

Sacrificing diversity for stability and safety: Why thousands of apple varieties will never make it to modern British supermarket shelves.

The great British apple, a staple arboreal fruit with centuries of cultural significance:

Few fruits that are both produced and consumed in the United Kingdom (U.K.) are as important a staple food than the humble apple. From childhood, we are taught as toddlers our alphabet beginning with “A for Apples” and scary fairy-tale stories, which includes the apple that poisoned Snow White. In British scientific history, it is the proverbialized fallen apple that catalysed Sir Isaac Newton’s theories on gravitational attraction. However, the variety of apple that fell in Newton’s family garden, *The Flower of Kent*, will never be commercially viable in today’s economy owing to its unfavourable, sharp taste. Neither will many of the nearly three thousand varieties of apple tree estimated to be actively tended in orchards across the U.K. ([The National Fruit Collection, 2020](#)). Whether they are too sweet, too acidic, too soft, too crisp, do not handle nor store efficiently, or are visually unappealing, countless apple varieties will never compete with the select few destined for British mouths.



Figure 1: A photo of *The Flower of Kent* apple variety, otherwise known as *Newton’s Apple*. **Image source:** [Pomiferous.com](#).

U.K. consumers purchased ~500,000 tonnes of dessert and cooking apples in 2019, with ~40% grown domestically ([DEFRA, 2020](#)). This is displayed in Figure 2 below that shows the trend of fresh apple production and purchases since 1988 to present. It is clear that demand consistently exceeds domestic supply, and so imports of fresh apples are necessary. [Costa-Font and Revoredo-Giha \(2018\)](#), analysing household purchasing data, highlight the wider reliance of U.K. customers, with focus on Scotland, on foreign imports of all major fruits sold at retail, each with differing intensity but the wider conclusion that domestic supply of fresh fruit could never fully satisfy domestic demand in the short-run. Two of the major varieties of apple grown by British orchardists today, *Gala* and *Braeburn*, originated from New Zealand. Global interdependence is central to the market for fresh apples.

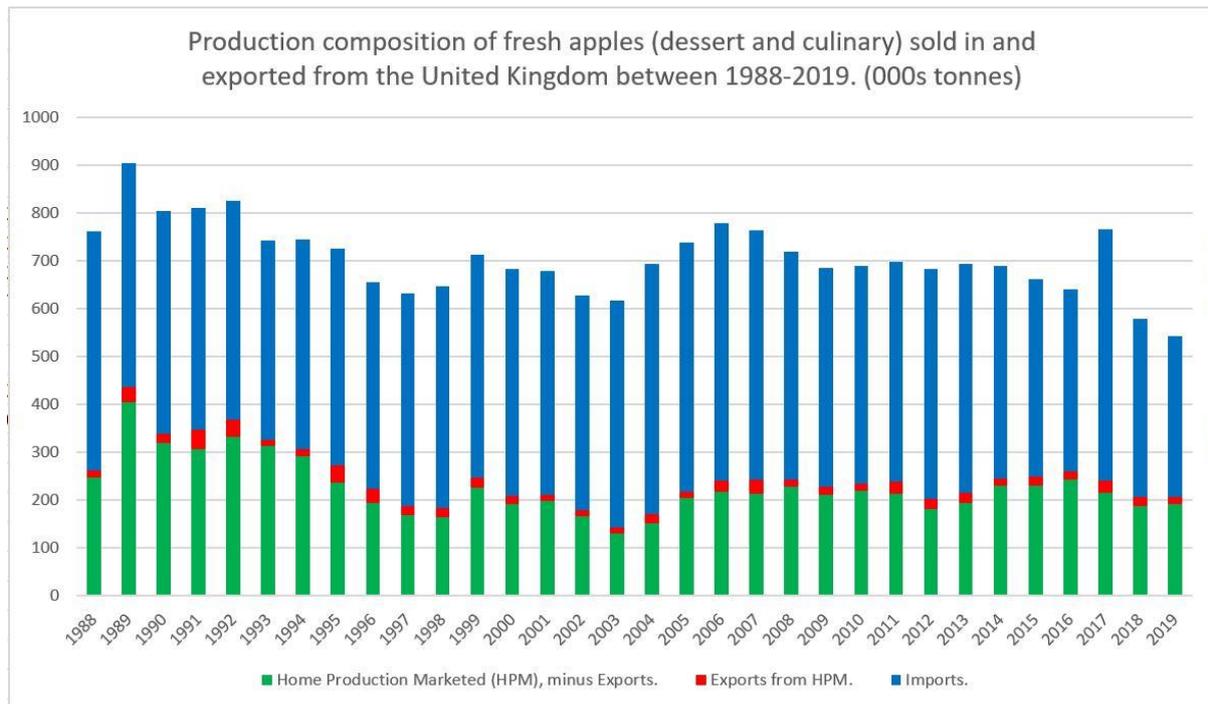


Figure 2: This graph demonstrates consistent high demand with an overall declining temporal trend for fresh apples in the United Kingdom. Domestic supply is supplemented by foreign imports. Very few of the apples produced in British orchards are exported and so the U.K. is a net importer of fresh apples. Created by author. **Data source:** [Horticultural Statistics 2019, DEFRA, 2020](#).

What makes an apple variety suitable for commercial production?

Supermarkets fulfil a crucial role in facilitating a consistent, year-round supply and communicating information about consumer preferences to producers. Through negotiating with domestic and foreign suppliers and facilitating the transport of produce to retail outlets throughout the country, supermarkets are a crucial stakeholder in the fresh apple supply chain. Retail industry standards, developed and enforced in part by supermarkets, ensure the standardisation of fresh apples sold in the U.K. The Specific Marketing Standards within [European Union Regulation No. 543/2011](#), ratified by the U.K. Department for Environment, Food, & Rural Affairs (DEFRA), state that **all** fresh apples sold at retail must be:

- Intact,
- Sound; produce affected by rotting or deterioration such as to make it unfit for consumption is excluded,
- Clean, practically free of any visible foreign matter,
- Practically free from pests,
- Free from damage caused by pests affecting the flesh,
- Free of abnormal external moisture,
- Free of any foreign smell and/or taste.

In addition, the development and condition of the apples must be such as to enable them:

- To withstand transportation and handling, and
- To arrive in satisfactory condition at the place of destination.

These minimum requirements preclude a large number of apple varieties that would not make it to supermarket shelves in suitable marketable condition. Of those that are possible for commercial production, DEFRA outlines the intra-variety grading specifications that determine whether an individual apple is “*Extra*”, “*Class P*”, or “*Class IP*” (each grading signifying descending quality, respectively). These requirements reinforce the significance of food safety and protect the health of the end consumer. Standardisation and measurable indicators of produce quality are useful in preventing the outbreak of foodborne illnesses. To ensure high volumes, uniformity, and verifiable quality, the modern commercial apple supply chain utilises a range of testing technology at every stage from the farm to the packaging facility, including the photographing and automated filtering of apples shown in Figure 3 below. Effective Hazard Analysis and Critical Control Point protocols ensure the minimisation of the loss of produce to avoidable errors in harvest, storage, sorting, and packaging that render apples unsafe or undesirable to consume. The high cost of this technology and the economic losses of substandard apples that are deliberately discarded during the processing stage results in significant competitive advantages to producers that can effectively utilise economies of scale. This is a reason why producers in countries with lower land, labour, and capital costs have come to dominate international fruit markets, including apples ([Retamales et Sepúlveda, 2011](#)).

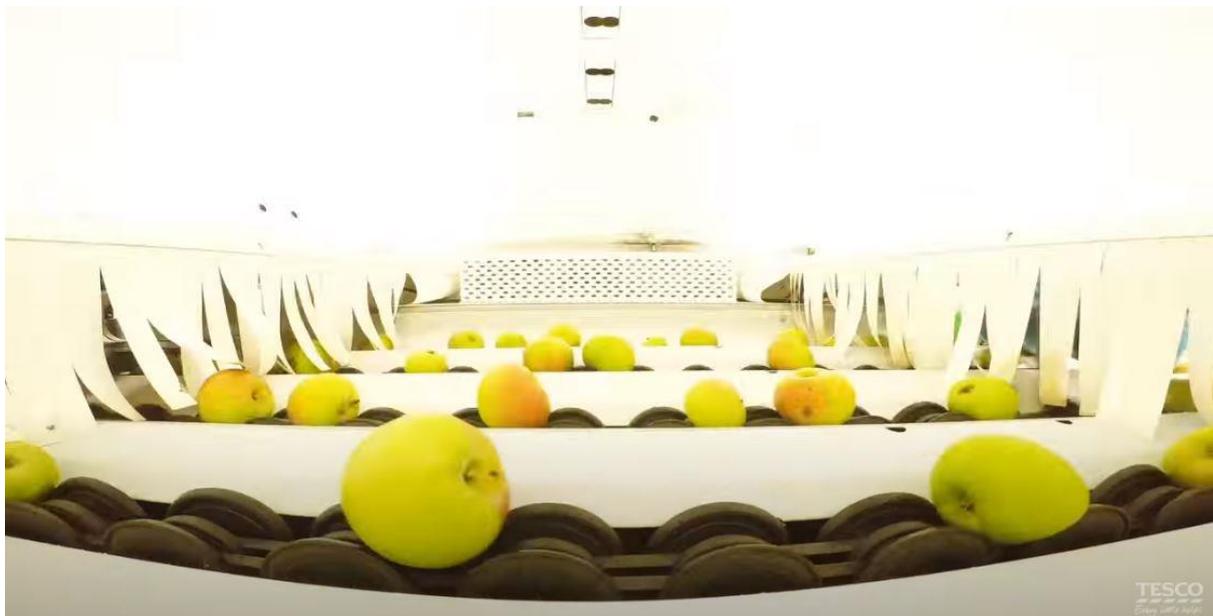


Figure 3: These stills, taken from a promotional video for Tesco supermarket on their YouTube Channel, demonstrate the imaging technology that is used in modern fresh apple processing plants to grade and quality check apple produce. Up to 20 images are taken of each apple, with human and technological input determining the decision. **Image source:** [Tesco News YouTube Channel](#).

Supermarkets have also increasingly sought to limit the number of suppliers of fresh produce to those who can provide a year-round supply (Fearne et Hughes, 1999). This means that small-scale British apple producers who can only supply the U.K. market during the domestic harvest period are less competitive in obtaining supermarket contracts than large scale producers with effective long-term storage facilities, including those with controlled atmospheric conditions. This distorts the traditional model of annual food supply in food security analysis that observes the sourcing from the domestic growers during the harvest period and importing during the lean months. Supermarkets stock apples from the southern hemisphere even during the peak harvest months in Britain.



Figure 4: Fresh apples originating from Chile. Stocked at Sainsbury's supermarket, Herne Hill, London. Image taken by author on 28th October 2020.



Figure 5: Fresh apples originating from South Africa. Stocked at Sainsbury's supermarket, Herne Hill, London. Image taken by author on 28th October 2020.



Figure 6: Fresh apples originating from New Zealand. Stocked at ASDA supermarket, Clapham Junction, London. Image taken by author on 28th October 2020.

Figures 4-6: These photos taken at Sainsbury's and ASDA supermarket outlets in central London on 28th October demonstrate that, even during the harvest months for British and northern hemisphere growers, fresh apples are still being sold originating from the southern hemisphere. **Image source:** Images taken by author.

Apple quality is *not* skin-deep – the problem with relying on search attributes:

Sometimes it is said that “you get what you pay for”, but acknowledgement of imperfect food market systems disputes this commercial proverb. The economic literature (Nelson 1970; Darby and Karni, 1973) identifies how our eyes can potentially deceive us and influence the contents of our supermarket trolleys adversely. This signalling model defines three quality attributes:

- a) **Search attributes** – information about a product that can be gained *before* consumption and (often) *prior* to purchase.
- b) **Experience attributes** – information that can only be obtained *during* consumption and (often) *after* purchase.
- c) **Credence attributes** – information that *cannot* be obtained either before or after purchase and consumption.

Asymmetry of information where the producer knows more about the quality of a product than the consumer is a well-documented phenomenon in economics. The famous “Market for Lemons” example typifies the potential for market failure if price becomes ineffective at signalling the value of a product (Akerlof, 1970). This is particularly important in the market for fresh apples if, when faced with a variety that they have never purchased nor consumed before, a supermarket customer cannot ascertain the taste nor texture (both are examples of experience attributes) of the apple prior to purchase and price does not convey reliable information on quality. The customer instead relies on search attributes, such as colour, size, skin condition, and other indications of quality (such as reliable labelling) to make their decision or may not purchase the new variety at all.

Shops such as Whole Foods or local farmers’ markets often allow taste sampling of alternative apple varieties and other lesser known foods prior to purchase and this can overcome a lack of information from

the consumer. Nevertheless, within the predominant U.K. supermarket framework that does not permit taste sampling prior to purchase, consistency, trust, and consumer loyalty are highlighted as crucial to overcoming initial barriers posed by asymmetric information (Caswell et Mojduszka, 1996). This allows for habitual purchasing behaviours as consumers and supermarkets mutually benefit from consistency of fresh produce.

Uniformity, brightness, and vividness of colour of apple skins are all highly desired. Yet, to anyone who has tasted a large number of apples in their lifetime, it is acknowledged that skin aesthetics alone convey unreliable information on the taste and texture of apples for inter-variety comparison. Conventionally ugly apple varieties can taste delicious and beautiful apple varieties, those likely to entice Snow White's eye, can taste foul. It is my strong belief that over-reliance on aesthetic characteristics erodes the significance of the most important qualities of an apple – its taste and texture.

It is important to divide these unnecessary aesthetic concerns from genuinely useful search attributes; such as bruising or visible pest damage. For instances of physical damage to apples, visual inspection can reliably inform the consumer whether the produce is less safe to consume and potentially of lower taste quality than an undamaged equivalent. Such information is useful for intra-variety comparison by an individual determining which apple to select within the availability at a specific shop. A serious question arises, if effective food safety protocols were followed for every apple variety stocked, whether food safety is indeed the barrier preventing broader diversity of access to apple varieties in U.K. supermarkets. I would argue that the business model of uniform pricing and competition of apples amongst other food products in supermarket shelves erodes the perceived heterogeneity of apple varieties.

Apple Day – correcting asymmetry of information and preventing genetic erosion:

Fresh apples on supermarket shelves are a specifically cultivated food product designed to look homogenous and be sold at the same price. The full perspective of the *malus domestica* (apple tree), either through selective or natural breeding, is wonderful and diverse. I am fortunate to have taken part in “*Apple Day*” these last three years, an annual event organised by The Royal Caledonian Horticultural Society here in Edinburgh. The event collates dozens of apple varieties grown across Scotland, sourced from a diverse range of orchards including those managed by The National Trust for Scotland to small-scale hobby gardeners. Information about the names, origin, and history of each variety is disseminated to the public, shown in Figure 7 below. More importantly, perhaps, prior to Covid-19 there has been free tasting of all and every apple variety at the event. The concept provides an unparalleled opportunity for physical and affordable access to a range of uncommon apple varieties.



Figure 7: Apples on parade. These are not the prettiest apples and would certainly not make it to supermarket shelves, but events such as Apple Day demonstrate the long history of orchards in Britain and can expose consumers to previously unknown varieties and flavours of apple. **Image source:** Colin Wren, The National Trust for Scotland. **Location:** Apple Day, The McHattie Room, Saughton Park Walled Garden, 2019.

This issue forms only part of a wider discussion on the economic and ecological importance of maintaining biodiversity. Beyond the scope of this discussion is the wider implications of monocropping on the stability

of crop biodiversity for future generations. Historically, wild apples have been a vital source of new fresh apple varieties. The world famous *Golden Delicious* and *Bramley* apples were not selectively bred, instead they were discovered wild; a result of natural breeding. [Esquinas-Alccázar \(2005\)](#) argues that the genetic erosion from destroying the habitats of wild crop species could deplete this finite natural resource irreversibly. The biological characteristics of apple pollination mean that seeds from a certain variety do not contain the same genetic information, making seed banks an unsuitable method of apple variety preservation.

The core of the issue:

Supermarkets have not created the problem of genetic erosion and lack of variation of apples sold in the United Kingdom. It is my belief that the modern supply chain for fresh apples within the U.K. is demonstrative of the wider effects of the Green Revolution, increasing urbanisation, and a competitive food retail industry. Price- and aesthetics-driven marketing dooms the local or small-scale British commercial orchardist and potentially prevents the exposure of subsequent generations to additional varieties of apples. If our focus as a policymaker is getting as many apples into our baskets at the lowest private cost and at every time of year, then the supermarket model has clearly succeeded in ensuring the stability of economic and physical access to fresh apples for the British population; regardless of the apple's origin. There is no intrinsic added value for an apple grown in Britain, besides the reduction in food miles, if Good Agricultural Practice and food safety protocol has been followed by a foreign producer.

Instead, it is my argument that supermarkets operate with a unique capacity to facilitate widespread exposure and access to apple varieties never before consumed by younger generations. This could be invaluable in reducing the prevalence of obesity in children and young adults in Britain, particularly in urban settings. Where organic produce has gained increasing prominence in recent years, local and/or seasonal produce could become sections of their own in the supermarket of tomorrow. Put simply, why, if there are dozens of highly differentiated chocolate and confectionary products, do we see less than a handful of varieties of fresh apples? Apples are not homogenous. Convenience has never been an issue as dessert apples are readily consumable. With more nutrients and natural sugars than large swathes of substitutable, heavily-processed sweet treats, it's time to ditch the fifteen different chocolate bars thrusting us towards an early grave and rediscover our love of the great British apple.

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