

# Homebrewing

**Homebrewing** is the brewing of beer, wine, sake, mead, cider, perry and other beverages through fermentation on a small scale as a hobby for personal consumption, free distribution at social gatherings, amateur brewing competitions or other non-commercial reasons. Both alcoholic and non-alcoholic beverages can be made at home.

Brewing on a domestic level has been done for thousands of years, but has been subject to regulation and prohibition. Restrictions on homebrewing were lifted in the UK in 1963,<sup>[1]</sup> Australia followed suit in 1972,<sup>[2]</sup> and the USA in 1978, though individual states were allowed to pass their own laws limiting production.<sup>[3]</sup>

The legality of homebrewing varies from country to country, and some countries limit the volume an individual can legally brew. Fewer countries allow distillation of alcohol in the home.

## History

Alcohol has been brewed domestically throughout its 7,000-year history beginning in Mesopotamia (modern Iraq), Egypt and China. Knowledge of brewing beer and wine was passed on from the Egyptians to the Greeks and then to the Romans.

Mass production of brewed beverages began in the 18th century with the Industrial Revolution. New innovations, like thermometers and hydrometers, allowed increases in efficiency. French microbiologist Louis Pasteur explained the role of yeast in beer fermentation in 1857, allowing brewers to develop strains of yeast with desirable properties (conversion efficiency, ability to handle higher alcohol content).

While the sale or consumption of commercial alcohol was never prohibited in the UK, throughout the first half of the 20th century, homebrewing was circumscribed by taxation and prohibition. One of the earliest, modern attempts to regulate private production that affected this era was the Inland Revenue Act of 1880 in the United Kingdom; this required a 5-shilling homebrewing license.<sup>[4]</sup>



Home winemaking

In the UK, on April 1963, the UK Chancellor of the Exchequer, Reggie Maudling removed the need for the 1880 brewing license.<sup>[1]</sup> Australia followed suit in 1972, when Gough Whitlam repealed Australian law prohibiting the brewing of all but the weakest beers and wines as one of his first acts as Prime Minister.<sup>[2]</sup>

In 1920, the United States outlawed the manufacture and consumption of alcoholic beverages "for beverage purposes." As a result of Prohibition, breweries, vineyards, and distilleries across the United States were closed down or placed into service making malt for non-alcoholic purposes. During prohibition, home wine-making was treated more leniently as the result of a 1920 IRS ruling that loosened



A beer homebrewing kit consisting of hopped malt extract, yeast and instructions



Wine fermentation vessels with airlocks

standards for allowable alcohol content for wine and cider but not for beer. Homebrewing of beer having an alcohol content higher than 0.5% remained illegal until 1978 when Congress passed a bill repealing Federal restrictions and excise taxes on the homebrewing of small amounts of beer and wine.<sup>[3]</sup> Jimmy Carter, 39th President of the United States, signed the bill, *H.R. 1337*, into law in October 1978;<sup>[5]</sup> however, the bill left individual states free to pass their own laws limiting production.

In the United Kingdom, many pioneers were home winemakers owing to the greater availability of information and ingredients. These included CJJ Berry, who co-founded the first wine brewing circle in Hampshire and three other English counties. Berry also produced the *Amateur Winemaker* magazine and published *First Steps in Winemaking*,<sup>[6]</sup> and *Home Brewed Beers and Stouts*. Another early proponent of homebrewing was Dave Line, who after also writing for *Amateur Winemaker* wrote *The Big Book of Brewing* in 1974.

The United States, having an established home winemaking culture, moved rapidly into the brewing of beer. Within months of legalization, Charlie Papazian founded the Association of Brewers (now Brewers Association and American Homebrewers Association). In 1984, Papazian published *The Complete Joy of Home Brewing*. This and Line's work remain in print to this day alongside later publications such as Graham Wheeler's *Home Brewing: The CAMRA Guide*.

## Brewing culture

People homebrew for a variety of reasons. Homebrewing can be cheaper than buying commercially equivalent beverages;<sup>[7]</sup> it allows people to adjust recipes according to their own tastes creating beverages that are unavailable on the open market or low-ethanol beverages that may contain fewer calories.<sup>[8]</sup> Many people enjoy entering homebrew competitions, sometimes referred to as "craft brewing",<sup>[9]</sup> and homebrewing has developed various homebrewing clubs and competitions. The Beer Judge Certification Program or BJCP is an American organization which sanctions beer, mead, and cider homebrew competitions, certifies judges, and offers categories for judging; these judging categories are called "Beer Style Guidelines" and are written by the BJCP Style Committee. Similar British organizations are The National Guild of Wine and Beer Judges,<sup>[10]</sup> who have judging categories for both beer,<sup>[11]</sup> and wine,<sup>[12]</sup> and the National Association of Wine and Beermakers (Amateur) - (NAWB),<sup>[13]</sup> who have held an annual show every year since 1959.<sup>[13]</sup>

## Legality

Country	Homebrewing	Home distillation
Germany	<b>Legal.</b> 200 liters of beer per household per year may be produced without taxation, but notification of the local customs office is necessary. Larger quantities are taxed according to law. <sup>[14]</sup>	
Czech Republic	<b>Legal.</b> 200 Liters per household per year of beer, including notification of the customs office. 2000 liters of wine household per year.	<b>Not permitted</b> although every household can distill fermented fruit only, up to 30 liters per year in a local distillery, for personal use only.
Poland	<b>Legal</b> for personal use only, not for sale.	<b>Prohibited</b>
Sweden	<b>Legal</b> for personal use only, not for sale. <sup>[15]</sup>	<b>Prohibited</b> , <sup>[15]</sup>
Ireland	<b>Legal</b> for personal use. <b>Illegal</b> with intent to sell or if sold for profit. <sup>[16]</sup>	<b>Illegal</b> except for officially licensed and regulated distilleries.
Russian Federation	<b>Legal</b> for personal use only.	<b>Legal</b> for personal use.
Finland	<b>Legal</b> for personal use only. <sup>[17]</sup>	

United Kingdom	<b>Legal</b> in unlimited quantity for domestic consumption only. Fermented products for sale must include payment of alcohol duty and registration with HM Revenue and Customs.	<b>Legal</b> with a license to distill granted by the government.
Canada	<b>Legal</b> in most Canadian provinces. Liquor laws are regulated provincially, while the federal government has laws about taxation and importation of beer, wine and other liquors.	
United States	Individual states remain free to restrict or prohibit the manufacture of beer, mead, hard cider, wine and other fermented alcoholic beverages at home. <sup>[18]</sup> For example, Ala. Code § 28-1-1 addresses the illegal manufacture of alcoholic beverages in Alabama, and no other provision of Alabama law provides an exception for personal use brewing.  However, most states permit homebrewing, allowing 100 gallons of beer per adult per year and up to a maximum of 200 gallons per household annually when there are two or more adults residing in the household. <sup>[19]</sup> Because alcohol is taxed by the federal government via excise taxes, homebrewers are restricted from selling any beer they brew. This similarly applies in most Western countries. In 1979, President Jimmy Carter signed into law a bill allowing home beers, which was at the time not permitted without paying the excise taxes as a holdover from the prohibition of alcoholic beverages (repealed in 1933). <sup>[18]</sup> This change also exempted home brewers from posting a "penal bond" (which is currently \$1000.00) which had the prohibitive effect of economically preventing brewers of small quantities from pursuing their hobby.	Regulated at the National level under USC Title 26 subtitle E Ch51. Production of distilled alcohols for consumption carries an excise tax and numerous requirements must be met to legally produce. <sup>[20]</sup> Owning or operating a distillation apparatus without filing the proper paperwork and paying the taxes carries federal criminal penalties. <sup>[21]</sup>
Australia	<b>Legal</b> for individuals to manufacture their own alcohol without paying excise with two provisions, that they do not employ the use of a still, and that they do not sell the product.	A license is required to own a still larger than 5 liters regardless of whether it is being used to produce alcohol. To operate any size still for the production of alcohol (even for personal use) requires a license and excise must be paid. The rate, as of March 2011, is in excess of \$71 (AUD) per liter of alcohol produced. <sup>[22]</sup>
New Zealand	<b>Legal</b> for personal use, not for selling without a license	<b>Legal</b> since 1996 to distill spirits for personal consumption, not for selling without a license.
South Africa	<b>Legal</b> for home brewed beers in unlimited quantities for personal use only, not for sale or barter, without any required permits or licenses. Registration as a "manufacturer not for commercial use" at the South African Revenue Service (SARS) is required to produce wine at home.	Registration and a permit are required to own, operate, or have a still in one's possession. Producing distilled spirits at home is limited "for own use" only and products may not be sold, or used for bartering.  As of 2010 "agricultural distilling" permits are no longer available. Commercial operations require a micro-manufacturing license (for quantities up to 2 million liters of spirits per year), and various other permits are required. For larger quantities, a full manufacturing license and various permits are required.
Singapore	<b>Legal</b> up to 30 liters per household per month. Brewers must be 18 years of age or older, and the brewing process must not "degrade the environment". The product must not be sold. <sup>[23]</sup>	<b>Legal</b> only with a license. <sup>[23]</sup>
Hong Kong	<b>Legal</b> without a license within limits.	
Japan	<b>Legal</b> up to 1% alcohol by volume only; suppliers sell homebrewing equipment and kits, leaving it up to the customer to brew within the law. <sup>[24]</sup>	<b>Illegal.</b>
Malaysia	<b>Illegal.</b>	<b>Illegal.</b>
Iran	<b>Illegal</b>	<b>Illegal.</b>

India	Illegal.	Illegal.
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## Beverages

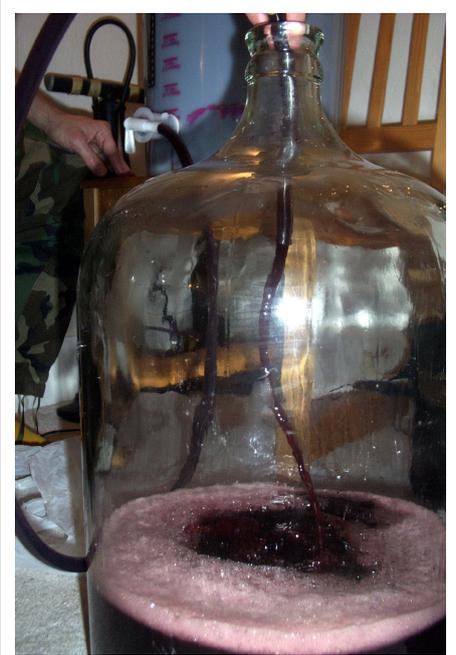
At present, several beverages are frequently brewed at home. These include beer, wine and cider, but also other fermented beverages such as ginger beer, kombucha, chicha, kumis, pulque, chhaang, kvass, sake, sonji, mead and others.

### Beer

In general, brewing beer at home is very similar to brewing commercially. Homebrewers can select from ingredients identical to those used in commercial brewing, in addition to a wide range of post-market customization. The basic ingredients that are necessary include water, malt, hops, and yeast. With the exception of water (although minerality, pH, and other characteristics do play a role and careful water selection is recommended, any water will do), there are countless varieties of these ingredients.

### Cider

Cider is normally fermented apple juice which can be freshly pressed or bought as a commercially available kit containing apple syrup and yeast but can be many other fruits including pear (perry) or plums (plum jerkum). The addition of yeast to freshly pressed apples is not vital as apples contain an amount of natural yeast. However, most homebrewers add yeast to ensure the process works well, as each variety of apple contains different amounts of yeast.



Wine being transferred to a secondary fermentation vessel

## Kilju

Kilju ("sugar wine") is a Finnish home-made alcoholic beverage made primarily from water, sugar, and yeast.

## Mead

**Mead** ( <sup>ⓘ</sup> <sup>ⓘ</sup> /ˈmiːd/; archaic and dialectal "medd"; from Old English "meodu"<sup>[25]</sup>), also called **honey wine**, is an alcoholic beverage that is produced by fermenting a solution of honey and water.<sup>[26]</sup>

## Homebrewing kits



1.5/1.8 kg Homebrewing kits

Homebrewing kits come in many different types and from many different manufacturers. A local homebrew store may create some of their own kits by packaging materials together. Most kits come with a full set of instructions for brewing. These instructions, sometimes called recipes, may vary widely in the amount of instruction given. For instance, many all-grain kits assume a familiarity with the brewing process and so may give fewer specific instructions on the general process. Many advanced brewers prefer to design and perfect their own recipes rather than buy kits. Kits may or may not include yeast.

### All-grain

For brewers with equipment and knowledge about the brewing process, all-grain kits include all the ingredients necessary to create homebrew from beginning to end. Most kits include grain and hops, some kits may also include yeast. A full set of instructions is generally included.

What sets these kits apart from others is the inclusion of milled malted grain which must first undergo a mash to extract the sugars necessary for fermentation. A full boil is then required, with one or more hop additions at different times depending on style.<sup>[27]</sup>

### Malt extract

Some kits contain a concentrated malt extract rather than grain. Malt extract can be either dry or in a syrupy, liquid form. A few advanced kits may also come with a small amount of milled, malted grain that must be steeped with the wort before boiling. A grain bag is usually included to facilitate this process. These additional grains help add different character to the beer so that a single extract can be used to brew several varieties of beer. A full boil is required, with hop additions at different times depending on style.<sup>[28]</sup>

### Pre-hopped malt extract

Sometimes known as beer in a can, no-boil, and hopped wort, these beer kits contain liquid malt extract that has already been boiled with hops to introduce bitterness and flavor. Pre-hopped kits simplify the brewing process by removing the need to add hops at specific times during the boil. Some kits may not require a boil at all, though this may increase the risk of off flavors in the resulting beer due to contamination from bacteria and wild yeasts. While some feel the quality of beer from these kits can be on par with commercial beer or homebrew made from other methods,<sup>[29][30]</sup> others feel that pre-hopped extract provides hop bitterness with little flavor and bouquet.<sup>[3]</sup>

## Brewing process

Primary fermentation in homebrewing takes place in large glass or plastic carboys or food-grade plastic buckets, nearly always sealed. When sealed, the fermenter is stoppered with a fermentation lock which allows the carbon dioxide gas produced to vent, while preventing other gasses and particles from entering. During this time, temperatures should be kept at optimum temperature for the particular yeast strain being used. For ale this temperature is usually 18–24 °C (64–75 °F);<sup>[31]</sup><sup>[32]</sup><sup>[33]</sup> for lager it is usually much colder, around 10 °C (**unknown operator: u'strong' °F**);<sup>[31]</sup><sup>[32]</sup><sup>[33]</sup> wine will start fermenting around 20 °C (**unknown operator: u'strong' °F**);<sup>[34]</sup> cider between 15–18 °C (59–64 °F).<sup>[35]</sup> A vigorous fermentation then takes place, usually starting within twelve hours and continuing over the next few days. During this stage, the fermentable sugars (maltose, glucose, and sucrose) are consumed by the yeast, while ethanol and carbon dioxide are produced as byproducts by the yeast. A layer of sediment, the lees or "trub", appears at the bottom of the fermenter, composed of heavy fats, proteins and inactive yeast. Often, the brew is moved to a second fermenting vessel after primary fermentation called a secondary fermenter. This secondary fermentation process is often utilized by more advanced home brewers to enhance flavor. While not required, it is generally practiced by home brewers who wish to age or clarify their beer by removing it from the sediment left behind by primary fermentation.<sup>[31]</sup>



Melomel mead being fermented.

Upon conclusion of fermentation, the beer is carbonated before it is consumed. This is typically done in one of two ways; force carbonation in a keg using compressed carbon dioxide, or bottle carbonation with priming sugar.<sup>[31]</sup> Any bottle that is able to withstand the pressure of carbonation can be used, such as used beer bottles, flip-top bottles with rubber stoppers such as Grolsch, or even plastic bottles such as soda bottles, provided they are properly sanitized. Priming briefly reactivates the yeast that remains in the bottle, carbonating the brew. Homebrewed beers and lagers are typically unfiltered<sup>[36]</sup> (filtering improves visual appearance of the product, but reduces its shelf life and complicates carbonation).

## Beer

The principles behind the process of homebrewing beer are similar to commercial brewing. A hopped wort is produced and yeast pitched into the wort to stimulate fermentation. The complexity of the process is mostly determined by the approach used to manufacture the wort; by far the simplest method is kit brewing.

Whether the homebrewer chooses to mash his own grains or chooses to purchase malt extracts, the homebrewer will then need to boil the liquid and add hops. The length of time the wort boils with the hops varies depending on the style of beer being brewed but overall boil times are usually an hour.

A partial mash differs from an extract brew in that the extract remains enzymatically active. Unlike dead malts where some of the starch has been converted to sugar via the action of heat and the natural enzymes have been destroyed, wheat and unmalted extracts need the help of enzymes to convert their starches into sugars.

The next step up from extract brewing is to use a diastatically active malt extract to convert starches from other beer adjuncts such as flaked and torried barleys, flaked wheat, and wheat flour into fermentable sugars. These extracts are currently only available in the canned form. Unmalted barleys and wheats can add extra "body" to a finished beer.

Advanced homebrewers forgo the use of concentrated extract and instead extract sugars from the grains themselves. The wort is made by making a mash from crushed malted barley (or alternative grain adjuncts such as unmalted barley, wheat, oats, corn or rye) and hot water. This requires a vessel known as a mash tun, which is often insulated. The process is often referred to as all grain brewing.<sup>[37]</sup>

In one procedure popular with homebrewers called the "Infusion Mash", milled grains are combined in the tun and hot water is added. Before being combined with the grains, the water is heated to a temperature that is hotter than the desired temperature for enzymatic activity. The reason the liquor is heated is to compensate for the fact that the grains are cooler than the desired temperature.

The grains are infused with yet hotter water to rinse more sugars from the mash in a process known as sparging. The sparging process will also stop any further enzymatic activity if much hotter water is used; conversely the mash may be heated to around 80 °C (**unknown operator: u'strong'** °F) to end such activity prior to placing it in the lauter-tun, and to prevent cooler grain from lowering the sparge water temperature to a lower than desirable figure.<sup>[3]</sup>

The resulting wort is then boiled, usually for 60–90 minutes. Hops are added at different times during the boil, depending on the desired result. Hops added at the beginning of the boil contribute bitterness, hops added in the last thirty minutes contribute flavor. Hops added in the last few minutes or even after the end of the boil contribute both flavor and hop aroma. These hop additions are generally referred to as bittering, flavor, and aroma additions respectively. Finings such as Irish Moss, a form of seaweed, and others can be added in the final 15–30 minutes of the boil to help prevent haze in the resulting beer. After primary fermentation, the beer may be moved to a secondary fermentation vessel to allow the beer more time to clarify and to reduce the possibility of off flavors due to dead yeast bodies and other sediment. Secondary fermentation vessels are often where brewers choose to add flavoring agents like orange peel, oak chips or even more hops (so-called "dry hopping").



Homebrewing malt extracts: liquid in a can and spray dried

## Carbonation

In homebrewing, adding priming sugar or malt extract at bottling time to beer that has had its fermentable sugar content totally consumed is the safest approach to carbonation. Exceeding recommended levels of priming sugar for a given recipe is dangerous, as is using inappropriate bottles or improper capping methods. Beer may also be force-carbonated using a keg and special bottling equipment so that the carbonation level can be carefully controlled.

## Kegs

Homebrewers often use kegs for aging, filtering, and storing beer. These are seldom the standard kegs used by major brewers to transport draught beer to wholesalers, but instead are reconditioned Cornelius kegs (colloquially known as "cornies") that were originally manufactured to store soda; these vessels are much easier to fill, clean and maintain than standard beer kegs.<sup>[38]</sup>

These kegs are stainless steel cylinders that hold approximately 5 U.S. gallons of liquid. The keg is filled with liquid via a removable hatch on the top, which is then closed and sealed. Carbon dioxide is added to pressurize the keg via an inlet port on the top and is facilitated by gently rocking the brew back and forth. Liquid is dispensed via an outlet port attached to a tube that extends to the bottom of the keg. **Pin-lock** and **ball-lock** fittings (or *posts*) are the two types of couplings used on the inlet and outlet ports. Coke distributors used pin-lock fittings, while Pepsi distributors used ball-lock fittings. Ball-lock are most used. The pin-lock style is often referred to as a "Coke" keg or style and the ball-lock is often referred to as a "Pepsi" keg or style, though the fittings themselves are removable, serviceable, and contain interchangeable parts.<sup>[38]</sup>

Homebrewers sometimes use 15.5 U.S. gallon commercial kegs (known as 1/2 kegs) for boiling vessels in creating wort. The kegs are drilled for a drain at the bottom, and the top cut open to create a large stainless steel cooking kettle. Many times, the piece of metal cut out of the top is re-used to create a false bottom for straining wort during the mashing process, as well as to strain the boiled wort when adding hops without using a mesh grain bag.<sup>[39]</sup>

Alternatively, kegs specifically designed for home brewing are available. The capacity may be matched to commercial extract brewing kits; typically 12 and 23 liters. Smaller 2.5 gallon kegs are also made for ease of transporting to a function.<sup>[39]</sup>

### Cleaning and care

All kegs may have residual pressure, and this must be vented to avoid having the valve explode and injure or kill a person as the valve shoots out. Conventional 15.5 U.S. gallon kegs have circle spring clips that can be removed to release the tap valve. Some kegs such as those used by Miller have threaded valves that are threaded into the keg, and after venting, can be opened by turning the valve counterclockwise using a piece of 1 3/4" wide metal inserted between the valve ears and turned with an adjustable wrench, or pipe wrench. A "wonderbar" type of pry bar just happens to fit. After the valve is loose it is still retained by a safety catch that must be pried inward. A simple valve seal depressing tool and a screwdriver with a 1/8" diameter shaft must be used to release the safety catch. See "How to remove a Miller threaded keg valve (not retained by a spiral ring)". The safety catch prevents the valve from releasing under pressure.

It is not recommended that kegs be sanitized with bleach. To avoid unpleasant residuals, sanitize kegs with an iodine or oxygen based sanitizer. Sanitizers like Star-San and B-Brite are commonly used. The ball lock valves may be unscrewed using wrenches to allow further cleaning or replacement of O-rings or poppet valves.

## Environmental impact

Homebrewing can reduce the environmental impact of fermented beverages by using less packaging and transportation than commercially brewed beverages, and by the use of refillable jugs, reusable bottles or other reusable containers.<sup>[40][41]</sup>

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