1 Defining Food and the Implications for Food Supply Chains

Jane Eastham

Introduction

The objective of this book is to offer students and academics food for thought. It is designed to examine issues facing the food supply chain, including food supply and security. It considers supply security in terms of food availability, traceability, the delivery of a sustainable diet, technological changes and the impact of current governance structures. The text revolves around the central theme of supply chains and the management of supply, but notes that a safe, effective food supply system is fraught with complexities, dichotomies and paradoxes.

For instance, the need to attain and deliver safe food may have implications in terms of food waste. Food waste may be an input to ensure sustainable sources of energy, but there is also a paradox between the supply of fuel and the supply of food, where there is increasing competition between the uses of land resources – resources that are equally important for the productivity of other industrial sectors. Within this book, we examine but some of these issues and attempt to highlight to the reader the level of interconnectivity and tensions in the delivery of food security and economic, social and environmental sustainability and the provision of safe and nutritious diets.

The major issue is how one manages food supply when faced with a product which is highly perishable and consequently has a high potential of wastage, and where there are long lead times between the decision to produce the product and delivery to market. Food integrity is also at risk, where the relatively low margins of the sector may encourage stakeholders to practice opportunistic and sometimes malevolent action.

This chapter broadly considers the complexity of the issues affecting food and food availability and how the emergent governance of the supply chain has impacted upon the distribution of net margins; a consequence of the distribution of power within the supply chain.

Food glorious food: Why is food different ?

Those involved in the distribution of sufficient safe nutritious food to populations are faced with greater levels of risk and less control over the volumes they produce in relation to demand than other industrial sectors. Risks experienced by the food supply sectors are both natural and contrived. Climate, weather and other natural phenomena can have a major impact on the volume of production, whilst the perishability of products may result in a lack of availability between harvests. Volumes produced may also be inflated or depressed as a consequence of speculation, both by farmers and other businesses either within or without the food sector, and/or by government intervention.

Whilst many influences will have a negative impact on margins within the food supply chain, it is also worth noting that nutritious food is central to human endeavour. The failure to deliver a nutritious diet can have enduring impact on the wider economy and the performance of other industry sectors.

■ Delivering the food

Food is grown in extensive and intensive farming systems, in domestic gardens, hedgerows and with limited or no human intervention at all. Yet the availability of sufficient quantities of food to feed a population is subject to the variability in conditions apposite for food production, as well as to the effective delivery to consumers. The challenge for the sustainable supply chain revolves around the management of supply and demand. In practice, for the farmer, this requires the balancing of volume and price; ensuring safe practice in the growing of products, whilst at the same time optimising value. For the distribution sector, the challenge is to ensure that food reaches food retailers in the condition in which nutritious safe food can be sold to the consumer.

The assurance of safe, nutritious food requires the monitoring of practices throughout the supply; a challenge exacerbated in the context of commodities with a short shelf-life and low margins. This requires that all practices in all tiers within the supply chain be monitored. In order to ensure that such monitoring occurs, food has become one of the most heavily regulated sectors; the legal responsibility in the UK for which, so-called ‘due diligence’, is in the hands of retailers. The need for regulation and inspections is made more critical with

the growth of ready and quick fix meal solutions and the growing criticality of temperature controlled storage and transportation. Additional processing and the costs of maintaining chilled or frozen supply chains temperatures have constrained margins still further.

The most critical aspect of managing temperature is to ensure against the contamination by micro-organisms, which can be pathogenic and/or result in food spoilage and reduce shelf life. However, other micro-organic contamination, such as Bovine Spongiform Encephalopathy (BSC), are zoonotic and have resulted in variant Creutzfeldt-Jakob Disease (vCJD) and as a consequence are damaging to farm incomes, and consumers' health. Even non-zoonotic diseases such as foot and mouth, particularly when addressed through mass slaughtering policy, undermine financial returns of farmers. The challenges of managing and monitoring micro-organic contamination are exacerbated in the context of extended food supply chains.

The emergence of extended and complex elongated supply chains means that consumers are no longer aware of provenance, and furthermore there are greater issues of traceability, greater potential for opportunistic and malevolent behaviour and malpractice, and thus a greater need to monitor the supply chain, to ensure nutritional food safety and avoid adverse economic consequences. For some it is not simply the issue of the risk in elongated supply chains, it is also an issue of diet (see Griffiths in Chapter 15). Through the disconnection of the consumer from the producer, consumers lack understanding of how food is produced and processed. In conjunction with the purported decline in culinary expertise in western countries, the consumer has become unable to influence the food they consume, in terms of cost, variety in diet and nutritional value.

Back to beginnings

For many millennia, humans were hunters and gatherers, served through a short supply chain with generally a diverse diet that supplied adequate nutrition (Lindeberg, 2012). Consumption was not simply immediate, which reduced the potential for pathogenic contamination of food products, but also offered greater nutritious balance and fueled further collection of food. When pastoral and agricultural communities emerged some 7-10 thousand years ago, increased yields facilitated the development of more complex, static societal infrastructures. However, in nutritional terms, the greater reliance on grain resulted in poorer diet with a degeneration of human health (Pollard, 2008) as measured by the smaller stature of early agriculturalists as compared with hunter-gatherers (Larsen, 2015). The fixed nature of the agricultural populations and, to a lesser extent pastoral communities, presented a challenge of assuring continuity of supply in the context of seasonality and the need to develop storage and preservation techniques.

Controlled intervention in the production of food might feed a larger population, but ensuring year-long availability and protecting against wastage and nutrient loss through bacterial and enzyme activity, presented a challenge.

The problem was exacerbated where yields varied considerably from year to year. Access to early written documentation found in religious texts shows the need to grow excess produce to ensure continual availability. Preservation techniques were developed, and some of the early techniques included drying and fermentation to allow easy storage. We note in Genesis 41 v 1-53, an early example of managing supply and demand in this vein, where Joseph is put in charge of ensuring sufficient storage of grain to feed Egypt during the seven lean years.

Whilst the Pharaoh had advance notice as to future availability of food supply, normally farmers are not so divinely informed and their ability to match demand and supply to ensure sufficient food and the maximisation of returns is dependent upon a whole series of interconnecting factors beyond their control. Weather conditions, pests and disease can have an impact on the total volume produced, and thus the price paid to farmers, and can vary across regions, countries and continents. How much food should be produced and indeed the amount of land to put over to the production of a crop is not only determined by local but regional, continent and global conditions. The balancing of food production to ensure farm prices and food availability is thus a complex activity. Unlike other commodities, identifying the volume that is required involves planning in advance, based on imperfect information on demand. This is a function of respective lead-times for food commodities; from the time of sowing or insemination through to consumption. For wheat, the lead-time from sowing averages at around 9 months, whilst pork, with current state of the art genetic interventions, will be ready for market in around 4.5 months, and so on. Were demand or climatic conditions to change, there must be a delay before the farmer can respond. In pig farming, for instance, this has a name – the 'cobweb effect'.

The distinctiveness of food as a financial commodity

The problem of ensuring sufficient stock without deflating price has exercised economists and engineers over time (Eastham, 1939; Carter and Revoredo-Giha, 2009). In modern commodity markets the situation is distinctive from the biblical illustration above.

In capitalist economies there is a distinction between stocks kept to ensure availability and those stocks used in a speculative capacity, i.e. the commoditisation of the primary food product. The discrimination between stocks as, what has been described as 'working capital'. that is stocks to ensure that food is available for consumption and stocks as 'liquid capital', which are food stocks in excess of demand between harvests, leads us to recognise that whilst storage does much to