



Managing Agricultural Value Chains in a Rapidly Urbanizing World

Peter J. Batt

Institute of Agriculture, University of Western Australia, Perth 6009, Australia; peter.batt@uwa.edu.au

1. Introduction

For the first time in history, the majority of humankind now reside in an urban environment, with that figure expected to reach two thirds by 2050 [1,2]. While our cities have always been focal points for economic growth, innovation, and employment [3], urban development invariably has a negative impact of the environment. Today, there is an increasing recognition that urbanization leads to urban sprawl, socio-spatial inequality, pollution, and environmental degradation associated with non-sustainable modes of production and consumption [4].

Not unexpectedly, as our cities expand, so also does the demand for food. As the demand generally exceeds the capacity of the adjacent agricultural regions to produce, our cities are becoming increasingly dependent on external food sources. Food chains are becoming longer and with that, our cities become more susceptible to climate-induced food shortages, food price hikes, breakdowns in logistics, and failures in food safety management systems [5].

Collectively, these issues have led to a renewed focus on food systems, as well as their sustainability and resilience; the potential to create viable employment and livelihoods; and the ability to provide access to affordable, safe, and nutritious food [1]. Aragrande and Argenti [6] describe urban food systems as the complex combination of activities (production, handling, storage, transport, processing, packaging, wholesale, and retail) operated by a myriad of dynamic actors that enable cities to meet their food requirements. Parson, Hawkes, and Wells [7] describe the food system as an interconnected system of everything and everybody that influences, and is influenced by, the activities involved in bringing food from farm to fork. By necessity, this includes: (i) the chain of activities from producer to consumer; (ii) the many internal and external factors that influence the chain of activities which have economic, political, environmental, health, and social impacts; (iii) the many entities, institutions, and people directly and indirectly involved; and (iv) the connections between drivers, activities, and outcomes that are dynamic and shift over time.

In its most basic form, a food supply chain describes how food gets from the paddock to plate, including all those involved and how these processes are structured [8]. It is typically depicted as a linear or circular sequence of activities that operate at various scales and levels [7], from producer to consumer directly or through long, highly complex integrated international value chains that involve multiple wholesalers and distributors and a myriad of retailers and institutional food suppliers.

Globally, food systems are highly differentiated, even within countries and territories [9]. Food supply chains vary depending on geography; the environment; and the socio-economic characteristics of producers, market intermediaries, food processors, and consumers. Food supply chains are linked to and influenced by market systems, the political system, the natural environment, farming systems, infrastructure systems, legal and regulatory systems, the financial system, global trade systems, social systems, and many other subsystems [10].

The food system can be considered as an economic system, as food is bought and sold through multiple financial transactions, where businesses of all sizes compete with



Citation: Batt, P.J. Managing Agricultural Value Chains in a Rapidly Urbanizing World. *Agronomy* **2022**, *12*, 1590. <https://doi.org/10.3390/agronomy12071590>

Received: 22 June 2022

Accepted: 28 June 2022

Published: 30 June 2022

Publisher's Note: MDPI stays neutral with regard to jurisdictional claims in published maps and institutional affiliations.



Copyright: © 2022 by the author. Licensee MDPI, Basel, Switzerland. This article is an open access article distributed under the terms and conditions of the Creative Commons Attribution (CC BY) license (<https://creativecommons.org/licenses/by/4.0/>).

one another [7]. However, within the food industry, economic inequity is widespread. Compared to retailers, the majority of food producers are in a position of relative weakness. Farmers are disadvantaged because of their relatively small size, most lack human and financial resources, they have no brand identity with consumers, and they generally work on much smaller profit margins [11]. Fearne, Duffy, and Hornibrook [12] describe how retailers have utilized their market power to impose promotional allowances, discounts, and charges on suppliers, often retrospectively, and to make changes to contracts without notice. Hingley [13] describes how, in the absence of any countervailing market power, suppliers have been forced to adapt to retailers' needs and to make significant relationship-specific investments. In parallel, as the competition intensifies at the retail level, prices and margins to suppliers have eroded [12].

Food policy is an area of public policy which concerns itself with how food is produced, processed, distributed, and purchased [14]. Good food policies are designed to influence the operation of the food system, providing the potential for economic growth and social security, education, and enhancing the health of the population, while at the same time protecting and improving the environment. Food policy can be promulgated on any level, from local to global, by a government agency, business, or organization.

While food is often regarded as a non-traditional policy arena for local government, the food system is embedded within a wide range of municipal and regional policy areas such as land use planning, infrastructure development, trade regulation, health regulation, transport, environmental conservation, housing, and economic and community development [15]. Hence, community advocates are increasingly calling on local and state governments to use their urban planning powers to tackle a variety of health and food-related issues. Food must be integrated within the economic, social, and environmental dimensions of urban planning.

Urban growth inevitably results in an increasing demand for natural resources, with most of these resources being sourced from places beyond the city boundaries [3]. Regrettably, our current food production system is destroying the environment upon which present and future food production depends. Agriculture is believed to be responsible for some 20–30 percent of anthropogenic greenhouse gas emissions; is the leading cause of deforestation, land use change, and biodiversity loss; accounts for 70 percent of all fresh water consumed; and is a major source of water pollution [16]. Furthermore, ISU [9] attribute much of the extensive soil erosion and widespread over-fishing to our current systems of food production.

Thus, there is an immediate need to develop and implement more sustainable food production practices that safeguard the planet and the resources upon which food production and human wellbeing depend [17]. Fortunately, farming practices are being developed that integrate ecosystem services such as integrated pest control, pollination, water regulation, and nutrient cycling to enhance productivity and resilience in agricultural landscapes while reducing harmful environmental effects. These practices include many approaches such as conservation agriculture, sustainable and ecological intensification, agroecological and diversified farming systems, precision agriculture, and organic farming. Most of these practices focus on sustainability at the farm level, including soil carbon sequestration, reducing nutrient leakage from fields, and enhancing the efficiency of water use by crops.

People need food to live, and yet there is overwhelming evidence that our current food system is failing to contribute to healthy nutritious diets for an increasingly large segment of the population [1]. Today, some 820 million people are undernourished, with more than 2 billion people suffering from one or more forms of micronutrient deficiency. However, and perhaps more disturbing, the prevalence of disease associated with high-calorie, unhealthy diets are increasing, with 2.1 billion adults currently overweight or obese [17]. Unhealthy diets are associated with non-communicable diseases such as heart disease, diabetes, and cancer. Today, 6 of the top 11 risk factors driving the global burden of disease are related to diet [2]. Furthermore, eating unsafe food is estimated to kill at least 420,000 people every

year, with antimicrobial resistance—arising in part from the widespread use of antibiotics in animal production—presenting a long-term threat to human health [7].

2. Urban Food Systems in Action: A Summary of the Papers Presented in This Special Edition

Constantin et al. (this issue) [18] note that while vegetable consumption is increasing in Romania, even in the presence of a favorable temperate climate, domestic vegetable production is decreasing, with imports, particularly during the winter months, securing an increasing share of the market. Using Porter's [19] diamond model, the lack of competitiveness is attributed to the fragmented nature of the industry, where most farmers are smallholders and indeed, even within Europe, many are subsistence farmers. However, numerous other factors also constrain the ability of local farmers to compete against imports, including the lack of appropriate machinery, a lack of irrigation, poor transport, and the lack of storage infrastructure. Furthermore, in the post-Soviet era, farmers' past experience with the collective system is making it very difficult to introduce any collaborative marketing arrangements. On the demand side, with the exception of the municipal capital region (Bucharest) and the counties of Ilfov and Prahova—which collectively account for 70 percent of imports—consumers' purchasing power is low.

In China, Wang et al. (this issue) [20] seek to explain the industrial upgrading of vegetable production in Shaanxi province, but rather than using Porter's diamond model, they opt for an alternative framework: new structural economics (NSE) [21]. Wang et al. argue that the frameworks most often used to explain competitiveness—the structure–conduct–performance paradigm and the diamond model—ignore the hierarchy and internal relationships among the factors. Agro-industrialization is a continuous process that involves technical modernization and accompanying enhancements in hard and soft infrastructure at each stage, rather than a reliance on basic factor endowments. Using the vegetable industry as an example, Wang et al. illustrate how, as farmers' income improves, the accumulation of capital and upgrading of production progressively transforms the industry, with growers continuously learning from the experience of other regions.

Continuing with the theme of technological improvements, Morella et al. (this issue) [22] explore the opportunities for Industry 4.0 to contribute to upgrading agricultural food chains. The properties that characterize Industry 4.0 are automation, digitalization, and real-time data acquisition, processing, and communication. The application of this technology provides a means of: (i) Improving productivity on farm through the integration of information and communication technology for the better utilization of resources from sowing; the application of fertilizers, pesticides, and herbicides; irrigation; and harvesting. (ii) Detecting, predicting, and diagnosing undesirable situations in the processing of food which have the potential to negatively impact food quality and safety. (iii) Enhancing traceability and sustainability through the adoption of blockchain technologies. (iv) Predicting and anticipating consumer decision making at the point of purchase. To facilitate the adoption of Industry 4.0 by the food industry, Morella et al. put forward 12 KPIs to assess the benefits of implementing these technologies, but also acknowledge the many constraints actors experience at multiple levels in integrating these technologies.

On a global level, as the COVID-19 pandemic illustrated, with the concentration and aggregation in international supply chains at both the food processor and retail level, many urban residents have been exposed to periodic food shortages. While mainstream food systems struggled to cope, local foods saw a marked increase in consumer demand. Hoang (this issue) [23] discusses how the renewed interest in short food supply chains is not only reconnecting consumers to food producers, but also providing smallholder farmers with a more fair and equitable proportion of the retail price, increasing their profitability, revitalizing local communities, and supporting farmers in their efforts to adopt more sustainable and ethical food production systems. However, the participation of smallholder farmers in these short food supply chains is constrained by many impediments, including the small scale of production; the higher costs of sustainable production; a smaller output

market; a lack of credit; the lack of capacity; and, just as Constantin et al. [18] noted, with a gradual shift in the political regime in Viet Nam, farmers' unwillingness to cooperate.

For many consumers and indeed even governments, including the European Union, engaging in more sustainable food production systems implies the more widespread adoption of organic agriculture [24]. Tsai et al. (this issue) [25] discuss how the Government of Taiwan is actively promoting organic rice production as a means of meeting its obligations under the UN SDGs. However, organic rice production accounts for less than 2 percent of the area planted. Consequently, Tsai et al. seek to explore the socio-economic factors and the farm characteristics that potentially support the adoption of organic rice production. Older farmers, more educated farmers, and those working full-time on farms smaller than 50 hectares were more likely to adopt organic rice production.

In Indonesia, Menggala et al. (this issue) [26] explore how the adoption of Geographic Indicators (GI) by cinnamon harvesters in Koerintji (Sumatera) has improved profitability for all actors in the value chain. Through the adoption of a Code of Practice, there was a marked improvement both in quality and food safety, supporting and indeed enhancing the reputation of Koerintji cinnamon in the international spice market. The successful application of GI has enabled producers to differentiate and reinforce the traditional quality attributes of products, boost competitiveness in both domestic and international markets, and provide traceability. Furthermore and perhaps most importantly, the adoption of GI has provided a mechanism which unites all the actors in the value chain, facilitating communication and negotiation between stakeholders.

In the final paper, Chevallier-Chantepie and Batt (this issue) [27] explore sustainable purchasing by restaurants in France. With urbanization and rising household incomes, more consumers are eating more food away from home and/or eating more ready-to-eat or ready-to-heat meals. Furthermore, consumers are becoming more conscientious and making more informed decisions based on social, economic, environmental, and ethical values. Not unexpectedly, these trends are encouraging many restaurateurs to purchase local food ingredients. However, local food is more difficult to procure, more expensive, and has more irregular supplies. By examining the importance of the criteria chefs use in their decision to purchase fresh food, Chevallier-Chantepie and Batt identify two distinct clusters: conventional buyers—those who place little to no importance on the credence quality attributes—and green buyers—those who specifically seek out fresh local food that has minimal impact on the environment and has been produced both sustainably and ethically. While the type of cuisine and restaurant size was found to play a minor role, the key differentiating factor was the personal values of the executive chef. Both the benefits and the constraints of operating a sustainable restaurant are explored, with this study concluding that sustainable purchasing did not lower costs or improve competitiveness.

Conflicts of Interest: The author declares no conflict of interest.

References

1. World Bank/FAO. *Food Systems for an Urbanising World*; Knowledge Product; World Bank Group: Washington, DC, USA; Food and Agriculture Organization of the United Nations: Rome, Italy, 2017.
2. International Food Policy Research Institute. *Global Food Policy Report*; International Food Policy Research Institute: Washington, DC, USA, 2017.
3. Wiskerke, J.S.C. Urban food systems. In *Cities and Agriculture: Developing Resilient Urban Food Systems*; de Zeeuw, H., Drechsel, P., Eds.; Earthscan Food and Agriculture; Routledge: London, UK, 2015; pp. 1–25.
4. Brand, C.; Bricas, N.; Conaré, D.; Daviron, B.; Debru, J.; Michel, L.; Soulard, C.T. *Designing Urban Food Policies Concepts and Approaches*; Springer: New York, NY, USA, 2017.
5. IPES-Food. *What Makes Urban Food Policy Happen? Insights from Five Case Studies*; International Panel of Experts on Sustainable Food Systems: Brussels, Belgium, 2017.
6. Aragrande, M.; Argenti, O. *Studying Food Supply and Distribution Systems to Cities in Developing Countries and Countries in Transition. Methodological and Operational Guide (Revised Version)*; Food into Cities Collection, DT/36-01E; FAO: Rome, Italy, 2001.
7. Parsons, K.; Hawkes, C.; Wells, R. Brief 2. What is the food system? A Food policy perspective. In *Rethinking Food Policy: A Fresh Approach to Policy and Practice*; Centre for Food Policy: London, UK, 2019.
8. FAO. *The State of Food and Agriculture 2013. Food Systems for Better Nutrition*; FAO: Rome, Italy, 2013.

9. Jennings, S.; Cottee, J.; Curtis, T.; Miller, S. *Food in an Urbanised World. The Role of City Region Food Systems in Resilience and Sustainable Development*; FAO: Rome, Italy, 2015.
10. FAO. *Developing Sustainable Food Value Chains—Guiding Principles*; FAO: Rome, Italy, 2014.
11. White, H.M.F. Buyer-supplier relationships in the UK fresh produce industry. *Br. Food J.* **2000**, *102*, 6–17. [[CrossRef](#)]
12. Fearne, A.; Duffy, R.; Hornibrook, S. Justice in UK supermarket buyer-supplier relationships: An empirical analysis. *Int. J. Retail. Distrib. Manag.* **2005**, *33*, 570–582. [[CrossRef](#)]
13. Hingley, M. Relationship Management in the Supply Chain. *Int. J. Logist. Manag.* **2001**, *12*, 57–71. [[CrossRef](#)]
14. Smith, N.W. *Food Policy. Reference Module in Food Sciences*; Elsevier: Amsterdam, The Netherlands, 2016.
15. Muriuki, G.; Schubert, L.; Hussey, K.; Roitman, S. *Urban Food Systems—A Renewed Role for Local Governments in Australia. A Discussion Paper of the Global Change Institute*; University of Queensland. Brisbane: St. Lucia, Australia, 2017.
16. Fischer, C.G.; Garnett, T. *Plates, Pyramids and Planets: Developments in National Healthy and Sustainable Dietary Guidelines: A State of Play Assessment*; FAO/Food Climate Research Network: Rome, Italy, 2016.
17. The Lancet Commission. Food in the Anthropocene: The EAT–Lancet Commission on Healthy Diets from Sustainable Food Systems. *Lancet* **2019**, *393*, 447–492.
18. Constantin, M.; Sacală, M.-D.; Dinu, M.; Pistalu, M.; Pătrălăgeanu, S.R.; Munteanu, I.-D. Vegetable Trade Flows and Chain Competitiveness Linkage Analysis Based on Spatial Panel Econometric Modelling and Porter’s Diamond Model. *Agronomy* **2022**, *12*, 411. [[CrossRef](#)]
19. Porter, M.E. *The Competitive Advantage of Nations*; MacMillan: London, UK, 1990.
20. Wang, H.; Sarkar, A.; Rahman, A.; Hossain, M.S.; Memon, W.H.; Qian, L. Research on the Industrial Upgrade of Vegetable Growers in Shaanxi: A Cross-Regional Comparative Analysis of Experience Reference. *Agronomy* **2022**, *12*, 38. [[CrossRef](#)]
21. Lin, J.Y. *New Structural Economics: A Framework for Rethinking Development and Policy*; The World Bank: Washington, DC, USA, 2012.
22. Morella, P.; Lambán, M.P.; Royo, J.; Sánchez, J.C. Study and Analysis of the Implementation of 4.0 Technologies in the Agri-Food Supply Chain: A State of the Art. *Agronomy* **2021**, *11*, 2526. [[CrossRef](#)]
23. Hoang, V. Modern Short Food Supply Chain, Good Agricultural Practices, and Sustainability: A Conceptual Framework and Case Study in Vietnam. *Agronomy* **2021**, *11*, 2408. [[CrossRef](#)]
24. European Commission. Farm to Fork Strategy for a fair, healthy and environmentally friendly food system. EU Green Deal. European Union. 2020. Available online: https://ec.europa.eu/food/horizontal-topics/farm-fork-strategy_en (accessed on 21 June 2022).
25. Tsai, M.-H.; Chang, Y.-C.; Yang, T.-Y.; Luh, Y.-H. Factors Determining Rice Farm Households’ Adoption of Organic Farming in Taiwan. *Agronomy* **2021**, *11*, 2195. [[CrossRef](#)]
26. Menggala, S.R.; Vanhove, W.; Muhammad, D.R.A.; Rahman, A.; Speelman, S.; Van Damme, P. The Effect of Geographical Indications (GIs) on the Koerintji Cinnamon Sales Price and Information of Origin. *Agronomy* **2021**, *11*, 1410. [[CrossRef](#)]
27. Chevallier-Chantepie, A.; Batt, P.J. Sustainable Purchasing of Fresh Food by Restaurants and Cafes in France. *Agronomy* **2021**, *11*, 2357. [[CrossRef](#)]