ANÁLISIS DE MODELOS DE INTEGRACIÓN PARA LA CADENA DE ABASTECIMIENTO AGROALIMENTARIA BAJO UN ENFOQUE DE COLABORACIÓN Y ECONOMÍA CIRCULAR: UNA REVISIÓN SISTEMÁTICA SEGÚN LAS DIRECTRICES PRISMA

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Trabajo de Investigación presentado como requisito para optar el título de:
ESPECIALISTA EN LOGISTICA DE OPERACIONES

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RESUMEN

El estudio se centra en analizar modelos de integración para mejorar la eficiencia y sostenibilidad en la cadena de abastecimiento agroalimentaria, enfocándose en la colaboración y la economía circular. Para esto, se realizó una revisión sistemática siguiendo las directrices de PRISMA.

Los estudios revisados resaltan la implementación de la economía circular en cadenas de alimentos frescos, la relación positiva entre economía circular y la madurez en cadenas de suministro, y el impacto de los mercados de agricultores en promover prácticas sostenibles y productos locales.

Aunque se reconoce la escasez de literatura en este campo, se destaca la importancia de la colaboración entre actores y estrategias circulares para reducir desperdicios y promover la sostenibilidad. Se enfatiza la necesidad de investigaciones cuantitativas para medir los beneficios precisos de enfoques colaborativos, reflejando el creciente interés de los consumidores por productos sostenibles.

Palabras clave:

Cadena de Abastecimiento Agroalimentaria, Economía Circular, Enfoque Colaborativo, Revisión Sistematizada, Directrices PRISMA.

ABSTRACT

The study focuses on analyzing integration models to enhance efficiency and sustainability in the agri-food supply chain, with a specific emphasis on collaboration and the circular economy. To achieve this, a systematic review was conducted following the PRISMA guidelines.

The reviewed studies highlight the implementation of the circular economy in fresh food chains, the positive relationship between the circular economy and supply chain maturity, and the impact of farmer markets in promoting sustainable practices and local products.

Although the scarcity of literature in this field is acknowledged, the significance of collaboration among stakeholders and circular strategies to reduce waste and promote sustainability is underscored. There is an emphasis on the need for quantitative research to precisely measure the benefits of collaborative approaches, reflecting the growing consumer interest in sustainable products

Key Words:

Agri-food Supply Chain, Circular Economy, Collaborative Approach, Systematic Review, PRISMA Guidelines

REFERENCIAS BIBLIOGRÁFICAS

1. Ali, J., & Kumar, S. (2011). Information and communication technologies (ICTs) and farmers' decision-making across the agricultural supply chain. International Journal of Information Management, 31. sciencedirect. https://doi.org/10.1016/j.ijinfomgt.2010.07.008.
2. Anastasiadis, F., Manikas, I., Apostolidou, I., & Wahbeh, S. (2022). The role of traceability in end-to-end circular agri-food supply chains. Industrial Marketing Management, 104, 196 - 211. sciencedirect. https://doi.org/10.1016/j.indmarman.2022.04.021.
3. Arcese, G., Fortuna, F., & Pasca, M. G. (2023). The sustainability assessments of the supply chain of agri-food products: The integration of socio-economic metrics. Current Opinion in Green and Sustainable Chemistry, 40. sciencedirect. https://doi.org/10.1016/j.cogsc.2023.100782.
4. Arias, C., & Moors, E. (2018). Reducing post-harvest food losses through innovative collaboration: Insights from the Colombian and Mexican avocado supply chains. Journal of Cleaner Production, 199, 1020-1034. ciencedirect. https://doi.org/10.1016/j.jclepro.2018.06.187.
5. Balaji, M., & Arshinder, K. (2016). Modeling the causes of food wastage in Indian perishable food supply chain. Resources, Conservation and Recycling,

114, 153-167. sciencedirect. https://doi.org/10.1016/j.resconrec.2016.07.016.

6. Banco Mundial. (2020). Abordar la pérdida y el desperdicio de alimentos: un problema global con soluciones locales. https://openknowledge.worldbank.org/entities/publication/1564bf5c-ed24-5224-b5d8-93cd62aa3611
7. Belamkar, P. ,., Biswas, S., Baidya, A., Majumder, P., & Kumar Bera, U. (2023). Multi-objective optimization of agro-food supply chain networking problem integrating economic viability and environmental sustainability through type-2 fuzzy-based decision making. Journal of Cleaner Production, 421. https://doi.org/10.1016/j.jclepro.2023.138294.
8. Bhattacharya, A., & Fayezi, S. (2021). Ameliorating food loss and waste in the supply chain through multi-stakeholder collaboration. Industrial Marketing Management, 93(2021), 328 - 343. sciencedirect. https://doi.org/10.1016/j.indmarman.2021.01.009.
9. Bloise, C. (2020). Collaboration in a circular economy: learning from the farmers to reduce food waste. Journal of Enterprise Information Management, 33(4), 769-789. 10.1108/JEIM-02-2019-0062
10. Carissimi, M., Creazza, A., Fontanella, M., & Urbinati, A. (2023). Circular Economy practices enabling Circular Supply Chains: An empirical analysis of 100 SMEs in Italy. Resources, Conservation and Recycling, 198. sciencedirect. https://doi.org/10.1016/j.resconrec.2023.107126.
11. Ciccullo, F., Cagliano, R., Bartezzaghi, G., & Perego, A. (2021). Implementing the circular economy paradigm in the agri-food supply chain: The role of food waste prevention technologies. Resources, Conservation and Recycling, 164. sciencedirect. https://doi.org/10.1016/j.resconrec.2020.105114.
12. Clavijo, N., Triana, L., & Escobar, J. (2023). A hybrid modeling approach for resilient agri-supply network design in emerging countries: Colombian coffee supply chain. Socio-Economic Planning Sciences, 85. sciencedirect. https://doi.org/10.1016/j.seps.2022.101431.
13. Colombo, C., de Oliveira, F., Pereira, C., Lago, A., & Delai, I. (2020). Retail food waste: mapping causes and reduction practices. Journal of Cleaner Production, 256. sciencedirect. https://doi.org/10.1016/j.jclepro.2020.120124.
14. Comisión EAT-Lancet. (2019). Healthy Diets From Sustainable Food Systems. Food Planet Health. Retrieved October 15, 2023, from https://eatforum.org/content/uploads/2019/07/EAT-Lancet_Commission_Summary_Report.pdf
15. Design and Planning of Agri-Food Supply Chains. (2019). In A. A. Kiss, E. Zondervan, R. Lakerveld, & L. Özkan (Eds.), 29th European Symposium on Computer Aided Chemical Engineering (pp. 55 - 60). Elsevier Science. https://doi.org/10.1016/B978-0-12-818634-3.50010-2.
16. Falappa, M. B., Lamy, M., & Vazquez, M. (2020, June 3). De una Economía Lineal a una Circular, en el siglo XXI. Biblioteca Digital UNCUYO. Retrieved October 5, 2023, from https://planificacion.bdigital.uncu.edu.ar/objetos_digitales/14316/falappa-fce.pdf

17. FAO. (2019). El estado mundial de la agricultura y la alimentación (SOFA). FAO. https://www.fao.org/3/ca6030es/ca6030es.pdf
18. Gallego, S., Gallego, D., & García, M. (2023). Sustainability in the agri-food supply chain: a combined digital twin and simulation approach for farmers. Procedia Computer Science, 217, 1280-1295. sciencedirect. https://doi.org/10.1016/j.procs.2022.12.326.
19. Ganeshkumar, C., Pachayappan 2 , G. Madanmohan 3, M., & Madanmohan, G. (2017). Gestión de la cadena de suministro agroalimentaria: revisión de la literatura. Gestión Inteligente de la Información, 9(2). Scientific Research. 10.4236/iim.2017.92004
20. Gholian-Jouybari, F., Hajiaghaei-Keshteli, M., Bavar, A., Bavar, A., & Mosallanezhad, B. (2023). A design of a circular closed-loop agri-food supply chain network—A case study of the soybean industry. Journal of Industrial Information Integration, 36. sciencedirect. https://doi.org/10.1016/j.jii.2023.100530.
21. Gholian-Jouybari, F., Hajiaghaei-Keshteli, M., Bavar, A., Bavar, A., & Mosallanezhad, B. (2023). A Design of Integrated Circular Agri-food Supply Chain Network; A Case Study of the Soybean Industry. ournal of Industrial Information Integration. https://doi.org/10.1016/j.jii.2023.100530.
22. Güher Tan, H. (2022). Revealing the circularities in farmers' market networked infrastructure of Western Anatolia. European Planning Studies, 30, 1311 - 1332. Taylor & Francis Online. https://doi.org/10.1080/09654313.2021.1960278
23. Guo, Y., Chen, T., Boulaksil, Y., Xiao, L., & Allaoui, H. (2023). Collaborative Planning of Multi-tier Sustainable Supply Chains: A Reinforcement Learning Enhanced Heuristic Approach. Computers & Industrial Engineering. sciencedirect. https://doi.org/10.1016/j.cie.2023.109669.
24. Hamidoğlu, A. (2023). A game-theoretical approach on the construction of a novel agri-food supply chain model supported by the government. Expert Systems with Applications, 237, Parte A. sciencedirect. https://doi.org/10.1016/j.eswa.2023.121353.
25. Hamidoğlu, A. (2024). A game-theoretical approach on the construction of a novel agri-food supply chain model supported by the government. Expert Systems with Applications, 237 parte A. sciencedirect. https://doi.org/10.1016/j.eswa.2023.121353.
26. Hudnurkar, M., Jakhar, S., & Rathod, U. (2014). Factors Affecting Collaboration in Supply Chain: A Literature Review. Procedia - Social and Behavioral Sciences, 133. sciencedirect. https://doi.org/10.1016/j.sbspro.2014.04.184.
27. Jiménez, J., & Hernández, S. (2010, 10 06). Marco conceptual de la cadena de suministro: un nuevo enfoque logístico. Instituto Mexicano del Transporte. Retrieved October 19, 2023, from http://www.imt.mx/archivos/Publicaciones/PublicacionTecnica/pt215.pdf
28. Kiss, A. A., Zondervan, E., Lakerveld, R., & Özkan, L. (Eds.). (2019). 29th European Symposium on Computer Aided Chemical Engineering. Elsevier Science. https://doi.org/10.1016/B978-0-12-818634-3.50010-2.

29. Krishnan, R., Yen, P., Agarwal, R., Arshinder, K., & Bajada, C. (2021). Collaborative innovation and sustainability in the food supply chain- evidence from farmer producer organisations. Resources, Conservation and Recycling, 168. sciencedirect. https://doi.org/10.1016/j.resconrec.2020.105253.
30. Kumar, A., & Agrawal, S. (2023). Challenges and opportunities for agri-fresh food supply chain management in India. Computers and Electronics in Agriculture, 212. sciencedirect. https://doi.org/10.1016/j.compag.2023.108161.
31. Kusumowardani, N., Tjahjono, B., Lazell, J., Bek, D., Theodorakopoulos, N., Andrikopoulos, P., & Priadi, C. R. (2022). A circular capability framework to address food waste and losses in the agri-food supply chain: The antecedents, principles and outcomes of circular economy. Journal of Business Research, 142. sciencedirect. https://doi.org/10.1016/j.jbusres.2021.12.020.
32. Kusumowardani, N., Tjahjono, B., Lazell, J., Bek, D., Theodorakopoulos, N., Andrikopoulos, P., & Rianti, C. (2022). A circular capability framework to address food waste and losses in the agri-food supply chain: The antecedents, principles and outcomes of circular economy. Journal of Business Research, 142, 17-31. sciencedirect. https://doi.org/10.1016/j.jbusres.2021.12.020.
33. Magalhães, V., Ferreira, L., & Silva, C. (2021). Causes and mitigation strategies of food loss and waste: A systematic literature review and framework development. Sustainable Production and Consumption, 28, 1580-1599. sciencedirect. https://doi.org/10.1016/j.spc.2021.08.004.
34. Magalhães, V., Ferreira, L., & Silva, C. (2021). Using a methodological approach to model causes of food loss and waste in fruit and vegetable supply chains. Journal of Cleaner Production, 283. sciencedirect. https://doi.org/10.1016/j.jclepro.2020.124574.
35. McDougall, N., Wagner, B., & MacBryde, J. (2022). Competitive benefits & incentivisation at internal, supply chain & societal level circular operations in UK agri-food SMEs. Journal of Business Research, 144. sciencedirect. https://doi.org/10.1016/j.jbusres.2022.02.060.
36. McDougall, N., Wagner, B., & MacBryde, J. (2022). Competitive benefits & incentivisation at internal, supply chain & societal level circular operations in UK agri-food SMEs. Journal of Business Research, 144. sciencedirect. https://doi.org/10.1016/j.jbusres.2022.02.060.
37. Moola, S., Munn, Z., Tufanaru, C., Aromataris, E., Sears, K., Sfetc, R., Currie, M., Lisy, K., Qureshi, R., Mattis, P., & Mu, P.-F. (2020). Chapter 7: Systematic reviews of etiology and risk. In E. Aromataris & JBI (Eds.), JBI Manual for Evidence Synthesis. JBI.
38. Moreno, C., & Dries, L. (2022). Integrating coordination mechanisms in the sustainability assessment of agri-food chains: From a structured literature review to a comprehensive framework. Ecological Economics, 192. sciencedirect. https://doi.org/10.1016/j.ecolecon.2021.107265.
39. Mousapour, M., Jafari, A., Mohammadnazari, Z., Mahdi, M., & Yazdani, M. (2023). Hybrid machine learning-metaheuristic model for sustainable agri-

food production and supply chain planning under water scarcity. Resources, Environment and Sustainability, 24. sciencedirect. https://doi.org/10.1016/j.resenv.2023.100133.

40. Muñoz Torres, M. J., Fernández Izquierdo, M. Á., Ferrero Ferrero, I., Escrig Olmedo, E., & Rivera Lirio, J. M. (2022). Transitioning the agri-food system. Does closeness mean sustainability? how production and shipping strategies impact socially and environmentally. Comparing Spain, South Africa and U.S. citrus fruit productions. Agroecology and Sustainable Food Systems, 46(4), 540 - 577. scopus. 10.1080/21683565.2022.2039835
41. Naik, G., & Suresh, D.N. (2018). Challenges of creating sustainable agri-retail supply chains. IIMB Management Review, 30(3), 270 - 282. https://www.sciencedirect.com/science/article/pii/S097038961830154X. https://doi.org/10.1016/j.iimb.2018.04.001.
42. Onggo, B., Panadero, J., Corlu, C. G., & Juan, A. A. (2019). Agri-food supply chains with stochastic demands: A multi-period inventory routing problem with perishable products. Simulation Modelling Practice and Theory, 97. sciencedirect. https://doi.org/10.1016/j.simpat.2019.101970.
43. Organización de las Naciones Unidas para la Alimentación y la Agricultura (FAO). (2012). Pérdidas y desperdicio de alimentos en el mundo : alcance, causas y prevención ; estudio realizado para el congreso internacional SAVE FOOD! en Interpack 2011 Düsseldorf, Alemania. Organización de las Naciones Unidas para la Alimentación y la Agricultura.
44. Parlamento Europeo. (2023, May 24). Economía circular: definición, importancia y beneficios. Economía circular: definición, importancia y beneficios | Noticias | Parlamento Europeo. Retrieved October 2, 2023, from https://www.europarl.europa.eu/news/es/headlines/economy/20151201STO05603/economia-circular-definicion-importancia-y-beneficios
45. Poponi, S., Arcese, G., Pacchera, F., & Martucci, O. (2022). Evaluating the transition to the circular economy in the agri-food sector: Selection of indicators. Resources, Conservation and Recycling, 176(176). sciencedirect. https://doi.org/10.1016/j.resconrec.2021.105916.
46. Priefer, C., Jörissen, J., & Bräutigam, K.-R. (2016). Food waste prevention in Europe – A cause-driven approach to identify the most relevant leverage points for action. Resources, Conservation and Recycling, 109. sciencedirect. https://doi.org/10.1016/j.resconrec.2016.03.004.
47. Prima, W., Xing, K., & Amer, Y. (2018). Collaboration behavioural factors for sustainable agri-food supply chains: A systematic review. Journal of Cleaner Production, 186, 851 - 864. sciencedirect. https://doi.org/10.1016/j.jclepro.2018.03.148.
48. Prima, W., Xing, K., & Amer, Y. (2018). Collaboration behavioural factors for sustainable agri-food supply chains: A systematic review. Journal of Cleaner Production, 186, Pages 851 - 864. sciencedirect. https://doi.org/10.1016/j.jclepro.2018.03.148.
49. Programa del Medio Ambiente de las Naciones Unidas. (2022). Análisis sobre la situación de la temática de desperdicio de alimentos en Bogotá. Tecnologías verdes y digitales para reducir los desperdicios de alimentos a

nivel de consumidor en Bogotá, y Colombia: un destino gastronómico sostenible y libre de plásticos. https://wedocs.unep.org/20.500.11822/40741

50. Rais, M., & Sheoran, A. (2015). Scope of supply chain management in fruits and vegetables in India. Journal of Food Processing and Technology, 6(3). Google Scholar.
51. Ren, Y., Li, R., Wu, K.-J., & Tseng, M.-L. (2023). Discovering the systematic interlinkages among the circular economy, supply chain, industry 4.0, and technology transfer: A bibliometric analysis. Cleaner and Responsible Consumption, 9. sciencedirect. https://doi.org/10.1016/j.clrc.2023.100123.
52. Rico, S., Kimita, K., & Nishino, N. (2023). Characteristics of decision process towards circular food economy: A review. Cleaner Logistics and Supply Chain, 7. sciencedirect. https://doi.org/10.1016/j.clscn.2023.100104.
53. Rico Lugo, S. D., Kimita, K., & Nishino, N. (2023). Characteristics of decision process towards circular food economy: A review. Cleaner Logistics and Supply Chain, 7. sciencedirect. https://doi.org/10.1016/j.clscn.2023.100104.
54. Rudin-Rush, L., Michler, J. D., Josephson, A., & Bloem, J. R. (2022). Food insecurity during the first year of the COVID-19 pandemic in four African countries. Food Policy, 111. sciencedirect. https://doi.org/10.1016/j.foodpol.2022.102306.
55. Ruiz, A., Caicedo, A., & Orjuela, J. (2015). Integracion externa en las ´ cadenas de suministro agroindustriales: Una revision al ´ estado del arte. Ingeniería, 20(2), 9-30. http://dx.doi.org/10.14483/udistrital.jour.reving.2015.1.a01
56. Sablón Cossío, N., Acevedo Suárez, J. A., Pérez Quintana, M., & Acevedo Urquiaga, A. J. (2018). Modelo de planificación colaborativa estratégica en cadenas de suministro. Casos de estudio. In Nuevas tendencias en investigación de operaciones y ciencias administrativas. Un enfoque desde estudios iberoamericanos (pp. 75-114). Ediciones Universidad Simón Bolívar. https://bonga.unisimon.edu.co/bitstream/handle/20.500.12442/2601/Cap_3_Modelo_Planificaci%c3%b3n.pdf?sequence=7&isAllowed=y
57. Sanabria, L., Peralta, A., & Orjuela, J. (2017). Modelos de Localización para Cadenas Agroalimentarias Perecederas: una Revisión al Estado del Arte. Ingeniería, 22(1), 23-45. scielo. https://doi.org/10.14483/udistrital.jour.reving.2017.1.a04
58. Scandurra, F., Caeiro, S., & Gulotta, T. M. (2023). The maturity level of the agri-food sector in the circular economy domain: A systematic literature review. Environmental Impact Assessment Review, 100(2023). https://www.sciencedirect.com/science/article/pii/S0195925523000458. https://doi.org/10.1016/j.eiar.2023.107079.
59. Sehnem, S., Oly Ndubisi, N., Preschlak, D., Juarez Bernardy, R. J., & Santos Junior, S. (2020). Circular economy in the wine chain production: maturity, challenges, and lessons from an emerging economy perspective. Sustainability implications for Operations Management: Building the Bridge through Exemplar Case Studies, 31. Taylor & Francis Online. https://doi.org/10.1080/09537287.2019.1695914

60. Sharifi, E., Fang, L., & Hassanzadeh, S. (2023). A novel two-stage multi-objective optimization model for sustainable soybean supply chain design under uncertainty. Sustainable Production and Consumption, 40. sciencedirect. https://doi.org/10.1016/j.spc.2023.07.006.
61. Singh, G., Daultani, Y., Rajesh, R., & Sahu, R. (2023). Modelando las barreras de crecimiento de la cadena de suministro de productos frescos en el contexto indio. Benchmarking: An International Journal, 30(2), 653-677. Esmerald insight. https://doi.org/10.1108/BIJ-09-2021-0517
62. Surendra, V., Singh, A.R., Gunasekaran, A., Raut, R. D., & Narkhede, B. E. (2022). A systematic literature review of the agro-food supply chain: Challenges, network design, and performance measurement perspectives. Sustainable Production and Consumption, 29, 685 - 704. sciencedirect. https://doi.org/10.1016/j.spc.2021.11.019.
63. Surendra, V., Singh, A.R., Gunasekaran, A., Raut, R. D., & Narkhede, B. E. (2022). A systematic literature review of the agro-food supply chain: Challenges, network design, and performance measurement perspectives. Sustainable Production and Consumption, 29, 685 - 704. sciencedirect. https://doi.org/10.1016/j.spc.2021.11.019.
64. Tapia, L. (2019, March 9). Diseño de la cadena de suministro agroalimentaria de la berenjena en Córdoba-Colombia mediante la integración del modelo scor y el enfoque de optimización. Repositorio Universidad Tecnológica de Bolívar. Retrieved October 19, 2023, from https://hdl.handle.net/20.500.12585/1840
65. Tsolakis, N. K., Keramydas, C. A., Toka, A. K., Aidonis, D. A., & Iakovou, E. T. (2014). Agrifood supply chain management: A comprehensive hierarchical decision-making framework and a critical taxonomy. Biosystems Engineering, 120, 47 - 64. sciencedirect. https://doi.org/10.1016/j.biosystemseng.2013.10.014.
66. Tuni, A., & Rentizelas, A. (2022). Improving environmental sustainability in agri-food supply chains: Evidence from an eco-intensity-based method application. Cleaner Logistics and Supply Chain, 5. sciencedirect. https://doi.org/10.1016/j.clscn.2022.100081.
67. Vafadarnikjoo, A., Moktadir, M. A., Kumar Paul, S., & Mithun Ali, S. (2023). A novel grey multi-objective binary linear programming model for risk assessment in supply chain management. Supply Chain Analytics, 2. sciencedirect. https://doi.org/10.1016/j.sca.2023.100012.
68. Vinrald, S. M., Mrinalini, S., & S., S. B. (2012). An insight into agri-food supply chains: A review. International Journal of Value Chain Management, 6, 115-143. Scopus. 10.1504/IJVCM.2012.048378
69. Vlajic, J. V., Mijailovic, R., & Bogdanova, M. (2018). Creating loops with value recovery: empirical study of fresh food supply chains. Supply chain operations for a circular economy, 29. Taylor & Francis Online. https://doi.org/10.1080/09537287.2018.1449264
70. The World Economic Forum. (2018, enero 23). Innovation with a Purpose: The role of technology innovation in accelerating food systems transformation. www3 .weforum .org /docs /WE.

https://www3.weforum.org/docs/WEF_Innovation_with_a_Purpose_VF-reduced.pdf

71. World Population Prospects 2022 Summary of Results. (2023). In United Nations Publications (Ed.), World Population Prospects 2022: Summary of Results. United Nations Fund for Population Activities. https://desapublications.un.org/publications/world-population-prospects-2022-summary-results
72. Zhao, G., Chen, H., Liu, S., Dennehy, D., Jones, P., & Lopez, C. (2023). Analysis of factors affecting cross-boundary knowledge mobilization in agri-food supply chains: An integrated approach. Journal of Business Research, 164. sciencedirect. https://doi.org/10.1016/j.jbusres.2023.114006.
73. Zhao, X., Wang, P., & Pal, R. (2021). The effects of agro-food supply chain integration on product quality and financial performance: Evidence from Chinese agro-food processing business. International Journal of Production Economics, 231. sciencedirect. https://doi.org/10.1016/j.ijpe.2020.107832.