How green are our apples?

A look at the environmental and social effects of apple production.

Research: Rosemary Hoskins

Series editor: Tim Lobstein

Food Facts No 4

s.a.f.e alliance

Sustainable Agriculture, Food and Environment.

Public concern about the quality of the food we eat in the UK is demonstrated by increased fears of unsafe food — a recent poll[1] showed a majority now believe food safety is deteriorating — and a growing interest in healthier eating combined with rising sales for organically-produced foods.

There is also concern about the environment and farming practices, and how our food production and distribution systems may be contributing to problems such as transport pollution, global warming and loss of wildlife.

This report is one of a series intended to provide information about the negative and positive impacts of food production methods on our environment and society.

SAFE Food Facts are sign-posting documents, indicating the current scope of the issues and sources of further information. SAFE Alliance members and observer organisations are additional sources of such information and their contact details can be found inside the back cover.

This is the fourth report in the series, focusing on apple production. It has been produced with funding from the Government's Environmental Action Fund, the Esmée Fairbairn Charitable Trust, the Cobb Charity, the Cecil Pilkington Charitable Trust and the Chapman Charitable Trust.

The views expressed do not necessarily represent those of every member of the SAFE Alliance.

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SAFE Food Facts No 4

How green are our apples?

Apples are by far the most popular of UK-grown fruit, yet apple production is not in a healthy shape.

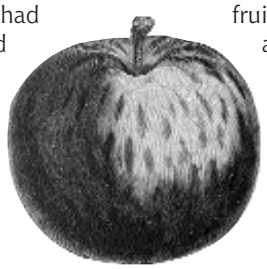
We have lost nearly two-thirds of our UK apple orchards in less than thirty years. Use of pesticides is widespread, the loss of apple orchards is reducing biodiversity, and increased long-distance transport is damaging the environment.

This document takes a look at those issues and at both the good and bad sides of apple production. We look at some traditional varieties we are in danger of losing, and the moves being made to preserve them. The loss of jobs and production, and moves being made to rekindle interest are examined. We then look at agrochemical use and long-distance transport and the need for sustainable and less polluting methods of production. Finally, we cover the importance of apples in a healthy diet, and we ask if we want to eat apples, which should we choose?

As it was - local orchards, customs and varieties

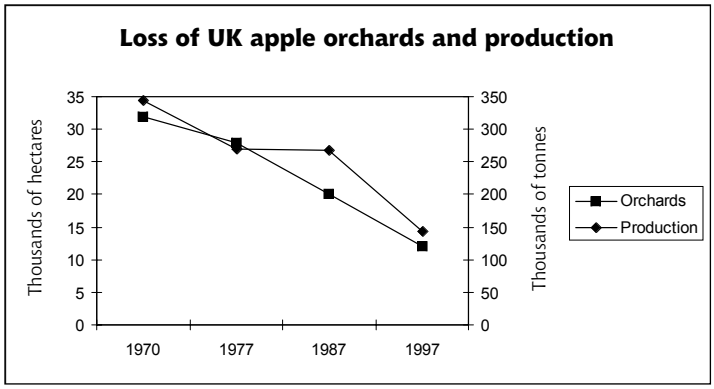
Apples were probably the first fruit to be cultivated by man,[2] and have been the subject of mythology and legend since the Garden of Eden. King Arthur healed his wounds at Avalon, described as an island of apple trees. But it was Henry VIII who, reluctant to import apples, sent his chief fruiterer, Richard Harris, to France to learn the art of fruit cultivation. Harris brought back 'a great store of graftes' and started the first large-scale orchard in Tyneham, Kent. There are as many as 6000 varieties of dessert and cooking apples and hundreds more cider varieties.[3] The names of many of these apples, such as Marriage-Maker or Poor Man's Profit, evoke local histories of apple trees and apple fruit, communities and cultures.

Before the globalisation of our food economy, many of these varieties would have had particular local, culinary, and seasonal uses. For example, the Norfolk Beefing apple was used both as a cooking apple and a dessert apple. Norfolk Beefing apples were baked in bread ovens after the bread had been removed and an iron plate was placed on top to press the air out of them. From the early 19th century until the mid 20th century, these 'biffins' were packed in boxes by Norwich bakers and sold via London fruitiers.



As it is - disappearing orchards

Over 60 per cent of UK apple orchards have been lost since 1970,[5] (see Appendix, table 2) and losses of traditional orchards may be even higher as the official statistics are based mainly on commercial orchards. In some cases EU grants have paid for the orchards to be grubbed up.[6] This loss of orchards has meant both more intensive production,[7] at the expense of wildlife,[8] and concentration on fewer varieties. The loss of apple varieties both reduces the value of orchards as diverse wildlife habitats and also increases vulnerability of the apple crop to risks such as late frosts.



Variety was once the spice of life

Today ten varieties account for 92 per cent of the UK's area of eating apple orchards.[9] The two most dominant UK varieties, Cox and Bramley, together account for 70 per cent of the UK's eating apple orchards. (In 1970 the main varieties accounted for 72 per cent of apple orchards and Cox and Bramley together comprised 59 per cent of the UK total.)

At the peak of the British apple season only around a dozen apple varieties can be found for sale even in our largest supermarkets. Ironically some stores stock more apple varieties out of season, when they can have up to 19 imported varieties in store[10] (see table page 4). Over two-thirds of the apples we eat come from abroad.[11]

Market share

Apples are the UK's top selling fruit by value, with 23 per cent of the UK fruit market.[12] In 1996 we spent £562m on apples. Although the consumption of fresh fruit is rising generally, the consumption of apples is not (see Appendix, table 3). We do, however, spend more on the apples we buy — due largely to a move towards premium-priced varieties such as Gala and Braeburn. Cox remains the top selling British apple but is losing its share of the market to imported varieties.[13]

Employment

The loss of so many UK orchards in the last thirty years has led to a decline in job and business opportunities.[14] In addition, competition from imports and mechanised harvesting of modern, closely planted orchards has had further adverse effects on communities once dependent on orchard-related employment opportunities.

In West Somerset the sharp decline in the number of viable orchards led the local councils to develop plans to bring over 100 orchards back into viable cultivation. Taunton Cider, the major local employer, is keen to obtain these locally produced apples in order to reduce reliance on long-distance supplies, and so will provide a guaranteed market. In addition to the potential socio-economic benefits, it is expected that the work will also benefit the environment and the community.[15]

Dunkertons Cider in Hereford is another example of a cider enterprise with benefits for the environment and the local community.[16] Susie and Ivor Dunkerton bought a smallholding and planted an orchard which is run organically and now employs two additional staff. With the help of development funding, they have also opened a farm restaurant with an associated sparkling cider project which uses the organic farm and local produce. Five full time and two part time staff are employed in the restaurant as well as several casual staff.

Growing imports & food miles

In 1996 a total of 223,000 tonnes of apples were grown in the UK.[17] Apple imports in 1996 were 434,000 tonnes, 202,000 tonnes of which were from outside Europe. In the same year, 30,000 tonnes of UK apples were exported (see Appendix table 4).

The main source of apples imported from the EU into the UK is France, which accounts for 35 per cent of all imports by value. Other major sources for imported apples are South Africa and New Zealand, with shares of 16 and 12 per cent of the imported market value respectively.[18] As well as from other European countries, our apples can come from as far away as the USA, Australia, New Zealand and Chile.[19]

Food miles: the long-distance transport of food

Importing apples which we can grow ourselves in the UK from overseas has environmental effects due to transport pollution (see Appendix, boxes on Food Miles and on the Greenhouse Effect and Appendix tables 5 and 6). Besides the damaging effects of pollution, long distance transport has other implications, both for the quality of the food we eat and for the environment.

In order to preserve apples during storage and transport they are routinely treated with post-harvest chemicals and waxed to prevent wrinkling, improving their appearance and extending their shelf life.[20]

Post-harvest treatment chemicals, unlike those which may be used while the apples are being grown, are intended to stay on the fruit. Eighty-one per cent of all fruit is treated with a chemical dip or drench before storage. Ninety per cent of Bramley and eighty-five per cent of Cox apples are treated.[21]

As fruit sold in the UK does not have to be labelled as treated, the only way to avoid such fruit is to buy organic or apples specifically labelled as not having been subject to post-harvest treatment. Nor does waxed fruit have to be labelled, although it does in the US.[22] The waxes used include shellac (the secretion of the Lac beetle) and petroleum-based waxes.

Extended storage

Apples are less perishable than many other fruit and were some of the first fruit which could sustain voyages of several weeks.[23] Some apple varieties were traditionally grown for their ability to store well. Nowadays much research effort goes into discovering how best to store large tonnages of fruit. Storage conditions vary for different fruit, varieties of the fruit and storage times, refrigerating to different temperatures and controlling atmospheres with varying gas mixes.

Traditional varieties[4]

Peasgood's Nonsuch was grown in the 1850s by Mrs Peasgood when she was a child living in Grantham, Lincolnshire, and later taken by her to Stamford. In 1872 the Royal Horticultural Society Fruit Committee called it 'One of the most handsome apples in cultivation'. It cooks to sweet, delicately flavoured purée and makes a generous baked apple. Juicy eaten fresh; good in vegetable salads.

Average length of apple storage

1975 .....3 to 6 months
1983 .....3 to 9 months
1992 .....3 to 10 months

Source: Export Fruit Boom from the South: A Threat for the North? OECD, Paris 1996

The longest storage is for Bramley apples, where a 12 month marketing season is maintained by using fruit from storage up until the next picking season begins in July/August. British fruit producers use extended storage to maintain a share of the market in the face of competition from imports, and in response to consumer expectations of buying apples whatever the season.

Controlled atmosphere gases, generally used together with refrigeration, allow fruit to be stored longer and to be picked at a more advanced stage of ripeness (which means that it has a better flavour than fruit picked less ripe). In combination with faster transport, this technology has allowed countries in the southern hemisphere to expand their fruit export markets in the northern hemisphere.[24]

Storage may increase the opportunities for apple producers to sell their apples, but there are nutritional implications for storing fruit. Vitamin C, in particular, declines rapidly after the fruit is picked. The amount remaining will be determined by the initial levels — which differs from variety to variety (see table on page 8) — as well as the time in storage and the storage conditions. Long-term storage also requires energy to maintain refrigeration, and the equipment may contain ozone-damaging refrigerants.

Traditional varieties[4]

Norfolk Beefing was cited in a fruit tree list in a notebook of 1698 belonging to the Walpole family near Norwich. Used early in the season for cooking, but sweet enough to eat fresh in spring. It keeps its shape when cooked and has quite a rich taste. Baked to make 'biffins', very slowly at the lowest oven setting for 24 hours, the flesh becomes thick and tastes almost of raisins and cinnamon. The apple has a tough rather dry flesh and a tough skin which allows the fruit to be baked without bursting. Commercial operations waned in 1914 but biffins were on sale up to the 1950s. In the 19th century they were grown in gardens all over the country. Many trees are still found in Norfolk.

Crop specialisation

A major problem of long-distance transport of food is that it can lead to specialisation in production of one crop best suited for a long-distance market[25] Specialisation in single varieties increases the risk for producers as, if a crop fails, most or all of that year's income source may have gone.

The risk of losing the entire apple crop to a spell of bad weather or to pests increases as the number of varieties decreases, and in turn this may lead to increased use of pesticides to protect the apples, with the environmental and health risks that this can involve (see sections on pesticides, pages six and seven)

Specialisation and intensification can be problems for producers both in the UK and overseas. For overseas workers there may be additional vulnerability due to price fluctuations for their produce. Another problem is that people lose traditional food production skills if their work is focused on one specialised activity.

Finally, long-distance food transport, whether nationally or internationally, breaks the link between consumer and producer. Unless buying a Fair Trade product, consumers have little assurance that the people producing their food have acceptable working conditions. Fair Trade products and schemes promoting direct purchase from the producer (such as farmers' markets - see below) are designed to overcome these problems, but there are no such schemes for imported apples.

The role of supermarkets

An increasing proportion of shoppers (63 per cent in 1997) buy their fruit and vegetables from supermarkets. Most of the supermarkets' gain has been at the expense of greengrocers.[26]

Sales of fresh produce by the major multiple retailers have increased to around 76 per cent of the market (from 63 per cent in 1994), while that of independent greengrocers has declined from 25 per cent to 15 per cent in the same period. Sunday trading and the advent of 24 hours opening by some Sainsbury's and Tesco stores have also adversely affected smaller traders.

Supermarkets' influence on growers

As the place where most people now buy their food, the major supermarkets have an important role in determining the food production systems that shape our environment. Their large scale and the centralisation of their operations, however, do not naturally lend themselves to providing a choice of local and seasonal apples.

Smaller-scale growers offering less common apple varieties may be able to supply only a few outlets for a limited period. The traditional wholesale

The varieties in our stores

Number of varieties available, according to the supermarket head offices

	July 21 1998		October 21 1998 (Apple Day)	
	Total	of which UK-grown	Total	of which UK-grown
Sainsbury	21	2	17	8
Co-op CWS	5	1	9	4
Co-op CRS	9	2	10	5
Marks & Spencer	nk	nk	13	nk
Safeway	4	nk	7	nk

nk = not known

Source: SAFE Alliance survey. Tesco said they were unable to identify their varieties and sources for this survey.

markets are collapsing due to the loss of the greengrocers. As a result, the wholesalers are also now only buying in bulk, in order to minimise their costs. In response, growers have started to form marketing co-operatives, in order to be able to offer fruit to buyers in sufficient bulk. Another solution for traditional apple growers has been to grow cider varieties, where they are able to agree a fixed price contract for all of their apples, whether the crop is good or poor.

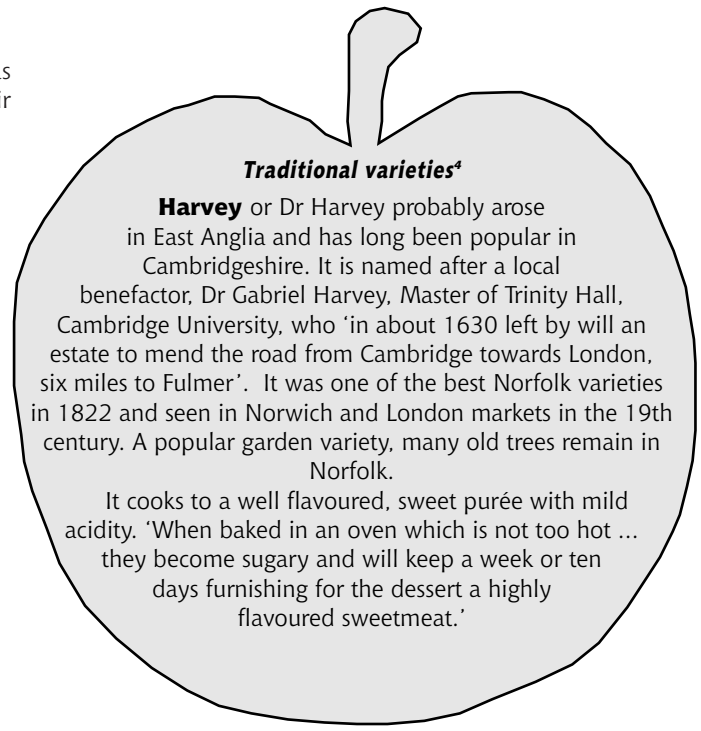
Unless consumer demand for traditional varieties of British apples is clear, the major supermarkets will continue to keep their costs down by buying huge amounts of one apple variety, often from abroad.

Supermarkets offering consumers choice?

Supermarket buyers exercise considerable power as they choose which apples will be available for their shoppers to buy. Appearance and size have been ranked by the supermarkets as of greatest importance to most shoppers, and they apply stricter standards than European Union classing systems.[27] As a result, small or russeted apples are excluded from the major stores. They are sold at low prices for juice or animal feed instead,[28] or even destroyed. Some growers say that it was the supermarkets' strict requirements that led them to abandon fruit growing and grub up their orchards.[29]

OFT enquiry into supermarkets

The SAFE Alliance highlighted the problems inherent in such a dominant retailer sector in a 1996 report.[30] Following concerns about the level of profits made by supermarkets while farmers' incomes are falling, in July 1998 the Office of Fair Trading announced an investigation into the level of buyer power that the major supermarket groups are able to exercise. Preliminary investigations were expected to take until the end of 1998.



Traditional varieties[4]

Harvey or Dr Harvey probably arose in East Anglia and has long been popular in Cambridgeshire. It is named after a local benefactor, Dr Gabriel Harvey, Master of Trinity Hall, Cambridge University, who 'in about 1630 left by will an estate to mend the road from Cambridge towards London, six miles to Fulmer'. It was one of the best Norfolk varieties in 1822 and seen in Norwich and London markets in the 19th century. A popular garden variety, many old trees remain in Norfolk.

It cooks to a well flavoured, sweet purée with mild acidity. 'When baked in an oven which is not too hot ... they become sugary and will keep a week or ten days furnishing for the dessert a highly flavoured sweetmeat.'

Biodiversity

The UK is committed to protecting and enhancing the variety of living things through the international Convention on Biological Diversity. Biological diversity or biodiversity refers to genetic variation within and between species and includes variation in domesticated species such as apples.[31]

Apples are important both for the many varieties of fruit which exist and for the wildlife which traditional orchards support.

Not only have huge areas of orchards been lost, but fewer varieties are covering greater proportions of those orchards which do still remain, reducing biodiversity from two directions (see Appendix table 3).

Orchards as wildlife habitats

As traditional orchards have rarely had any artificial inputs such as pesticides, herbicides or fertilizers, they can be an ideal habitat for wild flowers such as common, spotted and early purple orchids, cowslips, primroses, hay rattle and ragged robin. Mistletoe and lichens grow on old trees. Wild bees, butterflies and other insects, hares and birds feeding on the insects and the fruit all use orchards as a habitat, as may hedgehogs, foxes and badgers.[32]

A study by the Government's Central Science Laboratory of orchards in Herefordshire found that traditional orchards are significantly better habitats for wild birds than modern intensively managed orchards.[33] Traditional orchards are smaller, have older, larger, widely spaced trees and livestock graze below the trees. The modern orchards are larger with smaller, younger and densely planted bush trees which have bare strips below them and they are mown.

The traditional orchards receive few or no applications of pesticides while the modern orchards use herbicide below the trees and receive relatively frequent applications of pesticides.

The study recorded over twice as many birds in traditional orchards than in modern orchards. The species in traditional orchards were also more diverse. Among the ten most numerous species in the traditional orchards was the tree sparrow, the species which has declined most notably in arable farmland habitats. It was almost absent from modern orchards. The other most common species found in traditional orchards were the blue tit, chaffinch, blackbird, woodpigeon, robin, great tit, greenfinch and magpie.

The study found that hedgerows surrounding even the intensively managed orchards could be a habitat for birds and that the less trimmed and managed the hedges, the higher the number of birds.

Traditional varieties[4]

Devonshire Quarrenden. A UK variety that may have arisen in Devon or have been introduced from France. It possibly took its name from Carentan, Normandy. It was recorded in 1676.

The distinctive flavour is of strawberries or loganberries and the taste is sweet with plenty of acidity. It is not easy to catch in its prime and soon goes soft once picked. It was valued in the 19th century as a summer dessert and grown 'from Devonshire to Murray Firth'. It was sold in markets as 'Quarantine' and 'always made high price'. In decline by 1890s, it is still often found in old gardens.

Preserving old orchards

Countryside Stewardship grants are available from MAFF to help with the costs of maintaining the environmental benefits of traditional orchards.

Grants apply to old orchards of widely spaced standard trees of traditional varieties. Old trees can be restored by pruning and surgery, and appropriate local varieties planted. Management of orchard pasture to benefit wild flowers is also important and proposals should address associated features such as hedgerows or ponds.[34]

Although this grant scheme is helpful to farmers who wish to ensure environmental benefits from their work, not enough funding is available to meet the demand. During the last three years more than 3000 applications have been turned down.[35] An additional £20 million would be required to fund these schemes.

Apple crop type	Percentage area of crop not treated with pesticides
dessert apples - Cox	0.9
dessert apples - others	3.6
cookers - Bramley	2.1
cookers - others	10.2

Source: Central Science Laboratory 199839

Pesticides

Apple growers are among the most intensive users of pesticides in the UK.[36] While traditionally managed orchards receive few or no pesticide applications, modern orchards are treated relatively frequently.[37] Because of the lack of orchards falling in between these two extremes, the Central Science Laboratory study of Herefordshire orchards was unable to determine whether pesticide use itself affected bird numbers, although it did conclude that any effects would be indirect (through reducing the birds' food supply) rather than through direct toxicity of the pesticides.

The Government's 1996 pesticide usage survey found that Cox's were the most intensively treated of all orchard crops, receiving on average a total of 16 pesticide sprays, containing 36 active substances (including repeat applications).[38] Cox's, which make up the majority of the modern apple crop, are notoriously vulnerable to pests. The monoculture nature of many apple orchards also means that they are more at risk from pests. Less than one per cent of Cox's were not treated (see table above).

In addition to affecting ecosystems as discussed above, pesticide use has implications both for consumers eating fruit which may have chemical residues on it and for agricultural workers applying the chemicals to crops.

Pesticide residues

The latest government survey of fruit (conducted in 1997) found evidence of 32 different agrochemicals leaving detectable traces in apples.[40] Nineteen samples of UK apples and 51 samples of imported apples were tested along with two samples of unknown origin. Fifty-one of the total of 72 samples contained multiple residues. Nine per cent of apples were found to contain the insecticide phosalone at levels which, the report acknowledged,

could lead to consumption of the chemical at up to six times the acceptable daily intake.

Both UK-produced and imported fruit were found to contain traces of a wide range of chemicals — the full details are given in Appendix table 7.

Another concern related to pesticide residues is the high variation between the levels of chemicals found on different apples. A report by the US Environmental Working Group[41] analysed US government pesticide residue data and found that an American child has a 13 per cent chance of eating an apple with a unsafe dose of pesticide residues. In the UK the Pesticides Safety Directorate announced[42] in 1997 that they had found unexpectedly high variations in pesticide residues, noting that the risk of eating an apple with residue levels that might cause adverse health effects was 1 in 1000.

Following this survey, the government issued advice saying 'consumers should wash fruit before eating it, and that, whilst peeling fruit is a matter of choice, it is a sensible additional precaution when preparing fruit for small children'.[43]

Traditional varieties[4]

Lane's Prince Albert is believed to be a cross between Russet Nonpareil and Dumelow's Seedling. The original tree was transplanted in 1841 by Thomas Squire to his Berkhamsted front garden on the day that Prince Albert and Queen Victoria called at the King's Arms for a change of horses. He accordingly named his seedling Victoria and Albert.

The tree regularly bore heavy crops, but remained small and neat, impressing John Lane who obtained grafts and introduced it as Lane's Prince Albert.

It was a popular garden apple by the 1880s and also planted for market. The fruit bruises easily which has led to its commercial demise. It is widely distributed throughout northern Europe and grown in eastern Germany for juice and as a sharp dessert apple in March. It cooks to a lemon coloured purée, brisk but not as strong as a Bramley. It becomes sweeter and milder but can be rather tough cooked.

ALAR alarm

Alar, a growth regulator used in apple production, became the subject of a consumer boycott campaign after estimates were made that one in a thousand young children may develop cancer as a result of eating residues in apple juices and apple-based baby foods. The chemical could not be washed or peeled off the fruit and it was claimed that its active ingredient breaks down into a potent carcinogen when apples are cooked, processed or made into juice.

MAFF insisted that the risks were exaggerated and refused to ban the chemical, but sustained campaigning led the manufacturers to withdraw the product in both the UK and the USA.

Working hazards

The Health and Safety Executive conducted a survey in 1996/7 to measure the exposure of UK workers involved in orchard spraying to chlorpyrifos, an organophosphate pesticide used in spraying apple orchards as well as for other fruit. Organophosphates (OPs) affect the nervous system. Many public interest groups would like to see this group of chemicals placed under a moratorium.[44] The survey found that compliance with the recommended safety requirements — wearing gloves, masks and other protective equipment — was generally poor.[45]

Workers in developing countries are also at risk from applying pesticides to fruit crops destined for the UK market. Organophosphates dominate the pesticide market in Latin America and up to 30 per cent of workers tested by the World Health Organisation showed indications of exposure to OPs.[46] The main exposure route for these farmworkers is via their skin while working in orchards sprayed with pesticides, as the apples are picked, sorted and packed by hand. There are also problems of storage and handling of pesticides. In Chile, for example, a country with an increasingly important apple export industry, the warnings and instructions on pesticide containers are not usually in Spanish and even when they are, not all workers are able to read them. Empty pesticide containers may not be disposed of properly and may even be used for carrying water.[47]

Diet and health

General health guidance is to avoid fat, particularly saturated fat, and to increase consumption of fruit and vegetables, along with other changes. These recommendations have been made by the UK government advisory committee on diet, and similar recommendations have been accepted by other EU member states.[48,49]

UK consumers eat less fruit and vegetables than in most European Union countries, with an average consumption of 2.5 portions per day (half of the recommended amount).[50] There is therefore considerable scope to encourage greater consumption of fruit, including apples, and the Department of Health and many voluntary organisations are encouraging this.[51]

One of the problems with growing a limited range of varieties, in large orchards in just a few regions, is that the fruit tend to be ready for market all at once. Instead of a gradual supply, there are large peaks and troughs of production. This can lead to marketing problems, with fruit being left unsold, or prices falling so low that the fruit are not worth harvesting. Apples harvests now show such fluctuations, and a scheme organised under the European Common Agriculture Policy allows apple-growers to remove fruit from the market when they see prices falling too low, and to be compensated for lost sales.

But what happens to this unsold fruit? Under the CAP scheme, the fruit can be offered free to schools and other charities. In reality this has not been happening. In both 1996 and 1997 the excess fruit withdrawn from the market were left to rot or fed to animals (see table overleaf).[52]

Traditional varieties[4]

Discovery was developed in about 1949 by Mr Dummer, Blacksmiths Corner, Langham, in Essex. As a worker on a fruit farm, Dummer had raised a number of seedlings from Worcester pips and decided to plant the best one in his front garden. He only had one arm and so his wife's help was needed, but she slipped and broke her ankle so that the tree had to remain, despite frosts, covered by a sack for some weeks before it was planted. Nevertheless it survived and produced colourful heavy crops.

Well ripened on the tree, it is bright red with crisp, juicy, often pink-stained flesh and a hint of strawberry flavour. The variety came to the notice of Mr Matthews, who bought grafts and every year held a party under the tree to popularise his new variety. It was the main early commercial variety by 1980s and widely grown in gardens. The original tree still grows in Langham.

Apples taken off the market

Kg	taken off the market	given to schools, charities etc	dumped or fed to pigs
1996	2,232,000	0	2,232,000
1997	40,000	3,000	37,000

Source: UK Intervention Board 1997, 1998[53]

Variation of Vitamin C in different apple varieties

Variety	Vitamin C per 100 grams
Sturmer	20mg
Discovery	16mg
Cox's Orange	9mg
Russet	8mg
Worcester	5mg
Golden Delicious	4mg
Granny Smith`	4mg
Red dessert	3mg

From The Food We Eat, Joanna Blythman, Michael Joseph, London 1996

Despite the UK population eating barely half the recommended amounts of fruit and vegetables, and despite encouragement to eat more fruit, it is destroyed rather than marketed.

Besides the problems of quantity, there are also problems of quality. The varieties of apples which dominate the market are not selected for their nutritional value. Worcester Pearmain are a heavy cropping apple variety, as are Golden Delicious and Granny Smith, but none of these are particularly rich in vitamins, such as vitamin C (see table above).

There is also some evidence that the nutritional value of apples has declined over the last 50 years. A comparison of the standard reference tables for eating apples published in 1930 and in 1980 shows a fall in the levels of calcium, magnesium, iron and copper, along with a small increase in the amount of water in the fruit, over the period.[54]

Alternative apples:

Organic production

Organic farming systems avoid artificial fertilizers and pesticides and maintain fertility and control pests through methods such as crop rotation.

The market for organic apples currently exceeds the supply from UK producers, which was estimated at approximately 2000 tonnes of organic apples produced in 1997.[55] There is therefore considerable scope for more UK organic apple production. However, conventional apple production relies heavily on chemicals for control of pests and diseases such as aphids and scab, means which are not available to the organic grower.

Organic systems rely on a healthy living soil to provide sufficient nutrients for strong growth in the crop. This is achieved by returning essential minerals and nutrients to the soil through reutilising farm waste by returning it to the soil and by using leguminous crops to boost nitrogen levels. In orchards the option of crop rotations is not viable, although it may be possible to undersow with clover to boost nitrogen in the soil. If necessary, composted farmyard manure from conventional systems can be used.

Maintaining biodiversity in organic orchards encourages natural enemies for suppression of pests. A few chemical treatments are allowed in organic systems, including the use of soft soap (Savona) and cultures of the bacterium ***Bacillus thuringiensis*** to prevent the spread of aphids and caterpillars.

No herbicides are allowed in organic systems so weed control needs to be done physically. Plastic mulches are allowed, which prevent weed growth by stopping light reaching the soil around the tree. These may be expensive but will protect from weeds and retain soil moisture.

Traditional varieties[4]

D'Arcy Spice was found in about 1785 in the garden of The Hall, Tolleshunt d'Arcy, Essex but is possibly older. With a hot, spicy, almost nutmeg-like flavour by New Year, it is fairly sharp but sweetens. The firm white flesh becomes rather spongy by spring but the flavour remains. Traditionally it is picked on Guy Fawkes Day or Lord Mayor's Day and stored in sacks hung on trees or packed away in trunks. It remains a popular Essex variety on sale locally.

Encouraging growth

Organisations including the HDRA, the SAFE Alliance and the National Association of City Farms are promoting the practice of 'growing-your-own', particularly in urban areas.[56] And a joint project of the National Food Alliance and the SAFE Alliance project, CityHarvest, is also supporting urban agriculture.

To encourage rare varieties, the organic gardening organisation, the Henry Doubleday Research Association (HDRA), keeps a range of fruit varieties as part of their Heritage Seed collection of fruit and vegetables not grown commercially.

Apple Day: 21st October

Apple Day was initiated by the charity Common Ground as an annual celebration of the diversity of apples and other tree fruit and as a way to demonstrate the importance of old traditional orchards. It is now a countrywide festival created by people in their own locality.

In March Marcle in Herefordshire the Big Apple festival was founded in 1989 with the aims of raising interest in English apples, conserving old varieties and traditional orchards, encouraging visitors to the area and enabling local community groups to raise funds. Visitors to the 1998 festival over the weekend of 17-18 October could visit traditionally managed orchards, have their apples or pears identified and taste apples, pears, cider, perry and juices, as well as visiting traditional and commercial cider makers. Real enthusiasts were able to attend a cider making day which encompassed gathering fruit (from a traditionally managed organic orchard) and pressing the cider, reviving traditional skills.

In Bristol, Apple Day was celebrated on October 21st with a farmers' market.

Farmers' markets allow producers to sell directly to the public in the area local to their farm. The benefits of farmers' markets include increased communication and understanding between producers and consumers, and the provision of fresh food, as well as cutting down food miles and transport pollution. The markets also allow producers to increase the proportion of the sales price they earn and to build up customer loyalty.

On Apple Day the stall holders included local makers of single traditional variety apple juices and products such as cider vinegar, as well as apple tasting and apple day activities. As well as being the busiest of the farmers' markets held in Bristol to date, the market also acted as a focus for the local and regional media, further raising awareness of the issues.

Traditional varieties[4]

Bess Pool. Discovered in the 1700s in a Nottinghamshire wood by Bess Pool. She took the apples home to her father who kept an inn, and the fruit achieved local fame. It has a beautiful crimson flush and is rich, almost aromatic by January with sweet rather dry crumbly flesh. It becomes spongy but still good to eat. It was also used for cooking in the 19th century and to give colour to large fruit displays on dining tables. Widely grown in gardens and for market in the 19th century, it is still found growing in the North and Midlands.

Case study: community orchards

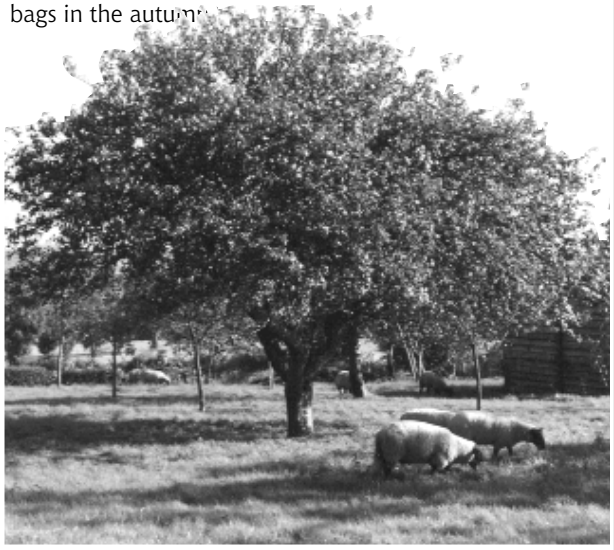
Community orchards are traditional orchards owned or looked after by the people living near them, with open access for the community. They provide the opportunity for people to relax and enjoy themselves as well as providing a focus for reviving traditional knowledge and orchard husbandry. Community orchards can act as repositories for many old local fruit varieties.

Lustleigh Community Orchard, Devon

This old farm orchard was left to the village after the death of its owner in 1960. Villagers have replanted and restored the orchard to its original condition. Most of the apples are cider varieties. Local people are free to take apples for their own use. The remaining fruit is sold for cider production. Further income is earned by sales of mistletoe from the trees and by letting sheep grazing in the orchard.

Shenley Park Trust — Stan Lord Orchard, Hertfordshire

Shenley Park was once an asylum and its extensive orchard of almost 400 apple trees (mainly dessert varieties) was the pride of the late Stan Lord who won many Royal Horticultural Society awards and prizes. The orchard was derelict until six years ago and is now managed by Shenley Park Trust staff with grant aid from the Countryside Stewardship Scheme. Apples are picked and sold in 2lb bags in the autum



Traditional cider making at the Big Apple festival

Apples are poured into the scratter to be crushed.

Crushed apple is transferred to the press.

The crushed apple is put in cloths which are made into 'cheeses'.

The cheeses are ready for pressing.

Recommendations
for retailers

- Support the growing of more varieties through assistance to producers and traditional breeders.
- Educate consumers to expect blemishes as part of a move towards chemical reduction and reliance of biological and natural pest and disease control.
- Stock local varieties of apples in stores, sourced locally and transported direct to stores. Label such produce and market its advantages.

Recommendations
for government

- Increase the level of direct financial aid and additional assistance and research for production of organic top fruit.
- Lobby to reform the Fruit and Vegetable Regime of the CAP to phase out grubbing-up grants and to further promote fruit consumption. Phase out taxpayer-funded destruction of healthy fruit.
- Make more funding available for Countryside Stewardship grants and other agri-environment schemes which can be used to create and maintain orchards.
- Encourage schools to make use of Intervention Board stocks.

Recommendations
for consumers

- Whenever possible, buy local apples in season. Ask your supermarket to stock traditional local varieties, sourced locally and not sent via distant distribution centres.
- Buy apples direct from the producer. The Soil Association has a directory of local food schemes such as organic food boxes and farm shops. Find out if your area has a farmers' market - contact the Environment Co-ordinator at your Local Authority.
- Celebrate Apple Day and get involved in your local community orchard. Details from Common Ground.
- Plant your own apple tree(s). Look for a traditional variety from your area. Common Ground has a list of nurseries which stock traditional varieties. The Brogdale Horticultural Trust also sells traditional fruit trees. The Henry Doubleday Research Association sells a list of tree suppliers, including organic tree suppliers, as well as advice leaflets on planting and organic pest control methods.
- Encourage your local school to get hold of free fruit from the Intervention Board stocks (details from the Intervention Board on 0118 953 1694).

***Traditional varieties*[4]**

Bramley's Seedling was developed in around 1810 by Miss Mary Anne Brailsford and planted in a garden in Southwell, Nottinghamshire. Bramley's Seedling was first admired by Henry Merryweather about 1857 when the tree and cottage belonged to Mr Bramley, the local butcher. The original Bramley tree blew down in a storm in the early 1900s but branches grew up from the old trunk and it still survives and fruits. Extensively planted in the early 1900s, it remains a valued garden variety and almost the only cooker grown commercially. It cooks to a pale cream purée with strong acidity and flavour; rarely overwhelmed in the most sugary and highly spiced recipes. With keeping, the acidity falls and home stored fruit can serve as sharp dessert apples in spring, but commercially stored fruit retains high acidity.

Appendix

Food miles

Food is being transported longer and longer distances between producers and consumers (see Appendix tables 4 and 5). For example, apples, which could be grown locally in the UK, are transported 7,000 miles from the western USA.

To protect food during long distance transit, it is either heavily processed, packaged or preserved. Pesticides are used both in storage and transport. One such, methyl bromide, which is used to fumigate food, is also a significant contributor to ozone layer depletion.

Other consequences of long distance food transport include air pollutants and greenhouse gas emissions from transport, packaging and pesticide manufacture.

Long distance trade in foodstuffs leads towards specialisation and intensification in agriculture and to the allocation of resources to production for export rather than meeting local food needs. In developing countries this can lead to health and safety risks for farmworkers, environmental damage resulting from inappropriate methods and economic vulnerability from dependence on export sales, especially where prices fluctuate.

The impacts of intensive production include increased mechanisation and loss of employment, increased use of artificial fertilizers and pesticides, soil erosion and reduced biodiversity in wild and domesticated species.

The enhanced greenhouse effect — global warming

Emissions of gases from the activities of man since the industrial revolution have led to a scientific consensus that the Earth will suffer from an enhanced greenhouse effect. The greenhouse effect is what keeps our planet at a temperature warm enough to support life, but the enhancement of the blanketing effect by man-made gases is thought to be causing global temperatures to rise at a rate that will be too fast for ecosystems or people to easily adapt.

Among the predicted effects of enhanced global warming are a rise in sea levels due to thermal expansion of the oceans, particularly threatening to the third of the world's population living in coastal areas. Other changes may include climatic effects such as increased storms or changes in weather patterns, so that crops are no longer suitable for the areas in which they are grown, and changes in the occurrence of diseases such as malaria.

Greenhouse gases include carbon dioxide, which is the most important gas in terms of volumes emitted as it is created by the burning of fossil fuels in transport or energy generation, although other gases such as methane have more potent effects. CFCs are also particularly potent greenhouse gases as well as causing damage to the ozone layer.

Though the United Nations Framework Convention on Climate Change, countries have agreed to limit their emissions of greenhouse gases in order to reduce the global impacts of climate change. The UK has the target of reducing emissions to 1990 levels by the year 2000.

Table 1
What do we grow on UK farm land?

	Thousand hectares
Crops	4,989
Of which	
Wheat	2,036
Barley	1,358
Other cereals	120
Oilseed rape	446
Sugar beet	196
Fodder beans	197
Potatoes	166
Open field vegetables	126
Orchard fruit	30
Soft fruit	11
All other crops	299
Set aside	307
Grass under 5 years old	1,393
Traditional grass	5,241
Rough grazing	5,595
Total	17,525

Source: MAFF Agricultural Statistics 1997

Table 3
We are buying more fruit — but not apples

Kilograms purchased per person per year

	apples	**all fresh fruit**
1982	10.2	27.3
1984	10.0	29.8
1986	9.5	29.6
1988	10.4	30.6
1990	10.3	31.1
1992	9.6	31.7
1994	9.4	33.5
1996	9.1	35.7
1997	9.3	37.0

Source: National Food Surveys, MAFF 1984-1998.

Table 2 Apples and apple orchards
The declining area of UK apple orchards, and the apples they produce

Hectares of apple orchards	**1970**	**1977**	**1987**	**1997**
Cox	11164	10564	5421	5028
Bramleys	7778	7009	5844	3376
Worcester Pearmain	3110	1939	633	294
Egremont Russet	673	517	319	298
Discovery	—-	856	1062	603
Other traditional varieties				
(e.g. Katy, Laxton Superb etc)	9131	7226	6245	1016
Four newer varieties				
(Gala, Spartan, Jonagold, Fiesta)	—-	—-	816	1281
TOTAL	31856	28111	20340	11896
Apple production (tonnes)	345,200*	269,900	267,000	143,000

Source: Annual orchard and crop statistics, MAFF, 1970-1998. *1972 statistic.

Table 4
Our dependence on imported apples

Thousands of tonnes

	imports from EU	imports from rest of world	exports (all to EU)
1979-81 average	263	110	15
1987	291	152	32
1992	252	214	20
1996	232	202	29
1997 (prov)	246	187	23

Source: Agriculture in the United Kingdom, MAFF 1988-1998

Table 5
Food miles: Our food is travelling further and further

In two decades the amount of food being transported on our roads has increased 30 per cent and the average distance travelled has increased nearly 60 per cent. By 1997 the total 'food miles' for UK food, drink and tobacco products amounted to 41 billion tonne-kilometres.

	Quantity (millions of tonnes)	Average distance (kilometres)
1975	266	76
1980	257	94
1985	268	95
1990	299	110
1995	308	122
1997	342	119

Source: SAFE Food Miles Report[57], DETR 1998[58]

Table 6
Food miles: Ship and rail are better than road or air

Road transport consumes more energy than rail, and is more polluting, yet in the UK rail takes barely 6 per cent of goods, while roads take more than 80 per cent.

	Energy consumed kilojoules per tonne-kilometre	Emissions of Carbon dioxide grams per tonne-kilometre	Hydrocarbons	Nitrogen oxides	Carbon monoxide
Rail	677	41	0.06	0.2	0.05
Boat	423	30	0.04	0.4	0.12
Road	2,890	207	0.3	3.6	2.4
Air	15,839	1,206	2.0	5.5	1.4

Source: SAFE Food Miles Report[59]

Table 7
Pesticide residues in apples

The pesticide residues detected in samples of apples on sale during 1997

	UK grown	imported
bifenthrin	nf	4%
bromopropylate	11%	2%
bupirimate	5%	nf
captan	21%	16%
carbaryl	5%	6%
carbendazim	58%	31%
chlorpyrifos	5%	8%
diazinon	nf	2%
dimethoate	nf	4%
diphenylamine	21%	53%
dithiocarbamates	11%	24%
ethoxyquin	5%	4%
iprodione	5%	4%
metalaxyl	42%	2%
myclobutanil	11%	2%
paclobutrazol	5%	nf
phosalone	nf	12%
pirimicarb	5%	4%
propargite	5%	12%
tecnazene	5%	nf
thiabendazole	nf	22%

nf = residue not found
Source: Table 5 in MAFF/HSE Working Party on Pesticide Residues, 1998

Useful contacts

Brogdale Horticultural Trust
Brogdale Road, Faversham, Kent,
ME13 8XZ
Tel 01795 535286 / 535462
Fax 01795 531710
www.brogdale.org.uk
Home of the National Fruit Collections.

Catholic Institute for International Relations
Unit 3 Canonbury Yard
190a New North Road
London N1 7BJ
Tel 0171 354 0883
Fax 0171 359 0883
Tackling the causes of poverty and injustice internationally through advocacy and skill sharing.

Common Ground
PO Box 25309
London
NW5 1ZA
Tel & Fax 0171 267 2144
Arts and environment charity encouraging people to value and look after their local places.

Council for the Protection of Rural England
Warwick House
25 Buckingham Palace Road
London SW1W OPP
Tel 0171 976 6433
Fax 0171 976 6373
www.greenchannel.com/cpre
cpre@gn.apc.org
National charity helping people to protect and enhance their local countryside and to keep it beautiful, productive and enjoyable for everyone.

East Anglia Food Link
49a High Street
Watton
Thetford
IP25 6AB
Tel 01953 889 200
Fax 01953 889 222
eafl@gn.apc.org
Provides advice and consultancy on organic production and regional and co-operative marketing and promotes exchange between farmers and organisations in the social economy in the UK and Europe.

Farming and Wildlife Advisory Group
National Agriculture Centre
Stoneleigh, Kenilworth
CV8 2RX
Tel 01203 696699
Fax 01203 696 760
An independent organisation with charitable status and the leading provider of farm conservation advice in the UK.

Friends of the Earth
26-28 Underwood Street
London N1 7JF
Tel 0171 490 1555
Fax 0171 490 0881
www.foe.co.uk
info@afoe.co.uk
One of the UK's most influential national environmental pressure groups.

Green Network
9 Clairmont Road
Lexden
Colchester CO3 5BE
Tel 01206 546902
Fax 01206 766005
Umbrella organisation of small organisations and individuals networking internationally, working on environmental pollution, human health issues, and with and for farmers.

Henry Doubleday Research Association
Ryton-on Dunsmore
Coventry
CV8 3LG
Tel 01203 303517
Fax 01203 639229
http://www.hdra.org.uk
Researching and promoting organic gardening and food.

Ministry of Agriculture, Fisheries and Food (MAFF)
17 Smith Square
London SW1P 3JR
Helpline (public enquiries) 0645 335577
www.maff.gov.uk
Government information on food and agriculture including Countryside Stewardship Grants.

National Federation of City Farms
The Greenhouse
Hereford Street
Bedminster
Bristol BS3 4NA
Tel 0117 923 1800
Fax 0117 923 1900
Farmgarden@btinternt.com
Information on community gardens and city farms.

The Pesticides Trust
Eurolink Centre
49 Effra Road
London SW2 1BZ
Tel 0171 274 8895
Fax 0171 274 9084
E-mail pesttrust@gn.apc.org
www.gn.apc.org/pesticidestrust
An independent charity addressing the health and environmental problems of pesticides and working for a sustainable future.

The Permacuture Association (Britain)
BCM Permaculture Association
London WC1N 3XX
Tel 01654 712188 (10-2 Tues-Thurs)
Permaculture.uk@btinternet
Permaculture is a way of designing and creating sustainable environments and systems.

The Royal Society for the Protection of Birds (RSBP)
The Lodge
Sandy
Bedfordshire SG19 2DL
Tel 01767 680551
Fax 01767 691178
www.rspb.org.uk
enquiries@rspb.org.uk
The charity that takes action for wild birds and the environment.

The Soil Association
Bristol House
40-56 Victoria
Bristol
BS1 6BY
Tel 0117 929 0661
Fax 0117 925 2504
info@soilassociation.org
Campaigning for organic food and farming and sustainable forestry.

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The Sustainable Agriculture, Food and Environment Alliance exists to unite farmer, environmental, consumer, animal welfare and development organisations. We seek forms of food production which are beneficial to the environment, sensitive to the need for global equity, and which produce safe and healthy food in a manner supportive of rural life and culture.

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