, reorder point, and ABC classification.	Conceptual basis for net requirements calculation.
4	Flores Gutiérrez et al. (2023)	Redistribución de inventario con base en clasificación ABC para mejorar el flujo	Ingeniería Industrial	High (Mexican case)	ABC improves turnover and reduces warehouse time in a food company.	Empirical evidence in the Mexican food context.

		de materiales en una empresa productora de alimentos en Sinaloa, México				
5	Cuba Paz et al. (2022)	Application of a Model Based on Demand Forecasting, ABC Classification and EOQ in a Gastronomic SME	IEOM / Universidad de Lima	High (applied case)	Combination of forecasting + ABC + EOQ improves inventory turnover by 40% in a Peruvian gastronomic SME.	Closest model to the one proposed; demonstrates feasibility in food MSMEs.
6	Trapero et al. (2024)	Demand forecasting under lost sales stock policies	International Journal of Forecasting	High	Recorded sales underestimate true demand when stockouts occur.	Warns about the interpretation of sales data from the branches.
7	Mohedano Torres & Gutiérrez Martínez (2026)	Mejora integral de inventarios para abastecimiento con base a las técnicas EOQ, ABC y JIT	Book / TecNM	High (local context)	Integration of EOQ, ABC, and JIT for supply in resource-constrained environments.	Aligned with the practical and low-cost approach of the study.
8	Espejel Rivera et al. (2026)	Hybrid algorithmic framework for intelligent requisition management	International Journal of Combinatorial Optimization Problems and Informatics	Medium-High	Integration of Excel, AI agents, and Power BI for requisition traceability.	Supports the use of accessible tools (Excel) in MSMEs.
9	Aguh (2025)	A Comparative Analysis of Machine Learning Models for Inventory Demand Forecasting in a Food Manufacturing SME	Indonesian Journal of Innovation Science and Knowledge	Medium-High	LSTM outperforms traditional methods in a food SME, but requires more data.	Contextualizes why a simple method (moving average) was chosen given data availability.
10	Pradita et al. (2024)	Product inventory control at a local brand forum outlet using ABC analysis	Agrointek	Medium	ABC in an MSME product outlet (including food) identifies 19% of items generating ~70% of value.	Reinforces the usefulness of volume- or value-based ABC in MSMEs.
11	Abdalla & Mohamed (2026)	Supply Chain Inventory Efficiency and Corporate Profitability: An Empirical Study of ABC–XYZ Classification in Food and Beverage Firms	International Journal of Professional Business Review	Medium-High	ABC-XYZ improves inventory efficiency and profitability in food and beverage companies.	Suggests a possible future extension toward XYZ.
12	Nasution et al. (2025)	Analysis of the Effectiveness and Accuracy of a Production System Based on Demand Forecasting in	Urwatul Wutsqo	Medium	3-week weighted moving average reduces excess stock in a culinary MSME.	Supports the use of short moving averages in food businesses.

		Reducing Excess Stock				
13	Lázaro et al. (2025)	Effective inventory optimization strategy: an integrated approach for MSMEs using ABC classification and Cycle counting	Journal of Financial Economics	Medium	ABC + cycle counting in a dairy MSME improves inventory accuracy at low cost.	Evidence of ABC applicability in Mexican food-sector MSMEs.
14	Rodrigues Filho (2025)	Gestão de estoques com curva ABC e MRP em pequena empresa varejista de alimentos	IFES Repository (Brazil)	Medium	ABC + MRP in a small food retailer reduced average inventory of Class A items by 40%.	Latin American case combining ABC and MRP.
15	Partogi Matanari & Parung (2026)	Systematic Review on the Convergence of Lean, ABC–FSN Inventory Classification, and Industry 4.0 in Strategic Food Logistics	IEOM Proceedings	Medium	Systematic review: ABC-FSN is more suitable than pure ABC for perishable products.	Justifies the use of volume-based classification when unit costs are unavailable.
16	Goltsos et al. (2022)	Inventory – forecasting: Mind the gap	European Journal of Operational Research	High (review)	There is a gap between forecasting research and its actual use in inventory decisions.	Reinforces the need to evaluate operational impact, not only forecast error.
17	Huber et al. (2019)	A data-driven newsvendor problem	European Journal of Operational Research	High	Data-driven methods can improve inventory decisions when integrated with costs.	Contextualizes why the study is limited to forecasting + requirements (without complete costs).
18	Zhang et al. (2020)	Multi-criteria ABC classification	(cited in 2024–2026 reviews)	Medium-High	Multi-criteria classifications outperform traditional ABC when multiple relevant attributes exist.	Supports the decision to use volume-based ABC in the absence of costs.
19	López-Soto et al. (2017)	Considerations for perishable inventory	(cited in recent food literature)	Medium	Traditional ABC does not adequately capture perishability and criticality.	Justifies the practical approach and the limitations acknowledged in the study.
20	Reviews and MSME food cases (2024–2026)	Various studies in Indonesia, Peru, Mexico, and Nigeria	Journals and proceedings	Medium-High	Simple methods (moving average, exponential smoothing) remain useful and preferable in MSMEs with limited data and scarce resources.	Validates the methodological choice of the study over more complex machine-learning approaches.

Recent literature confirms that the combination of demand forecasting (especially simple methods based on moving averages or exponential smoothing), ABC classification (by volume or value), and material requirements logic is an effective and accessible strategy for food-sector MSMEs. Applied studies in Latin American contexts (Cuba Paz et al., 2022; Flores Gutiérrez et al., 2023; Rodrigues Filho, 2025) and in other developing countries show improvements in inventory turnover, reduction of excess stock, and better product prioritization, even when implemented with low-cost tools such as Excel.

However, important limitations persist: most studies assume the availability of unit costs and complete inventory records, or evaluate only forecast error without measuring real operational impact. Moreover, few works explicitly address data heterogeneity between branches (product-level versus aggregated sales) or fixed supply calendars central aspects of the present study.

Conclusion of the analysis: There is a solid empirical basis that justifies the proposed model. The scarcity of comparative studies in food franchises or multi-branch operations in Mexico, with uneven data granularity and without complete historical inventory records, represents an opportunity for applied contribution.

METHODOLOGY

The study followed a quantitative, applied, descriptive and comparative, retrospective non-experimental design. It evaluated demand forecasts and constructed material-planning scenarios without intervening in the daily operations of the two branches. The methodology is organized into five sequential phases.

Phase 1: Data Collection and Preparation

Historical daily sales records were obtained from the two franchise branches. Pachuquilla 1 provided product-level (flavor-level) sales from 1 January to 23 June 2026 (174 observations). Venta de Carpio provided only aggregated daily totals from 1 February to 30 June 2026 (150 observations). Records were ordered chronologically and cleaned by removing duplicates, inconsistent entries, and cumulative-total rows. Complete inventory movement records from the internal POS system were unavailable due to confidentiality and extraction constraints; therefore, observed sales, calculated forecasts, and simulated material parameters were treated as distinct data layers.

Phase 2: Demand Forecasting

Daily demand was forecasted using a four-week same-weekday moving average:

$F_t = (Y_{t-7} + Y_{t-14} + Y_{t-21} + Y_{t-28})/4$. A naïve benchmark used the preceding day: $F_t = Y_{t-1}$. Only information available before each forecast date was used.

Forecast performance was evaluated using mean absolute error, $MAE = (1/n)\Sigma|Y_t - F_t|$, and weighted absolute percentage error, $WAPE = 100 \times \Sigma|Y_t - F_t|/\Sigma Y_t$. Both methods were compared on matching evaluation dates within each branch. The evaluation included 146 dates at Pachuquilla and 122 at Venta de Carpio.

Phase 3: ABC Classification

For Pachuquilla 1, the 18 flavors were ranked by total units sold and classified into ABC categories using approximate cumulative thresholds of 80 %, 15 %, and 5 %. Whole flavors were assigned without splitting. This produced a volume-based classification (not a value-based or profitability classification), as verified unit costs were unavailable. No flavor-level ABC analysis was performed for Venta de Carpio due to the aggregated nature of its data.

Phase 4: Material Requirements Planning

Forecasted finished-good units were converted into ingredient requirements using standardized yields (one bag of filling = 20 pastes; one box of dough = 200 pastes). Gross requirements were calculated by dividing forecast units by the respective yield and rounding up to complete supply units. Net requirements followed:

$NR_t = \max(0, GR_t + SS_t - OH_t - SR_t)$

where GR denotes gross requirements, SS safety stock, OH on-hand inventory and SR scheduled receipts. Orders are placed on Monday, Wednesday and Friday, corresponding to two- or three-day replenishment intervals. Ingredient shelf life is approximately three weeks. Missing inventory parameters are scenario

assumptions, not observed stock movements. The approach is a material requirements planning proposal, not a full MRP II implementation.

Phase 5: Comparative Analysis and Interpretation

Forecast performance and derived material requirements were compared between branches. Differences in data granularity, sales volume, and forecast accuracy were analyzed. The procedure was evaluated for practical applicability under fixed replenishment schedules and limited inventory visibility.

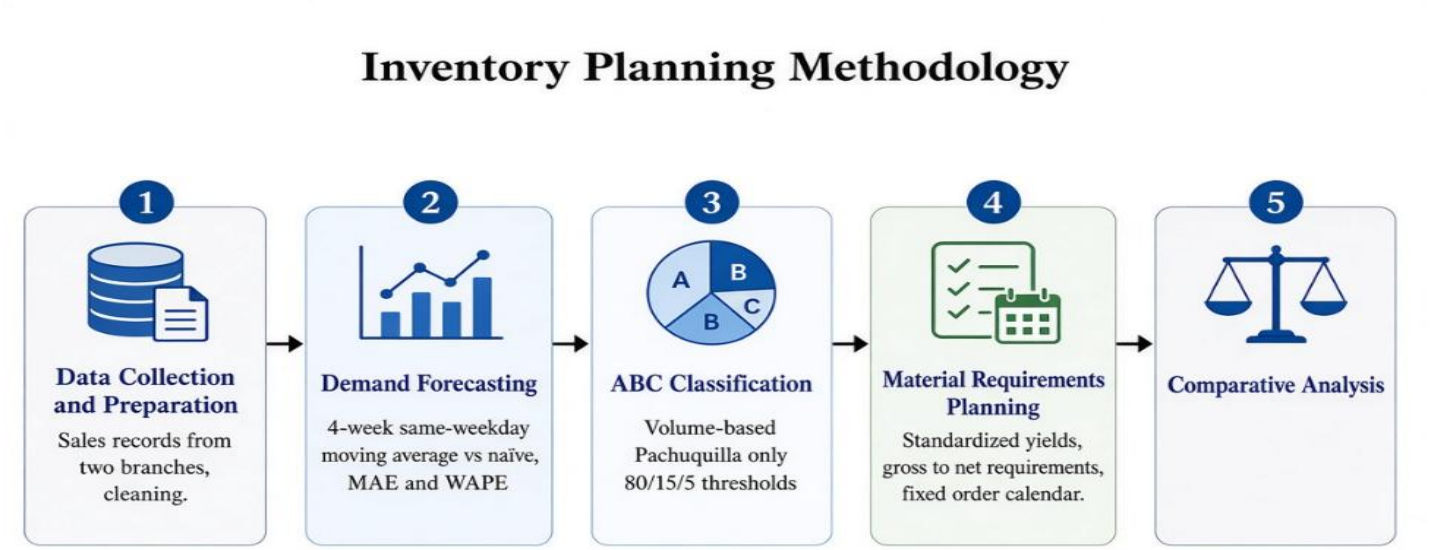


Figure 1. Conceptual Diagram of the Methodology

The flowchart illustrates the five sequential phases of the methodology. Data from both branches enter Phase 1 for cleaning. Cleaned series feed Phase 2, where the same-weekday moving average and naïve forecasts are generated and evaluated with MAE and WAPE. Phase 3 applies volume-based ABC classification only to the product-level data of Pachuquilla. Phase 4 translates forecasts into ingredient requirements using standardized yields and the fixed supply calendar, producing net order quantities under scenario assumptions. Phase 5 compares results across branches and interprets operational implications. The linear structure emphasizes the retrospective, non-experimental nature of the study and the clear separation between observed sales, calculated forecasts, and simulated material parameters.

RESULTS AND DISCUSSION

The results are presented according to the five methodological phases. All calculations are retrospective and based on the historical sales records described in the methodology. Complete inventory movement data were unavailable; therefore, material-requirement figures remain scenario-based.

Phase 1: Descriptive Analysis of Historical Sales

The two branches exhibited substantially different sales volumes and observation windows. Pachuquilla 1 recorded 66,519 units over 174 days (mean of 382.3 units per day), while Venta de Carpio recorded 142,688 units over 150 days (mean of 951.3 units per day). Venta de Carpio's daily average was approximately 2.49 times higher than that of Pachuquilla. Because the observation periods differ, daily averages are more appropriate for comparison than aggregate totals.

Table 2. Descriptive comparison of historical sales

Indicator	Pachuquilla 1	Venta de Carpio
Start date	01/01/2026	02/01/2026

End date	06/23/2026	06/30/2026
Days	174	150
Units sold	66,519	142,688
Daily mean	382.3	951.3

Phase 2: Forecast Accuracy

The four-week same-weekday moving average outperformed the previous-day naïve forecast in both branches. The advantage was markedly larger at Pachuquilla (WAPE of 1.24 % versus 33.40 %) than at Venta de Carpio (WAPE of 12.38 % versus 13.40 %). The evaluation covered 146 days at Pachuquilla and 122 days at Venta de Carpio. These results are retrospective and do not guarantee future forecasting performance.

Table 3. Retrospective forecast performance

Indicator	Pachuquilla 1	Venta de Carpio
Evaluation days	146	122
Moving-average MAE	4.74	119.35
Moving-average WAPE	1.24 %	12.38 %
Naïve MAE	127.86	129.16
Naïve WAPE	33.40 %	13.40 %

Phase 3: ABC Classification

At Pachuquilla 1, the 18 flavors were classified by unit volume. Category A comprised 14 flavors and accounted for 84.7 % of total sales volume, indicating that demand is distributed across a relatively large number of varieties rather than concentrated in a few items. The leading individual flavors were potato with meat (5,674 units), pastor (5,061 units), and sausage, ham and cheese (4,451 units). No flavor-level ABC classification was possible for Venta de Carpio because only aggregated daily totals were available.

Table 4. ABC classification by sales volume at Pachuquilla 1

Class	Flavors	Units sold	Share
A	14	56,331	84.7 %
B	3	7,646	11.5 %
C	1	2,542	3.8 %
Total	18	66,519	100 %

Phase 4: Material Requirements Planning

Using standardized yields (one filling bag = 20 pastes; one dough box = 200 pastes), gross requirements can be derived directly from forecasts. For example, a forecast of 180 pastes of a single flavor requires nine filling bags, and an aggregate forecast of 760 pastes requires four dough boxes after rounding up. Net order quantities further depend on actual on-hand inventory, safety stock, and scheduled receipts—parameters that were not available as historical records and were therefore treated as scenario assumptions. The fixed ordering calendar (Monday, Wednesday, and Friday) and the approximate three-week shelf life of ingredients require balancing the risk of shortages against the risk of excess inventory.

Phase 5: Comparative Interpretation

Daily sales volume and forecast accuracy differed substantially between the branches. The same-weekday moving average achieved a very low retrospective WAPE at Pachuquilla (1.24 %) and a moderate WAPE at Venta de Carpio (12.38 %), both better than the naïve benchmark. The volume-based ABC classification at Pachuquilla supports prioritizing a broad set of products (14 Class A flavors) rather than a small number of dominant items. Because complete historical inventory records were unavailable, reductions in stockouts, waste, or operating costs could not be demonstrated. The main contribution is therefore a reproducible planning

procedure that adapts replenishment decisions to local demand patterns and fixed supply schedules, rather than evidence of realized operational savings. Future operational implementation and the incorporation of inventory and cost data would be required to quantify such benefits.

Material Requirements and Operational Implications

With standardized yields, a forecast of 180 pastes of one flavor requires nine filling bags; an aggregate forecast of 760 pastes requires four dough boxes after rounding up. Net order quantities additionally depend on actual stock, safety reserves and scheduled receipts. The fixed ordering calendar and finite shelf life require balancing shortage risks against excess inventory.

The forecasting results suggest the potential value of weekday-based demand patterns, consistent with the importance of choosing methods appropriate to the demand series (Syntetos & Boylan, 2005). However, the unusually low retrospective error at Pachuquilla should be validated with subsequent periods, in line with the cautions concerning forecast error metrics discussed by Hyndman and Koehler (2006).

The volume-based ABC classification supports prioritizing a broad set of products but cannot substitute for an economic-value classification without unit cost data. The absence of complete historical POST inventory records also prevents a direct estimate of reductions in storage costs, stockouts, waste or lost sales. Thus, the main contribution is a reproducible planning procedure rather than evidence of realized operational savings.

CONCLUSION

This study developed and retrospectively evaluated a comparative inventory planning approach for two branches of a food-sector MSME producing and selling pastes. The model integrates a four-week same-weekday moving average for demand forecasting, volume-based ABC classification, and standardized material requirements planning under a fixed replenishment calendar. The analysis was conducted using historical sales records from Pachuquilla 1 (product-level data) and Venta de Carpio (aggregated daily totals), without intervening in store operations and in the absence of complete inventory movement records.

The results reveal substantial differences between the two branches. Venta de Carpio exhibited a daily sales volume approximately 2.49 times higher than Pachuquilla. The same-weekday moving average consistently outperformed the previous-day naïve forecast in both locations, with particularly strong retrospective performance at Pachuquilla (WAPE of 1.24 % versus 33.40 % for the naïve method) and a more modest improvement at Venta de Carpio (WAPE of 12.38 % versus 13.40 %). These findings indicate that weekday-based demand patterns are relevant for planning in this context and that relatively simple forecasting methods can provide useful guidance when data series are short and resources are limited.

At Pachuquilla, the volume-based ABC classification showed that demand is distributed across a relatively large number of flavors: Category A included 14 out of 18 products and accounted for 84.7 % of total unit sales. This distribution suggests that prioritization efforts should focus on a broad set of items rather than a small number of dominant products. Because verified unit costs were unavailable, the classification remains volume-based and cannot substitute for an economic-value or multi-criteria analysis. No product-level classification was possible for Venta de Carpio due to data aggregation.

The translation of forecasts into material requirements using standardized yields (20 pastes per filling bag and 200 pastes per dough box) demonstrates a practical pathway for generating gross and net order quantities aligned with the Monday–Wednesday–Friday supply schedule. However, the absence of historical on-hand inventory, safety stock, and scheduled receipt records means that the resulting net requirements are scenario-based rather than observed operational outcomes. Consequently, the study does not provide empirical evidence of reductions in stockouts, waste, storage costs, or lost sales.

The main contribution of the work is therefore a reproducible, low-cost planning procedure that accommodates heterogeneous data availability across branches and fixed replenishment constraints typical of food MSMEs. By clearly separating observed sales, calculated forecasts, and simulated material parameters, the approach offers a

transparent foundation for more systematic ordering decisions when full inventory records and unit costs are lacking.

Several limitations must be acknowledged. The retrospective nature of the evaluation does not guarantee future forecasting performance, and the unusually low error observed at Pachuquilla requires validation with subsequent periods. The lack of complete inventory and cost data precludes quantification of operational or financial benefits. In addition, the model does not incorporate lost-sales effects, promotional impacts, or external factors that may influence demand. Future research should implement the procedure in a live operational setting, incorporate actual inventory movements and cost information, test alternative safety-stock policies, and extend the analysis to additional branches or time periods. Comparative evaluation against other simple forecasting methods and the eventual integration of multi-criteria classification techniques would further strengthen the practical relevance of the approach.

In summary, the combination of same-weekday demand forecasting, volume-based ABC classification, and standardized material requirements planning provides a feasible and accessible framework for inventory decision support in food-sector MSMEs operating under data and resource constraints. While the present study establishes the methodological foundation and demonstrates differential performance across branches, operational validation remains necessary to confirm reductions in shortages, waste, or costs.

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21. Note: Some entries from the SALSA table (particularly #18, #19 and #20) remain incomplete because full bibliographic details were not available in the source table; they should be completed or replaced with fully verifiable references before final submission.