



THE ASIAN BULLETIN OF GREEN MANAGEMENT AND CIRCULAR ECONOMY

<http://abgmce.com/> 10.62019/abgmce. v4i1.68.

ISSN (online): 2959-0035
ISSN (Print): 2959-0027

Beyond Borders: A Review of Food Market Integration and Sustainable Development Goals

Ghulam Hussain Wagan*, Jam Ghulam Murtaza Sahito, Aijaz Ali Khooharo, Hakimzadi Wagan, Farahnaz Gilal

Chronicle

Article history

Received: April 8, 2024

Received in the revised format:
April 28, 2024

Accepted: April 30, 2024

Available online: May 2, 2024

Ghulam Hussain Wagan, Jam Ghulam Murtaza Sahito, Hakimzadi Wagan, and Farahnaz Gilal are currently affiliated with Department of Agricultural Economics, Sindh Agriculture University, Tando Jam.

Email: ghwagan@sau.edu.pk

Email: sahito@sau.edu.pk

Email: hwagan@sau.edu.pk

Email: gilalfarah556@gmail.com

Aijaz Ali Khooharo is currently affiliated with Department of Agricultural Education, Extension, Sindh Agriculture University Tando Jam Pakistan.

Email: khooharo@sau.edu.pk

Abstract

This paper presents a comprehensive review of food market integration research spanning 1990–2023, provides a thorough bibliography, and emphasizes its growth between developed and emerging economies. It evaluates 140 papers with the aim of highlighting the importance of price transmission, market stability and market integration in the food sector. The study provides an overview of econometric methodologies, review global assessment methods, and identifies the major elements that influence market integration, such as commerce, social capital, government interference, export policies, institutions, information, competition, and market power. The finding reveals a rise in research activities between 2000 and 2015, with a growing focus on developing countries. This work is to offer a synopsis to researchers, academicians, and policy makers on the extent of the food market both internationally and domestically. This paper will be helpful for the researchers interested in understanding and investigating the dynamics of food market integration with a useful resource by classifying previous works and identifying current developments. The review also offers commentary on current research and prospects and their implication in line with SDG 1 (No Poverty) and SDG 10 (Reduced Inequalities) as it promotes fair access to resources and economic opportunities.

*Corresponding Author:

Keywords: Food market integration, Market stability, Co-integration, Price transmission, Policymaker, Market inter-relationships, Knowledge gaps. SDG 1 (No Poverty), SDG 10 (Reduced Inequalities)

© 2024 Asian Academy of Business and social science research Ltd Pakistan. All rights reserved

INTRODUCTION

Sustainably feeding a growing population requires more than simple dietary changes (White & Gleason, 2022). Market dynamics and integration are critical to any food system, to meeting the demands of a burgeoning population, and to improving food security (Adekambi et al., 2019). Food market integration is the set of forces that link together the world's food markets, creating a single global system in which trade barriers fall, information flows freely, and resources move to their highest and best use for the benefit of economic growth and stability (Kramskyi et al., 2022). Overall, market integration is a critical element of economic growth and stability on a global scale. Market integration is broadly termed into two categories: spatial (price indicators across places) and vertical (price signals across channels); both influence marketplace efficiency and useful resource allocation (Dominguez-Barreto et al., 2023; Jiang et al., 2023; Mechri et al., 2023). Due to price volatility within the food markets, food security for consumers, manufacturers, and society is all at risk (Pavithra, 2022). Price transmission ensures that changes in prices flow between markets, affecting supply, demand, resource allocation, and thus marketplace performance. This makes price transmission critical to agricultural market integration. Studies on price

transmission and volatility are a valuable instrument for evaluating market integration, stability, and the prospect of disruptions. It additionally advises decision-makers about infrastructure needs and regulations to improve stability (Kumar et al., 2022; Muharam et al., 2019). Since fragmented food markets have little potential to allocate resources and respond to crises, they pose serious risks of inefficiency, less consumer preference, price volatility, and increased food insecurity (Baulch, 1997a). Consequently, for well-informed decision-making and investment techniques inside market economies, information on price transmission and market integration is critical. Our comprehension of the co-integration and interdependence of the global food system is constantly enhanced by means of ongoing analysis. Since the early 1800s, there has been a considerable increase in the focus on linking food markets due to changes in trade regulations, and improved transportation, especially after the inception of World Trade Organization (WTO). Early research activities adopted correlation and regression estimates to assess market coordination by relying on the linear model framework; a few examples of such studies are Cummings, 1967; Farruk, 1970; Blyn, 1973; Jhala, 1984. Later, sophisticated methods like Johansen co-integration, auto-regression, Granger causality, and error correction were developed by many researchers from 1980 to early twenty first century. However, recent research has shifted towards advanced econometric techniques and went beyond co-integration and error correction mechanism, like parity-bound models, Auto-regressive Distributed Lag (ARDL), thresholds, asymmetries, and other nonlinear models, enabling rigorous assessment of food market interconnectedness. Minten and Kyle, 2000; Ghosh, 2010; Minten et al., 2014; Sahito, 2017; Svanidze, 2019; Waiswa, 2023. This trend reflects an increasing emphasis on robust empirical analysis. Some of the research on food market integration concentrates on specific regions like South Asia, Africa, and North America (e.g., Pakistan, India, the USA, Ghana, Ethiopia, China, etc.).

While some studies encompass a wider geographical scope. This disparity may reflect data availability in some countries. The study addresses a broader review of the evolution of research on food market integration. Initially, a systematic review was conducted of scholarly articles published in esteemed journals between 1990 and 2023. This time limit selection ensures a thorough analysis of the field's development. The selection process specifically targeted articles that critically evaluate the econometrical approaches employed in various analyses. This methodological emphasis enables a better grasp of the research's strengths and weaknesses in the field. The study also explored the scope of earlier research in this area. The studies conducted by Li (2000), Marks (2010), and Sadiq et al. (2021) analyzed the longest historical periods of 173, 58, and 51 years, respectively. In most studies, the sample duration is less than 30 years, and studies focus on a single country.

After globalization, the free movement of food has become easier and more convenient. Markets are essential for ensuring food availability and accessibility. The level of market integration directly affects the capacity to stabilize food supply, demand, and prices. Integrated markets enable coordinated price movements, expand the diversity of suppliers and commodities, and improve overall market efficiency. Additionally, integrated markets support global trade by creating a large single market where suppliers can access a wider consumer base and consumers can enjoy a greater variety of food products. Therefore, food market integration research significantly affects global food investment decisions, diversification strategies, and a nation's food security. This paper investigates the significant differences in studies on food market integration. Despite the importance of market integration concept, study findings vary greatly; some studies suggest no integration, while others demonstrate substantial or moderate degrees, even some researchers are of the opinion that the

Beyond Borders: A Review of Food Market Integration and SDGs Wagan, G. H. et al., (2024)

markets should not be integrated. The opinions of the researchers on market integration theory are the cause of this discrepancy. Those who support it could see high degrees of connection, while those who are against it might see almost no integration at all. This study aims to bridge this gap by critically examining existing literature, identifying knowledge gaps, assessing global assessment methods, and recommending critical topics for further research in this vital domain. The primary objective of this study is to estimate the current overview of market integration in food markets by providing a detailed literature review to researchers, academicians, and policy makers on the extent of food market both domestically and internationally. Another objective of this paper is to categorize past literature of market integration from different perspectives, such as econometric methodologies applied in various countries using different data spans.

The current study argued that considering sustainability and conformity with the Sustainable Development Goals (SDGs) is essential when it comes to integrating food markets. In order to achieve SDG 2 (Zero Hunger), it is crucial to establish efficient and integrated food markets. These markets play a vital role in increasing the distribution and accessibility of food across different regions. This ensures that all individuals, particularly those who are most vulnerable, have consistent access to nutritious and safe food throughout the year. Furthermore, SDG 12 (Responsible Consumption and Production) highlights the significance of sustainable food production systems and robust agricultural practices that enhance productivity and output, preserve ecosystems, and enhance the ability to adapt to climate change, extreme weather, drought, flooding, and other calamities. Integrated food markets can also support the achievement of SDG 13 (Climate Action) by optimizing the supply chain and minimizing waste, hence reducing the carbon emissions linked to farming practices and food delivery. Market integration promotes the adoption of best practices and technology necessary for sustainable agriculture by allowing information and commodities to freely cross borders. In addition, it can contribute to the stabilization of food prices and enhance the resilience of food systems against socio-economic shocks. This is in line with SDG 1 (No Poverty) and SDG 10 (Reduced Inequalities) as it promotes fair access to resources and economic opportunities. Ultimately, the promotion of food market integration with an emphasis on sustainability guarantees that the environmental, social, and economic aspects are considered, thus fostering a well-rounded strategy that benefits both present and future generations. This method not only promotes international trade and economic expansion, but also guarantees that food systems make a positive contribution to sustainable development goals, so making the global food market a crucial participant in building a more sustainable and fairer world.

METHODOLOGY

The research investigated food market integration through a comprehensive review of 140 studies published between 1990 and 2023. Table 1 summarizes the detailed review of literature, including various aspects such as names of authors, country of study, research period, data span, methodologies employed, and key findings. From a broad perspective, the method of selection of research articles on food market integration is based on Sharma and Seth, 2012; who used eight sub-classifications. However, in this research six sub-classifications are used, such as: econometric tools and methodology used for data analysis, year of publication, country-wise distribution, number of years as sample datasets, number of countries selected for the study to be sampled data, sources of the articles.

Table 1: Classification of literature on food market integration

S. No	Authors, year, and country of study	Title of Study	Journal	Data Span	Methodology used for data analysis	Finding and conclusions
1	Faminow and Benson (1990), Canada	Integration of spatial markets	American Journal of Agricultural Economics	11	Ravallion Model	According to the results, the non-competitive pricing system collapsed in the 1970s and 75s due to significant changes in the Canadian hog market, leading to the adoption of the FOB price system.
2	Dahlgran and Blank (1992), USA	Evaluating the integration of contiguous discontinuous markets	American Journal of Agricultural Economics	3	Vector Auto Regressive (VAR) Model	The study reveals that discontinuous markets hinder the integration of continuous markets, and price plays a crucial role in the allocation process in competitive lucerne hay markets between California and Arizona.
3	Alderman (1993), Ghana	Inter-commodity price transmittal: analysis of food markets in Ghana	Oxford Bulletin of Economics and Statistics	14	Ravallion Model, Co-integration, Causality	Results show that Ghanaian coarse grain markets exhibit functional, if not perfect, efficiency in price integration of grains.
4	Palaskas and white (1993), India	Testing market integration: New approaches with case material from the west Bengal food economy	Journal of Development Studies	2	Co-integration, Autoregressive Heteroskedasti (Gluschenko Karchevskaya)	The study found that markets are mostly integrated, but paddy and rice prices showed a lower degree of integration, and structural and institutional factors influenced performance.
5	Alexander and Wyeth (1994), Indonesia	Cointegration and market integration: an application to the Indonesian rice market	Journal of Development Studies	12	Co-integration	The study found that supply sources are more influential than demand in driving prices, and although the CPI was co-integrated with all price series, it did not significantly influence rice prices.
6	Gardner and Brooks (1994), Russia	Food prices and market Integration in Russia: 1992-93	American Journal of Agricultural Economics	1	Ravallion Model	During the period of January 1992 to April 1993, there was no noticeable progress in market integration for food items in Russia.
7	Goletti and Babu (1994), Malawi	Market liberalization and integration of maize markets in Malawi	Agricultural Economics	8	Co-integration	The study reveals that liberalization in Malawi improved market integration, but still has low levels. Investments in marketing infrastructure are needed for structural change.
8	Dercon (1995), Ethiopia	On market integration and liberalisation: Method and application to Ethiopia	Journal of Development Studies	6	Co-integration	The study shows that liberalization significantly impacted the integration of Ethiopian food markets, with several markets becoming integrated with Addis Ababa in the long and short run.

Beyond Borders: A Review of Food Market Integration and SDGs Wagan, G. H. et al., (2024)

9	Fafchamps and Gavian (1996), Niger	The spatial integration of livestock markets in Niger	Journal of African Economies	of 21	Parity Bounds Model (PBM)	The article reveals that Niger's livestock markets are poorly integrated, with occasional large price differentials, confirming regional segmentation in West African livestock trade.
10	Palaskas and Crowe (1996), UK	Testing for price transmission with seasonally integrated producer and consumer price series from agriculture	European Review of Agricultural Economics	of 20	Co-integration	The paper suggests that research on economic issues like agricultural price transmission and market integration using time-series price data could benefit from sophisticated techniques for integration and co-integration.
11	Baulch (1997a), Developing Countries	Testing for food market integration revisited	Journal of Development Studies	of 10	Ravallion Model, Co-integration	The study highlights limitations in traditional econometric methods for assessing market integration, suggesting the inclusion of transfer costs and simultaneous price formation for a more accurate assessment.
12	Baulch (1997b), Philippine	Transfer costs, spatial arbitrage, and testing for food market integration	American Journal of Agricultural Economics	of 14	Parity Bounds Model (PBM)	The paper introduces the parity bounds model (PBM), a method for assessing market integration in Philippine rice markets, incorporating transfer costs and food prices.
13	Badiane and Shively (1998), Ghana	Spatial integration, transport costs, and the response of local prices to policy changes in Ghana	Journal of Development Economics	of 1	Timmer, ARCH	Economic reforms in 1983 reduced local prices and variance, influenced by local and central market forces, with differences in market integration impacting long-term transport costs and market price evolution.
14	Ismet et al. (1998), Indonesia	Government intervention and market integration in Indonesian rice markets	Agricultural Economics	12	Multivariate Co-integration	Results show that government intervention in rice procurement positively influenced market integration, while regional per capita income was positively related to higher integration levels.
15	Loy and Weaver (1998), Russia	Inflation and relative price volatility in Russian food markets	European Review of Agricultural Economics	of 3	Multivariate Generalised Autoregressive Conditional Heteroskedacity (MGARCH)	The study reveals that expected inflation rates cause distortions in relative prices, not unanticipated or inflation uncertainty, and rejects the Lucas hypothesis.
16	Lutz and Bassolet (1999), Burkina Faso	Information service and integration of cereal markets in Burkina Faso	Journal of African Economies	of 3	Co-integration	This article shows that the article indicates moderate impact of price diffusion on market integration in Burkina Faso cereal markets, and that market information service does not significantly influence this integration.

17	Kuiper et al. (1999), Benin	Testing for the law of one price and identifying price-leading markets: an application to corn markets in Benin	Journal of Regional Science	2	Co-integration	The spatial arbitrage system, while not effective for the Benin corn market, had considerable time lag across multiple marketplaces, suggesting potential for improving market adjustment speed.
18	Minten and Kyle (1999), Democratic Republic of Congo	The effect of distance and road quality on food collection, marketing margins, and traders' wages: evidence from the former Zaire	Journal of Development Economics	1	Seemingly Unrelated Regression Estimation (Goletti and Babu)	This analysis shows that food price dispersion in former Zaire was significant, with transportation costs and road quality influencing differences. Food prices decreased faster than transportation costs, and traders' wages increased.
19	Zanias (1999), Italy	Seasonality and spatial integration in agricultural (product) markets	Agricultural Economics	17	Co-integration	The study found that France, Italy, Belgium, Germany, and UK have integrated soft wheat markets, but no significant market integration was observed between these countries.
20	Abdulai (2000), Ghana	Spatial price transmission and asymmetry in the Ghanaian maize market	Journal of Development Economics	17	Threshold Co-integration	The findings indicate that the study reveals that Ghana's major maize markets are well-integrated, with local markets responding more quickly to price increases than to price decreases in central markets.
21	Li (2000), China	Integration and disintegration in north china's grain markets, 1738-1911	Journal of Economic History	173	Correlation, Coefficients of Variation	The paper proves that while local grain markets in Zhili province fragmented, they grew more integrated with external markets, influenced by Qing state food policies and rural market conditions.
22	Minten and Kyle (2000), Democratic Republic of Congo	Retail margins, price transmission and price asymmetry in urban food markets: the case of Kinshasa (Zaire)	Journal of African Economies	3	SURE	Food product margins are influenced by search, supervision, and transaction costs, with price asymmetry and standardization leading to lower retail margins and symmetrical behavior.
23	Tiffin and Dawson (2000), UK	Structural breaks, co-integration, and the farm- retail price spread for lamb	Applied Economics	15	Co-integration	The study reveals a long-term relationship between retail and producer prices, with lamb prices set in retail markets. A structural break occurred in January 1990 due to price increases.
24	Zhou et al. (2000), China	Integration of rice markets: the case of Southern China	Contemporary Economic Policy	4	Co-integration	China's indica rice markets face challenges like poor transport, government intervention, and limited grain availability, with more liberalized marketing systems promoting more market integration.
25	Gonzalez-Rivera and	The extent, pattern, and degree of market	American Journal of	28	Vector Error Model (VECM) Correction	Findings show that high trade volumes alone don't guarantee high integration, as factors like physical and

Beyond Borders: A Review of Food Market Integration and SDGs Wagan, G. H. et al., (2024)

	Helfand (2001), Brazil	integration: a multivariate approach for the Brazilian rice market	Agricultural Economics				product space distance can also contribute to low integration.
26	Goodwin and Piggott (2001), USA	Spatial market integration in the presence of threshold effects	American Journal of Agricultural Economics	7	Co-integration, Threshold Autoregression (TAR)		Results confirmed that thresholds are essential for market integration, but adjustments aftershocks may take days. Threshold models suggest faster adjustments for deviations from equilibrium.
27	Lloyd et al. (2001), UK	The impact of food scares on price adjustment in the UK beef market	Agricultural Economics	9	Co-integration		Results proved that Market power increases upstream sector price changes due to retail demand changes, causing food safety concerns to widen marketing margins between stages.
28	Thompson et al. (2002), Germany	Spatial market efficiency and policy regime change: seemingly unrelated error correction model estimation	American Journal of Agricultural Economics	24	Seemingly Unrelated Regression- Augmented Dickey-Fuller (SURADF), Error Correction Model (ECM)		The paper argues that SURADF is more efficient than traditional models, demonstrating efficient spatial markets and conformity to one price law, and market liberalization reforms in the EU.
29	Park et al. (2002), China	Market emergence and transition: arbitrage, transaction costs, and autarky in China's grain markets	American Journal of Agricultural Economics	8	Parity Bounds Model (PBM)		The paper reveals that trade restrictions do not explain the uneven market development pattern over time, instead, infrastructure bottlenecks, managerial incentive reforms, and production specialization policies are key factors affecting market performance.
30	Barrett and Li (2002), USA	Distinguishing between equilibrium and integration in spatial price analysis	American Journal of Agricultural Economics	7	Extended PBM		The study found that Pacific soybean meal markets maintain competitive equilibrium and tradability despite intermittent trade flows, indicating their functioning well.
31	Penzhorn, N., & Arndt, C. (2002) Mozambique	Maize markets in Mozambique: testing for market integration	Agrekon	6	Parity Bounds Model (PBM)		The study uses the PBM model to analyze market integration between Maputo and Chimoio maize markets in Mozambique, finding significant integration (74.87%) and non-integration (22.58%).
32	Madhusudan Ghosh (2010), India	Spatial Integration of Wheat Markets in India: Evidence from Cointegration Tests	Oxford Development Studies	19	Co-integration		The study examines India's wheat markets' integration, revealing long-term spatial integration and stable price relationships across regions, but not strictly adhering to the "law of one price".
33	Rashid (2004), Uganda	Spatial integration of maize markets in post-liberalized Uganda	Journal of African Economies	3	Co-integration, Vector Auto Regression (VAR) Model		The study indicates improved spatial price responsiveness in Ugandan maize markets, but northern districts still lack integration with central region markets and show increased interdependence among markets.

34	Getnet et al. (2005), Ethiopia	Modelling spatial price transmission in the grain markets of Ethiopia with an application of ARDL approach to white teff	Agricultural Economics	1	Co-integration, Autoregressive Lag (ARDL)	Distributed	The study reveals that white teff wholesale price significantly influences local producer prices, suggesting that government interventions can improve marketing margins and grain market performance post-liberalization.
35	Bojnec and Peter (2005), Slovenia	Vertical market integration and competition: the meat sector in Slovenia	Agricultural and food science	11	Co-integration		The paper confirms long-term market integration in the meat chain and price adjustment speed, highlighting the role of supply side processing and marketing factors in retail meat price determination, and the need for efficiency improvements in Slovenian food markets.
36	Araujo (2005), Burkina Faso	Devaluation and cattle markets integration in Burkina Faso	Journal of African Economies	7	Switching Regression	Regime	The study reveals that the devaluation of the CFA franc positively impacted local cattle market integration by increasing marginal trade profit and cattle prices, primarily due to real exchange rate depreciation and labor-intensive transaction costs.
37	Lohano, H. D., & Mari, F. M. (2005), Pakistan	Spatial Price Linkages in Regional Onion Markets of Pakistan	Journal of Agriculture and Social Sciences	35	Auto Regressive Model		The study found that stable onion prices in Pakistan, indicating spatial integration and competitiveness. It also highlights strong correlations between prices across markets.
38	Lutz et al. (2006b), Vietnam	Rice market integration in the Mekong River Delta	Economics of Transition	4	Vector Error Correction Model (VECM)		The results show that strong correlation between price patterns in the Mekong River Delta and other regions, with state-owned food companies indirectly influencing the outcome, and still dominating export transactions.
39	Lutz et al. (2006a), Benin	Maize market liberalisation in Benin: a case of hysteresis	Journal of African Economies	15	Co-integration		The article suggests that Benin's liberalization policies did not significantly impact maize market integration, suggesting the need for more effective policy instruments to enhance market competitiveness.
40	Alemu, Z. G., & Biacuana, G. R. (2006), Mozambique	Measuring Market Integration in Mozambican Maize Markets: A Threshold Vector Error Correction Approach	International Association of Agricultural Economists Conference, Gold Coast, Australia	12	Threshold Vector Error Correction Model (TVECM)		The study explores the correlation between market integration, transaction costs, and infrastructure in Mozambique's maize markets, revealing that higher costs correlate with distance and poor road conditions.
41	Van Campenhout (2007), Tanzania	Modelling trends in food market integration: method and an application to Tanzanian maize markets	Food Policy	12	Parity Bounds Model (PBM), Threshold Autoregressive (TAR)		This study reveals that transaction costs decreased over time in all six market pairs, particularly in Tanzania, which could aid government officials in enhancing market performance and ensuring food security.

Beyond Borders: A Review of Food Market Integration and SDGs Wagan, G. H. et al., (2024)

42	Negassa and Myers (2007), Ethiopia	Estimating policy effects on spatial market efficiency: an extension to the parity bounds model	American Journal of Agricultural Economics	7	Extended PBM		The study found that grain marketing reforms in Ethiopia have improved spatial efficiency in some markets, worsened it in others, and had negligible effect on Ethiopian grain markets, emphasizing the need for adjustment periods.
43	Awokuse (2007), China	Market reforms, spatial price dynamics, and China's rice market integration: a causal analysis with directed acyclic graphs	Journal of Agricultural and Resource Economics	1	Co-integration, Acyclic Graphs	Directed	The study confirms strong market linkages after early 1990s reforms in China, but linkages decrease as government reverses policies, indicating effective agricultural market policy reforms.
44	Asche et al. (2007), Norway	Price transmission and market integration: vertical and horizontal price linkages for salmon	Applied Economics	7	Co-integration, VAR, ECM		The study reveals high price transmission and market integration in Norwegian and UK salmon supply chains, leading to a close link at the export level. Measures at any point in the supply chain affect producer prices, benefiting UK producers.
45	Tahir Mukhtar and Muhammad Tariq Javed (2007), Pakistan	Price Integration in Wholesale Maize Markets in Pakistan	The Pakistan development review	11	Co-integration, Correction Model (ECM)	Error	The study analyzes monthly wholesale maize prices across different markets, finding a 0.83 pricing impact due to changes in spatial integration in Lahore and Hyderabad.
46	M. Ben-Kaabia and Jose. M. Gil (2007), Spain	Asymmetric price transmission in the Spanish lamb sector	European Review of Agricultural Economics	7	Threshold Vector Error Correction Model (TVECM)		This paper investigates the non-linear adjustment of prices. The results show that, overall, price transmission is perfect, and any supply or demand shocks are fully transmitted along the marketing chain. In the short run, price adjustments are asymmetric and reveal a demand-pull transmission mechanism. On the other hand, retailers benefit from any shock, whether positive or negative, that affects supply or demand conditions.
47	Cirera and Arndt (2008), Mozambique	Measuring the impact of road rehabilitation on spatial market efficiency in maize markets in Mozambique	Agricultural Economics	1	Parity Bounds Model (PBM)		The study indicates a positive impact of road rehabilitation on spatial efficiency, but the robustness is questioned due to significant fuel price increases.
48	Baulch et al. (2008), Vietnam	The spatial integration of paddy markets in Vietnam	Journal of Agricultural Economics	14	Ravallion Model		There was evidence of both threshold effects and stronger market integration within the Red and Mekong River deltas. These results suggest that national level policies cannot be relied upon to stabilise or support paddy prices

									in Vietnam.
49	Khalid Mushtaq, Abdul Gafoor, and Maula Dad (2008), Pakistan	Apple Market Integration: Implications for Sustainable Agricultural Development	Lahore Journal of Economics	10	Vector Error Correction Model (VECM)				The paper concludes that Pakistan's apple markets are highly competitive and interconnected, with Quetta being the most influential, achieving long-term equilibrium within 2-3 months without government intervention.
50	Tahir Mukhtiar, Muhammad Tariq Javed (2008), Pakistan	Market integration in wholesale maize markets in Pakistan	Regional and Sectoral Economic Studies	11	Co-integration, Error Correction Model (ECM)				The research indicates that maize markets in Pakistan are well-integrated, with Lahore dominating price formation in the other three markets, indicating efficient and significant price correlations.
51	Moser et al. (2009), Madagascar	Spatial integration at multiple scales: rice markets in Madagascar	Agricultural Economics	1	Parity Bounds Model (PBM)				The study finds that Malagasy rice markets are well-integrated at the sub-regional level, with efficient and competitive local trade, but not as competitive at national and regional levels.
52	Brummer et al. (2009), Ukraine	The impact of market and policy instability on price transmission between wheat and flour in Ukraine	European Review of Agricultural Economics	5	Markov-Switching VECM				The analysis reveals four regimes coincided with political and economic events in Ukraine, with a high uncertainty regime and discretionary policy interventions potentially amplifying instability.
53	Nguyen Thi Duong Nga and Flordeliza A. Lantican (2009), Vietnam	Spatial Integration of Rice Markets in Vietnam	Asian Journal of Agriculture and Development	8	Vector Auto Regressive (VAR) Model				The study examines Vietnam's domestic rice market integration, finding limited integration with only nine out of thirty-four markets forming a common market, despite functional price transmission.
54	Iregui and Otero (2010), Colombia	Testing the law of one price in food markets: evidence for Colombia using disaggregated data	Empirical Economics	9	Vector Auto Regressive (VAR) Model				The study indicates that market integration benefits populations and economies with similar economic sizes, and that perishable food products tend to have faster convergence of price differentials to exogenous shocks.
55	Serra et al. (2010), Brazil	Price volatility in ethanol markets	European Review of Agricultural Economics	8	Co-integration, MGARCH				Results show that Ethanol producers use crude oil as a substitute, causing inflation in the Brazilian renewable fuels market. Sugar price increases ethanol price volatility, strengthening the link between food and energy markets.
56	Sanogo and Maliki Amadou (2010), Nepal	Rice market integration and food security in Nepal: the role of cross-border trade with India	Food Policy	6	Threshold Autoregressive Model (TAR)				Results show that traders' price response behavior aligns with an asymmetric price adjustment mechanism, with Nepalese coarse rice prices responding faster to shocks from India.

Beyond Borders: A Review of Food Market Integration and SDGs Wagan, G. H. et al., (2024)

57	Marks (2010), Indonesia	Unity or diversity? On the integration and efficiency of rice markets in Indonesia, c. 1920–2006	Explorations in Economic History	58	Co-integration	The paper reveals that Indonesia's rice markets were efficient during its colonial period, but disintegrated post-World War II, returning to a national integrated economy in the late 1970s.
58	Ge et al. (2010), China	Cotton market integration and the impact of China's new exchange rate regime	Agricultural Economics	5	ARCH	The study reveals a long-term co-integration relationship between the US Intercontinental Exchange and China's Zhengzhou Commodity Exchange, influenced by China's recent exchange rate reform and bilateral cotton trade liberalization.
59	Cudjoe et al. (2010), Ghana	Local impacts of a global crisis: food price transmission, consumer welfare and poverty in Ghana	Food Policy	2	Threshold Co-integration	This paper shows that a strong correlation between domestic grain product prices and global market prices, with high price transmission between regional producer and consumer markets, particularly in northern Ghana.
60	Mohammad Ismail Hossain abd Wim Verbeke (2010), Bangladesh	Evaluation of Rice Markets Integration in Bangladesh	Lahore Journal of Economics	3	Vector Error Model (VECM)	Correction The study evaluates the integration of Bangladesh's regional rice markets, revealing moderate overall integration, weak short-term integration, and no single dominant market influencing all others.
61	Rico Ihle, Stephan von Cramon-Taubadel, and Zorya, Sergiy (2010), Eastern Africa	Country and border effects in the transmission of maize prices in Eastern Africa: evidence from a semi-parametric regression model	3rd African Association of Agricultural Economists (AAAE) and 48th Agricultural Economists Association of South Africa (AEASA) Conference, Cape Town, South Africa	9	Vector Error Model (VECM)	Correction The study reveals weaker market integration in Tanzanian pairs with multiple markets, stronger in Nairobi-based pairs, and suggests non-parametric methods for understanding PT and market integration.
62	Wouter Zant (2010), Malawi	Market Integration with Transaction Costs in Developing Country Staple Food Markets: The Case of the Malawi Maize market	3rd African Association of Agricultural Economists (AAAE) and 48th Agricultural Economists	11	Parity Bounds Model (PBM)	The study examines market integration and transaction costs in Malawi's domestic maize trade, revealing improved integration during food shortages and decline during surplus periods, indicating underdeveloped trading infrastructure.

			Association of South Africa (AEASA) Conference, Cape Town, South Africa				
63	Ihle, Rico, von Cramon-Taubadel, and Stephan (2010), Tanzania	Price Dynamics in Tanzanian Maize Markets: Insights from a Semiparametric Cointegration Model	3rd African Association of Agricultural Economists (AAAE) and 48th Agricultural Economists Association of South Africa (AEASA) Conference, Cape Town, South Africa	9	Semi parametric Error-correction (SPVECM)	Vector Model	The study uses SPVECM to analyze maize price transmission across five Tanzanian markets, revealing a long-run equilibrium relationship and convergent short-run deviations.
64	Rico Ihle and Stephan von Cramon-Taubadel (2010), Tanzania	Semi parametric Evidence on the Nature of Price Transmission in Tanzanian Maize Markets	Agricultural & Applied Economics, Association 2010 AAEA, CAES, & WAEA Joint Annual Meeting, Denver, Colorado	9	Semi parametric Error-correction (SPVECM)	Vector Model	The study uses a semi parametric vector error-correction model (SPVECM) to analyze the spatial transmission of maize prices across five Tanzanian markets. Results show a long-run equilibrium relationship, with short-run deviations converging back to equilibrium. The SPVECM is a valuable tool for investigating price dynamics and effectively captures the spatial transmission mechanism for maize prices in Tanzania.
65	Serra et al. (2011), USA	Nonlinearities in the U.S. corn-ethanol-oil-gasoline price system	Agricultural Economics	19	Smooth Transition Error Correction (TPVECM)	Vector Model	The study shows significant long-term cointegrating correlations between food and energy prices, as well as substantial Granger-causal relationships.
66	Ghoshray and Ghosh (2011), India	How integrated is the Indian wheat market?	Journal of Development Studies	19	Multivariate- TAR		Results show that wheat price signals within states are transmitted asymmetrically over time, indicating price differentials may respond to poor market knowledge dissemination and high transaction costs.
67	Baquedano et al. (2011), Mali and Nicaragua	World market integration for export and food crops in developing countries: a case study for Mali and Nicaragua	Agricultural Economics	10	Generalized ECM		Nicaragua exhibits higher integration and price transmission in world markets for its main exports, coffee, and rice compared to Mali.

Beyond Borders: A Review of Food Market Integration and SDGs Wagan, G. H. et al., (2024)

68	Hussain, Babar (2011), Pakistan	Testing the law of one price in gram markets of Pakistan	Munich RePEc (MPRA)	Personal Archive	16	Vector Auto regression (VAR) Model	The study examines Pakistan's gram markets, revealing co-integration and long-term equilibrium, indicating strong competitiveness. It suggests government involvement in information and infrastructure development.
69	Hussain, Babar and Fahim, Muhammad Amir and Sajid, Muhammad (2011), Pakistan	Testing the law of one price in gram, mash and masoor markets of Pakistan	Munich RePEc (MPRA)	Personal Archive	20	Co-integration	The study reveals Pakistan's pulse markets are efficient and competitive, indicating that government initiatives to improve infrastructure and reduce transportation costs could enhance market integration.
70	Asche et al. (2012), Tanzania	Testing the central market hypothesis: a multivariate analysis of Tanzanian sorghum markets	Agricultural Economics		10	Co-integration	The paper examines the central market hypothesis using a Johansen cointegration test, revealing two Tanzanian sorghum market regions with central markets for non-stationary prices.
71	Alam et al. (2012), Bangladesh	The dynamic relationships between world and domestic prices of rice under the regime of agricultural trade liberalization in Bangladesh	Journal of the Asia Pacific Economy		10	Co-integration, Vector Error Correction Model (VECM)	This paper highlights the significant reliance of the Bangladeshi rice market on the global rice market and emphasizes the need for effective policies to ensure food security.
72	Zant (2012), Malawi	How is the liberalization of food markets progressing? Market integration and transaction costs in subsistence economies	World Economic Review	Bank	10	Parity Bounds Model (PBM)	The study reveals significant fluctuations in market regime probabilities, including a decrease in market integration with trade during food shortages, suggesting a modification to Baulch's PBM.
73	Ankamah-Yeboah, Isaac (2012), Ghana	Spatial Price Transmission in the Regional Maize Markets in Ghana	Munich RePEc (MPRA)	Personal Archive	9	Threshold Autoregressive Model (TAR)	The study evaluates regional maize market integration and price transmission dynamics using econometric techniques, revealing short-term and long-term integration, and suggesting policy interventions for improved transportation infrastructure and storage facilities.
74	Henry de-Graff Acquah (2012), Ghana	Threshold Effects and Asymmetric Price Adjustments within the Ghanaian Maize	Journal of Economics and Behavioral Studies		10	Threshold Autoregressive (C-TAR) Consistent, Momentum Threshold Autoregressive (C-MTAR),	The study reveals price asymmetry in Ghana's maize price adjustment process, indicating further research and analysis for other agricultural commodities, while the C-MTAR model confirms price co-integration with threshold

		Market					adjustment.
75	Sekhar (2012), India	Agricultural market integration in India: an analysis of select commodities	Food Policy	21	Gonzalo–Granger Model		The study suggests that reducing trade barriers can improve the integration of commodity markets, with markets with fewer restrictions showing stronger national integration, while those with more stringent restrictions show no integration.
76	Abdul Ghafoor and Manan Aslam (2012), Pakistan	Market integration and price transmission in Rice markets of Pakistan	South Asia Network of Economic Research Institute	10	Johansen Co-integration, Error Correction Mechanism (ECM)		The paper highlights Pakistan's efficient domestic rice markets but suggests policy improvements are needed to improve co-integration between domestic, FOB, and international prices.
77	Amarendra Reddy (2012), India	Market integration of grain legumes in India: The Chickpea Market	SAARC Journal of agriculture	8	Error Correction Model (ECM)		The study examines weak long-term integration of chickpea markets in North India, with terminal markets in Delhi and Doha/Gujarat significantly influencing price discovery.
78	Heman D. Lohano (2012), Pakistan	Measuring Spatial Integration in Tomato and Onion Markets of Pakistan: An Application of Error Correction Model in the Presence of Stationarity	Agricultural & Applied Economics Association's 2012 AAEA Annual Meeting, Seattle, Washington	29	Error Correction Model (ECM)		The study shows steady prices of tomatoes and onions in Pakistan, with long-term market interconnections, with onions showing greater integration due to extended shelf life.
79	Weldesebet (2013), Slovakia	Asymmetric price transmission in the Slovak liquid milk market	Agricultural Economics	18	Co-integration, Error Correction Model (ECM)		The study found co-integration of wholesale and producer prices, retail, and producer prices, but no co-integration between wholesale and retail prices, indicating asymmetric price transmission in Slovakia's liquid milk market.
80	Götz et al. (2013), Russia and Ukraine	Wheat export restrictions and domestic market effects in Russia and Ukraine during the food crisis	Food Policy	4	Markov-Switching VECM		Results show that Export restrictions temporarily reduced Russian and Ukrainian domestic market integration in world wheat markets, pushing growers' prices below equilibrium, disconnected domestic markets, and increasing market instability.
81	Abdul Ghafoor, Manan Aslam and Wasim Akhter (2013), Pakistan	Testing the Degree of Market Integration and Price Transmission in Major Onion Markets of Pakistan	Global and Policy Journal of International Relations	10	Johansen Co-integration, Error Correction Model (ECM)		The study found effective price signals exchange in Pakistan's onion marketplaces, with granger-caused price creation in Lahore market. Adjustment process took three to four months.

Beyond Borders: A Review of Food Market Integration and SDGs Wagan, G. H. et al., (2024)

82	Adetola I. Adeoti, Olufemi Popoola and Adeyinka B. Aremu (2013), Nigeria	The Effect of Market Liberalization on Maize Price Distributions in Nigeria	Journal of Agricultural Science	18	Autoregressive Conditional Heteroskedastic in Mean (ARCH-M)	The analysis proves that market liberalization in Nigeria has led to increased maize prices and regional variances, requiring policymakers to maintain stability through supply control, subsidized inputs, and knowledge dissemination.
83	Ianchovichina et al. (2014), Saudi Arabia	How vulnerable are Arab countries to global food price shocks?	Journal of Development Studies	12	Co-integration, Vector Auto Regression (VAR) Model	Findings from this study suggest that international food price shocks impact domestic markets, with estimates aligning with other countries' data, but caution is needed due to differing food basket compositions.
84	García Enríquez et al. (2014), Spain	Spatial integration in the Spanish mackerel market	Journal of Agricultural Economics	12	Co-integration	Results indicate that the Spanish mackerel market lacks long-term integration between its five regional markets, requiring local, regional, and European authorities to implement distinct policies.
85	Bor et al. (2014), Turkey	Asymmetry in farm-retail price transmission in the Turkish fluid milk market	New mediterranean Journal of Economics, Agriculture & Environment	10	Co-integration, Error Correction Model (ECM)	Results suggest that the Turkish milk market exhibits positive price asymmetry and significant market power, indicating that retailers can exert considerable influence.
86	Baquadano and Liefert (2014), USA	Market integration and price transmission in consumer markets of developing countries	Food Policy	5	Co-integration, Single Equation Error Correction Model (SEECM)	The study indicates that developing countries' consumer markets are interconnected with global markets, with slow transmission of changes and equilibrium aftershocks.
87	Minten et al. (2014), Ethiopia	Structural transformation of cereal markets in Ethiopia	Journal of Development Studies	11	Threshold Autoregressive Model (TAR)	Results show that Ethiopia's cereal markets have experienced significant improvements in the last decade, including strong economic growth, urbanization, improved infrastructure, and adoption of modern inputs, leading to better spatial price integration and reduced-price differences.
88	Jonas Luckmann, Rico Ihle, Ulrich Kleinwechter & Harald Grethe (2014), Vietnam	World market integration of Vietnamese rice markets during the 2008 food price crisis	Food Security	3	Vector Error Correction Model (VECM)	The study reveals Vietnamese rice markets are highly integrated, despite export regulations reducing prices in the primary region, and most exhibit significant cointegration.

89	Alufohal, G.O and A.A Ayantoyinbo (2014), Nigeria	Co-integration Analysis of Maize Marketing in Osun State, Nigeria	NISEB Journal	11	Vector Error Correction Model (VECM)	The study found a significant correlation between white maize pricing trends in Osun's rural and urban markets, with rural markets leading in price creation and transmission.
90	Lovemore Neyango (2014), Malawi	Maize Price Differences and Evidence of Spatial Integration in Malawi	International food policy research institute	9	Vector Auto Regressive (VAR) Model, Error Correction Model (ECM)	The study reveals low short-term integration in maize markets due to poor price information transmission, while nine out of fifteen market pairs show long-term integration due to poor road connections and border markets.
91	Akpan, Sunday Brownson Udoh, Edet Joshua Udo, Udo Jacob (2014), Nigeria	Monthly price analysis of Cowpea (Beans) and Maize in Akwa Ibom State, Southern Nigeria	International Journal of Food and Agricultural Economics	9	Vector Error Correction Model (VECM)	The study found exponential growth in cowpea and maize prices, indicating co-movement and perfect market integration. Government funding and reducing externality costs could improve information transmission.
92	Adesola Adebola Ikudayisi and Kabir Kayode Salman (2014), Nigeria	Spatial integration of Maize market in Nigeria – A vector error correction model	International Journal of Food and Agricultural Economics	10	Vector Error Correction Model (VECM)	The study explores spatial price linkages and market efficiency in the maize market, revealing a unique equilibrium between producers and consumers, suggesting improvements in price information dissemination.
93	Babatunde O. Abidoye, Marlene Labuschagne (2014), South Africa	The Transmission of World Maize Price to South African Maize Market: A Threshold Cointegration Approach	Agricultural economics	11	Threshold Co-integration	The study reveals that global price variations do not impact local markets, and global prices take longer to reach South African pricing when trading at export parity.
94	Burhan Ahmad and Ole Gjolberg (2015), Pakistan	Are Pakistan's Rice Markets Integrated Domestically and With the International Markets?	SAGE Open	17	Vector Error Correction Model (VECM)	The study explores Pakistan's rice market integration, revealing significant domestic and international growth, with the abolition of price support policies in 2002 boosting domestic integration.
95	Umar Ijaz Ahmed, Liu Ying, Muhammad Khalid Bashir, Muhammad Amjed Iqbal, (2015), Pakistan	Spatial price transmission in Pakistan: the case of wheat and price markets	Pakistan Journal of Agricultural Research	9	Vector Error Correction Model (VECM), Co-integration	The study suggests that improving government regulation and infrastructure can improve food security and market efficiency by addressing geographical and transportation disparities in wheat and rice markets.

Beyond Borders: A Review of Food Market Integration and SDGs Wagan, G. H. et al., (2024)

96	Koffi Yovo (2015), Togo	Information Service and Integration of Maize Markets in Togo	Modern Economy	10	Ravallion Model	The study shows that price dissemination does not significantly enhance maize markets in northern or rural areas, recommending improved price information services, more accessible data, and in-depth market player surveys.
97	Francis Srofenyoh (2015), Ghana	Maize Market Integration: A Case Study of Maize Marketing in Ghana	International Journal of Technology and Management Research	11	Co-integration	The study reveals a significant price transmission relationship between Ghanaian maize producers and consumer markets, recommending the Ministry of Food and Agriculture to implement weights, stabilize prices, and enhance data collection facilities.
98	Mattos, Fabio Silveira, Rodrigo L. F. (2015), Brazil	The Effects of Brazilian Second (Winter) Corn Crop on Price Seasonality, Basis Behavior, and Integration to International Market	Proceedings of the NCCC-134 Conference on Applied Commodity Price Analysis, Forecasting, and Market Risk Management in 2015	20	Vector Error Correction Model (VECM)	The study reveals that Brazil's winter maize harvest has enhanced international market integration by modifying seasonality and price, impacting trading, marketing, and risk management strategies.
99	Ndiaye Mactar, Maitre d'Hôtel Elodie, Le Cotty Tristan, (2015), Burkina Faso	Maize Price Volatility, Does Market Remoteness Matter?	World Bank Group Policy Research Working Paper	10	Autoregressive Conditional Heteroskedasticity Model	The study reveals maize price volatility is higher in remote and maize-surplus markets, suggesting road infrastructure and regional integration could reduce volatility, improve food security, and enhance rural development in Burkina Faso.
100	Nelissa Jamora and Stephan von Cramon-Taubadel (2016), Many developing Countries	Transaction cost thresholds in international rice markets	Journal of Agricultural Economics	13	Threshold Vector Error Correction Model (TVECM)	The study highlights that price transmission in global rice trade has decreased since 2008, but increased transaction costs have accelerated due to domestic market interventions and policy responses.
101	Bo Chen and Sayed Saghaian (2016), Thailand, Vietnam, and USA	Market Integration and Price Transmission in the World Rice Export Market	Journal of Agricultural and Resource Economics	14	Threshold Vector Error Correction Model (TVECM), Vector Auto Regressive (VAR)	The study reveals a competitive international rice export market, with Thailand and the US leading prices, while Vietnam adjusts quickly to long-run equilibrium.

102	Tracy Davids, Ferdi Meyer and Patrick Westhoff (2017), South Africa	Impact of trade controls on price transmission between southern African maize markets	Agrekon	12	Autoregressive Distributed Lag (ARDL)	The study shows a long-term relationship between Zimbabwean and Zambian prices under open trade regimes, but no relationship between South African and Zimbabwean prices under trade-controlled scenarios.
103	Rekha Rani, Rakesh Singh, Harshita Tewari, S. K. Singh, and P. K. Singh (2017), India	Integration of major Indian Maize markets: A cointegration analysis	International Journal of Agricultural and Statistical Sciences	12	Johansen Multivariate Co-integration, Vector Error, Correction Model (VECM)	The paper reveals long-term relationships between maize markets, with Mainpuri market adjusting faster than Udaipur, and Honnali market having no causality. Policy measures should improve information dissemination.
104	Moses, Daudu Joyce (2017), Nigeria	Maize Prices and Market Integration in Selected Markets in Gombe State, Nigeria	International Journal of Innovative Agriculture and Biology Research	6	Co-integration, Index of Market Concentration (IMC)	The study found low integration of maize markets in the area, suggesting the need for efficient information flow, access roads, and infrastructural development for improved market performance.
105	Koffi Yovo (2017), Togo	Spatial Price Transmission and Asymmetry in the Togolese Maize Market	American Journal of Economics	16	Asymmetric Error Correction Model (AECM)	The paper reveals that price adjustment in rural markets in Togo is faster than in Lome, primarily due to asymmetric transmission and suggests policy improvements.
106	Mumtaz Ahmed and Naresh Singla (2017), India	Market Integration and Price Transmission in Major Onion Markets of India	Economic Affairs	9	Johansen Co-integration	The study reveals India's onion markets are competitive and efficient, but supply shocks can cause price volatility, suggesting minimal government intervention for price stability.
107	Sajid Karim, Asghar Ali, Abdul Ghafoor, Muhammad Ali Imran, And Nasir Nadeem (2017), Pakistan	Market Integration and Price Transmission in Poultry Products Markets of Punjab, Pakistan	International Review of Management and Business Research	4	Johansen Co-integration	The study reveals India's onion markets are competitive and efficient, but supply shocks can cause price volatility, suggesting minimal government intervention for price stability.
108	Jam Gulam Murtaza Sahito (2017), Pakistan	Market Integration of Wheat in Pakistan	Journal of Agricultural Research	23	Threshold Vector Error Correction Model (TVECM)	The paper highlights a robust long-term relationship between Pakistan's wheat markets, but short-term adjustments to disequilibrium vary. It suggests the need for government infrastructure and information services.

Beyond Borders: A Review of Food Market Integration and SDGs Wagan, G. H. et al., (2024)

109	Burhan Ahmad, Ole Gjølberg and Mubashir Mehdi (2017), Pakistan	Spatial Differences in Rice Price Volatility: A Case Study of Pakistan 1994-2011	The Pakistan development review	17	GARCH Model		The paper reveals that rice volatility in Pakistan's regional markets varies due to market forces, infrastructure, and information flow. Investments in transportation and controlling middlemen's market power could reduce price risk.
110	Rodrigo Valdes Salazar (2018), Mexico	Measuring market integration and pricing efficiency along regional maize-tortilla chains of Mexico	Faculty of Agricultural Sciences of the National University of Cuyo, Argentina	7	Vector Error Correction Model (VECM)		The study reveals Mexico's maize markets are poorly integrated, with prices remaining stagnant. Improving performance requires efficient information flow, access roads, and infrastructural development.
111	Hassanzoy Najibullah Ito Shoichi, Isoda Hroshi, Amekawa Yuichiro (2018) Afganistan	Spatial Market Integration and Price Transmission among High and Low Quality Rice Markets in Afghanistan	Journal of Faculty of Agriculture, Kyushu University	9	Vector Error Correction Model (VECM)	Correction	The study highlights the interconnectedness of high and low-quality rice markets, highlighting market inefficiencies and imperfections, and suggests an integrated approach for improved market functioning and competitiveness.
112	Tomgouani Lanie (2018), Togo	Asymmetric Price Transmission of Rice in Togo	African Development Bank Group	16	Threshold Co-integration		The study reveals that central-local market pairings' prices are co-integrated with low-price transmission elasticities, and local paddy markets adjust asymmetrically to processed rice price changes.
113	Hayat Khan, Sisira Jayasuriya (2018) Pakistan	Vertical Integration and Cross-Country Price Transmission in Pakistan's Agriculture Market	Policy and Institutional Reforms to Improve Horticulture Markets in Pakistan	6	NOVAL		The study reveals Pakistan's marketing system's vertical integration is ineffective, with minimal integration in some markets and spatial price transmission between Pakistan and India affecting fresh fruits, poultry, eggs, and grains markets.
114	Wang G.Y., Si R.X., Li C.X., Zhang G.T., Zhu N.Y. (2018), China	Asymmetric price transmission effect of corn on hog: evidence from China	Agricultural Economics / Zemedelska Ekonomika	15	Smooth Transition Regression (STR) Model		The paper suggests that government policies should be implemented to stabilize the hog market and mitigate the impact of corn price shocks.
115	Bandi Srikanth, K. V. Deshmukh, and S. S. More (2019), India	Market integration of major maize markets in Telangana State	International Journal of Current Microbiology and Applied Sciences	15	Vector Error Correction Model (VECM)	Correction	The study reveals co-integrated maize markets in Telangana, with efficient price transmission and long-term equilibrium. It recommends further improvement in marketing infrastructure and information flow.

116	Toyin Benedict Ajibade, Opeyemi Eyitayo Ayinde, and Tahirou Abdoulaye (2019), Nigeria	Spatial market integration and price information flow in Nigeria markets: The case of Yam	Alanya Akademik Bakış/Alanya Academic Review	1	Vector Auto Regressive (VAR) Model	The paper highlights Nigeria's highly integrated yam markets, highlighting dynamic relationships and responsiveness. It recommends improved infrastructure, commodity association membership, trader-farm gate linkage, and active price seeking behaviors for price stabilization and food affordability.
117	Miranda Svanidze, and Linde Götz (2019), Russia and USA	Spatial market efficiency of grain markets in Russia and global food security: A comparison with the USA	Leibniz Institute of Agricultural Development	5	Threshold Vector Error Correction Model (TVECM)	The paper discusses Nigeria's integrated yam markets, identifying both exogenous and endogenous markets, and suggests improvements in infrastructure, commodity association membership, trader-farm gate linkage, and price seeking behaviors.
118	Miranda Svanidze, Linde Götz, and Dmytro Serebrennikov (2019), Russia	The influence of Russia's 2010/2011 wheat export ban on spatial market integration and transaction costs of grain markets	Applied Economic Perspectives and Policy	7	Threshold Vector Error Correction Model (TVECM)	Results conclude that during the export ban, domestic wheat market integration improved, but post-ban integration returned to pre-ban levels, but increased risk of domestic grain trade led to higher transaction costs.
119	Mahniya Zafar, Naved Hamid, and Fatima Arshad (2020), Pakistan	Are Agricultural Markets in the Punjab Technically Efficient?	Lahore Journal of Economics	7	Vector Auto Regressive (VAR) Model	The study reveals that potato, onion, and mango markets are horizontally and vertically well integrated, with rapid price adjustment, while kinnow and basmati rice markets are vertically integrated.
120	Limon Deb, Yoonsuk Lee, and Sang Hyeon Lee (2020) Bangladesh	Market Integration and Price Transmission in the Vertical Supply Chain of Rice: An Evidence from Bangladesh	Agriculture Journal	12	Vector Error Correction Model (VECM)	The study reveals that Bangladesh's integrated rice markets experience asymmetric and nonlinear price transmission, suggesting policy changes to improve market efficiency and ensure fair prices for producers and consumers.
121	Jan Piter Sinaga, Muhammad Firdaus, Idha Widi Arsanti, and Akhmad Fauzi (2020), Indonesia	Medium rice market integration in Indonesia: Regional disaggregation analysis	International Journal of Social Science and Economic Research	3	Panel Vector Error Correction Model (PVECM)	The paper explores spatial and vertical integration in Indonesia's medium rice markets, recommending policy recommendations for market efficiency and price stabilization.

Beyond Borders: A Review of Food Market Integration and SDGs Wagan, G. H. et al., (2024)

122	Tanvir Khaliq Shami, Sultan Ali Adil, Sarfraz Hassan, and Muhammad Khalid Bashir (2020), Pakistan	Spatial market integration and price transmission in major potato markets of Punjab, Pakistan	Indian Journal of Science and Technology	12	Vector Error Correction Model (VECM), Vector Autoregressive (VAR)	The paper explores spatial and vertical integration in Indonesia's medium rice markets, recommending policy recommendations for market efficiency and price stabilization.
123	Mesay Yami Gurm (2020), Ethiopia	Market Integration and Price Transmission of Maize in Ethiopia	Ethiopian Journal of Agricultural Sciences	13	Asymmetric Error Correction Model (AECM)	The results of this study showed Asymmetric Price Transmission (APT) in Mek'ele and Nekemete, out of fourteen regional maize market pairs with central Addis Ababa maize market.
124	Inong Hasti Yunika, Ratya Anindita, and Putri Budi Setyowati (2020) Indonesia	Market integration of Corn (Zea mays) in Tuban district	Agricultural Socio-Economics Journal	5	Error Correction Model (ECM)	The study shows that the corn market has been integrated in both the long and short term between producers, wholesalers, retailers, and producers and retailers.
125	Alege, A. M., Jirgi, A. J., Likita Tanko, and Ndanitsa, M. A. (2021) Nigeria	Analysis of market integration of Maize in rural and urban markets of Oyo state, Nigeria	Nigerian Journal of Agricultural Economics	11	Index of Market Concentration (IMC)	The study found non-stationary maize price trends, which became stationary after initial differentiation, indicating short-run market integration between rural and urban markets, with both uni-directional and bi-directional causalities.
126	Dennis Otieno (2021), Kenya	Deepening Market Integration in Kenya through Increased maize production	Global Scientific Journal	11	Vector Error Correction Model (VECM)	The paper reveals a long-term relationship between Kenyan maize markets, but slow and inefficient short-term price adjustments. It suggests irrigation can lower maize prices, promote food security, and reduce rural poverty.
127	Mohammed Sanusi Sadiq, Invinder Paul Singh, and Muhammad Makarfi Ahmed, (2021) China, Cambodia, India, Pakistan, Thailand, and USA	Spatial Market Integration of Rice in the World	Turkish Journal of Agricultural Research	51	Vector Error Correction Model (VECM)	The paper highlights the long-term relationship between Kenyan maize markets, suggesting irrigation can lower prices, promote food security, and reduce rural poverty.

128	Ehsanur Rauf Prince, Basanta Kumar Barmon, and Teresa Islam (2022), Bangladesh	An Investigation into the Spatial Rice Market Integration in Bangladesh: Application of Vector Error Correction Approach	Munich Personal RePEc Archive (MPRA)	5	Vector Error Correction Model (VECM)	The paper suggests that Bangladesh's rice markets are moderately integrated but have weak short-term price transmission, recommending government investment in transportation, information delivery, and infrastructure facilities.
129	Mohit Kumar, A. S. Shaikh, and Rohit Kumar Sharma (2022), India	Market Integration and Price Transmission Analysis of Onion in Wholesale Markets of India	Asian Journal of Agricultural Extension, Economics & Sociology	17	Johansen Co-integration	The paper highlights India's onion markets as competitive and well-functioning, suggesting policy improvements such as market information cells, marketing infrastructure, and transportation facilities.
130	Mumtaz Ahmed, Naresh Singla, and Kulwinder Singh (2022), India	Market integration and price transmission in wheat markets of India: a transaction cost approach	Journal of Agribusiness in Developing and Emerging Economies	10	Threshold Vector Error Correction Model (TVECM)	The paper reveals cointegration in wheat market pairs and bidirectional causality, suggesting improving rural infrastructure and connectivity to remove market asymmetries and facilitate price adjustment.
131	Mohammad Jahangir Alam, Andrew M. McKenzie, Ismat Ara Begum, Jeroen Buysse, and Eric J. (2022), Bangladesh	Spatial market integration of rice in Bangladesh in the presence of transaction cost	Agricultural and Food Economics	23	Vector Error Correction Model (VECM)	The paper reveals cointegration in wheat market pairs and bidirectional causality, suggesting improving rural infrastructure and connectivity to remove market asymmetries and facilitate price adjustment.
132	Philly Ramoroka, and Chiedza L. Muchopa (2022), South Africa	Inter-commodity Price Transmission between Maize and Wheat in South Africa	International Journal of Economics and Financial Issues	29	Vector Auto Regressive (VAR) Model	The study reveals a unidirectional correlation between maize and wheat producer prices, suggesting that maize producer prices can predict wheat prices, necessitating wheat policies considering national context and food security.
133	Dejene Gizaw Kidane (2022), Ethiopia	Market integration and price transmission in the regional grain markets in Ethiopia	Journal of Applied Economics	10	Threshold Autoregressive Model (TAR)	The paper reveals Ethiopia's major grain markets are well-integrated, with efficient price transmission, but persistent grain price increases are attributed to supply shocks, exchange rate fluctuations, and world price shocks.

Beyond Borders: A Review of Food Market Integration and SDGs Wagan, G. H. et al., (2024)

134	S. Rani, (2023), Pakistan	Banana market integration and cointegration: Implications for sustainable agricultural developmen	Pakistan Journal of Agriculture, Agricultural Engineering and Veterinary Sciences	40	Johansen Co-integration	The study evaluates market integration and price transmission dynamics in Pakistan's provincial banana markets using cointegration analysis, revealing high integration, long-run equilibrium, and co-movement in Hyderabad.
135	Mehar ul Nissa Rais, Tehmina Mangan, Jam Ghulam Murtaza Sahito, and Hakimzadi Wagan (2023), Pakistan	Market Integration of Wholesale Chilli Prices of Pakistan	Journal of Applied Research and Plant Sciences	19	Vector Error Correction Model (VECM)	The study explores market integration in major Pakistani chilli wholesale markets, revealing strong price linkages between Hyderabad, Lahore, and Quetta, but partial integration in Peshawar due to geographical distance and seasonal factors.
136	M Maheshnath, R Vijaya Kumari, Korabandi Suhasini, and D Srinivasa (2023), India	An econometric analysis of price transmission between major markets of maize in India	The Pharma Innovation Journal	6	Vector Error Correction Model (VECM)	The study employs advanced econometric techniques to assess price integration and causality in major Indian maize markets, revealing high integration, bidirectional and unidirectional causal relationships, and varying price adjustments towards equilibrium.
137	Charles Uchendu, Nasiru Murtala, and Usman Haruna (2023), Nigeria	Analysis of spatial price variation in Maize and Sorghum marketing in Kaduna state, Nigeria	Journal of Agripreneurship and Sustainable Development	16	Vector Auto regression (VAR) Model	The study investigates spatial integration and price transmission in maize and sorghum markets in Kaduna State, Nigeria, revealing a long-term equilibrium relationship between prices in Saminaka.
138	Hongqiang Yan, Barry K. Goodwin, and Mehmet Caner (2023), US, Argentina, and Ukraine	Investigating Integration and Exchange Rate Pass-Through in World Maize Markets Using Inferential LASSO Methods	Agricultural and Applied Economics Association Annual Meeting	20	LASSO	The study uses a novel declassified LASSO method to analyze market integration and exchange rate pass-through in global corn markets, revealing significant relationships between domestic and global economic factors and price linkages.

139	Denis Waiswa, (2023), Kenya, Tanzania, and Uganda	Spatial Price Transmission of Maize Grain Prices among Markets in Kenya, Tanzania, and Uganda: Evidence from the Nonlinear ARDL Model	East African Scholars Journal of Economics, Business and Management	8	NARDL Model	The study investigates spatial price transmission of maize prices in Uganda, Tanzania, and Kenya, finding no significant correlation between wholesale maize prices, but a 1% increase in Kenya led to a significant increase.
140	Denis Waiswa, and Fahri Yavuz (2023), Uganda	Market integration and asymmetric price transmission in selected domestic markets for major staple foods in Uganda	Future Business Journal	9	NARDL Model	The study analyzes Uganda's staple food price dynamics using econometric models, revealing a one-way causality from wholesale to retail prices, suggesting well-integrated markets.

FINDINGS AND DISCUSSION

The findings of the literature review on food market integration are provided in this section. A thorough bibliography of the research given in Table 1, which is arranged in accordance with the variables shown in Figure 1. This section offers a thorough examination of the research done in this field by elaborating on each variable and the associated conclusions from the review.

Econometric tools and techniques

This section provides the econometric tools and techniques used for data analysis in the selected studies. The predominant econometric methods found in the reviewed publications are co-integration tests, and unit root tests. These tools assess causal links among market prices, long-term equilibrium connections, and stationarity. Added techniques comprise impulse response functions, VAR models, and error correction mechanisms for inter-market dynamics. Nevertheless, a deeper investigation uncovers distinctions between commonly employed and less common approaches.

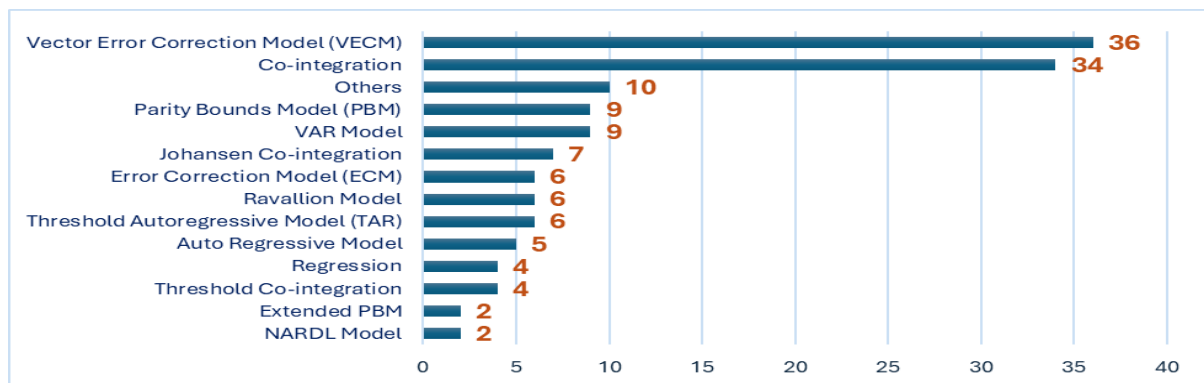
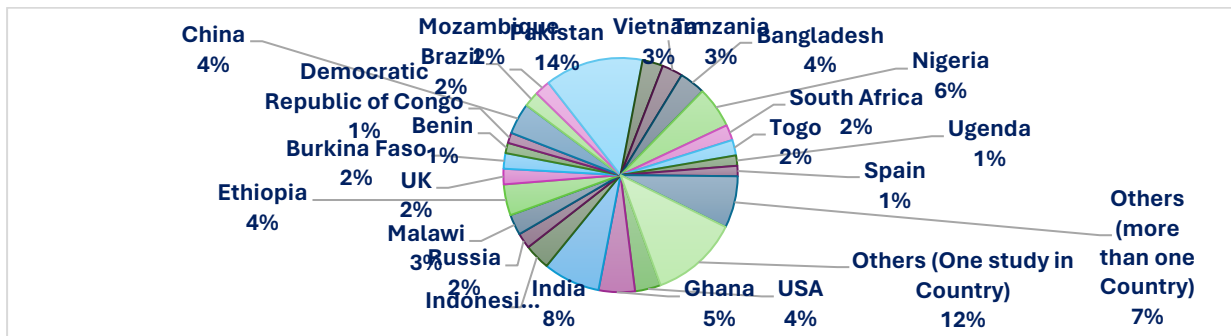


Figure-2.
Econometric methods used in the selected papers for data analysis.

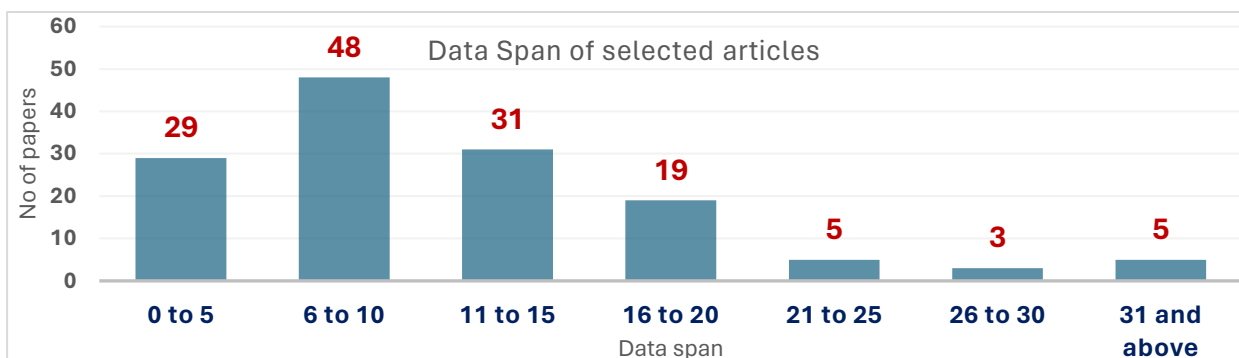
Figure 2 demonstrates the frequency of different econometric methods used for data analysis in the examined studies. When evaluating food market integration, mostly the research employed vector error correction, which was followed by co-integration analysis, parity boundaries model, VAR model, Ravallion, error correction model, Johansen co-integration, and regression. This also displays less common econometric techniques such as the extended PBM, Markov-switching NARDL model, unrelated regression error, and more. These tools were also employed in autoregressive and threshold co-integration analyses. Every method has its own limitations. Unit root tests and cointegration are the basic tests to check data properties. Error correction mechanism is used to analyze the short run dynamics or speed of adjustment if the long run relationship is established. But, error correction, although widely used especially in local studies, is a basic model. The relationship of prices of different markets is a complex phenomenon and mostly non-linear. Among non-linear models Parity bond and threshold models have band limitation. Further, most of the methods do not consider transaction costs.

**Figure 3.****Year-wise study classification**

The study on food market integration has been steadily increasing since the mid-2000s, as seen in Figure 3 above, with most studies conducted between 2010 and 2023. The fact that more than 60% of the examined material comes from this time limit indicates a notable increase in scholarly interest over the previous ten years, particularly in less developed countries is focused. This pattern demonstrates the growing interest in research on the integration of the food sector.

**Figure 4.****Summary of country wise distribution of studies**

The geographic distribution of research on food market integration, as shown in Figure 4, highlights a focus on developing countries. Pakistan (14%), India (8%), Indonesia, Bangladesh (4%) and Vietnam (3%) respectively, while African nations such as Nigeria (6%), Ghana (5%), Tanzania and Ethiopia (3% each) Mozambique, South Africa, and Togo (2%) respectively make up a substantial share of the research (140). Interestingly, advanced economies like the USA and China each contribute (4%), Russia, Brazil, and UK (2%) respectively. The remaining 14% of studies originate from various countries, including European nations like Germany, Slovenia, and Norway.

**Figure-5.**

Summary of the years included in the sample data range.

Figure-5 presents further information on the duration of sample data analyzed in each study. Most studies (48) examined samples ranging from 6 to 10 years. Out of the 140 studies, 31 used datasets spanning 11 to 15 years. 19 studies covered periods of 16 to 20 years, while 29 studies had durations of under 5 years. Moreover, 5 studies analyzed datasets covering 21 to 25 years. Additionally, three investigations included datasets spanning twenty to thirty years. Lastly, the remaining 5 studies incorporated datasets exceeding 30 years.

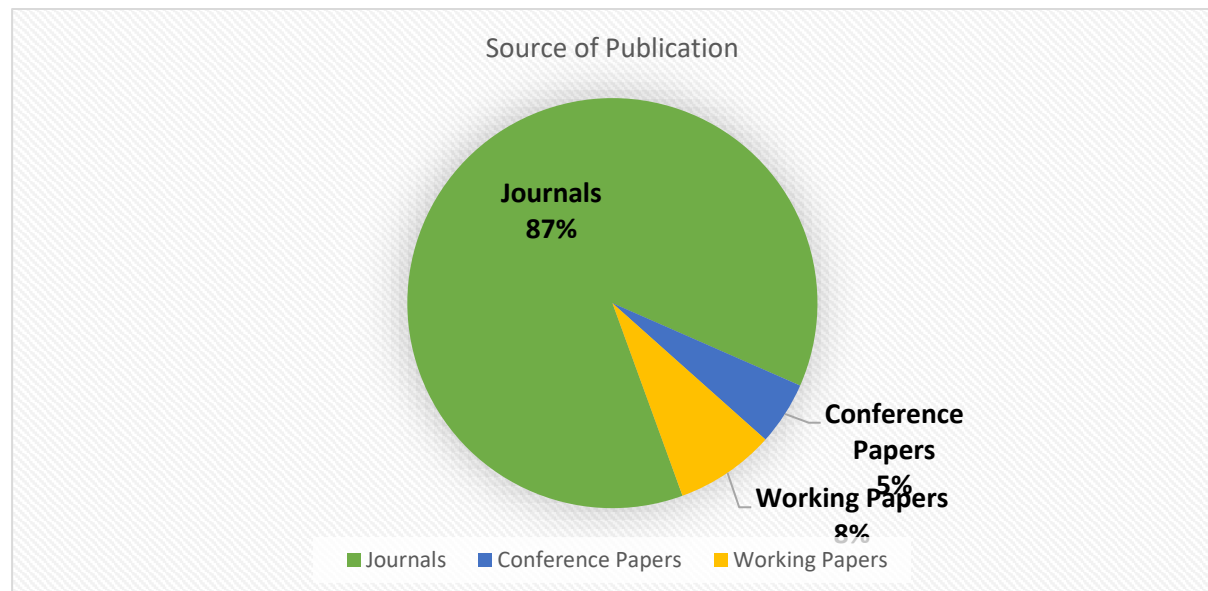


Figure-6.

Publication sources of selected research articles.

Tables 6 and Figure 6 provide an overview of the sources used for the research papers. Academic journals with peer review comprised 87% of the total number of publications. Working papers 8%, and conference papers 5% of the sources are included in the research. Most of the selected research papers are from reputed ISI Index Journal a few examples are Agricultural Economics, 13 Papers, American Journal of Agricultural Economics 10 papers, Food Policy 06, Journal of Development Studies 07, European Review of Agricultural Economics 05. and some other reputed journals of the field.

CONCLUSIONS AND FUTURE RESEARCH

This review provides a comprehensive analysis of the current state of food market integration research. It aims to categorize the existing body of literature and find potential avenues for future exploration. From 1990 to 2023, there was a notable and consistent increase in research focusing on food market integration. Over this period, scholars, academics, and researchers across various disciplines and regions explored the complex dynamics of food market integration, investigating its impact on global trade patterns, agricultural methods, and consumer behavior. It is also observed that developed countries i.e., USA, China, Russia, UK are more advanced in research in market integration, but mostly we have focused the research work has been done in developing nations like Pakistan, India, Nigeria, Ethiopia, Ghana, Bangladesh, and Indonesia because of the following reasons, first due to non-accessibility of journals and second for the exploring market integration in the developing nation. Therefore, more of the countries are tried to cover in this review, however, still there is huge gape

to cover in future studies on food market integration.

Both qualitative and quantitative analysis of the food market integration is used in this paper. We utilized 140 research papers, offering a comprehensive collection of literature in the field of food market integration. Current research on food market integration looks at the end results, often borrowing methods from food markets. This needs to expand future studies should explore deeper into the factors driving integration and how these findings can be applied in real-world situations. To achieve this, researchers need to use novel approaches, by using longer periods of data to track how integration changes over time and employing more advanced analytical tools to capture the complexities of food markets. By incorporating these improvements, future research can generate more reliable and practical insights into food market integration. It is also recommended that transportation/transaction costs must be considered as a variable of change in one way or the other, such as: non-linear modelling or band of no-adjustment.

The results of the study also implies that Sustainability and the pursuit of the Sustainable Development Goals (SDGs) are increasingly central to discussions on food market integration, as integrated markets play a pivotal role in addressing global challenges of food security, economic inequality, and environmental sustainability. Strategic alignment with the SDGs, particularly SDG 2 (Zero Hunger) and SDG 12 (Responsible Consumption and Production), is essential for fostering sustainable food systems that not only support economic growth but also ensure environmental stewardship and social inclusivity. Integrated food markets enhance the efficiency of food distribution and resource use, which can significantly reduce food waste—a key target of SDG 12. By streamlining the flow of food products from producers to consumers across different regions, integrated markets can help minimize losses in the supply chain, promote the use of sustainable agricultural practices, and support local economies. This contributes to more resilient food systems that are better equipped to withstand climate-related shocks and stressors, supporting SDG 13 (Climate Action).

DECLARATIONS

Acknowledgement: We appreciate the generous support from all the supervisors and their different affiliations.

Funding: No funding body in the public, private, or nonprofit sectors provided a particular grant for this research.

Availability of data and material: In the approach, the data sources for the variables are stated.

Authors' contributions: Each author participated equally to the creation of this work.

Conflicts of Interests: The authors declare no conflict of interest.

Consent to Participate: Yes

Consent for publication and Ethical approval: Because this study does not include human or animal data, ethical approval is not required for publication. All authors have given their consent.

REFERENCES

- Abdulai, A. (2000). Spatial price transmission and asymmetry in the Ghanaian maize market. *Journal of Development Economics*, 63(2), 327-349.
- Abidoye, B. O., & Labuschagne, M. (2014). The transmission of world maize price to South African maize market: a threshold cointegration approach. *Agricultural economics*, 45(4), 501-512.

Beyond Borders: A Review of Food Market Integration and SDGs Wagan, G. H. et al., (2024)

- Acquah, H. D. G. (2012). Threshold Effects and Asymmetric Price Adjustments within the Ghanaian Maize Market. *Journal of Economics and Behavioral Studies*, 4(9), 497-504.
- Adekambi, S. A., Ingenbleek, P. T., & van Trijp, H. C. (2019). The role of market learning in the market integration of African smallholders. *African journal of business Management*, 13(18), 613-621. <https://doi.org/10.5897/ajbm2019.88122>
- Adeoti, A. I., Popoola, O., & Aremu, A. B. (2013). The effect of market Liberalization on Maize price Distributions in Nigeria. *Journal of Agricultural Science*, 5(6), 36-40.
- Ahmad, B., & Gjølberg, O. (2015). Are Pakistan's rice markets integrated domestically and with the international markets? *SAGE Open*, 5(3), 2158244015596791.
- Ahmad, B., Gjølberg, O., & Mehdi, M. (2017). Spatial Differences in Rice Price Volatility: A Case Study of Pakistan 1994-2011. *The Pakistan Development Review*, 265-289.
- Ahmed, M., & Singla, N. (2017). Market integration and price transmission in major onion markets of India. *Economic Affairs*, 62(3), 405-417.
- Ahmed, M., Singla, N., & Singh, K. (2022). Market integration and price transmission in wheat markets of India: A transaction cost approach. *Journal of Agribusiness in Developing and Emerging Economies*.
- Ahmed, U. I., Ying Liu, Y. L., Bashir, M. K., Iqbal, M. A., Muhammad Rizwan, M. R., Iqbal, M. M., & Aftab Nazeer, A. N. (2015). Spatial price transmission in Pakistan: the case of wheat and rice markets. *Pakistan Journal of Agricultural Research*, 28(4), 254-262.
- Ajibade, T. B., Ayinde, O. E., & Abdoulaye, T. (2019). Spatial market integration and price information flow in Nigeria markets: The case of Yam. *Alanya Akademik Bakış/Alanya Academic Review*, 3(2), 181-200.
- Akpan, S. B., Udoh, E. J., & Udo, U. J. (2014). Monthly price analysis of cowpea (beans) and maize in Akwa Ibom State, Southern Nigeria. *International Journal of Food and Agricultural Economics (IJFAEC)*, 2(2), 65-86.
- Alam, M. J., Buysse, J., McKenzie, A. M., Begum, I. A., Wailes, E. J., & Van Huylenbroeck, G. (2012). The dynamic relationships between world and domestic prices of rice under the regime of agricultural trade liberalization in Bangladesh. *Journal of the Asia Pacific economy*, 17(1), 113-126.
- Alam, M. J., McKenzie, A. M., Begum, I. A., Buysse, J., Wailes, E. J., Sarkar, M. A. R., & Van Huylenbroeck, G. (2022). Spatial market integration of rice in Bangladesh in the presence of transaction cost. *Agricultural and Food Economics*, 10(1), 20.
- Alderman, H. (1993). Intercommodity price transmittal: analysis of food markets in Ghana. *Oxford Bulletin of Economics and Statistics*, 55(1), 43-64.
- Alege, A. M., Jirgi, A. J., Tanko, L., & Ndanitsa, M. A. (2021). Analysis of market integration of Maize in rural and urban markets of Oyo State, Nigeria. *Nigerian Journal of Agricultural Economics*, 8(1), 16-25.
- Alemu, Z. G., & Biacuana, G. R. (2006). Measuring market integration in Mozambican maize markets: A threshold vector error correction approach.
- Alexander, C., & Wyeth, J. (1994). Cointegration and market integration: An application to the Indonesian rice market. *The Journal of Development Studies*, 30(2), 303-334.
- Alufohai, G. O., & Ayantoyinbo, A. A. (2018). Co-integration Analysis of Maize Marketing in Osun State, Nigeria. *NISEB Journal*, 14(3).
- Ankamah-Yeboah, I. (2012). Spatial price transmission in the regional maize markets in Ghana. Munich Personal RePEc Archive, MPRA Paper No. 49720, posted 11 Sep 2013.
- Araujo, C., Araujo Bonjean, C., Combes, J. L., & Motel, P. C. (2005). Devaluation and cattle market integration in Burkina Faso. *Journal of African Economies*, 14(3), 359-384.
- Asche, F., Gjølberg, O., & Guttormsen, A. G. (2012). Testing the central market hypothesis: a multivariate analysis of Tanzanian sorghum markets. *Agricultural Economics*, 43(1), 115-123.
- Asche, F., Jaffry, S., & Hartmann, J. (2007). Price transmission and market integration: vertical and horizontal price linkages for salmon. *Applied Economics*, 39(19), 2535-2545.
- Awokuse, T. O. (2007). Market reforms, spatial price dynamics, and China's rice market integration: a causal analysis with directed acyclic graphs. *Journal of Agricultural and Resource Economics*, 58-76.

- Badiane, O., & Shively, G. E. (1998). Spatial integration, transport costs, and the response of local prices to policy changes in Ghana. *Journal of development economics*, 56(2), 411-431.
- Baquedaño, F. G., & Liefert, W. M. (2014). Market integration and price transmission in consumer markets of developing countries. *Food policy*, 44, 103-114.
- Baquedaño, F. G., Liefert, W., & Shapouri, S. (2011). World market integration for export and food crops in developing countries: a case study for Mali and Nicaragua. *Agricultural Economics*, 42(5), 619-630.
- Barrett, C. B., & Li, J. R. (2002). Distinguishing between equilibrium and integration in spatial price analysis. *American Journal of Agricultural Economics*, 84(2), 292-307.
- Bassolet, B., & Lutz, C. (1999). Information service and integration of cereal markets in Burkina Faso. *Journal of African Economies*, 8(1), 31-51.
- Baulch, B. (1997a). Testing for food market integration revisited. *The Journal of Development Studies*, 33(4), 512-534.
- Baulch, B. (1997b). Transfer costs, spatial arbitrage, and testing for food market integration. *American Journal of Agricultural Economics*, 79(2), 477-487.
- Baulch, B., Hansen, H., Trung, L. D., & Tam, T. N. M. (2008). The spatial integration of paddy markets in Vietnam. *Journal of Agricultural Economics*, 59(2), 271-295.
- Ben-Kaabia, M., & Gil, J. M. (2007). Asymmetric price transmission in the Spanish lamb sector. *European Review of Agricultural Economics*, 34(1), 53-80.
- Blyn, G. (1973). Price series correlation as a measure of market integration. *Indian Journal of Agricultural Economics*, 28(2):56-59
- Bojnec, S., & Peter, G. (2005). Vertical market integration and competition: the meat sector in Slovenia. *Agricultural and food science*, 14(3), 236-249.
- Bor, Ö. Ismihan, M., & Bayaner, A. (2014). Asymmetry in farm-retail price transmission in the Turkish fluid milk market. *New Medit*, 13(2), 2-8.
- Brümmer, B., von Cramon-Taubadel, S., & Zorya, S. (2009). The impact of market and policy instability on price transmission between wheat and flour in Ukraine. *European review of agricultural economics*, 36(2), 203-230.
- Chen, B., & Saghaian, S. (2016). Market integration and price transmission in the world rice export markets. *Journal of Agricultural and Resource Economics*, 444-457.
- Cirera, X., & Arndt, C. (2008). Measuring the impact of road rehabilitation on spatial market efficiency in maize markets in Mozambique. *Agricultural Economics*, 39(1), 17-28.
- Cudjoe, G., Breisinger, C., & Diao, X. (2010). Local impacts of a global crisis: Food price transmission, consumer welfare and poverty in Ghana. *Food policy*, 35(4), 294-302.
- Cummings, R. W. J. (1967). *Pricing Efficiency in the Indian Wheat Market*. Impex, New Dehli.
- Dahlgran, R. A., & Blank, S. C. (1992). Evaluating the integration of contiguous discontinuous markets. *American Journal of Agricultural Economics*, 74(2), 469-479.
- Dauids, T., Meyer, F., & Westhoff, P. (2017). Impact of trade controls on price transmission between southern African maize markets. *Agrekon*, 56(3), 223-232.
- Deb, L., Lee, Y., & Lee, S. H. (2020). Market integration and price transmission in the vertical supply chain of rice: An evidence from Bangladesh. *Agriculture*, 10(7), 271.
- Dercon, S. (1995). On market integration and liberalisation: Method and application to Ethiopia. *The Journal of Development Studies*, 32(1), 112-143.
- Domínguez-Barreto, A. P., Farah, I., López-Olmedo, N., Pérez-Ferrer, C., Ramírez-Toscano, Y., arrientos-Gutiérrez, T., & Stern, D. (2023). Trends in food and beverage purchases in informal, mixed, and formal food outlets in Mexico: Enigh 1994-2020. *Frontiers in Public Health*. <https://doi.org/10.3389/fpubh.2023.11519166>
- Fafchamps, M., & Gavian, S. (1996). The spatial integration of livestock markets in Niger. *Journal of African Economies*, 5(3), 366-405.
- Faminow, M. D., & Benson, B. L. (1990). Integration of spatial markets. *American Journal of Agricultural Economics*, 72(1), 49-62.
- Farruk, M. O. (1970). The structure and performance of the rice marketing system in East Pakistan. USAID Employment and Income Distribution Project, Occasional Paper 31-34, State College of Agriculture, Department of Agricultural Economics, Cornell University, Ithaca, New York.

Beyond Borders: A Review of Food Market Integration and SDGs Wagan, G. H. et al., (2024)

- García-Enríquez, J., Hualde, J., Arteché, J., & Murillas-Maza, A. (2014). Spatial integration in the Spanish mackerel market. *Journal of Agricultural Economics*, 65(1), 234-256.
- Gardner, B. L., & Brooks, K. M. (1994). Food prices and market integration in Russia: 1992-93. *American Journal of Agricultural Economics*, 76(3), 641-646.
- Ge, Y., Wang, H. H., & Ahn, S. K. (2010). Cotton market integration and the impact of China's new exchange rate regime. *Agricultural Economics*, 41(5), 443-451.
- Getnet, K., Verbeke, W., & Viaene, J. (2005). Modeling spatial price transmission in the grain markets of Ethiopia with an application of ARDL approach to white teff. *Agricultural economics*, 33, 491-502.
- Ghafoor, A. B. D. U. L., & Aslam, M. A. N. A. N. A. N. (2012). Market integration and price transmission in rice markets of Pakistan. *South Asia Network of Economic Research Institute, Working Paper*, (12).
- Ghafoor, A., Aslam, M., & Akhter, W. (2013). Testing the Degree of Market Integration and Price Transmission in Major Onion Markets of Pakistan. *Global and Policy Journal of International Relations*, 1(02).
- Ghosh, M. (2003). Spatial Integration of Wheat Markets in India: Evidence from Cointegration Tests. *Oxford Development Studies*, 31(2), 159-171. <https://doi.org/10.1080/13600810307426>
- Ghosh, M. (2010). Spatial price linkages in regional food grain markets in India. *The Journal of Applied Economic Research*, 4(4):495-516.
- Ghoshray, A., & Ghosh, M. (2011). How integrated is the Indian wheat market? *Journal of Development Studies*, 47(10), 1574-1594.
- Goletti, F., & Babu, S. (1994). Market liberalization and integration of maize markets in Malawi. *Agricultural Economics*, 11(2-3), 311-324.
- Gonzalez-Rivera, G., & Helfand, S. M. (2001). The extent, pattern, and degree of market integration: A multivariate approach for the Brazilian rice market. *American Journal of Agricultural Economics*, 83(3), 576-592.
- Goodwin, B. K., & Piggott, N. E. (2001). Spatial market integration in the presence of threshold effects. *American Journal of Agricultural Economics*, 83(2), 302-317.
- Götz, L., Glauben, T., & Brümmer, B. (2013). Wheat export restrictions and domestic market effects in Russia and Ukraine during the food crisis. *Food Policy*, 38, 214-226.
- Hassanzoy, N., Ito, S., Isoda, H., & Amekawa, Y. (2017). Spatial market integration and price transmission among high and low quality rice markets in Afghanistan. *Journal of Faculty of Agriculture, Kyushu University*, 62(1), 263-282
- Hossain, M. I., & Verbeke, W. (2010). Evaluation of Rice Markets Integration in Bangladesh. *Lahore Journal of Economics*, 15(2).
- Hussain, B. (2011). Testing the law of one price in gram markets of Pakistan. Munich Personal RePEc Archive, MPRA Paper No. 30708, posted 04. May 2011.
- Hussain, B., Fahim, M. A., & Sajid, M. (2011). Testing the law of one price in gram, mash and masoor markets of Pakistan. Munich Personal RePEc Archive, MPRA Paper No. 31679, posted 18 Jun 2011.
- Ianchovichina, E. I., Loening, J. L., & Wood, C. A. (2014). How vulnerable are Arab countries to global food price shocks? *The Journal of Development Studies*, 50(9), 1302-1319.
- Ihle, R., & von Cramon-Taubadel, S. (2010). Semiparametric Evidence on the Nature of Price Transmission in Tanzanian Maize Markets. *Agricultural & Applied Economics Association 2010 AAEA, CAES, & WAEA Joint Annual Meeting, Denver, Colorado, July 25-27*.
- Ihle, R., von Cramon-Taubadel, S., & Zorya, S. (2010). Country and border effects in the transmission of maize prices in Eastern Africa: evidence from a semi-parametric regression model. *3rd African Association of Agricultural Economists (AAAE) and 48th Agricultural Economists Association of South Africa (AEASA) Conference, Cape Town, South Africa, September 19-23, 2010*.
- Ikudayisi, A. A., & Salman, K. K. (2014). Spatial integration of maize market in Nigeria—a vector error correction model. *International Journal of Food and Agricultural Economics (IJFAEC)*, 2(3), 71-80.
- Iregui, A. M., & Otero, J. (2011). Testing the law of one price in food markets: evidence for

- Colombia using disaggregated data. *Empirical Economics*, 40, 269-284.
- Ismet, M., Barkley, A. P., & Llewelyn, R. V. (1998). Government intervention and market integration in Indonesian rice markets. *Agricultural Economics*, 19(3), 283-295.
- Jamora, N., & von Cramon-Taubadel, S. (2016). Transaction cost thresholds in international rice markets. *Journal of Agricultural Economics*, 67(2), 292-307.
- Jhala, M. L. (1984). Restructuring edible oil and oil economy of India. *Economic and Political Weekly*, 19(39):A111-128.
- Jiang, Q., Ghosh, D., Steinbach, S., & Stowers, K. C. (2023). A longitudinal assessment of racial and ethnic inequities in food environment exposure and retail market concentration. *Public Health Nutrition*. <https://doi.org/10.1017/s1368980023001179>.
- Karim, S., Ali, A., Ghafoor, A., Imran, M. A., & Nadeem, N. (2017). Market integration and price transmission in poultry products markets of Punjab, Pakistan. *International Review of Management and Business Research*, 6(3), 1016-1025.
- Khan, H., & Jayasuriya, S. (2018). Vertical Integration and Cross-Country Price Transmission in Pakistan's Agriculture Market. *Policy and Institutional Reforms to Improve Horticulture Markets in Pakistan*. WORKING PAPER 07/18.
- Kidane, D. G. (2022). Market integration and price transmission in the regional grain markets in Ethiopia. *Journal of Applied Economics*, 25(1), 784-801.
- Kramskyi, S., Tapakahob, & Antonyuk, P. (2022). Organizational forms of integration of agricultural markets to global value chains. *Ekonomični Inovacii*. [https://doi.org/10.31520/ei.2022.24.1\(82\).90-98](https://doi.org/10.31520/ei.2022.24.1(82).90-98)
- Kuiper, W.E., Lutz, C.H., & Tilburg, A.V. (1999). Testing for the Law of One Price and Identifying Price-Leading Markets: An Application to Corn Markets in Benin. *Journal of Regional Science*, 39, 713-738.
- Kumar, M., Shaikh, A. S., & Sharma, R. K. (2022). Market integration and price transmission analysis of onion in wholesale markets of India. *Asian Journal of Agricultural Extension, Economics & Sociology*, 40(12), 164-71.
- Lanie, T. (2018). Asymetric Price Transmission of Rice in Togo. *African Development Bank Group*. Working Paper Series (No. 306).
- Li, L. M. (2000). Integration and disintegration in north China's grain markets, 1738-1911. *The Journal of Economic History*, 60(3), 665-699.
- Lloyd, T., McCorriston, S., Morgan, C. W., & Rayner, A. J. (2001). The impact of food scares on price adjustment in the UK beef market. *Agricultural Economics*, 25(2-3), 347-357.
- Lohano, H. D., & Mari, F. M. (2005). Spatial price linkages in regional onion markets of Pakistan. *Journal of Agriculture and Social Sciences*, 1(4), 318-321.
- Lohano, H. D., & Mari, F. M. (2012). Measuring spatial integration in tomato and onion markets of Pakistan: An application of error correction model in the presence of stationarity. *Agricultural & Applied Economics Association's 2012 AAEA Annual Meeting, Seattle, Washington, August 12-14, 2012*
- Loy, J. P., & Weaver, R. D. (1998). Inflation and relative price volatility in Russian food markets. *European Review of Agricultural Economics*, 25(3), 373-394.
- Luckmann, J., Ihle, R., Kleinwechter, U., & Grethe, H. (2015). World market integration of Vietnamese rice markets during the 2008 food price crisis. *Food security*, 7, 143-157.
- Lutz, C., Kuiper, W. E., & van Tilburg, A. (2006). Maize market liberalisation in Benin: a case of hysteresis. *Journal of African Economies*, 16(1), 102-133.
- Lutz, C., Praagman, C., & Thanh Duc Hai, L. (2006). Rice market integration in the Mekong River Delta 1: The transition to market rules in the domestic food market in Vietnam. *Economics of Transition*, 14(3), 517-546.
- Maheshnath, M., Kumari, R. V., Suhasini, K., Reddy, D. S., & Meena, A. (2023). An econometric analysis of price transmission between major markets of maize in India. *The Pharma Innovation Journal*, 12(4), 300-305.
- Marks, D. (2010). Unity or diversity? On the integration and efficiency of rice markets in Indonesia, c. 1920-2006. *Explorations in Economic History*, 47(3), 310-324.
- Mattos, F., and R. L. F. Silveira. 2015. "The Effects of Brazilian Second (winter) Corn Crop on Price Seasonality, Basis Behavior and Integration to International Market." *Proceedings of the NCCC-134 Conference on Applied Commodity Price Analysis, Forecasting, and Market*

- Risk Management. St. Louis, Missouri.
- Mechri, A., Hanisch, M., & Hänke, H. (2023). The transformative value chain: rethinking food system interventions. *Frontiers in Sustainable Food Systems*. <https://doi.org/10.3389/fsufs.2023.1149054>.
- Minten, B., & Kyle, S. (1999). The effect of distance and road quality on food collection, marketing margins, and traders' wages: evidence from the former Zaire. *Journal of Development Economics*, 60(2), 467-495.
- Minten, B., & Kyle, S. (2000). Retail margins, price transmission and price asymmetry in urban food markets: The case of Kinshasa (Zaire). *Journal of African Economies*, 9(1), 1-23.
- Minten, B., Stifel, D., & Tamru, S. (2014tr). Structural transformation of cereal markets in Ethiopia. *Journal of Development Studies*, 50(5), 611-629.
- Moctar, N., d'Hôtel Elodie, M., & Tristan, L. C. (2015). Maize price volatility: does market remoteness matter? World Bank Policy Research Working Paper No. 7202.
- Moser, C., Barrett, C., & Minten, B. (2009). Spatial integration at multiple scales: rice markets in Madagascar. *Agricultural Economics*, 40(3), 281-294.
- Moses, D. J. (2017). Maize Prices and Market Integration in Selected Markets in Gombe State, Nigeria. *International Journal of Innovative Agriculture and Biology Research*, 5(3), 18-22.
- Muharam, H., Mawardi, W., Arfinto, E. D., & Najmudin, N. (2019). Volatility spillovers under difference in the degree of market integration: Evidence from the selected Asian and Eastern European stock markets. *Journal of International Studies*. <https://doi.org/10.14254/2071-8330.2019/12-1/9>
- Mukhtar, T., & Javed, M. T. (2007). Price integration in wholesale maize markets in Pakistan. *The Pakistan development review*, 1075-1084.
- Mukhtar, T., & Javed, M. T. (2008). Market integration in wholesale maize markets in Pakistan. *Regional and Sectoral Economic Studies*, 8(2), 85-98.
- Mushtaq, K., Gafoor, A., & Dad, M.E. (2008). Apple Market Integration: Implications for Sustainable Agricultural Development. *Lahore Journal of Economics*, 13, 129-138.
- Negassa, A., & Myers, R. J. (2007). Estimating policy effects on spatial market efficiency: An extension to the parity bounds model. *American Journal of Agricultural Economics*, 89(2), 338-352.
- Nga, N. T. D., & Lantican, F. A. (2009). Spatial integration of rice markets in Vietnam. *Asian Journal of Agriculture and Development*, 6(1), 13-28.
- Nyongo, L. (2014). Maize price differences and evidence of spatial integration in Malawi: The case of selected markets (Vol. 3). *International Food Policy Research Institute*.
- Otieno, D. (2021). Deepening Market Integration in Kenya through Increased maize production. *Global Scientific Journal*, 9(6), 1477-1498.
- Palaskas, T. B., & Crowe, T. J. (1996). Testing for price transmission with seasonally integrated producer and consumer price series from agriculture. *European Review of Agricultural Economics*, 23(4), 473-486.
- Palaskas, T. B., & Hariss-White, B. (1993). Testing market integration: New approaches with case material from the West Bengal food economy. *The Journal of Development Studies*, 30(1), 1-57.
- Park, A., Jin, H., Rozelle, S., & Huang, J. (2002). Market emergence and transition: arbitrage, transaction costs, and autarky in China's grain markets. *American Journal of Agricultural Economics*, 84(1), 67-82.
- Pavithra, K. N., & Gaddi, G. M. (2022). Price Volatility and Transmission: A case study of paddy and redgram markets in Karnataka. *Economic Affairs*, 67(2), 143-152. <https://doi.org/10.46852/0424-2513.2.2022.23>.
- Penzhorn, N., & Arndt, C. (2002). Maize markets in Mozambique: testing for market integration. *Agrekon*, 41(2), 146-159.
- Prince, E. R., Barmon, B. K., & Islam, T. (2022). An Investigation into the Spatial Rice Market Integration in Bangladesh: Application of Vector Error Correction Approach. *Munich Personal RePEc Archive (MPRA)*, Available at SSRN 4325164.
- Rais, M. U. N., Mangan, T., Sahito, J. G. M., Wagan, H., Qureshi, N. A., Khushk, G. M., & Mirjat, Z.

- H. (2023). Market Integration of Wholesale Chilli Prices of Pakistan. *Journal of Applied Research in Plant Sciences*, 4(01), 529-535.
- Ramoroka, P., & Muchopa, C. L. (2022). Inter-commodity Price Transmission between Maize and Wheat in South Africa. *International Journal of Economics and Financial Issues*, 12(5), 57.
- Rani, R., Singh, R., Tewari, H., Singh, S. K., & Singh, P. K. (2017). Integration of major Indian maize markets: a cointegration analysis. *International Journal of Agricultural and Statistical Sciences*, 13(2), 601-606.
- Rani, S. (2023). Banana market integration and cointegration: implications for sustainable agricultural development. *Pakistan Journal of Agriculture, Agricultural Engineering and Veterinary Sciences*, 39(1), 63-66.
- Rashid, S. (2004). Spatial Integration of Maize Markets in Post-liberalised Uganda. *Journal of African Economies*, 13, 102-133.
- Reddy, A. (2012). Market integration of grain legumes in India: The case of the chickpea market., *SAARC Journal of Agriculture*, 10(2), 11-29.
- Sadiq, S., Singh, I. P., & Ahmed, M. M. (2021). Spatial Market Integration of Rice in the World. *Türkiye Tarımsal Araştırmalar Dergisi/Turkish Journal of Agricultural Research*, 8(1), 56-74.
- Sahito, J. G. M. (2017). Market integration of wheat in Pakistan. *Journal of Agricultural Research* (03681157), 55(3).
- Salazar, R. V. (2018). Measuring market integration and pricing efficiency along regional maize-tortilla chains of Mexico. *Revista de la Facultad de Ciencias Agrarias UNCuyo/ Faculty of Agricultural Sciences of the National University of Cuyo, Argentina*, 50(2), 279-292.
- Sanogo, I., & Amadou, M. M. (2010). Rice market integration and food security in Nepal: The role of cross-border trade with India. *Food Policy*, 35(4), 312-322.
- Sekhar, C. S. C. (2012). Agricultural market integration in India: An analysis of select commodities. *Food Policy*, 37(3), 309-322.
- Serra, T., Zilberman, D., & Gil, J. (2011). Price volatility in ethanol markets. *European review of agricultural economics*, 38(2), 259-280.
- Serra, T., Zilberman, D., Gil, J. M., & Goodwin, B. K. (2011). Nonlinearities in the US corn-ethanol-oil-gasoline price system. *Agricultural Economics*, 42(1), 35-45.
- Shami, T. K., Adil, S. A., Hassan, S., & Bashir, M. K. (2020). Spatial market integration and price transmission in major potato markets of Punjab, Pakistan. *Indian Journal of Science and Technology*, 13(23), 2328-2335.
- Sharma, A. & Seth, N. 2012. Literature review of stock market integration: a global perspective. *Qualitative Research in Financial Markets*, 4, 84-122.
- Sinaga, J., Firdaus, M., Arsanti, I., & Fauzi, A. (2020). Medium rice market integration in Indonesia: Regional disaggregation analysis. *International Journal of Social Science and Economic Research*, 5(9), 2480-2502.
- Srikanth, B., Deshmukh, K. V., & More, S. S. (2019). Market integration of major maize markets in Telangana State. *International Journal of Current Microbiology and Applied Sciences*, 8(12), 1583-1591.
- Srofenyoh, F. (2015). Maize market integration: a case study of Maize Marketing in Ghana. *International Journal of Technology and Management Research*, 1(4), 1-11.
- Svanidze, M., & Götz, L. J. (2019). Spatial market efficiency of grain markets in Russia and global food security: A comparison with the USA. *Leibniz Institute of Agriculture Development*, Discussion Paper. (No. 187).
- Svanidze, M., Götz, L., & Serebrennikov, D. (2022). The influence of Russia's 2010/2011 wheat export ban on spatial market integration and transaction costs of grain markets. *Applied Economic Perspectives and Policy*, 44(2), 1083-1099.
- Thompson, S. R., Sul, D., & Bohl, M. T. (2002). Spatial market efficiency and policy regime change: Seemingly unrelated error correction model estimation. *American Journal of Agricultural Economics*, 84(4), 1042-1053.
- Tiffin, R., & Dawson, P. J. (2000). Structural breaks, co-integration and the farm-retail price spread for lamb. *Applied economics*, 32(10), 1281-1286.
- Uchendu, C., Murtala, N., & Haruna, U. (2023). Analysis of spatial price variation in Maize and Sorghum marketing in Kaduna State, Nigeria. *Journal of Agripreneurship and*

- Van Campenhout, B. (2007). Modelling trends in food market integration: Method and an application to Tanzanian maize markets. *Food policy*, 32(1), 112-127.
- Waiswa, D. (2023). Spatial price transmission of maize grain prices among markets in Kenya, Tanzania, and Uganda: evidence from the nonlinear ARDL model. *East African Scholars Journal of Economics, Business and Management*, 6, 43-55.
- Wang, G., Si, R., Li, C., Zhang, G., & Zhu, N. (2018). Asymmetric price transmission effect of corn on hog: evidence from China. *Agricultural Economics/Zemedelska Ekonomika*, 64(4).
- Weldesensbet, T. (2013). Asymmetric price transmission in the Slovak liquid milk market. *Agricultural Economics/Zemedelska Ekonomika*, 59(11).
- White, R., & Gleason, C. (2022). Global human-edible nutrient supplies, their sources, and correlations with agricultural environmental impact. *Scientific Reports*. <https://doi.org/10.1038/s41598-022-21135-1>
- Yami, M. (2020). Market integration and price transmission of maize in Ethiopia. *Ethiopian Journal of Agricultural Sciences*, 30(4), 277-292.
- Yan, H., Goodwin, B. K., & Caner, M. (2023). Investigating Integration and Exchange Rate Pass-Through in World Maize Markets Using Inferential LASSO Methods. *Agricultural & Applied Economics Association Annual Meeting*, Washington DC; July 23-25, 2023.
- Yovo, K. (2015). Information Service and Integration of Maize Markets in Togo. *Modern Economy*, 6(02), 259-274.
- Yovo, K. (2017). Spatial Price Transmission and Asymmetry in the Togolese Maize Market. *American Journal of Economics*, 7(2), 76-87.
- Yunika, I. H., Anindita, R., & Setyowati, P. B. (2020). Market integration of Corn (*Zea mays*) in Tuban district. *Agricultural Socio-Economics Journal*, 20(3), 207-212.
- Zafar, M., Hamid, N., & Arshad, F. (2020). Are Agricultural Markets in the Punjab Technically Efficient? *Lahore Journal of Economics*, 25(1), 89-138.
- Zanias, G. P. (1999). Seasonality and spatial integration in agricultural (product) markets. *Agricultural Economics*, 20(3), 253-262.
- Zant, W. (2010). Market Integration with Transaction Costs in Developing Country Staple Food Markets: The Case of the Malawi Maize market. *3rd African Association of Agricultural Economists (AAAE) and 48th Agricultural Economists Association of South Africa (AEASA) Conference*, Cape Town, South Africa, September 19-23, 2010.
- Zant, W. (2013). How is the liberalization of food markets progressing? Market integration and transaction costs in subsistence economies. *The World Bank Economic Review*, 27(1), 28-54.
- Zhou, Z. Y., Wan, G. H., & Chen, L. B. (2000). Integration of rice markets: the case of southern China. *Contemporary Economic Policy*, 18(1), 95-106.

