

Fruit

Fact sheet

In this fact sheet we take a look at the various types of fruit, nutrients in fruit and related health, food safety, behavioural and sustainability aspects.

Fruit, without added sugar or syrup, is in the Wheel of Five. Adults are recommended to eat at least two portions (200 g) of fruit per day. Fruit juice, coconut, sugared dried fruit and fruit in tins or jars with syrup are not included in the Wheel of Five.

Fruit contains many nutrients and consuming the recommended quantity of fruit is associated with a lower risk of chronic diseases. Eating enough fruit is associated with a lower risk of cardiovascular diseases, type 2 diabetes, colorectal cancer and lung cancer. Eating a variety of fruit is the best way to obtain the full range of nutrients from fruit. Fruit cannot be substituted or replaced with a vitamin pill.

To encourage people to eat enough fruit, the range of food products should be presented in a way that makes it easier for people to opt for fruit. Making fruit cheaper is another way to stimulate to buy more fruit. Consumers themselves can eat more fruit by selecting different kinds of fruit for their existing 'fruit moment', or by eating fruit at several eating moments such as in-between snacks or at breakfast.

It is recommended that fruit should always be washed thoroughly under running water to remove dirt and dust. In general, eating fruit that is in season is better for the environment than eating out-of-season fruit grown in gas-heated greenhouses or imported by plane.



Who is this fact sheet for?

This fact sheet is relevant for, among others, nutrition professionals, nutrition scientists, dieticians, doctors, nurse practitioners, teachers, policymakers, supermarkets, crop growers and fruit traders.

What issues are involved?

Fruit is the collective name for edible fruits. Fruit includes not only fresh fruit but also dried and tinned fruit. In botanical terms, a fruit is the edible part of the flower or what develops from it after fertilisation.

Some fruit are considered vegetables because they are eaten like vegetables. This applies to tomatoes, peppers, aubergines and cucumbers, for example.^{1, 2}

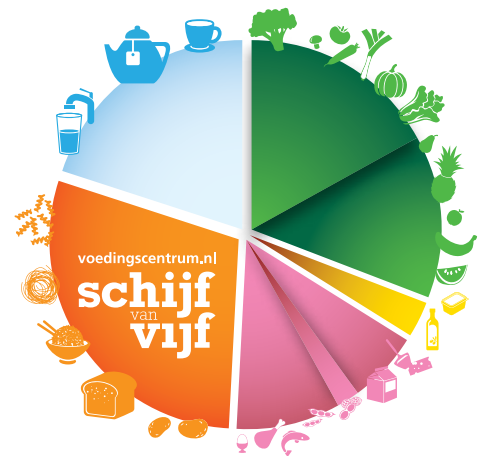
'Fruit' includes the following types:

- Soft fruit, such as berries, strawberries and grapes.
- Stone fruit, such as cherries, apricots, plums, peaches, nectarines, coconut and olives.
- Pip fruit, such as apples and pears.
- Citrus fruit, such as oranges, lemons and mandarins.
- Exotic fruit, such as bananas, kiwifruit and pineapples.

Recommended daily quantity

The Dutch Dietary Guidelines 2015, issued by the Health Council of the Netherlands, set out which foods and eating patterns lead to improved health.¹ The Netherlands Nutrition Centre has translated these guidelines into the Wheel of Five.²

Age	Recommended quantity for fruit consumption in the Wheel of Five (grams)
1-3	150
4-8	150
9-18	200
>18	200



Fruit within and outside the Wheel of Five

Included in the Wheel of Five

- Unprocessed fruit, both fresh and frozen
- Pureed fruit without added sugar, if eaten with a spoon
- Dried fruit without added sugar (max. 20 grams per day)
- Fruit in tins or jars in juice not from concentrate (drained)

Not included in the Wheel of Five*

- Coconut, dried coconut
- Fruit juices (including freshly pressed)
- Sugared dried fruit
- Fruit in tins or jars with syrup
- Olives

*Why not in the Wheel of Five?

- Coconut is not in the Wheel of Five due to its high saturated fat content (30.5 g/100 g). See the Wheel of Five Guidelines document for more information.⁴
- Fruit juices are sugary drinks. Sugary drinks increase the risk of overweight and type 2 diabetes.³
- Although olives have a high unsaturated fat content, they are not in the Wheel of Five due to the high amount of added salt.

Fruit consumption in the Netherlands

The latest Food Consumption Survey of the National Institute for Public Health and the Environment (RIVM) charts how much fruit the Dutch population ate in the period 2012-2014.⁵ This data was compared with the recommendations contained in the Wheel of Five.⁶ 16% of the population aged 1-79 eats the recommended daily quantity of fruit, 91% of which is included in the Wheel of Five. The average consumption of fruit by people aged 1-79 is 114 grams per day, most of which is included in the Wheel of Five, namely 105 grams per

day. Young children aged 1 to 3 and people aged over 50 eat the most fruit. Around 60% of the fruit is eaten between meals.

On average, the Dutch eat a little over one piece or portion of fruit per day. Big fruit eaters (=P95) eat more than the recommended quantity of fruit (Figure 1).

Since 2012, the downward trend in fruit and vegetable consumption among young adults (both men and women) appears to have been halted. Children are also eating more fruit.⁷

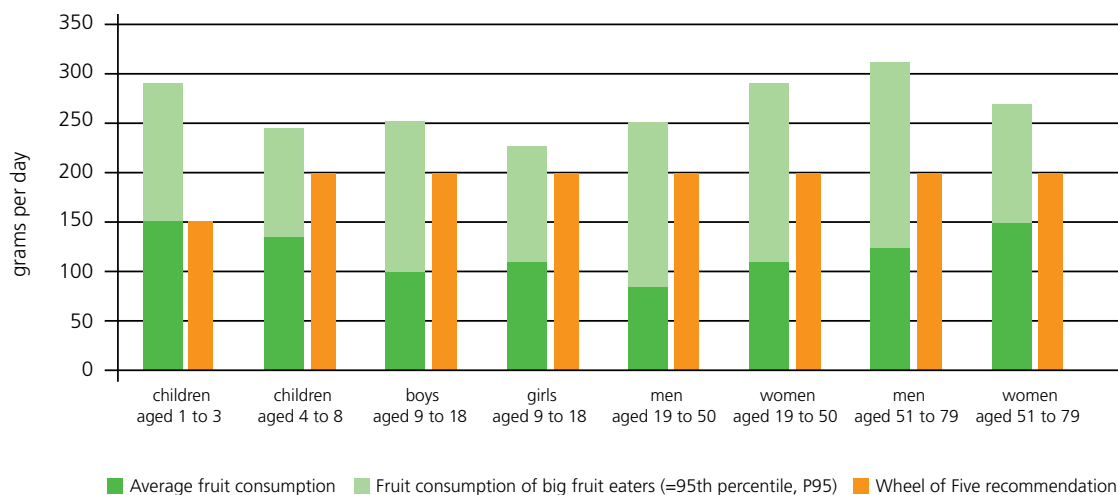


Figure 1. The fruit consumption of people aged 1 to 79 in The Netherlands (number of people=2,237).⁶ Both the average fruit consumption and the consumption of big fruit eaters are indicated (=P95) and compared with the fruit recommendation in the Wheel of Five.

Which fruits do we eat the most?

The top 10 most frequently eaten kinds of fruit among adults in the age category 1-79 are apples, bananas, pears, mandarins, oranges, grapes, strawberries, kiwis, pineapples and melons.⁸

Current scientific understanding:

Health

The available intervention studies have revealed a variety of health effects for both fruit and vegetables, but there's no data on the effects of fruit as distinct from vegetables. However, cohort studies have looked at the effects of fruit and vegetables separately.³

For more information about the different types of studies, visit www.voedingscentrum.nl/voedingswetenschap.

Health benefits of fruit

Eating 200 grams of fruit per day is associated with a reduced risk of coronary heart disease, stroke, type 2 diabetes, colorectal cancer and lung cancer.^{1,3} Little is known about the health effects of each specific kind of fruit. It does seem that eating citrus fruits leads

to a lower risk of stroke, although the evidence for this is thin.

Nutrients

Fruit supplies us with vitamins, minerals, dietary fibre and carbohydrates. Moreover, fruit contains acids and a large number of bioactive substances such as carotenoids, lycopene and flavonoids. These substances may play a role in the positive health effects of vegetables and fruit.^{1,3} It is not clear which substances in fruit provide protection against diseases. This is probably due to the various combinations of vitamins, minerals, fibres and other substances in fruit.⁹

The amounts of nutrients differ considerably according to the type of fruit.¹⁰ Differences can also be seen within the same fruit type. Nutrient amounts can vary according to the variety, season, soil, fertiliser and climate.¹¹ There is no hard evidence that organically-grown fruit contains more nutrients.¹² Tinned, preserved and frozen fruit all contain a comparable quantity of nutrients to unprocessed fresh fruit.^{13,14}

Fruit is not a vegetable

Because fruit and vegetables are different in nutrients, the Netherlands Nutrition Centre recommends that adults eat both 200 g of fruit and 250 g of vegetables every day. Different types of fruit also contain different quantities of nutrients. That's why it's important to eat a variety of types of fruit and vegetables, to get a large variety of nutrients.

Multivitamins

Fruit and vegetables cannot be replaced with a multivitamin pill or supplement.¹⁵ A healthy diet based on the Wheel of Five provides sufficient nutrients.^{3,4} For some groups, such as pregnant women and the elderly, or people who don't go outside often, certain dietary supplements may be necessary. Read more in the 'Recommendations for vitamins, minerals and trace elements' fact sheet at www.voedingscentrum.nl/factsheets.¹⁶

Nutrients past and present

For information about changes in the nutrient amounts in fruit over time, food charts such as the Dutch Nutrient File (NEVO) can be used.¹⁰ The NEVO contains data on the composition of many common foods eaten in the Netherlands. There are indications that some types of fruit contain fewer minerals than they used to.¹⁷ This difference may be partially caused by a difference in measuring methods. There are also variations in mineral quantities between different fruits

of the same type. Compared to these variations, differences between past and present are almost negligible.¹¹

Oral health

Fruit and fruit juices contain acids and sugars that can damage tooth enamel.¹⁸ If you limit the number of eating and drinking moments in a day to a maximum of seven, your tooth enamel will have sufficient time to recover.

Current scientific knowledge: food safety

It is important to handle fruit in line with food safety principles. This can be done by washing fruit well and also by varying the kinds of fruit you eat. You can eat fruit with or without its peel, fresh, from the freezer or dried. When preparing fruit, it is important to remove the seeds or kernels.

Bacteria and viruses

Pathogenic bacteria or viruses can occur on fruit through external contamination.¹⁹ These can cause a food-borne infection. Although it is not possible to wash off all bacteria, it remains important always to carefully wash fruit under running water. This also removes dirt and dust. Washing fruit is also important when the fruit is peeled. This is not necessary for fruit with thick peel, such as bananas, oranges and mandarins.



Soft fruit, such as raspberries, strawberries and forest fruits, is sensitive to viruses.²⁰ This also applies to frozen fruit, because viruses such as norovirus and hepatitis A are not killed by being frozen.

It is preferable to throw away mouldy fruit, because mould toxins may be present.

Pesticides

Pesticide residues can be found both on and in fruit. The likelihood that these pesticide residues may be hazardous to health is extremely low. The Netherlands Food and Consumer Product Safety Authority (NVWA) checks thousands of samples each year to see whether residue levels on fruit are higher than legally permitted. The vast majority of these products meet the legal requirements.¹⁹ The number of non-compliances is low, and far below the safety limits for public health. The positive effects of fruit far outweigh these potential risks. Fewer pesticides are used to grow organic fruit. The only pesticides that are used are of natural origin and are gentler on the environment.

It is not necessary to peel fruit in order to remove residues of pesticides. The pesticides have mostly already degraded when the fruit is sold. Many pesticides penetrate beyond the peel, and often they cannot be rinsed off in any case. However, washing remains important in order to remove dirt and dust.

Read more about this in the fact sheet 'Bestrijdingsmiddelen en voeding' (in Dutch) at www.voedingscentrum.nl/factsheets.²¹

Harmful substances

Harmful substances may be found both on and in fruit. These include contaminants, such as heavy metals, which are present in the environment and can find their way into our fruit. Levels are so low that they are not hazardous to health. By eating a variety of fruit, you can ensure that you aren't ingesting too much of a harmful substance and the health risk from possible harmful substances is reduced to minimal or negligible levels.⁷

Current scientific knowledge: sustainability

Compared to other food groups such as nuts, cereals and legumes, fruit has a relatively low average environmental impact.²² A large part of the environmental impact of fruit is caused by the energy use and other inputs for cultivation, storage and transport.^{23, 24} Fruit grown in gas-heated greenhouses and fruit imported by air requires more energy and thus has a higher environment impact than fruit grown outdoors.²⁵ Various (sub)tropical fruit types involve a relatively high water use, as extra irrigation is required in dry areas.²⁶ It is mandatory that the land of origin is stated on fresh and packaged fruit. This does not apply to processed fruit.

The Dutch foundation Milieu Centraal has compiled a fruit and vegetable calendar which shows at a glance which environmental category (A to E) a product falls into. The categories are based on the amount of fossil fuels, arable land and greenhouse gases it takes to get a product into the shops in a particular month.²⁷

Storage and transport

Almost all fruit is transported and stored under refrigerated conditions. Refrigerating fruit consumes extra energy. Greenhouse cultivation in the Netherlands consumes more energy than outdoor cultivation. European products grown outdoors produce fewer CO₂ emissions due to transport than products from outside Europe. This does not apply to Dutch fruit that is stored under refrigerated conditions for a long period. Dutch fruit grown in greenhouses has a higher impact than fruit grown outdoors, unless the greenhouse is heated with a sustainable heat source.²⁷

Only a small amount of fruit sold in the Netherlands is imported by air. This includes fruit such as strawberries, berries, papayas and lychees. Fruit such as apples, pears, mangos, bananas and kiwis can be stored for longer and is usually imported by ship. The environmental impact of ship transport is much lower than that of air transport.

Storage advice

Fruit is in the top five of the most-wasted products.²⁸ Fruit is a living product, so the quality is always different. As it gets older, fruit becomes desiccated and starts to look wrinkly. The process of ripening can change the taste and texture. Mouldy fruit should be thrown away, even if only one small area of mould is visible. This is because mould can easily spread through fruit and is not always visible. However, bruised areas caused by dropping or pressure can be cut away. In these cases, the rest of the fruit is still edible.

Fresh fruit will remain in good condition for as long as possible by:

- handling it carefully and packaging it well. This prevents damage and desiccation.
- storing it in the refrigerator, unless it is tropical fruit such as melons, nectarines, pineapples, bananas, mangos or papayas. Citrus fruits are also better stored outside the refrigerator.
- Soft types of fruit, such as strawberries, berries, blackberries and raspberries, have a short shelf life. These are best stored in the refrigerator in a paper bag. Do not remove calyces, stalks or stems.
- Storing various types of fruit separately from each other. Apples, bananas, pears and peaches produce

large amounts of ethylene, a natural substance that promotes ripening. Other fruits, as well as vegetables, are sensitive to this and can spoil more quickly. We therefore make specific recommendations for a longer shelf life (see Figure 2). Ethylene production is significantly reduced under refrigerated conditions (<4 °C).

Pre-cut fruit and fruit salads remain in good condition the longest if they are transported under refrigerated conditions, stored in the refrigerator and kept until the consume-by date stated on the packaging or up to one day after the packaging is opened.

		Ethylene-sensitive		
		High	Medium	Low
Ethylene-producing	High	Apples, kiwis, pears	Avocados, melons, passion fruits	
	Medium	Apricots, bananas, mangoes	Nectarines, papayas, peaches, plums, tomatoes	<i>Green: can be stored with all other products</i>
	Low	Cabbage types, carrots, cucumbers, lettuce, potatoes	Asparagus, celery, citrus fruits, aubergines	Artichoke, berries, cherries, grapes, pineapple, sweet peppers <i>Pink: do not store with orange and yellow</i> <i>Orange: accelerates ripening for orange and yellow</i>

Figure 2. Types of vegetables and fruit that produce ethylene and are sensitive to ethylene



Quality marks

In the (sub)tropics, working conditions are not always thoroughly supervised. For instance, workers in banana cultivation are often poorly paid. You can take this into consideration when buying fruit by noting the origin and any quality marks. There are also various quality marks relating to the environment. The quality marks you will find on fruit are: Milieukeur, European quality mark for organic agriculture, EKO quality mark, Demeter, Fairtrade/Max Havelaar and Rainforest Alliance. In 2019, Milieukeur will be replaced for plant products by 'On the way to PlanetProof'.



Current scientific knowledge: behaviour

In order to reach the recommended quantity for fruit in the Wheel of Five, the Dutch should on average move up from one portion of fruit to two portions per day. This can be done by eating more fruit during the existing 'fruit moment' or by introducing several moments when fruit is eaten, such as between meals or at breakfast.

Make it easier to eat more fruit

Replacing confectionary and snacks with fruit would be a good step. People can make it easier for themselves to eat more fruit by buying different kinds of fruit^{29, 30} and putting the fruit bowl somewhere where it is easy to see.³¹

Healthier environment

Those responsible for presenting food products, such as food suppliers, as well as policymakers who have an influence over the consumer environment, can contribute to increasing fruit consumption. They can have an impact through municipal business location policies. Suppliers can present food products in a way that makes it easier for people to opt for fruit. People are more likely to choose foods that are prominently displayed in large quantities and are easy to pick up.^{32, 33}

This could be done in (school) canteens and company restaurants by, for instance, placing fruit in various easily visible locations, such as at the check-out.^{32, 33} Restaurants could include fruit in dishes more often. Employers could promote fruit eating by offering fruit to employees for free. Schools could make arrangements for eating fruit during breaks.

Making fruit cheaper

Fruit consumption can also be encouraged by making fruit cheaper, for example through subsidies or tax measures. The price of food plays a role in the quantities we buy. We know that cutting the price of fruit by 10% means people buy approximately 5% more fruit.³⁴ This doesn't mean that everyone will automatically buy more fruit if it's cheaper. Purchasing decisions are influenced by more than just price changes – factors such as the availability of alternative foods and the proportion of our income that we spend on food also play a role. Dutch consumers spend a relatively small part of their income (11%) on food.³⁵ In other countries, this share is higher than in the Netherlands.³⁶ It is logical that in a country where a relatively small amount of income is spent on food, price measures will have smaller effects.



Looking to the future

The Netherlands Nutrition Centre will continue to keep track of developments in the guidelines of the Health Council of the Netherlands and adjust its recommendations in line with these where necessary. In the field of food safety, it will continue to track the NVWA's screening for pesticide residues in products and monitor new research that might prompt it to adjust its standpoint.

The Netherlands Nutrition Centre also advocates creating an environment in which eating fruit is encouraged. This is an important task for policymakers, schools, restaurants, company cafeterias and other food suppliers.

In preparing this document the following experts were consulted:

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