International Standards for the Assessment of Cocoa Quality and Flavour

Protocol for:

Roasting Cocoa Beans

FIRST PUBLIC DRAFT – for review

Draft date: 28 February 2020

NOTE – This draft substitutes the version dated 19 December 2019 with the following updates:

- Acknowledgement of financial support and proofreading and editing of Spanish translation – pages 3–4
- Update of protocol names in diagram of Manual Content– page 5
- Update of scope – page 6
- Update of Table 1– page 8
- Addition of option for disinfectant – page 9
- Correction of name of Table 2 – page 10
- Correctio of example in Annex C – page 18
- Minor updates in layout, format and English language editing throughout the document

Recipients of this draft (dated 28 February 2020) are invited to provide comments and evaluation of the protocol content as being acceptable for industrial, technological, commercial and user purposes. Draft international standards may on occasion be considered for their potential to become standards and referred to in national regulations. Recipients are also invited to send notifications of any relevant patent rights and to provide the supporting documentation. www.cocoaqualitystandards.org

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Contents

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DISCLAIMER

This document is a first draft of the protocol for Roasting Cocoa Beans. It forms part of the International Standards for the Assessment of Cocoa Quality and Flavour (ISCQF) developed under the guidance of the Working Group (WG) coordinated by the Alliance of Bioversity International and CIAT and the Cocoa of Excellence (CoEx) Programme. More information can be found here: www.cocoaqualitystandards.org

These protocols are the product of several consultations and numerous inputs from experts. They are based on an initial in-depth review carried out by Dr Darin Sukha in 2016 of the current protocols and practices for the assessment of quality and flavour for cocoa and other products such as coffee, olive oil and wine. The review led to a first proposal titled 'Elements of a Harmonized International Standard for Cocoa Flavour Assessment' by Dr Darin Sukha, which was the basis for broader consultation meetings held in Managua, Nicaragua and Paris, France in 2017. From these consultations 18 individual protocols have been developed and are at different stages of completion. The protocols were first reviewed at the meeting of the ISCQF WG in Paris (31 October to 2 November 2018), leading to first draft versions available publicly for broader input.

For any related questions, please contact Brigitte Laliberté, Coordinator of the ISCQF-WG: b.laliberte@cgiar.org or Dolores Alvarado, coordinating the drafting process: d.alvarado@cgiar.org

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We gratefully acknowledge financial support from the following organizations for consultancies and consultation meetings between 2017-2020:

- Cocoa of Excellence Programme coordinated by the Alliance of Bioversity International and CIAT and jointly organized by Event International
- CGIAR Research Programme on Forest, Trees and Agroforestry (CRP-FTA)
- Lutheran World Relief (LWR) and its project Cacao Movil, (supported by the United States Department of State, the Swiss Agency for Development and Cooperation (SDC))
- Asociación Mesoamericana de Cacao y Chocolate Finos (AMACACAO)
- Christian Aid
- Catholic Relief Services (CRS)
- United States Department of Agriculture (USDA) and the Penn State University (PSU)
- The project MOCCA (Maximising Opportunities in Coffee and Cacao in the Americas), funded by the U.S. Department of Agriculture (USDA) and implemented by a consortium led by TechnoServe with the cacao activities led by LWR and components on cacao research and quality standards led by the Alliance of Bioversity International and CIAT.

We acknowledge the in-kind contributions from the institutes participating in the process, namely Barry Callebaut, the Centre for the Promotion of Imports from developing countries (CBI), CRC, ECOM Trading, Guittard Chocolate Company, the Fine Cacao and Chocolate Institute (FCCI), the Fine Chocolate Industry Association (FCIA), Puratos/Belcolade, Seguine Cacao Cocoa and Chocolate Advisors, the USAID-Equal Exchange-TCHO Cooperative Development Programme (CDP) and Valrhona Chocolate.

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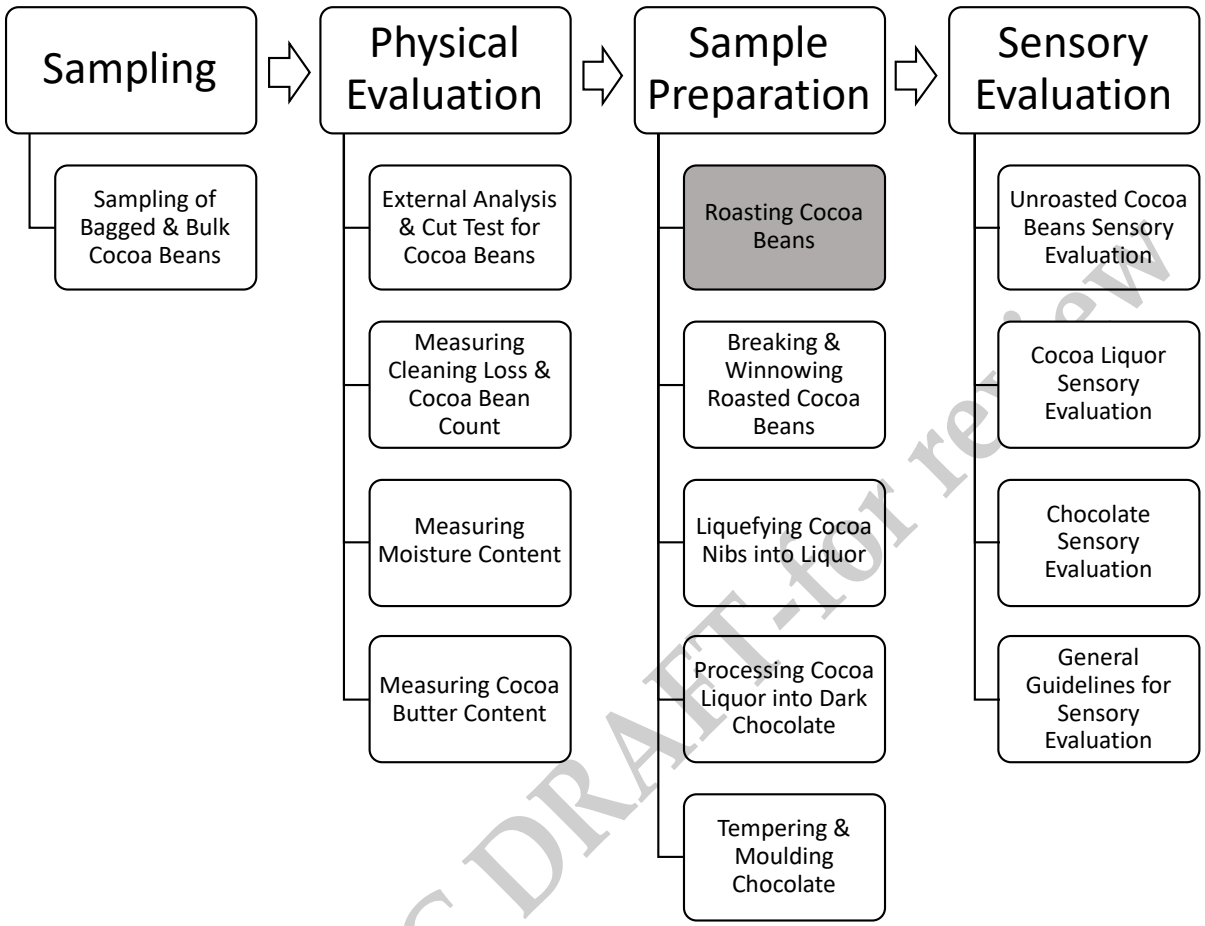
We thank Olga Spellman, Dolores Alvarado, Silvia Araujo de Lima and Brigitte Laliberté from the Alliance of Bioversity International and CIAT, and Fabien Coutel from Cocoa Source for proofreading and editing the English Spanish and French versions of the protocols, respectively.

Lastly, we thank the many individuals who participated in the consultation process and provided inputs to the protocols (see Annex G for a full list of contributors).

MANUAL CONTENT

The ISCQF manual consists of the following collection of protocols:



Title: Protocol for Roasting Cocoa Beans

Objective

- To carry out a standardized roasting process with the most suitable roasting conditions to express the full flavour potential of a representative sample of fermented and dried cocoa beans for processing into liquor for sensory evaluation.

Scope

This protocol describes how to roast a representative sample of fermented and dried cocoa beans in a standardized way to ensure the full flavour potential is obtained from any cocoa bean sample, irrespective of its origin. It indicates how to choose the most suitable roasting conditions for each sample based on the genetic dominance if known, the specific aromatic and physical characteristics (size and moisture content) of the cocoa beans before roasting. The procedure is specific to the use of a forced air convection oven with precise temperature and time control to ensure repeatability of the process. It does not substitute chocolate makers' or companies' own roasting protocols and should not be interpreted as the best roasting conditions for any specific bean, thus allowing each chocolate maker to choose their own roasting conditions to influence and enhance bean flavour.

Target users

This protocol targets any user along the cocoa supply chain who wants to prepare a cocoa bean sample in a standardized way for flavour evaluation.

Key specifications for this protocol

Parameter	Specification
Minimum test sample size	600g cocoa beans
Oven type	Forced air convection oven – specifications in Table 1
Basic roasting type: temperature and time	Light roast: 112°C x 25 min
	Medium roast: 120°C x 25 min
	Full roast: 130 °C x 25 min
Adjustments to roasting temperature and time	Based on bean size and moisture content – see Annex B - Table 6
Winnowing	Done within 60 minutes after roasting and having reached the targeted cooling temperature

1. Main references and resource materials for this draft

- Cocoa of Excellence Programme (2019) Technical Procedures for Processing the Cocoa Bean Samples from Participating Countries – from Reception, Physical Quality and Processing into Liquor and Chocolate for Flavour Sensory Evaluation.
- Heirloom Cacao Preservation Program (2018) Protocols for HCP Lab Tests and Raw Bean Characterization Pre-liquor Preparation and analysis. Fine Chocolate Industry Association (FCIA). [Online] https://hcpcacao.org/hcpapp/ [Accessed 24 May 2018]
- Sukha, D., Seguine E. (2015) Annex B: Protocols for the Preparation and Flavour Evaluation of Sample and Small-Scale Fermentation Techniques. In CAOBISCO/ECA/FCC Cocoa Beans: Chocolate and Cocoa Industry Quality Requirements. September 2015 (End, M.J. and Dand, R., Editors)

2. Equipment, tools and materials

2.1. Cocoa beans

- Minimum test sample: 600g of cleaned and sorted fermented and dried cocoa beans representing a cocoa bean lot.

This is the minimum amount for a representative test sample following the protocol for 'Sampling of Bagged and Bulk Cocoa Beans'. This amount can be increased depending on the capacity of the equipment and desired amount of cocoa liquor and chocolate for sensory evaluation. The amount of cocoa beans must be enough to cover each tray with a single layer of beans (see Section 3.2). For example, for the recommended oven in Annex A - Figure 1, this amount is around 800g but may vary in other ovens. If the desired amount exceeds the oven capacity, repeat the roasting process as needed.

Follow the protocol for 'Measuring Cleaning Loss and Cocoa Bean Count', to clean and sort good from damaged beans (missing shell, germinated, obviously defective or cut beans) extraneous matter and small or flat beans. Measure the bean count and note any observations on the bean size uniformity.

2.2. Roasting oven

The procedure described in this protocol is specific to the use of a forced air convection oven with the minimum recommended specifications, as outlined in Table 1 below.

Table 1. Recommended specifications for the roasting oven

Parameter	Specification
Type	Forced convection oven
Variables to control	Temperature (digital setting) and time
Temperature range	100–200°C
Recovery time after 30 secs of opening the door at 150°C in empty oven	Less than 5 minutes
Temperature uniformity within the oven at 150°C	Variation less than 2°C
Temperature stability (over time) within the oven at 150°C	Fluctuation less than 0.3°C
Speed of temperature increase (from ambient temperature to 150°C, empty oven)	6°C per minute maximum
Venting	Closed
Air circulation rate	80 chamber-air exchanges/hour
Number of trays	2
Position of trays	Symmetrically placed above and below the fan opening
Compliance	Food grade, national and local regulations

Examples of specifications for oven brands and models are shown in Annex A - Figure 1, and Annex B - Tables 4 and 5. Other roasting equipment can be used as long as:

- All individual beans inside the oven are simultaneously and homogenously roasted with one selected roasting process, i.e., all the beans are exposed to the same temperature for the duration of the roast.
- The roasting process can be replicated.

Check that the electrical requirements of the oven are compatible with the local electricity system. In some countries the electricity service is irregular and there are fluctuations in voltage that can alter the operation of the oven. Additional electronic devices may be needed to compensate these current fluctuations such as a high quality uninterruptible power supply (UPS), or a dynamic voltage regulator (DVR) but it will depend on the specific case.

2.3. Oven trays

- Two oven trays made of wire mesh screen, ideally stainless steel (but regular steel is also fine) (Annex A - Figures 2 and 3).
- Do not use zinc coated or treated steel wire mesh screen because of toxicity at high temperatures and interaction with bean acidity.
- The recommended screen open area (indicator of the thickness of the wire) should be more than 85%. Do not use metal plates trays with holes instead of stainless-steel wire mesh screen trays. There is not enough screen open area and conduction occurs where the metal touches the beans, thus roasting is not homogeneous but focuses on the contact point between the bean and the metal plate.

- Beans should have minimal contact with the oven tray surface, therefore the wires of the mesh screen should be as thin as possible not to transfer heat to the beans by conduction.
- If the wire mesh screen trays have wider spaces between the gridlines and the beans fall through, cover the trays with an additional screen (see example in Annex A - Figure 2).
- In the case where filler beans are used (see section 2.4), use thin stainless-steel or aluminium dividers to separate the two types of beans.

2.4. Filler beans

- Filler beans are used if the reference bean sample is not enough to fill the 2 oven trays.
- The filler beans should be cocoa beans free of defects and off-flavours (see protocol for the 'External Analysis and Cut Test for Cocoa Beans') to avoid transferring any odour taints to the reference sample.
- Filler beans should be neutral in flavour, meaning that based on the aroma of the beans as well as past experience, roasting these beans will not impart strong odours that could migrate to the bean sample. Similar flavour profile beans are desirable if the bean sample is known.
- They should require the roasting conditions than the reference sample to prevent over-roasting and transfer of over-roasted notes to the reference sample. Under-roasted notes are less likely to be transferred and are less of a concern.

2.5. Other tools

- A top loading digital scales for weighing at least 400g of beans and accuracy at most ± 1g.
- A digital timer if there is none on the oven.
- Heat-resistant mitts for loading and removing roasting trays.
- Food-grade containers for weighing and transferring beans from the scales to the roasting tray/s.
- Heat-resistant stand on which to rest the roasting tray for cooling or a separate tray to place the freshly roasted beans in for cooling.
- Brush to clean the oven.
- Food-grade odourless cleaning agent and disinfectant. Two options of basic disinfectants are: 1) 70% isopropyl alcohol spray and 2) 1% sodium hypochlorite solution that can be prepared by mixing 9 parts of potable water and one part of 10% sodium hypochlorite concentrate; once prepared, the disinfectant/solution has a shelf life of 6 months.

3. Procedure

The process described in this protocol is based on experience of roasting a wide range of genetic diversity of cocoa beans from around the world. It aims to best express the intrinsic flavour potential of any cocoa bean to determine its potential use in a chocolate, formulated in a recipe either as blend or single origin. Accuracy is extremely important in order to minimize variation due to human error and instruments, and to ensure repeatability of results.

3.1. Selecting the roasting conditions

The basic roasting conditions (light, medium or full) must be selected carefully and adjusted based on bean size and bean moisture content.

1. Choose the suitable basic roasting type and conditions from Table 2 considering the dominant genetic type (if known), the physical appearance of the beans (when this is clearly indicating a genetic type) and most importantly the aroma assessment results from the cut test (see protocol for 'External Analysis and Cut Test for Cocoa Beans').
2. Define the adjusted roasting temperature and time based on the bean size and moisture content (see protocols for 'Measuring Cleaning Loss and Bean Count for 'Measuring Moisture Content of Cocoa Beans") indicated in Annex B - Table 6.

These roasting conditions are meant to enhance the flavours that the beans are presenting. If the flavour notes are not perceivable enough, or you are unsure about the perceived notes, it is recommended to run roasting tests using 2 of the roast types that may be closest.

In all cases, it is essential to communicate the roasting conditions (time and temperature) selected along with the sensory evaluation (see Section 4 Documentation of results).

Table 2. Basic roasting type: temperature and time according to aromas identified in the cut test and dominant genetic type of cocoa beans (if known)

Roast type	Temperature (°C)	Time (minutes)	Cocoa bean aroma from cut test and remarks on genetic types
Light	112	25	Significant floral, nutty or caramel notes are perceived. This roast may be best suited for some of the Criollo types.
Medium	120	25	Significant fresh fruity, browned fruits, spicy notes are perceived. This roast may be best suited for some of the Trinitario types.
Full	130	25	None of the above notes are significantly perceived. At these roasting conditions, cocoa notes will be enhanced. This roast may be best suited for some of the Forastero types.

3.2. Loading the oven

1. Clean the oven shelves and wire mesh trays with a suitable brush before loading.
2. Attach additional wire mesh screens to the trays if needed.
3. Load each tray with a single layer of beans.
4. If there are not enough beans to completely cover the 2 trays, load the empty surface with filler beans using dividers to keep them separate (see Section 2.4).

NOTE: The oven load has an impact in the roasting results. Therefore it is very important that the 2 trays are covered exactly with a single layer of beans each.

3.3. Roasting process

1. Turn on the oven and set the target roasting temperature.
2. Have the 2 loaded trays ready and within close distance to the oven for rapid loading once the target oven temperature is reached.
3. Set the timer for the 20 seconds not to be exceeded between opening and closing the oven.
4. When the target oven temperature is reached, open the oven door and put the trays inside the oven on the racks and close the oven door. Do not exceed 20 seconds between opening and closing the oven door, using the timer, to ensure that temperature drop is minimum. The trays should be located as symmetrically as possible, above and below the circulating fan. Take note of the lowest temperature reached after closing the door (drop down temperature).
5. When the temperature reaches 2°C below the target roasting temperature, start measuring the targeted roasting time using a timer.
6. While the beans are roasting, be sure to put away any unroasted beans that remain on the counters or contact surfaces (see note below).
7. When the targeted roasting time is over, open the oven door and remove the 2 trays.

   NOTE: Handle roasted and unroasted beans in separate rooms. Unroasted beans are a raw agricultural product that may contain pathogens prior to roasting and can cross-contaminate the roasted beans if there is no clear separation of processes. If handling both in the same space cannot be avoided, use a batch system. Clean and disinfect all counter space, contact surfaces and tools between batches of unroasted and roasted beans.

3.4. Cooling

1. Cool the beans on the trays, in a place free of strong odours, at room temperature. Use a fan on the beans to accelerate the cooling if necessary. If available, use a cooling tray (see Annex A - Figure 4).
2. The beans are ready to break and winnow when their temperature is at around 40°C, barely warm to the touch.
3. The roasted beans should be broken and winnowed in the next 60 minutes to avoid the shell sticking to the bean, making it more difficult to separate.

3.5. Verification of moisture content

For some processing, knowing exactly the moisture content of the beans after roasting may be an important data point. For this measure, see the protocol for 'Measuring Moisture Content of Cocoa Beans'.

4. Documentation of results

The information to document the process for each bean sample is shown in Table 3. Accurate and detailed description of the characteristics of the beans, the oven, the roasting conditions, and additional information on the roasting process is very important to interpret the results of the sensory evaluation of the cocoa liquor and/or chocolate, to make comparisons among samples and to communicate the exact roasting conditions to reproduce or repeat the process.

Table 3. Information on the roasting process

General	Reference sample number/ID	
	Date (dd/mm/yyyy)	
	Name of the person carrying out the roasting process	
Bean characteristics	Country and/or region of origin	
	Genetic dominance if known	
	Bean count (#beans/100g) as an indication of bean size– see protocol for 'Measuring Cleaning Loss and Cocoa Bean Count'	
	Visual general impression of bean size uniformity– see protocol for 'Measuring Cleaning Loss and Cocoa Bean Count'	
	Moisture content (%) – see protocol for 'Measuring Moisture Content of Cocoa Beans'	
	Aroma from cut test – see protocol for 'External Analysis and Cut Test of Cocoa Beans'	
Oven	Brand	
	Model	
	Type	
	Age (year)	
Trays	Material	
	Wire mesh screen open area (%)	
	Number of trays used	
Adjusted roasting conditions	Temperature (°C)	
	Time (minutes)	
Starting temperature	Temperature at which the time started to be measured (°C)	
Bean quantity	Total weight of beans before roasting (g)	
	Weight of beans per tray (g)	
	Total weight of beans after roasting (g)	
Roasting process	Oven heating-up time (minutes)	
	Oven open-door time (seconds)	
	Oven drop-down temperature (°C)	
	Temperature recovery time (minutes)	
Moisture content after roasting		
Additional information		

5. Annexes

Annex A – Figures

Figure 1. Image of Binder® Oven FD 56 closed (left) and open (right) Notice the symmetrical position of the trays above and below the fan opening
(Credit: https://www.binder-world.com/us/Products/Drying-and-heating-chambers-Avantgarde.Line/Series-FD/FD-56, https://www.coleparmer.co.uk/i/binder-9010-0255-fp-programmable-mechanical-convection-oven-4-1-cu-ft-rs-422-230v/0501233)

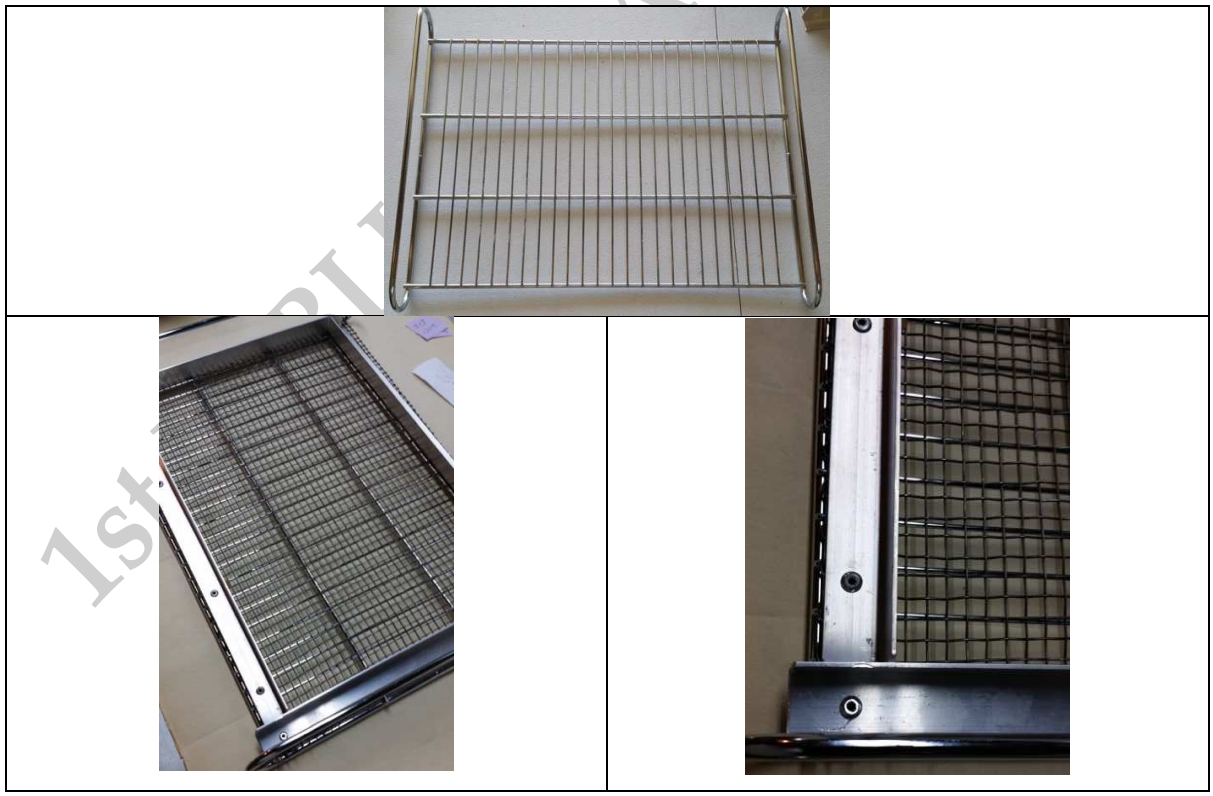


Figure 2. Original Binder ® oven tray (top); same tray screen covered (bottom left); detail of screen frame corner (bottom right). Notice the edge lips that allow the entire tray to be used for roasting but not risk any beans falling off (Credit: Seguine, 2014)

Figure 3. Stainless steel wire roasting tray (Credit: Sukha and Ali, 2016)

Figure 4. Example of cooling tray with fan attached at the bottom (Credit: https://cocoatown.com/shop/cooling-tray-micro/)

Annex B – Additional tables

Table 4. Examples of ovens that comply with the recommended specifications

Brand	Model	Website
Gemmy	YCO-010	http://www.gemmy.com.tw/home.php?fn=product_data&no=23
Binder®	FD 56/FD 53	https://www.binder-world.com/us/Products/Drying-and-heating-chambers-Avantgarde.Line/Series-FD/FD-56
France Etuves	XU112	http://www.france-etuves-store.com/xu112-etuve-de-laboratoire-universelle.html

Table 5. Specifications of the Binder® Oven FD 56 as an example

Parameter	Specification
Type	Forced convection
Variable control	Temperature and time digital setting
Temperature range	Ambient +10–300°C
Temperature variation at 150°C	1.7°C
Temperature fluctuation at 150°C	±0.3°C
Recovery time after 30 seconds door open at 150°C	4 minutes
Temperature uniformity	≤3.0°C
Internal dimensions	40 width × 345 depth × 440 height (in mm)
Tray quantity	2–4
Tray positions	Symmetrically above and below the fan opening

Table 6. Adjustments in roasting time (minutes) and temperature (°C) by cocoa bean size (bean count in 100g) and moisture content (%) (Source: CoEx, 2019)

a) For moisture content between 5.5 and 7.3%

time (min) / temp (°C)		Bean moisture content (%)																		
		5.5	**5.6**	**5.7**	**5.8**	**5.9**	**6.0**	**6.1**	**6.2**	**6.3**	**6.4**	**6.5**	**6.6**	**6.7**	**6.8**	**6.9**	**7.0**	**7.1**	**7.2**	**7.3**
Bean count in 100 g	**50**	0 min -4 °C	1 min -4 °C	1 min -4 °C	1 min -4 °C	2 min -4 °C	2 min -4 °C	2 min -4 °C	3 min -4 °C	3 min -4 °C	3 min -4 °C	4 min -4 °C	4 min -4 °C	4 min -4 °C	5 min -4 °C	5 min -4 °C	5 min -4 °C	6 min -4 °C	6 min -4 °C	6 min -4 °C
	55	-1 min -4 °C	0 min -4 °C	0 min -4 °C	0 min -4 °C	1 min -4 °C	1 min -4 °C	1 min -4 °C	2 min -4 °C	2 min -4 °C	2 min -4 °C	3 min -4 °C	3 min -4 °C	3 min -4 °C	4 min -4 °C	4 min -4 °C	4 min -4 °C	5 min -4 °C	5 min -4 °C	5 min -4 °C
	60	-1 min -3 °C	-1 min -3 °C	-1 min -3 °C	0 min -3 °C	0 min -3 °C	0 min -3 °C	1 min -3 °C	1 min -3 °C	1 min -3 °C	2 min -3 °C	2 min -3 °C	2 min -3 °C	3 min -3 °C	3 min -3 °C	3 min -3 °C	4 min -3 °C	4 min -3 °C	4 min -3 °C	5 min -3 °C
	65	-2 min -3 °C	-2 min -3 °C	-1 min -3 °C	-1 min -3 °C	-1 min -3 °C	0 min -3 °C	0 min -3 °C	0 min -3 °C	1 min -3 °C	1 min -3 °C	1 min -3 °C	2 min -3 °C	2 min -3 °C	2 min -3 °C	3 min -3 °C	3 min -3 °C	3 min -3 °C	4 min -3 °C	4 min -3 °C
	70	-3 min -2 °C	-2 min -2 °C	-2 min -2 °C	-2 min -2 °C	-1 min -2 °C	-1 min -2 °C	-1 min -2 °C	0 min -2 °C	0 min -2 °C	0 min -2 °C	1 min -2 °C	1 min -2 °C	1 min -2 °C	2 min -2 °C	2 min -2 °C	2 min -2 °C	3 min -2 °C	3 min -2 °C	3 min -2 °C
	75	-3 min -2 °C	-3 min -2 °C	-3 min -2 °C	-2 min -2 °C	-2 min -2 °C	-2 min -2 °C	-1 min -2 °C	-1 min -2 °C	-1 min -2 °C	0 min -2 °C	0 min -2 °C	0 min -2 °C	1 min -2 °C	1 min -2 °C	1 min -2 °C	2 min -2 °C	2 min -2 °C	2 min -2 °C	3 min -2 °C
	80	-4 min -2 °C	-4 min -2 °C	-3 min -2 °C	-3 min -2 °C	-3 min -2 °C	-2 min -2 °C	-2 min -2 °C	-2 min -2 °C	-1 min -2 °C	-1 min -2 °C	-1 min -2 °C	0 min -2 °C	0 min -2 °C	0 min -2 °C	1 min -2 °C	1 min -2 °C	1 min -2 °C	2 min -2 °C	2 min -2 °C
	85	-5 min -1 °C	-4 min -1 °C	-4 min -1 °C	-4 min -1 °C	-3 min -1 °C	-3 min -1 °C	-3 min -1 °C	-2 min -1 °C	-2 min -1 °C	-2 min -1 °C	-1 min -1 °C	-1 min -1 °C	-1 min -1 °C	0 min -1 °C	0 min -1 °C	0 min -1 °C	1 min -1 °C	1 min -1 °C	1 min -1 °C
	90	-6 min -1 °C	-5 min -1 °C	-5 min -1 °C	-5 min -1 °C	-4 min -1 °C	-4 min -1 °C	-4 min -1 °C	-3 min -1 °C	-3 min -1 °C	-3 min -1 °C	-2 min -1 °C	-2 min -1 °C	-2 min -1 °C	-1 min -1 °C	-1 min -1 °C	-1 min -1 °C	0 min -1 °C	0 min -1 °C	0 min -1 °C
	95	-6 min 0 °C	-6 min 0 °C	-6 min 0 °C	-5 min 0 °C	-5 min 0 °C	-5 min 0 °C	-5 min 0 °C	-4 min 0 °C	-4 min 0 °C	-3 min 0 °C	-3 min 0 °C	-3 min 0 °C	-2 min 0 °C	-2 min 0 °C	-2 min 0 °C	-1 min 0 °C	-1 min 0 °C	-1 min 0 °C	0 min 0 °C
	100	-7 min 0 °C	-7 min 0 °C	-6 min 0 °C	-6 min 0 °C	-6 min 0 °C	-5 min 0 °C	-5 min 0 °C	-5 min 0 °C	-4 min 0 °C	-4 min 0 °C	-4 min 0 °C	-3 min 0 °C	-3 min 0 °C	-3 min 0 °C	-2 min 0 °C	-2 min 0 °C	-2 min 0 °C	-1 min 0 °C	-1 min 0 °C
	105	-8 min 0 °C	-7 min 0 °C	-7 min 0 °C	-7 min 0 °C	-6 min 0 °C	-6 min 0 °C	-6 min 0 °C	-5 min 0 °C	-5 min 0 °C	-5 min 0 °C	-4 min 0 °C	-4 min 0 °C	-4 min 0 °C	-3 min 0 °C	-3 min 0 °C	-3 min 0 °C	-2 min 0 °C	-2 min 0 °C	-2 min 0 °C
	110	-8 min 0 °C	-8 min 0 °C	-8 min 0 °C	-7 min 0 °C	-7 min 0 °C	-7 min 0 °C	-7 min 0 °C	-6 min 0 °C	-6 min 0 °C	-5 min 0 °C	-5 min 0 °C	-5 min 0 °C	-4 min 0 °C	-4 min 0 °C	-4 min 0 °C	-3 min 0 °C	-3 min 0 °C	-3 min 0 °C	-2 min 0 °C
	115	-9 min 0 °C	-9 min 0 °C	-8 min 0 °C	-8 min 0 °C	-8 min 0 °C	-7 min 0 °C	-7 min 0 °C	-7 min 0 °C	-6 min 0 °C	-6 min 0 °C	-6 min 0 °C	-5 min 0 °C	-5 min 0 °C	-5 min 0 °C	-4 min 0 °C	-4 min 0 °C	-4 min 0 °C	-3 min 0 °C	-3 min 0 °C
	120	-10 min 0 °C	-9 min 0 °C	-9 min 0 °C	-9 min 0 °C	-8 min 0 °C	-8 min 0 °C	-8 min 0 °C	-7 min 0 °C	-7 min 0 °C	-7 min 0 °C	-6 min 0 °C	-6 min 0 °C	-6 min 0 °C	-5 min 0 °C	-5 min 0 °C	-5 min 0 °C	-4 min 0 °C	-4 min 0 °C	-4 min 0 °C
	125	-11 min 0 °C	-10 min 0 °C	-10 min 0 °C	-10 min 0 °C	-9 min 0 °C	-9 min 0 °C	-9 min 0 °C	-8 min 0 °C	-8 min 0 °C	-8 min 0 °C	-7 min 0 °C	-7 min 0 °C	-7 min 0 °C	-6 min 0 °C	-6 min 0 °C	-6 min 0 °C	-5 min 0 °C	-5 min 0 °C	-5 min 0 °C
	130	-11 min 0 °C	-11 min 0 °C	-11 min 0 °C	-10 min 0 °C	-10 min 0 °C	-10 min 0 °C	-10 min 0 °C	-9 min 0 °C	-9 min 0 °C	-8 min 0 °C	-8 min 0 °C	-8 min 0 °C	-7 min 0 °C	-7 min 0 °C	-7 min 0 °C	-6 min 0 °C	-6 min 0 °C	-6 min 0 °C	-5 min 0 °C
	135	-12 min 0 °C	-12 min 0 °C	-11 min 0 °C	-11 min 0 °C	-11 min 0 °C	-10 min 0 °C	-10 min 0 °C	-10 min 0 °C	-9 min 0 °C	-9 min 0 °C	-9 min 0 °C	-8 min 0 °C	-8 min 0 °C	-8 min 0 °C	-7 min 0 °C	-7 min 0 °C	-7 min 0 °C	-6 min 0 °C	-6 min 0 °C
	140	-13 min 0 °C	-12 min 0 °C	-12 min 0 °C	-12 min 0 °C	-11 min 0 °C	-11 min 0 °C	-11 min 0 °C	-10 min 0 °C	-10 min 0 °C	-10 min 0 °C	-9 min 0 °C	-9 min 0 °C	-9 min 0 °C	-8 min 0 °C	-8 min 0 °C	-8 min 0 °C	-7 min 0 °C	-7 min 0 °C	-7 min 0 °C
	145	-13 min 0 °C	-13 min 0 °C	-13 min 0 °C	-12 min 0 °C	-12 min 0 °C	-12 min 0 °C	-12 min 0 °C	-11 min 0 °C	-11 min 0 °C	-10 min 0 °C	-10 min 0 °C	-10 min 0 °C	-9 min 0 °C	-9 min 0 °C	-9 min 0 °C	-8 min 0 °C	-8 min 0 °C	-8 min 0 °C	-7 min 0 °C
	155	-14 min 0 °C	-14 min 0 °C	-13 min 0 °C	-13 min 0 °C	-13 min 0 °C	-12 min 0 °C	-12 min 0 °C	-12 min 0 °C	-11 min 0 °C	-11 min 0 °C	-11 min 0 °C	-10 min 0 °C	-10 min 0 °C	-10 min 0 °C	-9 min 0 °C	-9 min 0 °C	-9 min 0 °C	-8 min 0 °C	-8 min 0 °C
	155	-15 min 0 °C	-15 min 0 °C	-14 min 0 °C	-14 min 0 °C	-14 min 0 °C	-13 min 0 °C	-13 min 0 °C	-13 min 0 °C	-12 min 0 °C	-12 min 0 °C	-12 min 0 °C	-11 min 0 °C	-11 min 0 °C	-11 min 0 °C	-10 min 0 °C	-10 min 0 °C	-10 min 0 °C	-9 min 0 °C	-9 min 0 °C
	160	-16 min 0 °C	-15 min 0 °C	-15 min 0 °C	-15 min 0 °C	-14 min 0 °C	-14 min 0 °C	-14 min 0 °C	-13 min 0 °C	-13 min 0 °C	-13 min 0 °C	-12 min 0 °C	-12 min 0 °C	-12 min 0 °C	-11 min 0 °C	-11 min 0 °C	-11 min 0 °C	-10 min 0 °C	-10 min 0 °C	-10 min 0 °C

For higher moisture contents see next page.

b) For moisture content between 7.4 and 9.2%

time (min)		Bean moisture content (%)																	
temp (°C)		7.4	7.5	7.6	7.7	7.8	7.9	8.0	8.1	8.2	8.3	8.4	8.5	8.6	8.7	8.8	8.9	9.0	9.1	9.2
Bean count in 100 g	50	7 min -4 °C	7 min -4 °C	7 min -4 °C	8 min -4 °C	8 min -4 °C	8 min -4 °C	9 min -4 °C	9 min -4 °C	9 min -4 °C	10 min -4 °C	10 min -4 °C	10 min -4 °C	11 min -4 °C	11 min -4 °C	11 min -4 °C	12 min -4 °C	12 min -4 °C	12 min -4 °C	13 min -4 °C
	55	6 min -4 °C	6 min -4 °C	6 min -4 °C	7 min -4 °C	7 min -4 °C	7 min -4 °C	8 min -4 °C	8 min -4 °C	8 min -4 °C	9 min -4 °C	9 min -4 °C	9 min -4 °C	10 min -4 °C	10 min -4 °C	10 min -4 °C	11 min -4 °C	11 min -4 °C	11 min -4 °C	12 min -4 °C
	60	5 min -3 °C	5 min -3 °C	6 min -3 °C	6 min -3 °C	6 min -3 °C	7 min -3 °C	7 min -3 °C	7 min -3 °C	8 min -3 °C	8 min -3 °C	8 min -3 °C	9 min -3 °C	9 min -3 °C	9 min -3 °C	10 min -3 °C	10 min -3 °C	10 min -3 °C	11 min -3 °C	11 min -3 °C
	65	4 min -3 °C	5 min -3 °C	5 min -3 °C	5 min -3 °C	6 min -3 °C	6 min -3 °C	6 min -3 °C	7 min -3 °C	7 min -3 °C	7 min -3 °C	8 min -3 °C	8 min -3 °C	8 min -3 °C	9 min -3 °C	9 min -3 °C	9 min -3 °C	10 min -3 °C	10 min -3 °C	10 min -3 °C
	70	4 min -2 °C	4 min -2 °C	4 min -2 °C	5 min -2 °C	5 min -2 °C	5 min -2 °C	6 min -2 °C	6 min -2 °C	6 min -2 °C	7 min -2 °C	7 min -2 °C	7 min -2 °C	8 min -2 °C	8 min -2 °C	8 min -2 °C	9 min -2 °C	9 min -2 °C	9 min -2 °C	10 min -2 °C
	75	3 min -2 °C	3 min -2 °C	4 min -2 °C	4 min -2 °C	4 min -2 °C	5 min -2 °C	5 min -2 °C	5 min -2 °C	6 min -2 °C	6 min -2 °C	6 min -2 °C	7 min -2 °C	7 min -2 °C	7 min -2 °C	8 min -2 °C	8 min -2 °C	8 min -2 °C	9 min -2 °C	9 min -2 °C
	80	2 min -2 °C	3 min -2 °C	3 min -2 °C	3 min -2 °C	4 min -2 °C	4 min -2 °C	4 min -2 °C	5 min -2 °C	5 min -2 °C	5 min -2 °C	6 min -2 °C	6 min -2 °C	6 min -2 °C	7 min -2 °C	7 min -2 °C	7 min -2 °C	8 min -2 °C	8 min -2 °C	8 min -2 °C
	85	2 min -1 °C	2 min -1 °C	2 min -1 °C	3 min -1 °C	3 min -1 °C	3 min -1 °C	4 min -1 °C	4 min -1 °C	4 min -1 °C	5 min -1 °C	5 min -1 °C	5 min -1 °C	6 min -1 °C	6 min -1 °C	6 min -1 °C	7 min -1 °C	7 min -1 °C	7 min -1 °C	8 min -1 °C
	90	1 min -1 °C	1 min -1 °C	1 min -1 °C	2 min -1 °C	2 min -1 °C	2 min -1 °C	3 min -1 °C	3 min -1 °C	3 min -1 °C	4 min -1 °C	4 min -1 °C	4 min -1 °C	5 min -1 °C	5 min -1 °C	5 min -1 °C	6 min -1 °C	6 min -1 °C	6 min -1 °C	7 min -1 °C
	95	0 min 0 °C	0 min 0 °C	1 min 0 °C	1 min 0 °C	1 min 0 °C	2 min 0 °C	2 min 0 °C	2 min 0 °C	3 min 0 °C	3 min 0 °C	3 min 0 °C	4 min 0 °C	4 min 0 °C	4 min 0 °C	5 min 0 °C	5 min 0 °C	5 min 0 °C	6 min 0 °C	6 min 0 °C
	100	-1 min 0 °C	0 min 0 °C	0 min 0 °C	0 min 0 °C	1 min 0 °C	1 min 0 °C	1 min 0 °C	2 min 0 °C	2 min 0 °C	2 min 0 °C	3 min 0 °C	3 min 0 °C	3 min 0 °C	4 min 0 °C	4 min 0 °C	4 min 0 °C	5 min 0 °C	5 min 0 °C	5 min 0 °C
	105	-1 min 0 °C	-1 min 0 °C	-1 min 0 °C	0 min 0 °C	0 min 0 °C	0 min 0 °C	1 min 0 °C	1 min 0 °C	1 min 0 °C	2 min 0 °C	2 min 0 °C	2 min 0 °C	3 min 0 °C	3 min 0 °C	3 min 0 °C	4 min 0 °C	4 min 0 °C	4 min 0 °C	5 min 0 °C
	110	-2 min 0 °C	-2 min 0 °C	-1 min 0 °C	-1 min 0 °C	-1 min 0 °C	0 min 0 °C	0 min 0 °C	0 min 0 °C	1 min 0 °C	1 min 0 °C	1 min 0 °C	2 min 0 °C	2 min 0 °C	2 min 0 °C	3 min 0 °C	3 min 0 °C	3 min 0 °C	4 min 0 °C	4 min 0 °C
	115	-3 min 0 °C	-2 min 0 °C	-2 min 0 °C	-2 min 0 °C	-1 min 0 °C	-1 min 0 °C	-1 min 0 °C	0 min 0 °C	0 min 0 °C	0 min 0 °C	1 min 0 °C	1 min 0 °C	1 min 0 °C	2 min 0 °C	2 min 0 °C	2 min 0 °C	3 min 0 °C	3 min 0 °C	3 min 0 °C
	120	-3 min 0 °C	-3 min 0 °C	-3 min 0 °C	-2 min 0 °C	-2 min 0 °C	-2 min 0 °C	-1 min 0 °C	-1 min 0 °C	-1 min 0 °C	0 min 0 °C	0 min 0 °C	0 min 0 °C	1 min 0 °C	1 min 0 °C	1 min 0 °C	2 min 0 °C	2 min 0 °C	2 min 0 °C	3 min 0 °C
	125	-4 min 0 °C	-4 min 0 °C	-4 min 0 °C	-3 min 0 °C	-3 min 0 °C	-3 min 0 °C	-2 min 0 °C	-2 min 0 °C	-2 min 0 °C	-1 min 0 °C	-1 min 0 °C	-1 min 0 °C	0 min 0 °C	0 min 0 °C	0 min 0 °C	1 min 0 °C	1 min 0 °C	1 min 0 °C	2 min 0 °C
	130	-5 min 0 °C	-5 min 0 °C	-4 min 0 °C	-4 min 0 °C	-4 min 0 °C	-3 min 0 °C	-3 min 0 °C	-3 min 0 °C	-2 min 0 °C	-2 min 0 °C	-2 min 0 °C	-1 min 0 °C	-1 min 0 °C	-1 min 0 °C	0 min 0 °C	0 min 0 °C	0 min 0 °C	1 min 0 °C	1 min 0 °C
	135	-6 min 0 °C	-5 min 0 °C	-5 min 0 °C	-5 min 0 °C	-4 min 0 °C	-4 min 0 °C	-4 min 0 °C	-3 min 0 °C	-3 min 0 °C	-3 min 0 °C	-2 min 0 °C	-2 min 0 °C	-2 min 0 °C	-1 min 0 °C	-1 min 0 °C	-1 min 0 °C	0 min 0 °C	0 min 0 °C	0 min 0 °C
	140	-6 min 0 °C	-6 min 0 °C	-6 min 0 °C	-5 min 0 °C	-5 min 0 °C	-5 min 0 °C	-4 min 0 °C	-4 min 0 °C	-4 min 0 °C	-3 min 0 °C	-3 min 0 °C	-3 min 0 °C	-2 min 0 °C	-2 min 0 °C	-2 min 0 °C	-1 min 0 °C	-1 min 0 °C	-1 min 0 °C	0 min 0 °C
	145	-7 min 0 °C	-7 min 0 °C	-6 min 0 °C	-6 min 0 °C	-6 min 0 °C	-5 min 0 °C	-5 min 0 °C	-5 min 0 °C	-4 min 0 °C	-4 min 0 °C	-4 min 0 °C	-3 min 0 °C	-3 min 0 °C	-3 min 0 °C	-2 min 0 °C	-2 min 0 °C	-2 min 0 °C	-1 min 0 °C	-1 min 0 °C
	155	-8 min 0 °C	-7 min 0 °C	-7 min 0 °C	-7 min 0 °C	-6 min 0 °C	-6 min 0 °C	-6 min 0 °C	-5 min 0 °C	-5 min 0 °C	-5 min 0 °C	-4 min 0 °C	-4 min 0 °C	-4 min 0 °C	-3 min 0 °C	-3 min 0 °C	-3 min 0 °C	-2 min 0 °C	-2 min 0 °C	-2 min 0 °C
	155	-9 min 0 °C	-8 min 0 °C	-8 min 0 °C	-8 min 0 °C	-7 min 0 °C	-7 min 0 °C	-7 min 0 °C	-6 min 0 °C	-6 min 0 °C	-6 min 0 °C	-5 min 0 °C	-5 min 0 °C	-5 min 0 °C	-4 min 0 °C	-4 min 0 °C	-4 min 0 °C	-3 min 0 °C	-3 min 0 °C	-3 min 0 °C
	160	-9 min 0 °C	-9 min 0 °C	-9 min 0 °C	-8 min 0 °C	-8 min 0 °C	-8 min 0 °C	-7 min 0 °C	-7 min 0 °C	-7 min 0 °C	-6 min 0 °C	-6 min 0 °C	-6 min 0 °C	-5 min 0 °C	-5 min 0 °C	-5 min 0 °C	-4 min 0 °C	-4 min 0 °C	-4 min 0 °C	-3 min 0 °C

For lower moisture contents see previous page.

Annex C – Example for adjusting the roasting conditions

In Table 6a, 6b and 6c the adjustments are given in the cell pointed out by the intersection of the moisture content (horizontal axis) and the bean count (vertical axis). Inside the cell, the number at the top indicates the adjustment in time (minutes) and the number at the bottom the adjustment in temperature (°C).

Example: Beans with the following characteristics and basic roasting conditions:

Aroma from cut test	No significant aroma notes perceived
Moisture content (%)	7.8
Bean count (#of beans in 100g)	65
Basic roasting conditions selected	Full roast at 130°C for 25 minutes

In Annex B -Table 6, the information at the intersection of the moisture content and bean count indicate a '6' at the top and a '-3' at the bottom which mean that 6 minutes would be added to the roasting time and 3 degrees deducted from the roasting temperature resulting in 127°C for 31 minutes. See Figure 5 below.

time (min)* / temp (°C)	Bean moisture content (%)								
Bean count in 100 g	7.4	7.5	7.6	7.7	7.8	7.9	8.0	8.1	8.2
50	7 min -4 °C	7 min -4 °C	7 min -4 °C	8 min -4 °C	8 min -4 °C	8 min -4 °C	9 min -4 °C	9 min -4 °C	9 min -4 °C
55	6 min -4 °C	6 min -4 °C	6 min -4 °C	7 min -4 °C	7 min -4 °C	7 min -4 °C	8 min -4 °C	8 min -4 °C	8 min -4 °C
60	5 min -3 °C	5 min -3 °C	6 min -3 °C	6 min -3 °C	6 min -3 °C	7 min -3 °C	7 min -3 °C	7 min -3 °C	8 min -3 °C
65	4 min -3 °C	5 min -3 °C	5 min -3 °C	5 min -3 °C	6 min -3 °C	6 min -3 °C	6 min -3 °C	7 min -3 °C	7 min -3 °C
70	4 min -2 °C	4 min -2 °C	4 min -2 °C	5 min -2 °C	5 min -2 °C	5 min -2 °C	6 min -2 °C	6 min -2 °C	6 min -2 °C
75	3 min -2 °C	3 min -2 °C	4 min -2 °C	4 min -2 °C	4 min -2 °C	5 min -2 °C	5 min -2 °C	5 min -2 °C	6 min -2 °C
80	2 min -2 °C	3 min -2 °C	3 min -2 °C	3 min -2 °C	4 min -2 °C	4 min -2 °C	4 min -2 °C	5 min -2 °C	5 min -2 °C
85	2 min -1 °C	2 min -1 °C	2 min -1 °C	3 min -1 °C	3 min -1 °C	3 min -1 °C	4 min -1 °C	4 min -1 °C	4 min -1 °C
90	1 min -1 °C	1 min -1 °C	1 min -1 °C	2 min -1 °C	2 min -1 °C	2 min -1 °C	3 min -1 °C	3 min -1 °C	3 min -1 °C
95	0 min 0 °C	0 min 0 °C	1 min 0 °C	1 min 0 °C	1 min 0 °C	2 min 0 °C	2 min 0 °C	2 min 0 °C	3 min 0 °C

Figure 5. The pointed cell indicating the roasting time and temperature adjustements for beans with 7.8% moisture content and 65 bean count in 100g

Annex D – Terms and definitions

NOTE – this section will be completed at the end of the review process.

Term	Definition
Forced air convection oven	
Drop down temperature	Lowest temperature that the oven reaches at the moment where the beans are put inside the oven and the oven door is just closed.
Filler beans	
Full flavour potential	
Reference sample	
Roasting conditions	
Temperature uniformity	
Temperature stability	

Annex E – Materials used for this protocols and further reading

- Cocoa of Excellence Programme (2019) Technical Procedures for Processing the Cocoa Bean Samples from Participating Countries – from Reception, Physical Quality and Processing into Liquor and Chocolate for Flavour Sensory Evaluation.
- Heirloom Cacao Preservation Program (2018) Protocols for HCP Lab Tests and Raw Bean Characterization Pre-liquor Preparation and analysis. Fine Chocolate Industry Association (FCIA). [Online] https://hcpcacao.org/hcpapp/ [Accessed 24 May 2018]
- Lim, C. (2019) Assessing the Cocoa of Excellence Programme's Roasting Adjustments based on Bean Count and Moisture Content by Gas Chromatography – Mass Spectrometry (GC_MS) and Sensory Analysis – Initial Work on Standardizing a Decision Table for Processing Cocoa Beans into Liquor for Sensory Evaluation. Master's Thesis submitted to obtain the degree of European Master of Science in Food Science, Technology and Business. KU Leuven, Ghent Technology Campus.
- Seguine, E. (2014) Operating Procedures and Recommendations for Equipment Operation - Laboratory Evaluation of Cocoa Beans, Version 1.0. Pennsylvania, Seguine Cacao Cocoa and Chocolate Advisors
- Sukha, D. (2017) Elements of a harmonized international standard for cocoa flavour assessment – a proposal for further consultation. [Online] http://www.cocoaofexcellence.org/info-and-resources [Accessed 19 November 2019]
- Sukha, D. Ali, N. (2016) Standard operating procedures for cocoa liquor production. Trinidad Food Technology Section of the Cocoa Research Centre (CRC), University of the West Indies (UWI).St. Augustine.
- Sukha, D., Seguine E. (2015) Annex B: Protocols for the Preparation and Flavour Evaluation of Sample and Small-Scale Fermentation Techniques. *In* CAOBISCO/ECA/FCC Cocoa Beans: Chocolate and Cocoa Industry Quality Requirements. September 2015 (End, M.J. and Dand, R., Editors)

Annex F – Acronyms

NOTE – this section will be completed at the end of the review process.

Acronym	Full name
CAOBISCO	Chocolate, Biscuit and Confectionery of Europe
CBI	Centre for the Promotion of Imports from Developing Countries
CDP	USAID – Equal Exchange – TCHO Cooperative Development Programme
CoEx	Cocoa of Excellence Programme
CRC/UWI	Cocoa Research Centre of the University of the West Indies
ECA	European Cocoa Association
EE	Equal Exchange
FCC	Federation of Cocoa Commerce
FCCI	Fine Cacao and Chocolate Institute
HCP	Heirloom Cacao Preservation Program
LWR	Lutheran World Relief

Annex G – Drafting and review process of this protocol

- Drafted and reviewed by Brigitte Laliberté, Chinkee Lim, Dolores Alvarado, Pramitha Pothan and Sue González (Alliance of Bioversity International and CIAT/CoEx Programme) and Darin Sukha (CRC/UWI)
- Draft discussed in Task Force video-conference call on 16 May 2018. Participants:
  - Alliance of Bioversity International and CIAT/CoEx Programme – Brigitte Laliberté, Dolores Alvarado and Pramitha Pothan
  - CRC/UWI – Darin Sukha
  - ECOM – Daniel Domingo
  - Seguine Cacao Cocoa and Chocolate Advisors/Guittard – Ed Seguine
  - TCHO – Brad Kintzer
  - Valrhona Chocolate – Florent Coste and Pierre Costet
- Draft reviewed by Brigitte Laliberté and Dolores Alvarado (Alliance of Bioversity International and CIAT/CoEx Programme)
- Draft version dated 14 September 2018 made available to Working Group members and commented by Cristina Liberati (EE/CDP) and Julien Simonis (Puratos/Belcolade)
- Draft discussed in Task Force video-conference call on 25 October 2018. Participants:
  - Alliance of Bioversity International and CIAT /CoEx Programme – Brigitte Laliberté, Chinkee Lim, Dolores Alvarado and Sue González
  - Puratos/Belcolade – Julien Simonis
  - Seguine Cacao Cocoa and Chocolate Advisors /Guittard Chocolate – Ed Seguine
  - TCHO – Brad Kintzer
  - Valrhona Chocolate – Pierre Costet
- Draft discussed at the Working Group meeting in Paris (Oct 2018). Participants:
  - Alliance of Bioversity International and CIAT/CoEx Programme – Arisa Thamsuaidee, Brigitte Laliberté, Chinkee Lim, Dolores Alvarado, and Sue González

  - Barry Callebaut – Coralie Veyrac and Renata Januszewska
  - CBI – Daphne Braak, Erik Plaisier and Nubia Martínez
  - CRC/UWI – Darin Sukha
  - ECOM Trading – Daniel Domingo
  - EE/CDP – Cristina Liberati
  - FCCI – Carla Martin, José López Ganem
  - Guittard Chocolate– John Kehoe
  - LWR – Carolina Aguilar, Rick Peyser
  - Penn State University – Siela Maximova
  - Puratos/Belcolade – Julien Simonis
  - Seguine Cacao Cocoa and Chocolate Advisors/Guittard Chocolate – Ed Seguine
  - Valrhona Chocolate – Pierre Costet
- Draft updated by Chinkee Lim and Sue González (Alliance of Bioversity International and CIAT/CoEx Programme)
- Draft reviewed by Brigitte Laliberté and Dolores Alvarado (Alliance of Bioversity International and CIAT/CoEx Programme)
- MSc research project carried out by Chinkee Lim (March–August 2019) to assess Table 6. Adjustments in roasting time (minutes) and temperature (°C) depending on cocoa bean size (bean count in 100g) and moisture content (%)
- Draft reviewed by Ed Seguine (Seguine Cacao Cocoa and Chocolate Advisors/Guittard Chocolate)
- Draft discussed in Task Force video-conference call on 3 October 2019. Participants:
  - Alliance of Bioversity International and CIAT/CoEx Programme–Brigitte Laliberté, Chinkee Lim and Dolores Alvarado
  - Puratos/Belcolade – Julien Simonis
  - Seguine Cacao Cocoa and Chocolate Advisors /Guittard Chocolate – Ed Seguine
  - TCHO – Brad Kintzer
  - Valrhona Chocolate – Florent Coste and Pierre Costet
- Draft reviewed by Brigitte Laliberté and Dolores Alvarado (Alliance of Bioversity International and CIAT/CoEx Programme)
- Draft version dated 26 November 2019 made available to all WG members and commented by Ed Seguine (Seguine Cacao Cocoa and Chocolate Advisors/Guittard Chocolate) and Juan Francisco Mollinedo (AMACACAO)
- Draft reviewed by Brigitte Laliberté and Dolores Alvarado (Alliance of Bioversity International and CIAT/CoEx Programme) and published in the ISCQF webpage on 20 December 2019
- Draft reviewed and updated after publication by Brigitte Laliberté and Dolores Alvarado (Alliance of Bioversity International and CIAT/CoEx Programme) and re-published in the ISCQF webpage on 3 March 2020
- Draft translated into Spanish by Alexandra Walter, reviewed by Dolores Alvarado and published on the ISCQF website on 3 March 2020
- Draft translated into French in collaboration with the CNFA initiative, reviewed by Silvia Araujo de Lima and Brigitte Laliberté (Alliance de Bioversity International and CIAT/

CoEx Programme) and Fabien Coutel (CocoaSource), and published on the ISCQF website on 21 July 2020.