

# PRICE TRANSMISSION IN MALAYSIA'S AGRIFOOD SECTOR: CURRENT EVIDENCE, METHODOLOGICAL TRENDS AND RESEARCH GAPS

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**Abstract.** Food prices, rising import dependencies, and improved food security have become major concerns worldwide and at the national level; therefore, a clear understanding of price transmission is essential for supporting, developing the market, and providing insight to policymakers. This study examines the current data, methodologies, and gaps related to research on price transmission in the agrifood sector of Malaysia. Using a narrative literature review approach, the study integrates the results of empirical research on price transmission in vertical and horizontal settings. However, many studies also reveal asymmetric price transmission, where price increases are communicated more quickly and completely than decreases in costs. This indicates the presence of market inefficiencies, unequal bargaining power, adjustment rigidities, and the influence of a dominant middleman in the supply chain. In addition, external factors such as exchange rates, global food prices, and import dependency increasingly affect domestic food prices. Methodologically, the literature demonstrates the use of nonlinear econometric approaches, such as Threshold Autoregressive (TAR), Error Correction Model (ECM), Autoregressive Distributed Lag (ARDL), and Nonlinear ARDL (NARDL) models to evaluate asymmetric market behaviour. The results of this study indicate differences in expenses at different levels of the agrifood supply chain, with some degree of temporal connection across the supply chain. Nonetheless, research in Malaysia's agrifood sector remains fragmented and limited to selected commodities and methodological diversity. Therefore, broader empirical research is needed to strengthen evidence-based agricultural policies and improve market efficiency as well as food security in Malaysia.

**Keywords:** *price transmission, asymmetric price transmission, agrifood markets, food security, Malaysia*

## Introduction

Over the past two decades, the global food market has grown increasingly unstable due to rising food price volatility, trade disruptions, climate-related shocks, geopolitical conflicts, and supply uncertainties. Major shocks such as the global food crisis, COVID-19, and export restrictions by major food exporters have heightened concerns about food affordability and security. The growing integration of global food markets has further increased domestic agrifood systems' exposure to international market shocks, resulting in greater price fluctuations. In Malaysia, food price instability has emerged as a pressing issue. Malaysia's increasing reliance on imported food commodities has heightened concerns about food security and vulnerability to global market disruptions (Shahirah, 2026). Statistics show that Malaysia's food import bill continues to increase, consistently with imports accounting for approximately 70%, and only 14% can be supplied from local production (Rozhan, 2025). The import value recorded in 2023 was RM78.80 billion, almost a twofold increase from RM42.62 billion in 2014 (Malaysian Technology Development Corporation, 2025). This reliance on imports has increased

the domestic market's vulnerability to changes in international prices, exchange rate variations, and disruptions in global supply chains. Grasping these dynamics is crucial for assessing market efficiency and bolstering evidence-driven policy development in Malaysia's agrifood industry (Ahmad et al., 2024; Norazman et al., 2018; Sharifuddin et al., 2013). As a result, price transmission has emerged as an essential focus of study in agricultural and food economics due to growing concerns over food price volatility, market integration, and food security. Price transmission refers to the speed and extent to which price changes at one level of the market or supply chain are reflected at another (Norazman et al., 2018; Lloyd, 2017). These changes can occur at global import levels, in local markets, or from producers to wholesalers and retailers. Efficient price transmission is crucial, as it reflects market operations and the precision of price signals communicated among participants.

Price transmission in agrifood markets can be either symmetric or asymmetric. Symmetric price transmission occurs when changes in prices (whether they are increasing or decreasing) are proportional and move through the market at similar speeds across all market levels; however, multiple studies provide significant evidence of substantial asymmetric price transmission within these markets, with increases in prices being transmitted more rapidly and/or fully, while decreases are transmitted much more slowly than increases (Meyer and Von Cramon-Taubadel, 2004). Retail prices often increase rapidly when input or wholesaler prices increase, but it takes retail prices much longer to decrease when input or wholesaler prices decrease (Peltzman, 2000). This effect is referred to in the literature as the "rocket and feathers effect," in which retail prices rise rapidly as farm-gate prices increase but take much longer to fall as costs decrease. Berezvai and Kónya (2025) define asymmetric price transmission as a condition where the speed and magnitude of price adjustments vary depending on whether prices are increasing or decreasing. The causes of asymmetric price transmission could include factors such as market concentration, adjustment costs, imperfect competition, asymmetric information, menu costs, and governmental interventions (Vavra and Barry, 2005). Asymmetric price transmission within agrifood markets can cause inefficiencies in the market, negatively affect consumer welfare and ultimately influence the formulation of public policy, especially in countries that are very affected by food price volatility and supply chain disruptions (Rezitis and Tsionas, 2019; Meyer and Von Cramon-Taubadel, 2004; Peltzman, 2000).

This review article has two primary goals: First, it examines theoretical frameworks, methodological strategies, and empirical evidence on price transmission in agrifood commodities in both developed and developing nations. The study also highlights research gaps and suggests future research directions pertinent to Malaysia's agrifood sector. This is especially relevant given the growing reliance on food imports and price fluctuations. The document is organised as follows. Section 2 offers an analysis of the theoretical and conceptual foundations of price transmission. Section 3 outlines the methodological review and the literature selection process. Section 4 offers an analysis and synthesis of current studies, highlighting methodological patterns and significant empirical results. Section 5 addresses the research gaps and their implications for Malaysia, whereas the concluding section wraps up the paper and suggests directions for future studies.

### ***Conceptual and theoretical background***

#### ***Horizontal and vertical price transmission***

The transmission of market price shocks has long been a hot topic among scholars, particularly in assessing the impact of prices on the agrifood supply chain. Price transmission is generally categorised into two main types, horizontal and vertical. Horizontal price transmission, as defined by Giulia and Roberto (2012) involves price interactions across different markets or commodities operating at the same level of the supply chain. This is often associated with spatial price transmission, which analyses price movements between geographically distant markets, including those across regions or countries (Vavra and Barry, 2005). Shifts influence such separations in trade, transportation and transaction costs (Von Cramon-Taubadel and Goodwin, 2021) and exchange rate variations (Norazman et al., 2018; Vavra, and Barry, 2005). Spatial price transmission is closely linked to the Law of One Price (LOP) and notably tied to the purchasing power parity (PPP) theory, which suggests that exchange rates adjust to equalise the purchasing power of currencies across countries (Olipra, 2020). It also relates to spatial arbitrage conditions, which highlight that price disparities should not exceed transaction costs, ensuring convergence through trade flows (Von Cramon-Taubadel and Goodwin, 2021). Giulia and Roberto (2012) further note that when such conditions are violated, arbitrageurs quickly exploit profit opportunities. In conclusion, horizontal price transmission emphasises the importance of transaction costs, exchange rates, and market integration in influencing cross-border price behaviour.

Conversely, vertical price transmission refers to the connections of prices within a specific supply chain (Giulia and Roberto, 2012). In the domestic supply chain, this begins at the farm gate, then moves to wholesalers and finally to retailers (Von Cramon-Taubadel and Goodwin, 2021). The concept is closely related to the Theory of Derived Demand, whereby retail prices are derived from farm-gate prices, together with additional marketing margins such as processing, transportation, and retail expenses (Norazman et al., 2018; Sharifuddin et al., 2013). Other studies also concur that prices tend to increase after incorporating additional costs associated with processing, distribution and marketing activities (Berezvai and Kónya, 2025; Hillen, 2021; Norazman et al., 2018). The transmission of prices across various stages of the agrifood chain is interconnected with multiple factors, including processing technologies, product differentiation, pricing tactics, and prevailing market conditions for rival inputs (Von Cramon-Taubadel and Goodwin, 2021). Research on vertical price transmission generally investigates the magnitude, speed, and symmetry of price adjustment, as these adjustments can significantly influence economic welfare and market efficiency (Roche, 2019). The efficiency of vertical transmission is also deeply influenced by market concentration and bargaining power (Acosta et al., 2020; Bonanno et al., 2018). Considered collectively, horizontal and vertical price transmission highlight the critical roles of transaction costs, exchange rates, market integration, and structural factors in shaping price dynamics across and within agrifood supply chains.

For a comprehensive theoretical understanding, price transmission is commonly analysed within the framework of short-run and long-run dynamics (Acosta et al., 2020; Lloyd, 2017). The short-run equilibrium refers to the immediate adjustment process following a price shock (Meyer and Von Cramon-Taubadel, 2004), or the speed of adjustment and the number of periods required for the market to return to equilibrium (Acosta et al., 2020; Ibrahim, 2009). In the short run, price adjustment is often incomplete and may exhibit asymmetry, whereby price increases are transmitted more rapidly than decreases. Meanwhile, the long-run relationship indicates the degree to which prices are economically interconnected over time, representing a stable target for

the market (Lloyd, 2017). Under efficient market conditions, deviations from the long-run equilibrium are expected to be corrected through an adjustment mechanism that restores price balance across the supply chain (Zhafira et al., 2026). Cointegration theory is closely related to this concept, which suggests that although individual prices may fluctuate independently in the short run, they remain linked by a stable long-run relationship (Charoenrit et al., 2021; Frey and Manera, 2007; Engle and Granger, 1987).

In economics literature, econometric models are widely employed to investigate price adjustment across markets and supply chain stages in response to shocks. The methodologies commonly employed include the Autoregressive Distributed Lag (ARDL), Error Correction Model (ECM), Threshold Autoregressive (TAR), and Nonlinear Autoregressive Distributed Lag (NARDL) models, all offering distinct advantages in analysing market adjustment behaviour. The ARDL approach is commonly used in price transmission analyses due to its capacity to simultaneously estimate short-run dynamics and long-run equilibrium relationships, regardless of whether the variables are integrated at levels,  $I(0)$  or first differences,  $I(1)$ , as long as none are integrated at second difference,  $I(2)$  (Pesaran et al., 2001). ARDL models are used to determine whether producer, wholesale, and retail prices move together in the long run, and to measure the speed of short-run adjustments to aftermarket disturbances. The flexibility of the ARDL model in accommodating variables of mixed integration orders makes it especially suitable for agrifood market studies (Sulaj et al., 2024). The existence of a long-run equilibrium relationship is typically examined through cointegration analysis. In contrast, the related Error Correction Model (ECM) assesses the rate at which deviations from equilibrium are adjusted over time. The error correction term is expected to be negative and statistically significant, suggesting that prices gradually return to equilibrium after temporary disturbances.

Price transmission does not always occur symmetrically, as positive and negative shocks may be conveyed differently across markets or levels of the supply chain. This asymmetric behaviour is significantly evident in the short run, where transaction costs, market power, inventory behaviour, and policy interventions can distort adjustment processes. To capture such nonlinear dynamics, Threshold Autoregressive (TAR) and Momentum Threshold Autoregressive (MTAR) models are widely employed, as they allow adjustment speeds to vary depending on whether deviations exceed specific thresholds (Enders and Siklos, 2001). More recently, the Nonlinear Autoregressive Distributed Lag (NARDL) model proposed by Shin et al. (2014) has attracted interest in research on price transmission. The NARDL method enhances the traditional ARDL framework by decomposing explanatory variables into positive and negative partial sums, enabling separate estimation of the impacts of price increases and decreases in both the short run and the long run. This approach is effective for investigating asymmetric price transmission in agrifood markets, as it offers a comprehensive framework for analysing upward and downward price movements differently across the supply chain. Compared to traditional TAR models, NARDL offers enhanced flexibility by allowing the simultaneous estimation of asymmetric short-run dynamics and long-run equilibrium within a single modelling framework. Thus, the choice of econometric methods in price transmission research primarily depends on the research goals, data characteristics, and the type of market adjustment under investigation. Although ARDL and ECM methods are more suitable for analysing general equilibrium adjustment and market integration, TAR and NARDL models offer deeper insight into asymmetric transmission behaviour and nonlinear market responses.

## Materials and Methods

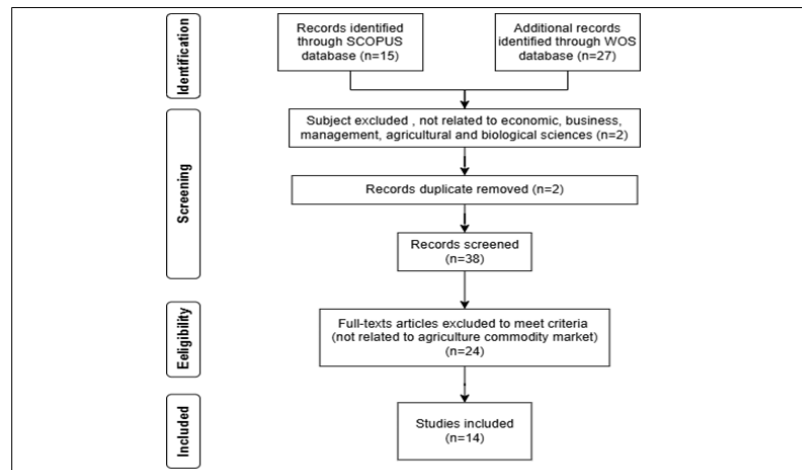
This study employs a narrative literature review to examine past and ongoing studies on price transmission in Malaysia's agrifood sector. The narrative review method is used because it allows the synthesis of specific findings from studies utilising analytical perspectives and econometric techniques, although the literature remains fragmented and relatively limited (Snyder, 2019; Grant and Booth, 2009). The study by Assefa et al. (2015) was selected because it provides a comparable framework for examining the transmission of price volatility throughout the food supply chain. Accordingly, this review aims to evaluate the methodologies, summarise key findings, and highlight critical areas for further research. This methodology accommodates diverse sources, including empirical, policy, and theoretical articles. Therefore, it offers a comprehensive understanding of the mechanisms of price transmission at both the global and regional levels and how these findings can inform Malaysia's agrifood sector. A comprehensive literature review should demonstrate depth and rigour by employing a clear article selection strategy and formal evidence extraction procedures, which are essential for generating insights and guiding research on sustainability quantification in the agri-food sector (Castillo-Díaz et al., 2024; Snyder, 2019).

### Identification and screening

The review started in May 2026, with the first step focusing on identifying the keywords for the search. Drawing on prior studies and thesaurus references, keywords and synonyms related to price symmetry, price asymmetry, and transmission mechanisms were selected. The search strategy then included the keywords listed in *Table 1*, which were applied across two major interdisciplinary electronic database repositories: Scopus and Web of Science (WoS). Scopus and Web of Science (WoS) are widely regarded as the two most influential citation indexes and are systematically under-representing academic work from regions outside North America, Europe, and Oceania, as well as publications in languages other than English (Asubiaro et al., 2026). Following the search string, the screening stage was conducted as depicted in *Figure 1*, in accordance with the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines. This study reports the steps taken in accordance with the PRISMA checklist to minimise the risk of bias. Of the initial 42 articles selected for review, 4 were excluded: 2 focused strictly on unrelated subject areas (economics, business, management, agriculture, and biological sciences), and 2 were duplicate entries across the databases. The next stage involved eligibility screening, during which the full texts were reviewed. After careful evaluation, 24 articles were rejected for failing to meet specific criteria. The final stage resulted in the selection of 14 articles, which were retained for in-depth review and will serve as the basis for further investigation.

**Table 1.** The search string.

| No | Database       | Keyword used                                                                                                                                                                                                                                       |
|----|----------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1  | Web of Science | TS = (("price transmission" OR "asymmetric price transmission" OR "price dynamics" OR "price movement" OR "agrifood market" OR "agricultural" OR "agrofood") AND ("cointegration" OR "equilibrium relationship" OR "common trend") AND (Malaysia)) |
| 2  | Scopus         | TITLE-ABS-KEY (("price transmission" OR "asymmetric price transmission" OR "price dynamics" OR "agrifood markets") AND ("cointegration") AND ("Malaysia"))                                                                                         |



**Figure 1.** PRISMA selection process.

### Data abstract and analysis

The remaining articles were analysed and systematically assessed, with a focus on studies that directly addressed the formulated research questions. Data extraction began with a careful reading of the abstract, followed by a full-text review to identify relevant themes. The synthesis and analysis were carried out narratively, comparing findings across different contexts to highlight common patterns, areas of conflict, and existing gaps in the literature.

### Results and Discussion

Table 2 summarises the literature review on price transmission in Malaysia's agrifood sector. The findings indicate that agrifood markets are interconnected at different stages of the supply chain. However, the degree of integration, efficiency, and adjustment across commodities, regions, and market frameworks. Findings further indicate that Malaysia's agrifood markets deviate from perfect conditions of competition. Price adjustments are frequently asymmetric, delayed, or shaped by powerful intermediaries and external economic factors. Despite these short-term distortions, long-run market integration is observed across various commodities, including poultry, vegetables, and fruits, as well as within local wholesale markets.

**Table 2.** Summary of reviewed literature.

|    | Commodity               | Authors                   | Chain-Stages                  | Sample Period        | Types of Analysis                     | Transmission & Key Findings                                                                                                     |
|----|-------------------------|---------------------------|-------------------------------|----------------------|---------------------------------------|---------------------------------------------------------------------------------------------------------------------------------|
| 1. | Broiler Meat & Eggs     | Sharifuddin et al. (2013) | Farm - Retail                 | 2000 – 2007          | Cointegration, Asymmetry ECM          | Asymmetric transmission exists; retail prices respond more strongly to farm-level increases than to decreases.                  |
| 2. | Broiler Meat (Vertical) | Muazu et al. (2014)       | Farm - Wholesale - Retail     | 2000 – 2011          | Johansen Cointegration, Asymmetry ECM | Transmission is symmetric between wholesale and retail, but Asymmetric from farm to retail.                                     |
| 3. | Broilers (Spatial)      | Kaur et al. (2010)        | Regional Markets (Peninsular) | (1990). – 2005 (Apr) | Threshold Autoregressive (TAR) models | Regional markets are integrated with Kuala Lumpur as the dominant price leader; threshold effects exist in six of nine regions. |
| 4. | Poultry (Wholesale)     | Muazu et al. (2013)       | Regional Wholesale            | 2000 – 2011          | ARDL, Granger                         | Long-run equilibrium exists; bidirectional causality between                                                                    |

|    |                                             |                                 | Markets                                  |                         | Causality                                        |                                                                                                                                                                                    |
|----|---------------------------------------------|---------------------------------|------------------------------------------|-------------------------|--------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 5. | Fresh Milk                                  | Suhaimi (2018)                  | Farm – PPIT (collection centre) - Retail | 2013 – 2016             | VAR<br>Johansen Cointegration, Granger Causality | Central and North regions, but unidirectional from South/East to Central.<br>Short-run asymmetry, where retail prices drive farm and collection-centre prices, but not vice versa. |
| 6. | Vegetables (Chinese Mustard, Spinach, etc.) | Mohamed et al. (1996)           | Farm - Wholesale - Retail                | 1989 – 1992             | Houck Approach, Wolfram's Procedure              | Asymmetric transmission: farm prices are more responsive to wholesale decreases, while retail prices adjust faster to wholesale increases.                                         |
| 7. | Vegetables                                  | Zainalabidin and Iliyasu (2017) | Farm - Wholesale - Retail                | 5-Year Period (Monthly) | Houck Approach, Granger Causality                | Bidirectional causality among all three tiers: wholesale price is highly responsive to changes in both retail and farm prices.                                                     |
| 8. | Fruits (Banana, Papaya, etc.)               | Arshad and Abdel Hameed (2014)  | Farm - Retail                            | 2000 – 2010             | Johansen Cointegration, VECM, Granger Causality  | Stable relationship for all. Bidirectional causality for non-seasonal fruits (banana/watermelon); unidirectional (farm-led) for others.                                            |
| 9. | Pork                                        | Tey et al. (2010)               | Farm - Retail                            | 2001 – 2008             | Markup Pricing, Houck, ECM                       | Symmetric price transmission: retail prices adjust sensitively and equally to farm-level price increases and decreases.                                                            |

### ***Asymmetric price transmission dominates Malaysian agrifood markets***

The literature consistently shows that price transmission across different market levels and regions evolves, suggesting the existence of equilibrium relationships within supply chains (Arshad and Abdel Hameed, 2014; Muazu et al., 2013; Kaur et al., 2010). Overall, Malaysian price transmission looks like a more dominant characteristic of Malaysian agrifood markets, asymmetric rather than symmetric. Showing that price increases are generally transmitted more quickly than decreases. For livestock products, retail prices respond more rapidly to increases in farm prices than to decreases. Sharifuddin et al. (2013), found that broiler meat and egg retailers transmitted farm price increases more fully than price reductions, suggesting positive asymmetry and indicating that consumers bear the burden of rising prices but receive limited benefits when farm prices decline. Similarly, Muazu et al (2013) demonstrates that wholesale and retail markets are relatively integrated; the transmission mechanism between farm and retail levels remains asymmetric, reflecting unequal market power across the supply chain. Comparable evidence is observed in fresh milk marketing. Suhaimi (2018) reported short-run asymmetry and concluded that Malaysia lacks significant long-run market integration, revealing structural weaknesses within the domestic dairy industry. Retail prices were found to significantly influence farm-gate and collection centre prices. This indicates that downstream market players have greater influence over price-setting than upstream producers.

The vegetable market displays similar asymmetric behaviour. Mohamed et al. (1996) concluded that both wholesale and retail levels respond more rapidly to increasing prices than to falling prices to protect margins amid supply uncertainty. Zainalabidin and Iliyasu (2017) further argued that wholesale markets act as the main coordinating entity linking the farm and retail sectors, as wholesale prices closely reflect both upstream and downstream shifts. Meanwhile, within the fruit industry, Arshad and Abdel Hameed (2014) emphasised the importance of seasonality in price transmission dynamics. Their study showed that non-seasonal fruits experienced bidirectional

causality, while seasonal fruits exhibited one-way, farmer-driven transmission patterns. The authors argued that consistent supply enhances market coordination, whereas production dependent on seasonal variation results in irregular adjustment processes. Nevertheless, among all the commodities studied, only one market displayed symmetrical price transmission, and even this was not universal. Tey et al. (2010) found evidence of symmetric price adjustment in the pork market, where retail prices responded equally to farm price increases and decreases. This suggests that more competitive market structures or efficient marketing systems may reduce pricing inefficiencies. This evidence suggests that asymmetric price transmission is the dominant pricing mechanism across Malaysian agricultural markets, albeit with varying magnitudes and across commodities.

### ***Market integration with varying price leadership***

Cointegration analyses consistently show that farm, wholesale, and retail prices exhibit stable long-run equilibrium relationships that differ across commodities. Evidence of regional market integration is shown by Kaur et al. (2010) study, in which she found that regional broiler markets across Peninsular Malaysia were integrated, with Kuala Lumpur as a dominant price leader. Threshold effects observed in most regions indicate that price fluctuations occur only after deviations exceed the costs associated with transportation, information delays, and market frictions across regional markets. Furthermore, Muazu et al. (2013) found that Malaysia's Central Region serves as a dominant transmission node due to its superior infrastructure, high concentration of demand, and enhanced market connectivity. Fruit and vegetable markets also display even more complex transmission patterns. Zainalabidin and Iliyasu (2017) reported bidirectional causality among farm, wholesale and retail markets and suggested continuous information exchange throughout the supply chains. However, Arshad and Abdel Hameed (2014) found that causality varies particularly in fruits, with non-seasonal fruits showing stronger two-way interactions than seasonal fruits. These findings indicate that market integration alone is insufficient to explain pricing behaviour. Instead, varying levels of market concentration, supply chain governance, geographic connectivity, and product characteristics dictate price leadership and adjustment processes.

### ***Commodity characteristics influence transmission behaviour***

Differences in commodity characteristics, such as perishability, storage opportunities, production cycles, and market concentration, also influence transmission patterns. The literature shows that perishable products such as vegetables, fresh milk, and poultry tend to exhibit faster but more asymmetric price adjustments due to limited storage capacity and availability, as well as weaker negotiating positions. Conversely, the pork market exhibits symmetrical price transmission, indicating higher supply chain integration and relative efficiency within the broader food system. Export-oriented commodities such as palm oil exhibit another pattern. Malaysia maintains a strong export position despite elevated production costs (Ismail et al., 2022). Nakajima (2012) demonstrated positive asymmetric transmission in Malaysian palm oil exports, showing that the pre-adjustment differs from Indonesia's in response to international price changes. The study highlights the importance of international market power, branding, and export competitiveness in determining transmission behaviour. These differences

imply that market structure and product characteristics jointly determine the efficiency of price transmission.

### ***Macroeconomic and external factors on domestic food***

Beyond vertical supply chain relationships, the literature indicates that Malaysian food price dynamics are heavily influenced by macroeconomic factors. Wiseman et al. (2021) reported that exchange rate fluctuations significantly influenced imported rice prices, as Malaysia relies heavily on rice imports, especially from Thailand. The authors argued that Ringgit depreciation has a stronger inflationary effect than Ringgit appreciation, leading to nonlinear exchange rate pass-through. Similarly, Norazman et al. (2018) found that international food prices and exchange rates are dominant drivers of Malaysian food prices, suggesting that horizontal transmission from global markets could be more important than vertical domestic transmission. This argument reflects Malaysia's increasing vulnerability due to its reliance on imports. At the broader macroeconomic level, Wong and Shamsudin (2017) asserted that gross domestic product (GDP) growth and exchange rates have asymmetric long-term effects on food prices, while oil price influences tend to be more symmetric. Their findings indicate that economic growth raises demand-related food inflation, while a declining exchange rate elevates import costs. Completing this, Mhd Ruslan and Mokhtar (2020) showed that the consumer price index (CPI) further supports the argument that geographical and logistical dependency underpins asymmetric regional transmission. For instance, Sabah's consumer prices were found to be strongly affected by price fluctuations in Peninsular Malaysia (in the 2008 global crisis), reflecting the Sabah economy's structural reliance on interregional trade and transportation networks. The food price transmission should be viewed as a multi-layered system comprising a supply chain, horizontal regional markets, and international economic linkages.

### ***Methodological evolution for future research***

At the methodological level, the literature argues that nonlinear econometric methods are most applicable to analysing agrifood price transmission, as agricultural markets rarely adjust symmetrically. The increasing use of Threshold Autoregressive (TAR), Momentum TAR (M-TAR), and Nonlinear Autoregressive Distributed Lag (NARDL) models demonstrates that conventional linear models are unable to capture market rigidities, transaction costs, and behavioural asymmetries. This methodological progression reflects growing recognition that agricultural prices rarely adjust in a purely linear manner. Nonlinear models provide a more robust framework by accommodating transaction costs, market frictions and behavioural responses that characterise agricultural markets. The reviewed literature indicates that although Malaysian agrifood markets are generally integrated in the long term, inefficiencies remain widespread due to asymmetric adjustments, imbalanced bargaining power, structural inflexibilities, reliance on imports, and external economic factors. Furthermore, the literature highlights the need for greater transparency and effective coordination among suppliers to enhance food market efficiency and ensure national food security.

### ***Research gaps and future directions***

#### ***Implications for Malaysia***

The analysis emphasises several implications for food security, market efficiency, and the development of agricultural policy in Malaysia. Nonetheless, although long-term integration exists, it does not reflect asymmetric short-term adjustments, which may contribute to a rapid rise and, ultimately, diminished consumer welfare in Malaysia's agrifood sector, particularly among low-income households (Norazman et al., 2018). Evidence further indicates that a high reliance on food imports exposes the country to risks and external shocks, including economic downturns and crises that may lead to rising food costs amid oil price surges, despite the limited degree of external price pass-through observed (Ibrahim, 2009; Ibrahim and Said, 2012). Policymakers should prioritise boosting domestic production and diversifying exports to mitigate external shocks, while modernising supply chains and logistics infrastructure (Ibrahim and Said, 2012). Moreover, implementing digital tools is critical to enhancing market transparency and supply chain resilience (Zaidi et al., 2022). The review also posits that improvement in logistics infrastructure, market information systems, and regional market connectivity could enhance transmission efficiency and reduce adjustment delays across supply chains. Lastly, the adoption of digital agriculture technologies and real-time market intelligence systems could help improve price transparency and strengthen coordination among producers, wholesalers, retailers, and consumers. From a research perspective, the literature indicates that price transmission studies in Malaysia remain limited in both commodity coverage and methodological diversity. Research on commodities should therefore be expanded to include less scrutinised sectors such as animal products, fisheries and aquaculture, livestock feed, grains, and horticultural products. In addition, further research attention should focus more extensively on nonlinear and dynamic econometric approaches, including NARDL, threshold models, and regime-switching models.

### ***Limitations***

This study acknowledges several limitations that characterise its scope. As a narrative literature review, the approach inherently introduces a degree of subjectivity in the selection and synthesis of sources. Nevertheless, this approach is justified given the fragmented and limited body of research on price transmission within Malaysia's agrifood sector. Most recent Malaysian research has focused on livestock, vegetables, rice, and palm oil, thereby resulting in gaps in understanding of price dynamics for other major agrifood commodities on which we are completely reliant and vulnerable to shocks. Thus, future analysis should incorporate a wider range of data sources and benefit from newly available datasets to address limitations and better capture market behaviour in Malaysia.

### ***Conclusion***

This review set out to integrate the fragmented evidence on price transmission within Malaysia's agrifood sector. Three integrative insights emerge that complement rather than merely recap the findings of the preceding sections. First, Malaysian agrifood markets consistently demonstrate the coexistence of long-run integration and short-run pricing inefficiency. Although farm, wholesale and retail prices remain cointegrated across poultry, vegetables and fruits (Muazu et al., 2013; Kaur et al., 2010), the available evidence shows that price increases are transmitted more rapidly than price decreases, whereas decreases are transmitted more slowly and incompletely

(Sharifuddin et al., 2013; Peltzman, 2000). This is not a contradiction; it indicates that markets are linked but operationally biased. The recurrence of this pattern across multiple commodities, combined with the singular exception of the pork market, frames asymmetric adjustment as a defining feature of the agrifood price system rather than an isolated inefficiency. Second, asymmetries in Malaysia are structural rather than incidental, and they are amplified by the country's exposure to the external trade and macroeconomic environment. The direction of these asymmetries reflects commodity-specific conditions such as perishability, seasonality and concentration of bargaining power, while their magnitude is enlarged by the country's heavy reliance on food imports (Shahirah, 2026; Malaysian Technology Development Corporation, 2025) and the asymmetric pass-through of exchange rate movements into domestic food prices (Norazman et al., 2018; Ibrahim, 2009). This logic sharpens the policy implication: improvements in domestic pricing efficiency cannot be pursued in isolation from trade, exchange rate and import diversification policies. Third, the methodological trajectory of the field has directly limited what can be confidently claimed about Malaysian price transmission. The progression from linear cointegration toward nonlinear estimators such as TAR, MTAR and NARDL (Frey and Manera, 2007; Enders and Siklos, 2001) was precisely what allowed asymmetries to be detected in the first place. This implies that future work built solely on linear approaches will continue to mischaracterise adjustment behaviour. Future research should therefore extend this progression to broader commodity panels, including livestock feed, fisheries, aquaculture, and grains, alongside emerging themes such as climate-related supply shocks, digital agricultural marketplaces, and the structural drivers of market power (Zaidi et al., 2022; Bonanno et al., 2018). Aligning broader empirical coverage with advanced nonlinear analytical techniques is a prerequisite for evidence-based policies. This alignment is vital for maintaining pricing efficiency in a food system that, by structural design, cannot be meaningfully insulated from global price volatility.

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## Conflict of interest

The authors declare no conflict of interest regarding the publication of this paper.

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