CARICOM REGIONAL STANDARD

Cocoa bean quality— Specifications

FL CRS 83: 202X

CARICOM Regional Organisation for Standards and Quality (CROSQ)
2nd Floor Baobab Tower
Warrens
St Michael
Barbados
T: 246.622.7670 | F: 246.622.7678
Website: http://www.crosq.org

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Committee representation

This CARICOM Regional Standard was developed by the Regional Technical Sub-Committee for Cocoa (hosted by the CARICOM Member State, Trinidad and Tobago) under the supervision of the Regional Technical Committee for Agricultural Produce, RTC 3A (hosted by the CARICOM Member State Dominica), which at the time comprised the following members:

Members	**Representing**
Dr Darin Sukha **(Chairman)**	Cocoa Research Centre, The University of the West Indies, St. Augustine, Trinidad and Tobago
Ms Amiesha Persaud Ms Ashana Baptiste-Paul (Alternate)	Grenada Bureau of Standards
Ms Anuradha Pooran-Ramroop Ms Mala Partap (Alternate)	Cocoa Development Company of Trinidad and Tobago Ltd
Ms Ellen Ligteringen	Tan Bun Skrati N.V., Suriname
Ms Jaiwante Samsoondar Ms Anita Baijoo (Alternate) Mr Renold Ramdial (Alternate)	Ministry of Agriculture and Fisheries, Trinidad and Tobago
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Mr Ricky Brumant Mr Franklyn Joseph (Alternate) Ms Saskia Augustin	Division of Agriculture, Dominica Saint Lucia Bureau of Standards
Ms Shadel Nyack Compton Ms Alicia Sarrao (Alternate)	Belmont Estate, Grenada
Ms Shivanie Mahadeo Dr Patrick Chesney (Alternate) Ms Taletha Laudat	Guyana National Bureau of Standards PC Consultants, Guyana Technical Expert, Dominica
Mr Wilkens-Ader Laroche Mr Etchnightder Esperance (Alternate)	Haitian Association for Quality Management, Haiti Bureau of Standards
Ms Adrienne Stewart (Technical Secretary) Ms Nkechi Williams	Trinidad and Tobago Bureau of Standards

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Foreword

This CARICOM Regional Standard CRS 83:202X, *Cocoa bean quality - Specifications* has been developed under the authority of the CARICOM Regional Organisation for Standards and Quality (CROSQ). It was approved as a CARICOM Regional Standard by the CARICOM Council for Trade and Economic Development (COTED) at its XX Meeting in MM YYYY.

The standard CRS 83 was developed to contribute to the improvement of the quality of regionally produced cocoa beans. Its development was encouraged by the Cocoa Research Centre - The University of the West Indies, St Augustine, and the Cocoa Research Section, of the Research Division, Ministry of Agriculture, Land and Fisheries in Trinidad and Tobago. This standard is intended to support the drive towards regional quality improvement for cocoa produced by CARICOM Member States.

This standard is intended for use by:

a) producers – to maintain or improve cocoa bean quality;

b) laboratories and quality assessors – to determine acceptable levels of quality parameters;

c) processors – to inform on quality expectations of producers; and

d) regulators – to facilitate inspections and determine compliance to applicable regulatory requirements;

In formulating this standard, considerable assistance was derived from the following publications which were still current when this standard was being developed:

— ARSO 1000-2:2021, *Sustainable cocoa — Part 2: Requirements for Cocoa Quality and Traceability*

— CAOBISCO/ECA Cocoa Beans: Chocolate and Cocoa Industry Quality Requirements. December 2023. (End, M.J. and Dand, R., Editors), CAOBISCO/ECA; Brussels

— Cacao of Excellence. 2024. Guide for the Assessment of Cacao Quality and Flavour. Compiled by the Cacao of Excellence programme of the Alliance of Bioversity International and CIAT, in collaboration with the members of the Working Group on the development of the International Standards for the Assessment of Cocoa Quality and Flavour (ISCQF). Bioversity International. 216 Pages. ISBN 978-92-9255-295-4 Print Issue, ISBN 978-92-9255-296-1 Digital Issue

— Sukha, D.A. (2019) Grading and quality of dried cocoa beans. Chapter 5 in: “Drying and Roasting of Cocoa and Coffee”. p. 90-132. Edited by Ching Lik Hii and Flavio Meira Borem. CRC Press Series: Advances in Drying Science and Technology. ISBN: 9781138080973. 356 pp. [https://www.crcpress.com/Drying-and-Roasting-of-Cocoa-and-Coffee/Hii-Borem/p/book/9781138080973]

— Sukha, D.A. and Ali, N.A. (2018). Analyzing Sensory and Processing Quality of Cocoa. Chapter 27 in: Achieving sustainable cultivation of cocoa – Volume 1 Genetics, Breeding, Cultivation and Quality. p. 395 – 436. Edited by Prof. Pathmanathan Umaharan. Burleigh Dodds Science Publishing. ISBN-13: 978-1-78676-168-2; ISBN-10: 1786761688. 588 pp. [https://shop.bdspublishing.com/checkout/Store/bds/Detail/Product/3-190-9781786761682-019]

International Organization for Standardization (ISO)

— ISO 2451: 2017, *Cocoa beans — Specification and quality requirements*

This standard includes the following normative annexes which are indispensable to the application of this standard:

— Annex A – Procedure and flowchart related to preliminary quality assessment

— Annex B – Method for determination of the sievings

— Annex C – Method for determination of cocoa bean related matter, flat beans and foreign matter

— Annex D – Method for determination of the bean count

— Annex E – Method for the cut test

— Annex F – Cocoa bean cutting tools

— Annex G – Methods for determination of moisture content (oven method)

— Annex H – International trade classification for fermented beans

This standard includes the following informative annexes which provide information for guidance purposes only, in the application of this standard:

— Annex I – Storage of cocoa beans

— Annex J – Disinfestation

— Annex K – Example of a test sample quality assessment report template.

Introduction

While cocoa (*Theobroma cacao L.*) was formally introduced to many parts of the Caribbean by European colonial powers in the 17th century as part of the establishment and expansion of plantation economies, its native presence especially in Belize and Suriname clearly predates colonisation. Cocoa in the region is also inextricably woven into the historical narrative of indigenous peoples in the region as well as introduced peoples from Africa, India, China, and elsewhere. These contributions have been central to the evolution of cocoa cultivation and processing in the Caribbean, forming a rich and multifaceted legacy. The region also developed a distinctive cocoa profile - most notably through the Trinitario variety, which originated in Trinidad as a hybrid of Criollo and Forastero types. This genetic heritage, paired with favourable agro-ecological conditions and traditional knowledge has influenced the region's identity as a producer of exceptional quality cocoa.

In today's global cocoa market, a clear distinction exists between "bulk" and "fine flavour" cocoa. Bulk cocoa makes up the majority of international trade, while fine flavour cocoa, used in premium chocolates, represents about 12% of the market. This niche segment demands specific flavour characteristics, traceability, and sustainable production practices. The Caribbean, with its rich genetic resources and unique quality attributes, is well positioned to meet these requirements. Notably, five CARICOM Member States are formally recognised under Annex C of the International Cocoa Agreement (2010) as either exclusive, or in the case of Haiti, partial producers of fine flavour cocoa.

However, the regional cocoa sector faces several interrelated constraints, including aging plantations and an aging farming population, small and often fragmented farm holdings, and the loss of productive cocoa land due to urbanisation and competing land uses. Additionally, many areas suffer from inadequate infrastructure and limited access roads, which hinders efficient production and transport. The sector is also increasingly impacted by climate change, as well as by evolving international food safety standards and trade regulations. Together, these challenges limit the ability of producers to consistently meet global market expectations for quality, traceability, and regulatory compliance.

This suite of CARICOM Regional Standards for Cocoa Beans has been developed as a strategic response to these challenges. The standards provide a harmonised framework to support quality improvement, facilitate traceability, promote sustainable and climate-resilient practices, and enhance access to high-value markets. They establish clear, measurable criteria that define the attributes of fine flavour cocoa, creating a benchmark for excellence that producers, processors, exporters, and regulators across the region can adopt and apply consistently.

These standards are not only intended to raise the profile of Caribbean cocoa globally, but also to serve as a catalyst for regional development. By strengthening cocoa value chains, supporting local agro-processing, and creating new opportunities for income generation, the standards contribute to the growth of a more competitive, sustainable, and inclusive cocoa economy. They also align with CARICOM's broader objectives for agricultural diversification, rural development, and environmental stewardship.

CROSQ, in collaboration with regional and national stakeholders, presents this suite of standards as a vital instrument towards a more sustainable regional cocoa economy to guide the transformation of the Caribbean cocoa sector - ensuring that it remains viable, vibrant, and valuable for future generations.

1 Scope

This document specifies the requirements for sampling, classification, test methods, packaging, marking of containers and storage for the assessment of cocoa bean quality within the CARICOM region.

This standard applies to cocoa beans originating within or imported into the CARICOM region.

2 Normative reference

The following references are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

CARICOM Regional Organisation for Standards and Quality (CROSQ)

CRS 82, *Cocoa bean quality — Sampling requirements*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in CRS 82 and the following apply.

3.1
adulteration
alteration of the composition of a lot of cocoa by any physical, chemical or microbial means so that the resulting mixture does not conform to the contractual description

3.2
bean cluster
two or more beans joined together which cannot be easily separated by using the finger and thumb of both hands
[SOURCE: ISO 2451:2017, 3.2]

3.3
bean count
total number of whole beans per 100 g determined under specific conditions
[SOURCE: ISO 2451:2017, 3.3]

3.4
broken bean
cocoa bean of which a fragment is missing, the remaining part being more than half of a whole bean
[SOURCE: ISO 2451:2017, 3.4]

3.5
cocoa bean
seed of the cocoa tree (*Theobroma cacao L.)*

Note 1 to entry: Commercially, and for the purpose of this document, the term refers to the whole seed, which has been fermented and dried.
[SOURCE: ISO 2451:2017, 3.5]

3.6
cocoa bean quality
cocoa bean conformance to specified requirements of moisture content, physical attributes (external and internal) and aroma as indicated in this standard

3.7
cocoa bean related matter
unwanted cocoa material present in the lot of cocoa beans, including bean clusters, broken beans and associated fragments or pieces of shell, placenta or any other combination of these

Note 1 to entry: See image in Annex C, Figure C1 for an illustration of cocoa bean related matter.

3.8
container
any type of containment used to protect cocoa beans from the environment, infestation, contamination and in a ready state for sampling

EXAMPLE: Jute bag, vegetable oil treated (VOT) jute bag, plastic, nylon or cloth type bag and hard lidded-container are some examples of a container.

3.9
contamination
presence of any substance or characteristic not intrinsic to well-fermented and properly dried cocoa beans, including but not limited to foreign materials, presence of non-typical odours, or other sensory deviations.

Note 1 to entry: Non-typical odours may include smoky, mouldy, putrid, manure, hammy, lactic acid, rancid or ammonia smells.

Note 2 to entry: Contamination is detected through physical inspection or a cut test of a reference sample.

3.10
cut test
procedure by which the cotyledons of cocoa beans are cut along the longitudinal axis and exposed for the purpose of determining the incidence of defective, slaty beans, violet or purple beans or the presence of contamination or any combination of these within a test sample

Note 1 to entry: See Annex E for the cut test method.

3.11
defective bean
any combination of internally mouldy, insect-damaged, slaty, germinating, flat or broken beans or bean cluster

3.12
dry cocoa
cocoa beans which have been evenly dried throughout and of which the moisture content meets the specific requirements

Note 1 to entry: See 7.2 Table 1 for specific requirements.

Note 2 to entry: Dry cocoa is considered a commercial term.
[SOURCE: ISO 2451:2017, 3.10]

3.13
flat bean
cocoa bean that is too thin to be cut longitudinally to give a complete surface of the cotyledons

3.14
foreign matter
any material other than whole intact cocoa beans

Note 1 to entry: Foreign matter includes cocoa bean related matter and non-cocoa bean related matter.

Note 2 to entry: See image in Annex C, Figure C3 for an illustration of foreign matter.

3.15
fragment
piece of cocoa bean equal to or less than half the original bean
[SOURCE: ISO 2451:2017, 3.14]

3.16
germinated bean
cocoa bean of which the seed germ has pierced the shell as evidenced either by the physical presence of the seed germ or by a hole in the shell following its detachment

Note 1 to entry: See Annex E, Figure E.4 for an image of a germinated beans.

[SOURCE: ISO 2451:2017, 3.15]

3.17
infested bean
a large number of insects affecting the external and internal parts of the cocoa bean

Note 1 to entry: See Annex E, Figure E.3 for an image of an infected bean.

3.18
insect-damaged bean
cocoa bean of which the internal parts are found to contain insects at any stage of development or show signs of frass present or damage caused thereby, which are visible to the naked eye

Note 1 to entry: Insect larvae are commonly observed in infested cocoa beans.

Note 2 to entry: Frass refers to the solid excreta of insects.

Note 3 to entry: See Annex E, Figure E.2 for images of insect-damaged beans.

3.19
lot
defined quantity of cocoa beans in a container established at any point in the cocoa supply chain and from which primary or incremental samples are drawn for quality analysis purposes

3.20
mouldy bean
cocoa bean which has mould, on the internal parts, that is visible to the naked eye

Note 1 to entry: Mould is not to be confused with white spot, which is a concentration of theobromine or cocoa fat.

Note 2 to entry: External moulds could indicate the presence of internal mould, but is not always an absolute indicator of internal moulds; in most cases it is superficial. A cut test will confirm the presence or absence of internal mould.

3.21
non-cocoa bean related matter
foreign material present in the lot of cocoa beans, including stones, metal, glass and plastic pieces, vegetative and animal matter and any other such matter where removal is manual or by use of magnets

Note 1 to entry: Foreign material not derived from the cocoa bean is non-cocoa bean related matter.

Note 2 to entry: See image in Annex C, Figure C2 for an illustration of non-cocoa bean related matter.

3.22
piece of shell
any portion of the shell with the absence of the cotyledon

3.23
reference sample
representative sample prepared by successively quartering the composite sample such that a maximum of 2 kg net remains

3.24
sieve
apparatus for the purpose of sieving, consisting of a sieving medium mounted in a frame

Note 1 to entry: See Annex B, Figure B3 for an image of a sieving tool.

3.25
sieving (verb)
sifting (verb)
act of passing cocoa beans through a sieve to remove foreign matter less than 5 mm width

3.26
sievings (noun)
siftings (noun)
material that passes through a sieve

[SOURCE: ISO 2451:2017, 3.24]

3.27
slaty bean
cocoa bean that shows a slate-like colour on at least half of the surface of the cotyledons exposed by the cut test irrespective of texture with a lack of well-defined internal ridging and usually indicative of severe under or absence of fermentation

3.28
smoky bean
cocoa bean with a smoky off-odour or off-flavour

Note 1 to entry: An off-odour or off-flavour that is reminiscent of wood smoke, hydro-carbon smoke, burnt rubber, burnt plastic, smoked meats or soot.

3.29
test portion
subset of the test sample for preparation and analysis

3.30
test sample
representative portion of cocoa beans taken from the reference sample and used in the preliminary assessment of bean quality

3.31
violet or purple bean
cocoa bean that shows a violet or purple colour on at least half of the surface of the cotyledons exposed by the cut test and usually indicative of some degree of under fermentation

4 Preparation

Wet cocoa beans shall be fermented and then dried until their moisture content no longer exceeds the percentage as specified in 7.2 Table 1. Cocoa beans prepared in this manner are referred to as fermented and dried cocoa beans.

5 Sampling

5.1 Sampling shall be carried out in accordance with the requirements of CRS 82.

5.2 For all the test methods, the reference sample shall be prepared in accordance with the method described in CRS 82.

6 Test methods

6.1 The procedure and sequence of test methods shall be in accordance with Annex A and as shown in the flowchart at Figure A.1.

6.2 Testing shall be carried out in accordance with the methods specified in Annexes B to G.

7 Quality requirements

7.1 General requirements

7.1.1 Odour

Lots of cocoa beans shall be free from odour contamination.

7.1.2 Adulteration

Lots of cocoa beans shall be free from adulteration.

7.1.3 Living insects and other infestation

Lots of cocoa beans shall be virtually free from living insects, insect eggs, larvae, and any other developmental stages, and shall be free from mites, rodents, or other types of infestation.

7.1.4 Violet or purple beans

Lots of cocoa beans shall be within the range for violet or purple beans, if specified, based on the grade or origin.

7.2 Specific requirements

The following specific requirements in Table 1, shall apply.

Table 1 - Specific requirements for cocoa beans

Parameter	Requirement
Cumulative requirement	The cocoa bean related matter in addition to flat beans and foreign matter shall not exceed 5.75 % of the mass of the reference sample.
Cocoa bean related matter	Less than or equal to 3.5 % of the mass of the reference sample representing the lot.
Flat beans	Less than or equal to 1.5 % of the mass of the reference sample representing the lot
Foreign matter	Less than or equal to 0.75 % of the mass of the reference sample representing the lot.
Moisture content	Between 6 % and 7.5 % by mass.
Sieving	Sieving[a] shall be carried out either as: a) part of the grading process; or b) a separate process. The sieving shall be carried out in accordance with the method specified in Annex B. The mass of the sieving shall not exceed 1.5 % of the mass of the reference sample representing the lot.
Other quality characteristics	Lots of cocoa beans shall be: a) reasonably free from germinated beans; b) uniform in size and colour; c) fermented; and d) fit for production of foodstuff.
a Both manual and mechanical means can be used in the sieving process.	

7.3 Grade determination

7.3.1 Classification for cocoa beans

7.3.1.1 Lots of cocoa beans shall be classified according to the categories listed in Table 2 or according to the international classification in Annex H.

7.3.1.2 The proportion of beans with defects shall be determined by the test method specified in Annex E, for each of the grades. See Figure E.1 for cut test chart.

Table 2 - Producing country internal classification for fermented and dried beans

Grade	Percentage of beans		
	Mouldy	Slaty	Insect-damaged and/or germinated
1	3	3	3
2	4	8	6

NOTE 1 The percentages are the maximum.

NOTE 2 The percentages given in the last column apply to the combined total of all the defects specified in the column header.

NOTE 3 The classification is carried out after the removal of defective beans other than the ones mentioned in Table 2.

NOTE 4 The grades percentages were sourced from ISO 2451:2017, Table 1.

7.3.1.3 When a bean has several defects, it shall be classified in one category only, that is, the least favourable. The decreasing order of the least favourable category is as follows, with mouldy beans being the least favourable:

a) mouldy beans;

b) slaty beans;

c) insect-damaged beans;

d) germinated beans, not applicable in Table H.1.

7.3.2 Substandard cocoa

Lots of fermented and dried cocoa beans, at Table 2 only, that exceed one of the limits accepted for Grade 2 shall be regarded as Grade 3 or substandard.

7.4 Bean size

Bean size shall be defined by the bean count and expressed by the number of beans per 100 g, as follows:

Table 3 – Bean size classification by bean count

Size of bean	Requirement for bean count
Standard size	Less than or equal to 100
Medium size	101 to 110
Small size	111 to 120
Very small size	Greater than 120

8 Packaging and marking

Packaging and marking shall be in accordance with Table 4.

Table 4 – Requirements for packaging and marking for reference sample, test sample and test portions

Aspect	Requirements
Packaging	a) cocoa beans shall be in hygienic, food safe containers only; b) containers shall be clean, sound, sufficiently strong to provide protection to the cocoa beans, and able to be closed or sewn[a]; c) ink, paint or glue used for marking or adhesive labels shall be food grade; and d) containers shall be able to be stacked and stored under conditions that do not cause damage to the cocoa beans. See Annex I for further information on storage and Annex J for further information on disinfestation.
Marking	Each container of cocoa beans shall be officially sealed. The container or seal shall show at least the following information in the official language(s) of the CARICOM Member States or the official language(s) of the export destination as applicable: a) the producing country; b) the name of the product; c) shipping marks when applicable; and d) any other applicable identification marks[b].
[a] Either a snap-sealed bag can be used or twist ties or string can be used to seal bags, as appropriate. [b] National regulations and regulations of importing country apply to identification markings, including any traceability marks for the bags or seals or both.	

9 Test report

The test report shall include at least the following:

a) all details required for complete identification of the reference sample;

b) the methods used and the results obtained;

c) any details of procedures not specified in this document, or regarded as optional;

d) any circumstances that may have influenced the result.

NOTE An example of a template is given in Annex K.

Annex A
(normative)

Procedure and flowchart related to preliminary quality assessment

A.1 General

This annex shows a flowchart of the sequence of testing that may be followed in accordance with the test methods specified in Annexes B to G using test samples of minimum 500 g or more, derived from the reference sample. Annex A may be used for preliminary quality assessment to establish whether lots of cocoa beans meet the requirements of this standard.

A.2 Procedure

A.2.1 Obtain four test samples of 500 g or by splitting or subdividing the reference sample into four fractions. Weigh the test samples; the masses of the four fractions may be different but *shall* represent a portion of the total mass of the entire reference sample. At least one of the test samples shall be safeguarded from drying out, exposure to extremes of temperature or relative humidity, which can be done by using a plastic bag or air-tight, hard lidded-container.

A.2.2 Proceed with the determination of the moisture content using a fraction of the test sample, that is, the one safeguarded from drying out as described in Annex G and shown in Figure A.1. Use one of the test samples for the analyses as described in Annexes B to E and shown in Figure A.1.

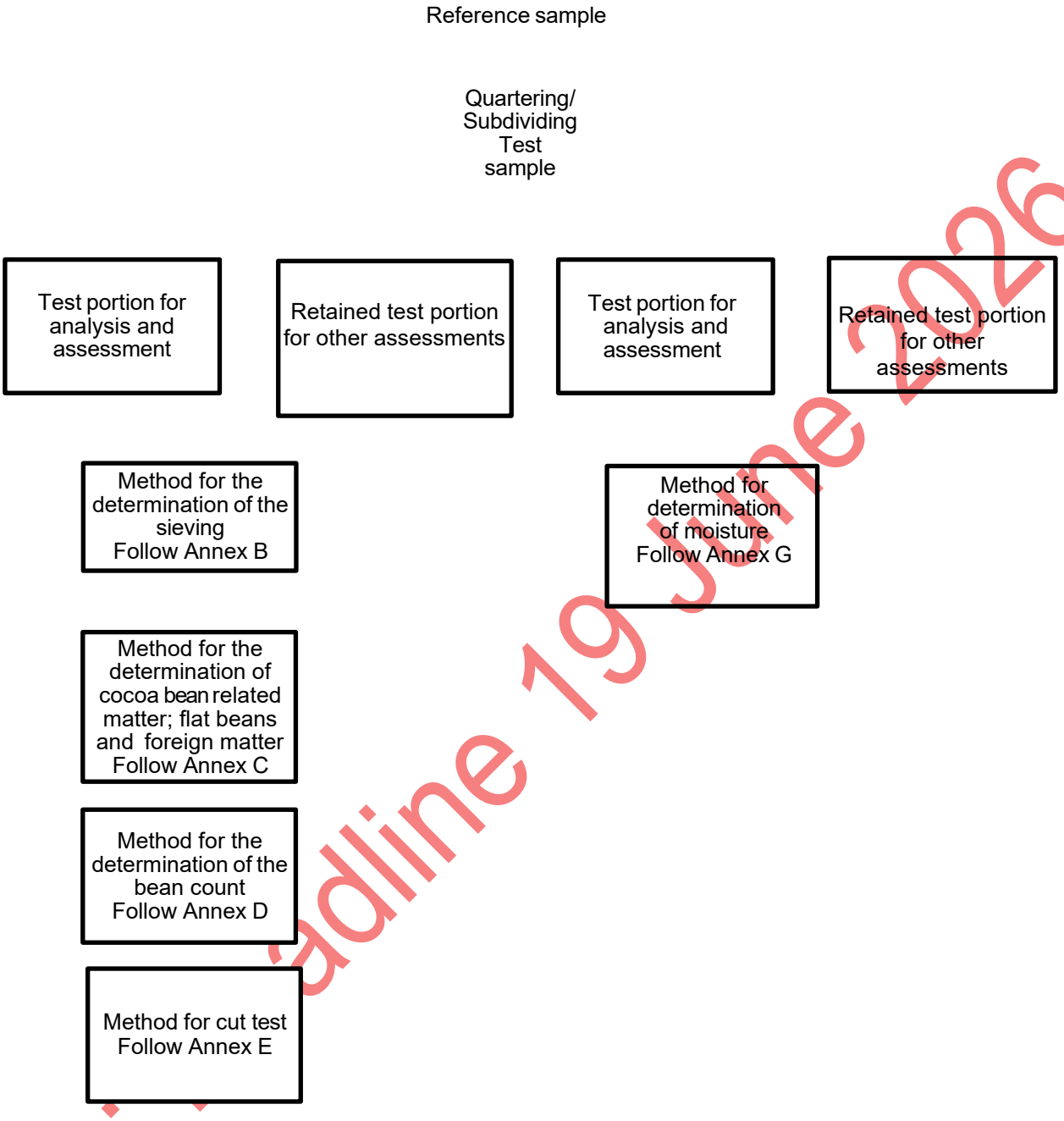

Figure A.1 — Flowchart of sequence of test methods for quality assessment bags

Annex B
(normative)

Method for determination of the sievings

B.1 Procedure

B.1.1 Weigh the entire reference sample (m_{TOTAL}) and record the total mass, then sift through a sieve with a diameter of 5.0 mm and an aperture opening of 4.5 mm. Collect and weigh the quantity passing through the sieve which is known as “the sievings”.

NOTE A mechanical shaker is often used for this process and the sieving is done for about five minutes.

B.1.2 Obtain the percentage of the sieving by comparing the mass of the sieving against the total mass of the reference sample multiplied by 100.

B.1.3 Once the measurement has been taken, do not re-integrate the sieving into the remainder of the reference sample (Derivative 1).

B.2 Expression of result

The value of the percentage of sievings, S, is given by Formula (B.1):

$$S = \frac{m\ x\ 100}{m_{TOTAL}} \qquad \text{(B.1)}$$

Where

m is the mass of the sievings, in g;

m_{TOTAL} is the total mass of the reference sample, prior to sieving, in g.

EXAMPLE

Where total mass of reference sample (m_{TOTAL}) = 1 kg or 1000 g

Where mass of sievings (m) = 0.8 g; and

Based on the equation at B.1, the sievings percentage ($s\ \%$) $= \times\ 100$

$S = 0.08\ \%$

B.3 Images of a sieving tool

The images in Figure B.1 and B.2 are visual examples of a sieving tool.

Figure B.1 – Image of a sieve mounted in a frame

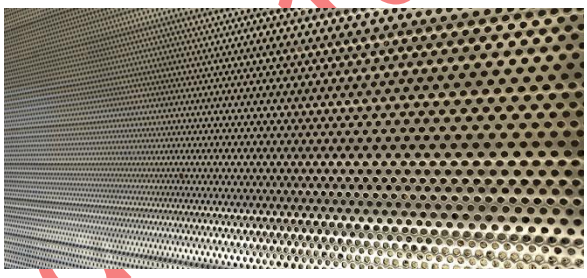

Figure B.2 – Image of a sieve with a diameter of 5.0 mm and an aperture opening of 4.5 mm

Annex C
(normative)

Method for determination of cocoa bean related matter, flat beans and foreign matter

C.1 Procedure

C.1.1 After sieving, empty the remainder of the reference sample (Derivative 1 of Annex B) onto a tray of sufficient size to facilitate the measurement of cocoa bean related matter, flat beans and foreign matter.

C.1.2 Either of the following shall be followed, as necessary:

a) Separate the cocoa bean related matter, flat beans and foreign matter from the reference sample, then combine and weigh the separated matter as in Example 1; or

b) Separate, aggregate and weigh each category, that is, cocoa bean related matter, flat beans and foreign matter, and express the mass of the quality parameter in relation to the net mass of the reference sample (m_{TOTAL}) in Annex B multiplied by 100, as in Example 2.

C.1.3 Express the mass of the quality parameters, that is, the combined mass of the cocoa bean related matter, flat beans and foreign matter in relation to the net mass of the reference sample of Annex B multiplied by 100.

C.1.4 Once the measurement has been taken, the matter that has been extracted for testing shall not be re-integrated into the remainder of the reference sample (Derivative 2).

C.2 Expression of result

The quality parameter, $P_{QUALITY}$ (%), is given by Formula C.1:

$$P_{\text{QUALITY}} = \frac{m_{\text{QP}} \times 100}{m_{\text{TOTAL}}} \quad \text{(C.1)}$$

Where

m_{QP} is the mass of the quality parameters (cocoa bean related matter + flat beans + foreign matter), in g;

m_{TOTAL} is the total mass of the reference sample, after sieving, in g

Example 1:

Where total mass of reference sample (m_{TOTAL}) = 1 kg or 1000 g

Where mass of quality parameters (cocoa bean related matter 10.5 g + flat beans 4.2 g+ foreign matter 1.3 g), = 16 g; and

Based on the equation at C.1, the $P_{QUALITY}$ = $\frac{16}{1000} g \times 100 = 1.6\ \%$

Example 2:

Individual $P_{QUALITY}$ (%) shall be calculated as follows:

Cocoa bean related matter = $\frac{10.5}{1000} g \times 100 = 1.05\ \%$

C.3 Images of cocoa bean related matter, non-cocoa bean related matter and foreign matter.

The images in Figure C.1, C.2 and C.3 provide visual examples of cocoa bean related matter, non-cocoa bean related matter and foreign matter.

Figure C.1 – Images of coco bean related matter

NOTE: Cocoa bean related matter includes bean clusters, broken beans and associated fragments or pieces of shell, placenta or any other combination of these.

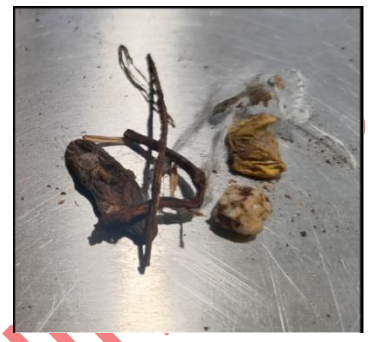

Figure C.2 – Images of non-cocoa bean related matter

NOTE: Non-cocoa bean related matter includes stones, metal, glass and plastic pieces, vegetative and animal matter.

Figure C.3 – Images of foreign matter

NOTE 1: Foreign matter includes cocoa bean related matter and non-cocoa bean related matter.

NOTE 2: Figure C.1, C.2 and C.3 were sourced from the Cocoa Research Centre - The University of the West Indies, St Augustine, Trinidad and Tobago, with permission.

Annex D
(normative)

Method for determination of the bean count

D.1 Procedure

The bean count determines the average number of whole cocoa beans that weigh 100 g. After sieving in accordance with Annex B and removing cocoa bean related matter, flat beans and foreign matter in accordance with Annex C, empty the remainder of the reference sample (Derivative 2) obtained from the procedure at Annex C, onto a clean, dry, flat surface and thoroughly mix. Take a test sample of not less than 600 g cocoa beans from this reference sample for the determination of bean count. The bean count shall be determined and expressed by the use of the procedure outlined at either D.2 or D.3.

D.2 Determination and expression of results using whole test sample

D.2.1 Weigh the test sample taken at D.1 and record the mass. Then count the total number of beans in the test sample. The resulting number is known as the bean count.

D.2.2 The bean count shall be expressed as number of beans per 100 g, as given by Formula (D.1):

$$n_{\mathrm{BEAN}} = \frac{n_{\mathrm{WHOLE}} \times 100}{m_{\mathrm{WHOLE}}} \qquad \text{(D.1)}$$

Where

n_{BEAN} is the number of beans in 100 g of the test sample

n_{WHOLE} is the number of whole beans in the test sample

m_{WHOLE} is the mass of whole beans in the test sample, in g

Example

Where the mass of the test sample = 500 g

Where the number of beans in the test sample = 550

$$n_{BEAN} = \frac{550 \times 100\ (\mathrm{g})}{500\ (\mathrm{g})}$$

n_{BEAN} = 110 beans

D.3 Determination and expression of result using sub-sample

D.3.1 Randomly take and weigh 100 g of beans from the remainder of the test sample. Count the number of beans in this sub-sample of the test sample. Record the number of beans

D.3.2 The bean count shall be expressed as the number of beans per 100 g.

Annex E
(normative)

Method for the cut test

E.1 Procedure

The cut test is conducted on the test sample of whole beans from the determination of the bean count in Annex D. Select 300 whole beans irrespective of size, shape and condition, from the test sample, for the purpose of determining, in addition to the presence of well fermented beans, the incidence of defective or slaty beans, or both, or violet or purple beans or germinated beans or the presence of contamination or all within the test sample.

NOTE Defects apply only to the beans which are in the cut test.

E.2 Determination

E.2.1 Cut these 300 beans along the longitudinal axis, through the middle, so as to expose the maximum cut surface of cotyledons.

E.2.2 Visually examine both halves of each bean in full daylight or equivalent artificial light. Count separately each type of defective bean, including those that are mouldy, slaty, violet, purple, insect-damaged, infested, germinated or flat.

E.2.3 The light exposure time for cut beans shall not exceed 30 minutes.

E.2.4 When a bean is defective in more than one respect, count only the defect that appears first in the list of defects expressed in their decreasing order of importance, as specified in 7.3.1.

E.3 Expression of result

Each defective type of bean shall be counted separately, and the result for each kind of defect shall be expressed as a percentage (%) of the 300 beans examined and the description of the defective beans in accordance with that of the cut test chart at Figure E.1, Figure E.2, Figure E.3 and Figure E.4.

The % Defects Calculation for Cut Test Categories shall be expressed, as given by Formula (E.1):

$$\% Defect\_i = (n\_i / 300) \times 100 \quad \text{(E.1)}$$

Where:

n_i *is the number of beans in category i*

EXAMPLE:

$$\% Mouldy = (n\_m / 300) \times 100$$

$$\% Slaty = (n\_s / 300) \times 100$$

$$\% Violet / Purple = (n\_v / 300) \times 100$$

$$\% Insect\text{-}Damaged = (n\_id / 300) \times 100$$

$$\% Infested = (n\_if / 300) \times 100$$

$$\% Germinated = (n\_g / 300) \times 100$$

$$\% Flat = (n\_f / 300) \times 100$$

Figure E.1 — Cut test chart[1]

[1] Sukha, D. and Rohsius, C. (2018) Cocoa Cut Test Chart (Version 2.0) Cocoa Research Centre, The University of the West Indies, St. Augustine. Trinidad and Tobago, with permission.

Figure E.2 – Images of insect-damaged beans

Figure E.3 – Image of infected bean

Figure E.4 – Image of germinated beans

NOTE: Figure E.2, E.3 and E.4 were sourced from the Cocoa Research Centre - The University of the West Indies, St Augustine, Trinidad and Tobago, with permission.

Annex F
(normative)

Cocoa bean cutting tools

The safe and adequate cutting of cocoa beans to be able to effectively conduct visual and physical assessments, requires the use of tools that are so designed. The tools at Figures F.1 to F.3 are commonly used for cutting cocoa beans.

Figure F.1 – Example of an anvil type secateur

Figure F.2 – Example of a knife designed for cutting cocoa beans

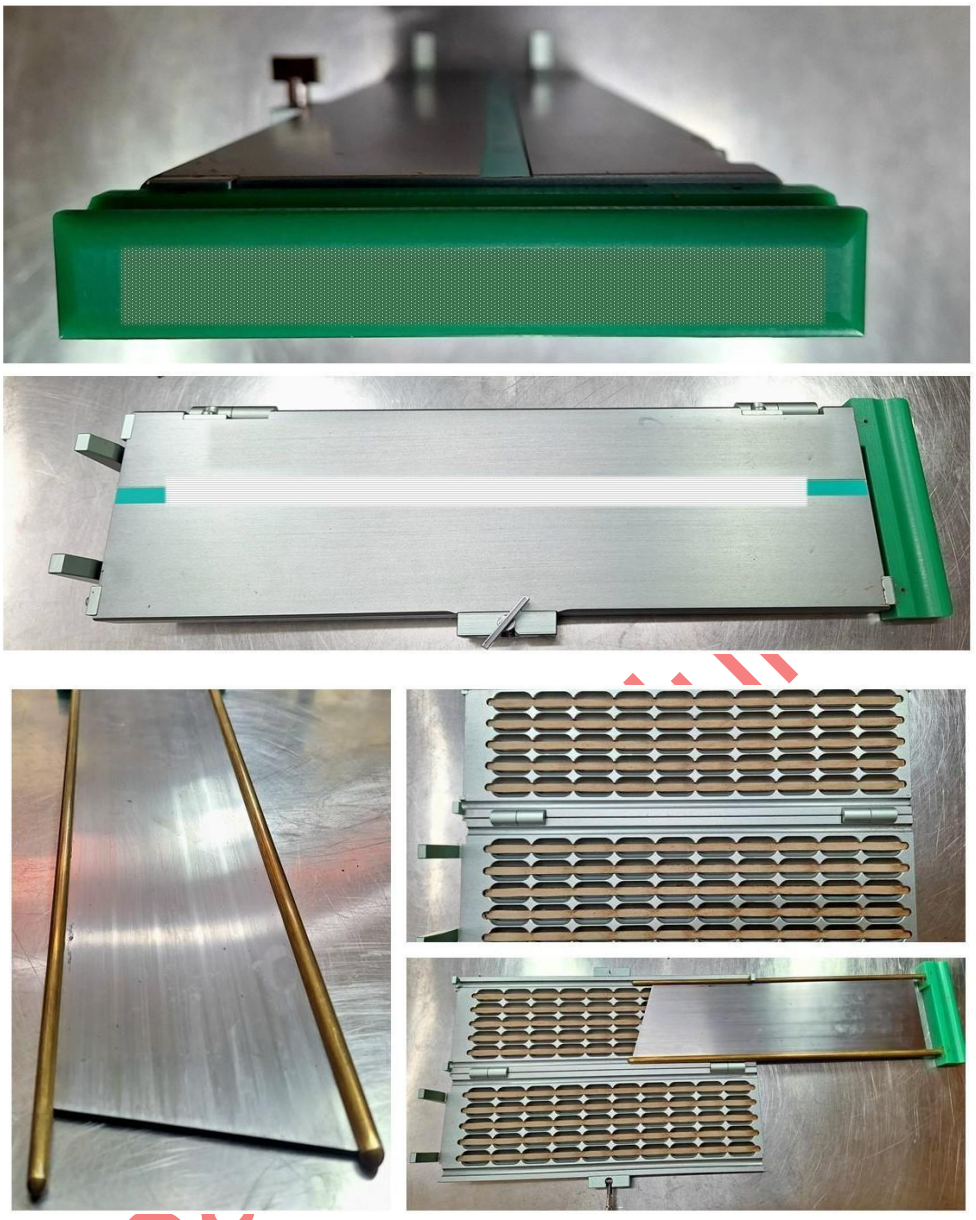

Figure F.3 – Example of a guillotine cutter

Note 1 Safety precautions need to be adhered to in the use of cutting tools.

Note 2 Figure F.1, F.2 and F.3 were sourced from the Cocoa Research Centre - The University of the West Indies, St Augustine, Trinidad and Tobago, with permission.

Annex G (normative)

Methods for determination of moisture content (oven method)

G.1 General

This annex specifies the oven method, a gravimetric method, for the determination of the moisture content of cocoa beans. The moisture content of cocoa beans is, conventionally, the loss in mass determined by the method specified in this annex and expressed as a percentage by mass.

In addition to the oven method, there are alternative methods of moisture determination using machines or other apparatuses applying technologies such as infrared, capacitance measurement, conductivity, dielectric, nuclear magnetic resonance or neutron probe. Such machines and apparatuses may be used provided that such other technology is correlated to the gravimetric method by a methodology published by the manufacturer together with operational instructions as to frequency and procedure for calibration thereof.

The oven method, however, is the standard reference method and other machines or apparatuses shall as far as possible be correlated therewith.

NOTE Where hand-held or bench top moisture meters are used, these vary from probe samplers that are inserted into the large 65 kg (approx 143 lb) jute bags, used to store cocoa, to small meters that have a chamber to manually crush beans to assess the moisture. The most commonly used meters utilise changes in capacitance to measure moisture. Whichever moisture meter used, the correct weight of beans must be added as per operating instructions and the meter must be calibrated for cocoa beans in the range of moisture contents being assessed. It is important that the beans going into the moisture meter are at ambient temperature and are neither hot nor cold.

NOTE Where sample quantities allow, it is recommended that the determination of moisture content (oven method) be carried out in triplicate for greater accuracy.

G.2 Principle

After grinding, weighing and drying of cocoa beans for 16 h in a ventilated oven controlled at 103 °C ± 2 °C, determine the moisture content by calculating the difference in mass.

G.3 Apparatus

The usual laboratory equipment include the following:

G.3.1 **Grinder**, which allows the beans to be ground without heating.

G.3.2 **Ventilated oven**, preferably fitted with a fan, capable of being controlled at 103 °C ± 2 °C.

G.3.3 **Dish with lid**, of metal, resistant to breakdown under the conditions of the test, or of glass or ceramic ware, with at least 35 cm^2 of useful surface.

EXAMPLE A useful surface can have a minimum diameter 7 cm and 2 cm to 2.5 cm deep.

G.3.4 **Desiccator**, containing an efficient desiccant.

G.3.5 **Analytical balance**, with a readability of 0.1 g.

G.4 Procedure

G.4.1 General

In order to obtain a test portion of 10 g, grind aliquots of preliminary test sample with a grinder to form particles that do not exceed 0.5 cm, but avoiding the formation of a paste. The beans used shall be representative of the reference sample.

G.4.2 Test portion

Weigh the previously dried empty dish with lid. After grinding the beans in accordance with G.4.1, quickly place in the dish a test portion of 10 g. Weigh the dish with lid, containing the grinded test portion, to the nearest 0.1 g.

G.4.3 Determination

Place the dish containing the test portion on its lid in the ventilated oven controlled at 103 °C ± 2 °C. Leave for 16 h ± 1 h, taking care not to open the oven. At the end of this period, remove the dish, cover it immediately with its lid and place it in the desiccator. Allow to cool to ambient temperature (approximately 30 min to 40 min after placing in the desiccator) and weigh, still covered, to the nearest 0.1 g.

G.4.4 Number of determinations

Carry out two determinations with test portions from the preliminary test sample after grinding, each on a quantity of beans that has been treated individually, i.e. grinding, taking the test portion and drying.

G.5 Note on procedure

The grinding and weighing operations for each determination shall be carried out as rapidly as possible, and in any event within 5 min. When it is not possible to perform the weighing operation within 5 min, the test portion shall be stored in a plastic bag or air-tight container for a maximum period of 2 h. After weighing the test portion, the dish with lid may be left to stand, for example in the case of a series of weighings.

G.6 Expression of result

G.6.1 Method of calculation and formula

The moisture content *(M_C)* of the preliminary test sample, expressed as a percentage by mass, is given by Formula G.1:

$$M_C = \frac{m_1 - m_2}{m_1 - m_0} \times 100 \qquad \text{(G.}$$

Where:

m_0 is the mass of the empty dish with lid, in g;

m_1 is the mass of the dish with lid and the test portion before drying, in g;

m_2 is the mass of the dish with lid and the test portion after drying, in g.

Take as the result the arithmetic mean of the two determinations (see G.4.4), provided that the requirement for repeatability (see G.6.2) is satisfied. If not, repeat the determinations. Report the result to one decimal place.

G.6.2 Repeatability

The difference between the results of two determinations, carried out simultaneously or in rapid succession by the same analyst, shall not exceed 0.3 g loss in mass per 100 g of the preliminary test sample.

Annex H
(normative)

International trade classification for fermented beans

H.1 Lots of cocoa beans which are classified according to the international classification shall be in accordance with the categories listed in Table H.1.

NOTE The regional classification is outlined in Table 1.

H.2 The proportion of beans with defects shall be determined by the test method specified in Annex F, for each of the grades. As an exception, for the purpose of Table H.1, germinated beans shall not be considered as beans with defects.

NOTE Defects apply only to the beans which are in the cut test.

H.3 The percentage of defects shall be expressed as a percentage of the 300 beans.

Table H.1 — International trade classification for fermented beans

Grade	Percentage of beans	
	Slaty	Mouldy and/or insect-damaged
Grade 1 (Good fermented)[a]	5	5
Grade 2 (Fair fermented)[b]	10	10
NOTE 1 The percentages are the maximum. NOTE 2 The percentages given in the last column apply to the combined total of all the defects specified in the column header.		
[a] Good fermented beans are cocoa beans that are not more than 5 % slaty and 5 % defective by count of the test sample		
[b] Fair fermented beans are cocoa beans that are not more than 10 % slaty and 10 % defective by count of the test sample.		

Annex I
(informative)

Storage of cocoa beans

I.1 Storage conditions

I.1.1 Lots of cocoa beans should be placed in warehouses constructed and used in such a way so as to maintain the bean moisture content as specified in 7.2.5. Measures should be taken to monitor the humidity and maintain it at less than or equal to 70 %.

NOTE Ways of maintaining humidity include, inter alia, the use of light coloured paints on the walls of warehouses, extractor fans and dehumidifiers.

I.1.2 The beans should be stored as follows:

a) on suitably treated wooden or food grade plastic gratings or deckings;

b) giving a clear space above ground of at least 7 cm for air circulation, and;

c) Away from the areas where there is the possibility of contamination due to disease transfer, smoke or diesel.

NOTE The use of vehicle checkpoints is one means of controlling product contamination.

I.1.3 Appropriate measures should be taken to prevent infestation by insects, rodents and other pests.

I.2 Stacking

I.2.1 The bags of cocoa beans should be stacked in such a way that:

a) individual grades and brands are separated by a passage which is at least 60 cm wide and similar to that which should be left between the bags and the walls of the warehouse;

b) disinfestation by fumigation or careful spraying or both with suitable insecticides at recommended application rates can be carried out if necessary (see Annex J); and

c) contamination by odours or flavours, or by dust from other products including other foods, or by products such as oil, cement, and tar or any other type of product is avoided.

I.2.2 Periodically during storage and immediately before sale or shipment, the moisture content of each lot should be checked.

Annex J
(informative)

Disinfestation

J.1 Use of pesticides

Where the use of pesticides in cocoa is necessary to control insects, rodents and other pests, only pesticides approved for use in cocoa by the national competent authority or the importing country should be applied.

NOTE 1 Importing countries often have specific national regulations for food safety, inclusive of approved pesticides for use in cocoa.

NOTE 2 Refer to the listing of pesticides approved by the national competent authority for cocoa production and development.

J.2 Pesticide residues

Residues should not exceed the maximum residue limits indicated for the pesticides used as prescribed by the FAO/WHO Codex Committee on Pesticide Residues (CCPR) or the government of the importing country. Great care shall be exercised in the choice of pesticides and in the technique of their application to avoid incurring risk of tainting or the addition of toxic residues to cocoa.

Annex K
(informative)

Example of a test sample quality assessment report template

Cocoa Bean Physical Quality Assessment Report

Sample name/Origin		**Sample code**	
		Date	
Other sample details			

Tick, score or comment where appropriate on the report

Physical Quality Assessment	***Sample grade*** 1 ☐ 2 ☐ 3 ☐	***General comments***	
Weight of reference sample			

	Seiving %		*Quality parameter % (Cocoa bean related matter)*
	Bean count		*Quality parameter % (Non Cocoa bean related matter)*
	Moisture content		Individual Bean Weight

Cut Test Results

No. of beans cut ☐

Comments on external appearance of beans

No. and percentage in each cut test category (refer to cut test chart)

No.	%		No.	%	
		Fully fermented			Germinated
		Over fermented			Part Purple/Part Brown
		Mouldy			Violet
		Slaty/Unfermented			
		Insect damaged/Infested			

Raw Bean Aroma - Positive Attributes		Raw Bean Aroma - Negative Attributes	
	Cocoa		Mouldy
	Vinegar		Smoky
	Alcohol		Putrid/Rotten
	Fruity		Manure
	Floral		Hammy
	Spicy		Lactic acid
	Nutty		Rancid/Oily
	Caramel/Malt		Ammonia

Comments on appearance and aroma of cut beans

Figure K.1 — Example of a test sample quality assessment report template

NOTE Specific notes on the sample, sample submitter and methods used can be provided on separate pages where appropriate.

END OF DOCUMENT

CARICOM REGIONAL ORGANISATION FOR STANDARDS AND QUALITY

The CARICOM Regional Organisation for Standards and Quality (CROSQ) was created as an intergovernmental organisation by the signing of an agreement among fourteen Member States of the Caribbean Community (CARICOM). CROSQ is the regional centre for promoting efficiency and competitive production in goods and services, through the process of standardisation and the verification of quality. It is the successor to the Caribbean Common Market Standards Council (CCMSC), and supports the CARICOM mandate in the expansion of intra-regional and extra-regional trade in goods and services.

CROSQ is mandated to represent the interests of the region in international and hemispheric standards work, to promote the harmonisation of metrology systems and standards, and to increase the pace of development of regional standards for the sustainable production of goods and services in the CARICOM Single Market and Economy (CSME), and the enhancement of social and economic development.

CROSQ VISION:
A global leader transforming lives through an innovative and sustainable Quality Infrastructure.

CROSQ MISSION:
To transform lives by delivering fit-for-purpose standards, metrology, accreditation and reliable conformity assessment solutions that promote collaboration, enhance trust-in-trade, foster reliability and consistency thereby improving the quality of CARICOM's products and services

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