

# How to roast with IKAWA Home 2.0

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We have really enjoyed bringing this together for you and we hope it helps to give you some guidance as you start your coffee roasting experience. Some of the content is new but a lot of it is leaning on guidance we have accumulated over the last few years in different places. It is by no means exhaustive, as you will see, and is designed as a foundational grounding in coffee roasting as it relates to the IKAWA home roaster.

The art and science of roasting coffee is a complex one. Professionals spend their entire careers perfecting it, in much the same way as a photographer or a wine sommelier would. It takes theory, sure - but most of all it takes experience and time. You now have, right there in your kitchen (and on your phone), everything you need to gain that experience. And it's up to you how far you take this.

Ultimately, we are in pursuit of the perfect cup of coffee for us and our loved ones - but the process of learning about how to roast coffee effectively can be an extremely enjoyable one (and luckily involves a lot of tasting to do properly!).

Have fun with it. And as always, if you have any feedback for us we would love to hear it!

IKAWA Home team

# Green coffee

Coffee is the seed of a fruit, often referred to as 'cherries'.

The fruit trees are grown at high altitudes, typically between the Tropic of Cancer and the Tropic of Capricorn.

The coffee cherries grow slowly at these high mountain altitudes (usually 1400 and 2000 metres above sea level) and can take between 8 and 11 months to ripen. Once ripe, they are picked and processed shortly afterwards.

Once harvested and processed, the coffee is set out to dry, which takes 10–20 days, stored, then prepared for export. It's at this point that it is called "green coffee" and now it's over to you.

The flavours of the coffee may be dictated by variety, processing, and terroir (such as soil, altitude, and climate).

Terroir is a word that we hear more and more in the coffee world, but it's been used in farming, wine and fine food for years. Coming from French, it can be defined as an ecosystem in a region. It is often used interchangeably with the term 'microclimate'.

However, that term doesn't take in consideration all the other factors that affect a crop's characteristics - altitude, soil type and quality, topography and farming practices.

Roasting (i.e. applying heat) has a huge impact on the coffee taste, but it cannot change the inherent flavours of the beans. A coffee that naturally has the potential to taste nutty can't be roasted to change its flavour to fruity.

It can only present the flavours of a bean or add to it in specific ways through flavours that come about in the chemical reactions that take place such as caramelisation and browning - also known as the maillard reaction.

We could write a whole book about green coffee, coffee growing regions and all of their nuances. Needless to say, differences in variety and region, affect the resulting flavours and may require different roast parameters for the optimum roast. For now, we would suggest keeping note of the coffee varieties and processing that you are roasting and enjoying, as well as trying to spot any commonalities between coffee's terroir (for example, altitude).



# Processing

Before we move on to the roasting itself, it is worth reviewing how processing can affect the flavour of coffee quite significantly.

This is the necessary act of removing the fruit and its protective layers from the coffee seeds and then drying the seeds to a low, stable moisture content. This can be done in several different ways and can significantly affect the flavour of a coffee.

Generally, there are 3 main categories of coffee processing:

**Natural** (also known as 'dry' or 'whole fruit') processed coffees leave the cherry fruit intact and on the seeds while it is dried. This is typically done on screen beds (for best air circulation on all sides) in natural sunlight. This process has a strong influence on the final flavour of the coffee and tends to be more fruit forward, lower in acidity, and creamy in texture.

**Washed** processed coffees involve removing the cherry fruit and the sticky, sugary layer called the mucilage from the coffee beans, by using water. Once the fruit is removed, beans are dried. As you would imagine, this results in a

crisper, cleaner flavour: increased acidity/sparkle, lighter body, and arguably allows for a better flavour representation of the inherent characteristics of the beans.

**Semi-Washed** (also called 'pulped natural' or 'honey') processed coffees follow a hybrid approach of the above two: where the cherry fruit is removed but the mucilage is left on the beans for drying. This process will impact the flavour by taking the best parts of washed (clean cup) and natural (heavy sweetness).

Coffee and its flavours are complex, to say the least. Even coffees that are of the same variety, processed the same way, can have different characteristics depending on where it is grown.

With that said, if you would like to learn more about how we have set up roasts differently for Washed and Natural coffees, we suggest that you try out "adding your own coffee" on the app and explore the different roast levels.

# How to talk about flavours

There's no right or wrong way to talk about flavours. Every individual has their own experience with taste and smell- there is no 'perfect' way to describe coffee.

We like to approach flavour in two key ways:

**Flavour characteristics** that are generally impacted by how a roast is set up and **flavour traits** (such as fruity or floral) **and specific flavour aromas** (such as dark chocolate or lemon).

**Flavour characteristics** On the IKAWA Home app you will notice that we focus on the flavour characteristics of Acidity, Bitterness, and Body. The different levels of these three characteristics represent the key ways a roast can generally impact the end result of flavour.

## Acidity

The varying quality of 'sparkle' that a coffee has. Classified in the app as varying levels to describe into 5 different descriptions: Subtle, Simple, Smooth, Lively, Complex.

## Bitterness

An inherent taste characteristic within coffee that ranges based on the roast degree and coffee process. We have organised the varying levels of Bitterness into 5 different descriptions: Mild, Moderate, Balanced, Sharp, Intense

## Body

The weight and texture of the brewed coffee, which changes based on the roast degree and the development time. Darker roasts tend to have a more velvety and creamy body, whereas Lighter roasts tend to have a more tea-like and juicy body. The 5 descriptors that we use to classify body are as follows: Tea-like, Juicy, Silky, Velvety, Creamy.

## Flavour traits and specific aromas

When tasting your coffee it is useful to think about the flavour characteristics above, but it also becomes possible to be more specific about the flavours and aromas you are tasting. We really like the work done by CoffeeMind. In their flavour wheel, you will see more general, accessible 'flavour trait' descriptors on the outside, and more specific, complex descriptors as you move towards the centre.

When learning how to describe coffee, think of common food and drink that you have had before. If you have never experienced the sweet acidity of a strawberry, you will have a hard time picking that note out of a coffee. Also, sometimes coffee simply tastes of coffee.





# Roasting technology

Behind its aesthetic appeal, the IKAWA home roaster is a smart piece of engineering. Paired with the App, you have everything you need to create and customise your own roasts. On our technology that means selecting your roast outputs (roast degree, development time) in order to change the roast inputs: precise, controlled application of heat over time.

Pressing that start button begins a process of complimenting systems that make sure the coffee is roasted in the way that you or our recommended recipes have selected.

When you press the start button, the fan motor, the only moving component of the machine will begin rotating. The fan does many things, most importantly for now, it draws room temperature air into the roaster. This air is then moved upwards into the roasting chamber, past an electric heat source. As the air is moving past the heat source, the temperature is measured by a precise temperature sensor (this

is the temperature you will see on your App, referred to as the "inlet" temperature).

The air, now hot, is blown into the roasting chamber and is doing several things at one:

- It is transferring heat to the beans passing around and through them.
- It is moving the beans allowing evenly distributed heat transfer (also known as "airflow").
- And finally, it is entering the roasting chamber in such a way that creates a cyclone effect - important to ensure evenness, prevent smoke build-up, and neatly collect the chaff as it separates during the roasting process.

Throughout the roast, electronics are simultaneously receiving data from the temperature sensor and using that data to make adjustments to the heat source according to the roast recipe that has been sent to the roaster. This same process is used to ensure the airflow, the speed of rotation within the fan motor, is accurate.

It continues these tiny cycles of measurement and adjustments until the roast has finished. At the end of the roast recipe, the fan kicks up a gear to allow fast cooling of the beans before being ready to 'eject'.

## Heat transfer

The most important thing in roasting is applying heat to the coffee beans. This heat is what causes chemical reactions to take place in the beans. Besides processing, variety etc., heat applied in key stages of the roast has the biggest effect on the flavour of the end result.

There are three methods of heat transfer and the IKAWA Home roaster seeks to maximise the impact of Convection heat transfer, whilst minimising the impact of the other two, Radiant and Conduction heat transfer. This is to allow the most control possible. Let's take a look at this.



### Convection Heat

While there are elements of Radiant and Conduction Heat transfer in the IKAWA Home Roaster, these methods of heat transfer are minimised by using aluminium and other materials that do not retain heat energy. The main method of heat transfer in the IKAWA Home Roaster is Convection.

Through Convection heat transfer, the IKAWA Home Roaster heats the air that is blown into the roasting chamber, heating the coffee beans. The air might need to be heated to a very high temperature or kept at a low temperature, based on the coffee being roasted.

The heat in air is much more controllable and fit for our purpose of roasting coffee precisely according to our programmed recipe outputs. The temperature of the air is programmed and measured using a very accurate PT1000 temperature sensor.

### Measuring temperature

We are measuring the temperature of the air immediately after it has passed through the heat

source, using the internal PT1000 temperature sensor. We call this measurement the "inlet" temperature because it's the temperature of the air input to the beans.

In most other roasting machines, the temperature is measured in a position that better represents the actual temperature of coffee beans (often called the "bean" temperature). To do this, these machines need to use a more durable and therefore less precise (increased resistance for those who know!) temperature measurement device - sometimes called a probe.

This would not suit our needs because of the importance our machine places on the temperature measurement and the role it plays in how we control each roasts for selected outputs - requiring precision and fast-reaction.

This makes IKAWA Home recipes look very different to the average roast profile you will find on google or books written by Coffee Gurus. These two different approaches to measuring the temperature - 'inlet'

and 'bean'- are aimed at the same thing: to control and roast a coffee really well.

Of course, these two measurements will correspond to one another. In the same way slamming the brakes on a car would eventually lead to the car stopping, drastically decreasing the temperature of heat applied will pause the coffee from roasting further.

For the purpose of changing a roast recipe, our roast output selections will change the inlet temperature to control the acceleration or deceleration of the heat input and use distinct (and visible) stages of a roast to understand and change 'how fast the coffee is travelling'. We'll come back to these stages shortly and look at how varying levels of heat can impact them..

Now we know how the roasting technology works, how it transfers heat, and how it measures temperature; we can look at how to start exploring our favourite roasts.



# Controlling roast

## Controlling roast

As you will have seen us mention a few times now, we make a distinction between roast inputs (heat application over time) and roast outputs. Roast outputs are we attempt to describe the results different roast inputs can lead to. This is how we make sense of the complexities roasting coffee entails and its also how we make controlling roasts much more accessible.

In the IKAWA Home app, from the recommended recipes, you are able to use the two most important roast outputs to control your roasts. These are 'roast degree' and 'development time'. Let's take a closer look at these now.

## Roast Degree

Roast Degree refers to the colour of the coffee once it has been roasted. The colour of the coffee will range from light, light-medium, medium, medium-dark and dark.

The Roast Degree is created by how high the temperature gets in the roast recipe, for how long and whether that high temperature occurred in the drying phase or the development phase (more on these in a moment). Other than the condition and qualities of the green coffee itself, Roast Degree is the choice that will have the greatest effect on the flavour of the coffee. A lighter roast degree will generally have complex acidity, mild bitterness and a tea-like body, whereas a dark roast will generally have subtle acidity, intense bitterness and a velvety body.

## Development Time

Development Time is the amount of time the recipe lasts once first crack occurs. A low development time for a light roast may be as little as 30 seconds, whereas a high development time for a dark roast may be over 2 minutes and 30 seconds.

The length of Development Time is related to how easy or difficult it may be to extract the flavours from a coffee in brewing. Generally speaking, a coffee roasted for espresso benefits from a High Development Time, and any coffee intended for brewing for a longer time, benefits from a Low Development Time.

On the app, we denote the amount of Development Time a recipe has by using +. Low Development time is +, Medium Development Time is ++ and High Development Time is +++

Roast outputs from roast inputs  
We know that these roast outputs are achieved through varying levels of applied heat over time, but more specifically it's variances in heat application at and around the key stages of a roast that matter the most. We explore these next.

# Key stages of roasting

## How do we change flavourless green coffee into something so delicious?

*Warning: do not attempt to try brewing green coffee.  
You will most certainly break your grinder!*





**Amazingly, to create all the chemical reactions needed, all we have to do is add heat. The complexity of roasting is in how and when heat is applied. With careful monitoring of 'how fast the coffee is roasting', we can learn to tease out the flavours we love in coffee and avoid those we don't.**

Luckily for us, we can monitor the visibly different colour stages of the beans through the glass lid of the roaster. The colour changes gives us a really good idea of what is happening to the coffee throughout the roast.

We start with green beans entering the roasting chamber, the very beginning of the roast. The temperature of the beans at this stage is low (room temperature). It's therefore really important we inject a lot of heat so we can properly build the momentum of our roast.

You'll notice that all of our recommended roast recipes begin in this manner. It's here that our profiles differ the most from profiles you see elsewhere. This is to do with the way the temperature is measured, using the inlet temperature measured by the PT1000 sensor.

We are beginning to roast green coffee - at room temperature: we need to begin with a big injection of heat so we can quickly move our raw beans to it's first key stage: drying.

#### **Drying**

All coffee has a little bit of moisture, which is important in flavour development: too little and the roast will taste flat and dull, too much and you may experience defects in your coffee. All green coffee in good condition will have between 9-13% moisture content. Before the coffee can begin to change colour, it must go through this critical stage of drying.

#### **Yellowing**

An indication that the coffee has begun to dry out and the green coffee has started to change. It also indicates that the inside of the coffee is no longer at room temperature, and that sugar browning of the coffee is beginning.

#### **First crack**

A necessary key point in the roasting process and in our opinion: the best part of a roast! The coffee will audibly pop or crack like popcorn and puff up slightly. This is caused by a build up of steam pressure inside the bean resulting in moisture

bursting through the weakest point. Now more than at any stage in the roast so far, the inside of the bean is exposed to more heat.

We must be careful to not apply too much heat at this point. You may observe that the red line on the recommended recipe declines at this point, as less heat is necessary to progress the coffee through the roasting process.

Depending on how heat has been applied before this stage, first crack will be quick and loud or slow and long. But regardless, it's from this point that we could, if we wanted, stop the roast and consume the coffee. It's also the point in the roast where the most flavour development happens.

#### **Development**

First crack also marks the beginning of the development, where the the sugars and amino acids that make up the flavour are developing and becoming more pronounced.

The importance of this stage cannot be overstated, hence our focus on Development Time as a roast output. Things are happening quickly here: even small changes in heat application and/or time can

produce different flavours in the cup. How much development time and temperature is applied can make a huge difference to the expected flavour characteristics of the coffee.

A quick note on second crack: it's important to know that if the roast continues long enough, coffee will experience a second crack. This is slightly softer sounding and it's usually when oils will begin to move from the inside of the bean to the surface.

The coffee bean becomes quite brittle at this point. Second crack is a good marker for the point at which the darker roast flavours can dominate the inherent flavour of the coffee beans. For this reason we do not tend to set up roast controls that go that far.

#### **Cooling and degassing**

Once our roast has finished, we want to cool the beans down as quickly as possible in order to stop the chemical reactions and any further development past where we want to stop the roast.

Degassing is the process of allowing Carbon Dioxide to escape from the roasted coffee. Roasted coffee can be set aside in a sealed container for 3-6 days before use. We have

found that coffee that has been roasted by Convective heat can remain 'fresh' tasting for several weeks. How long you leave coffee to degass is a matter of preference. You may even find it preferable to wait even longer than 3-6 days before using your roasted coffee, depending on your brew method.



# How to find your perfect roast level

As you become more comfortable with roasting our recommended recipes, experimenting with the different levels of roast degree and development time becomes a really enjoyable experience. Not least because these controls have such a big impact on the flavour of the coffee - both at a higher level (flavour characteristics) and in the cup (flavour traits and specific aromas).

Now that you have the knowledge and basic principles of the IKAWA Home Roaster, you are ready to make informed decisions about your roasts, taking our recommended recipes and confidently making them your own.

We hope that this document has been helpful for you to learn more about how your Roaster works, a brief theory of Green Coffee and roasting, and the logic behind how the recipes work.

We wish you well taking this new understanding of roasts forward and hope you enjoy the process!





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**Image assets**

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Aroma wheel: coffee-mind.com

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