
Sustainable cocoa — Part 2: Requirements for Cocoa Quality and Traceability



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Introduction

With the progressive liberalization of cocoa sector in cocoa producing countries, the private sector in the international cocoa trade recognized the need to ensure that quality Standards are developed and maintained to meet trade and industry requirements. Consequently, the original International Standards on cocoa beans (ISO 1114, ISO 2291, ISO 2292), which were integrated using relevant parts to produce ISO 2451 *Cocoa beans — Specification and quality requirements*, form the basis for this document in order to ensure quality in cocoa production, trade and commerce.

Also, this African Standard contains the requirements for the traceability of sustainably produced cocoa. These requirements are necessary for improvement in the weaknesses encountered in the economic, social and environmental activities in the cocoa supply chain to ensure that integrity is maintained across the three pillars of sustainability. The traceability system for sustainably produced cocoa will assist interested parties operating within the cocoa supply chain to trace the source of cocoa beans within the value chain and assure the achievement of the defined sustainable cocoa objectives. It is intended to ensure credibility of the source of the sustainably produced cocoa in the supply chain and fulfill customer expectations of quality.

This African standards series 1000 are designed to be relevant to interested parties within the cocoa sector and is in three parts as follows:

| Standard | Title | Subject |
|------------|---|---|
| ARS 1000-1 | Requirements for Cocoa Farmer as Entity/Farmer Group/Cooperative - Management Systems and Performance | This Standard is intended to structure the management systems of the Farmer as Entity/Farmer Group/Cooperative to enhance performance in the production of sustainable cocoa and their livelihood. The requirements include economic, social and environmental aspects. |
| ARS 1000-2 | Requirements for Cocoa Quality and Traceability | This Standard is to be used by all stakeholders in the cocoa value chain to promote and maintain the quality of cocoa beans and establish traceability from the cocoa farm to point of export. |
| ARS1000-3 | Requirements for Cocoa Certification Scheme | This Standard is intended for certification bodies involved in auditing cocoa farms as well as for registered farmers wishing to be audited by a third party certification body in order to make claims of conformity. This Standard also addresses requirements to the Regulator/Legal Entity and Supervisory Council. |

Sustainably produced cocoa beans are obtained by fulfilling the requirements in ARS 1000-1 and ARS 1000-2 Standards. A third party approved by the Regulator/Legal Entity to demonstrate compliance to these two Standards shall certify farmers as Entities/Farmer Group/Cooperative.

In this document:

- “shall” indicates a requirement;
- “should” indicates a recommendation;
- “may” indicates a permission;
- “can” indicates a possibility or a capability.

Information marked “Note” is for guidance in understanding or clarifying the associated requirement.

Sustainable cocoa — Part 2: Requirements for Cocoa Quality and Traceability

1 Scope

This draft African standard specifies the requirements for quality including classification, sampling, test methods, packaging and marking of cocoa beans (*Theobroma cacao* Linnaeus). It also specifies the basic requirements for the design and implementation of one or more traceability systems within the cocoa supply chain for sustainably produced cocoa beans from farm to the point of export (Free On Board), as well as to the factory gate at the local level for grinders.

2 Normative references

The following referenced documents are indispensable for the application 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.

ARS 1000-1, *Sustainable cocoa — Part 1 Requirements for cocoa farmer as entity, farmer group, cooperative — Management system and performance.*

3 Terms and definitions

For the purpose of this standard the following terms and definitions apply.

3.1

cocoa bean

commercial term designating the whole seed of the cocoa tree (*Theobroma cacao* Linnaeus) which has been fermented and dried.

3.2

dry cocoa

commercial term designating cocoa beans which have been evenly dried throughout and of which the moisture content corresponds to the requirements of this African Standard.

3.3

cocoa bean fermentation

process of spontaneous processing from the mucilaginous pulp of the accumulated fresh cocoa beans until the typical characteristics are obtained, such as swelling of the beans, odour of the mass, brown colouring of the cotyledons and drop in temperature.

3.4

cocoa

cocoa beans or derived products from cocoa.

3.5

adulteration

alteration of the composition of a lot (3.29) of cocoa by deliberate mixing-

3.6

audit

systematic, independent and documented process for obtaining objective evidence and evaluating it objectively to determine the extent to which the audit criteria are fulfilled. An audit could be internal or external.

**3.7
internal audit**

audit conducted by the recognised entity itself, or by an external party on its behalf.

**3.8
external audits**

audits, which include those generally, called second and third party audits. Second party audits are conducted by parties having an interest in the organization, such as customers or by other persons on their behalf. Third party audits are conducted by external, independent auditing organizations.

**3.9
audit evidence**

any objective document or instrument that is used to evaluate how well audit criteria are being met.

Note 1: Audit evidence may be qualitative or quantitative

Note 2: As defined in ISO 19011.

**3.10
audit criteria**

set of requirements used as a benchmark against which objective evidence is compared.

**3.11
bean count**

total number of whole beans per 100 g determined under specific conditions.

Note: The specific conditions and the test method are specified in Annex D.

**3.12
preliminary test sample**

quarter of the reference sample (3.33) obtained by using a splitter/divider, which can be less than 600g.

**3.13
test sample**

not less than 600g of cocoa beans drawn from the reference sample by using a flat-bottomed shovel drawn across the middle of the reference sample. Test sample shall be obtained after sieving in accordance with the method specified in Annex B and after removing the cocoa related matter, flat beans and foreign matter.

**3.14
sieve**

screen with round holes, the diameter of which are 5.0mm.

**3.15
cocoa related matter**

bean clusters, broken beans and associated fragments and/or pieces of shell that do not pass through the sieve.

**3.16
broken bean**

cocoa bean of which the fragment (3.18) is missing, the remaining part being more than half of the whole bean.

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3.17

bean cluster

two or several beans joined together which cannot be easily separated by using the finger and thumb of both hands.

3.18

fragments

piece of cocoa bean equal to or less than half the original bean.

3.19

cocoa supply chain

sequence of the stages and operations involved in the movement and processing of cocoa, from cocoa farm to export of sustainable cocoa beans and/or by products.

3.20

cocoa supply chain actor

person or entity that physically handles or takes legal ownership or makes claims of sustainably produced cocoa.

3.21

conformity

fulfillment of a requirement.

3.22

contamination

presence of a smoky, hammy or other smell not typical to cocoa, or a substance not natural to cocoa, which is revealed during the cut test (3.24) or physical inspection of a reference sample (3.33).

3.23

corrective action

action to eliminate the cause of a nonconformity and to prevent recurrence

Note 1: There can be more than one cause for non-conformity.

Note 2: Corrective action is taken to prevent recurrence whereas preventive action is taken to prevent occurrence.

3.24

cut test

procedure by which the cotyledons of cocoa beans (3.1) are exposed for the purpose of determining the incidence of defective and or slaty beans (3.37), violet or purple beans (3.39) and or presence of contamination within a test sample (3.34).

3.25

flat bean

cocoa bean that is too thin to be cut to give a complete surface of the cotyledon

3.26

foreign matter

any substance other than cocoa beans.

Note: Cocoa related matter, sieving, husk and placenta are to be considered as foreign matter.

3.27

germinated bean

cocoa bean (3.1) 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.

3.28

insect-damaged bean [infested bean]

cocoa bean (3.1) of which the internal parts are found to contain insects or mites at any stage of development, or show signs of damage caused thereby, which are visible to the naked eye.

3.29

lot

quantity of cocoa beans in bags or in bulk established at any point in the cocoa supply chain and from which primary samples and/or incremental samples are to be drawn for quality analysis purposes.

3.30

main crop

beans produced during the main harvest period of that particular origin.

Note 1: Beans produced during the main crop are usually of a lower bean count (per 100 g)/larger size.

Note 2: Light/mid-crop beans produced during the light/mid harvest period of that particular origin.

Note 3: Beans produced during the light/mid-crop are usually of a higher bean count (per 100 g)/smaller size.

3.31

mouldy bean

cocoa bean on the internal parts of which mould is visible to the naked eye.

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

3.32

one step forward and one step back

identification from where the cocoa came and to where the cocoa went.

3.33

process

set of interrelated or interacting activities which transforms inputs into outputs.

Note: 1 Inputs to a process are generally the outputs of other processes.

Note: 2 Processes in an organization are generally planned and carried out under controlled conditions to add value.

3.34

reference sample

representative sample prepared by successively quartering the composite sample such that a minimum of 2 kg net remains.

3.35

segregation

process that separates conforming from non-conforming cocoa.

3.36

sieving

act of separating debris from cocoa beans

3.37

slaty bean

cocoa bean that shows a slaty colour on at least half of the surface of the cotyledon exposed by the cut test irrespective of texture.

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3.38

sustainably produced cocoa

cocoa beans that are produced in an economically viable, environmentally sound and socially responsible manner, by the Farmer as an Entity/Farmer Group/Cooperative.

3.39

violet or purple bean

cocoa bean that shows a violet or purple colour on at least half of the surface of the cotyledon exposed by the cut test.

3.40

traceability

ability to follow the physical movement of sustainably produced cocoa through specified stage(s) of production, marketing and processing.

3.41

traceability system

totality of data and operations that is capable of maintaining desired information about sustainably produced cocoa and its components through production and/or supply chain.

3.42

sieving waste

any material, debris passing through the sieve with round holes, the diameter of which are 5.0 mm.

4 Requirements for the registration of cocoa supply chain actors

As a pre-requisite for undertaking any sustainable cocoa supply chain operations, supply chain actors shall approach the Regulator/Legal Entity for the purpose of being registered.

5 Preparation for quality of cocoa beans

The quality of cocoa beans starts from harvesting through pod-breaking, fermentation, drying, packaging and storage in compliance to clauses 11.3.6 to 11.3.10 of ARS 1000-1.

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

6 Requirements for quality

6.1 General requirements

Lots of cocoa beans shall be :

- (i) free from smoky or other smell not typical to cocoa, or a substance not natural to cocoa, free from any evidence of adulteration.
- (ii) virtually free from live insects, insect eggs, larvae, and any other developmental stages, free from mites, rodents, or other types of infestation.
- (iii) within the range for violet or purple beans, if specified, typical for the grade or origin
- (iv) practically free from germinated beans,

- (v) practically uniform in size and colour, good fermented, fit for production of foodstuff.

6.2 Specific requirements

Cocoa bean shall comply with the specific requirements stipulated in Table 1 below.

Table 1 — Specific requirements for cocoa

| Parameter | Maximum limit | Methods of test |
|----------------------|--|-----------------|
| Cocoa related matter | not exceeding 3,5 % of the mass of the reference sample representing the lot | Annex C |
| Flat beans | Not exceeding 1.5 % of the mass of the reference sample representing the lot. | Annex C |
| Foreign matter | Not exceeding 0.75 % of the mass of the reference sample representing the lot. | Annex C |
| Moisture content | Not exceeding 8% by mass | Annex F |
| Debris | Not exceeding 1.5 % of the mass of the reference sample representing the lot. | Annex B |

6.3 Grade determination

6.3.1 Classification for cocoa beans

Cocoa beans grades shall be classified in accordance with Table 2 and 3 and tested in accordance with methods prescribed in Annex E.

Table 2 — Producing country internal classification for fermented beans

| Grade | Maximum Percentage of beans | | | Method of test |
|-------|-----------------------------|-------|----------------------------------|----------------|
| | Mouldy | Slaty | Insect-damaged and/or germinated | Annex E |
| 1 | 3 | 3 | 3 | |
| 2 | 4 | 8 | 6 | |

Note 1: The Maximum percentage of beans". given in the last column apply to the combined total of all the defects specified in the column header.

Note 2: National regulations apply if percentage range is different from above.

Table 3 — International trade classification for fermented beans

| Grade | Maximum Percentage of beans | | Method of test |
|----------------|-----------------------------|------------------------------|----------------|
| | Slaty | Mouldy and/or Insect-damaged | Annex E |
| Good fermented | 5 | 5 | |
| Fair fermented | 10 | 10 | |

Note: The percentages given in the last column applies to the combined total of all the defects specified in the column header.

6.3.2 Substandard cocoa

Fermented cocoa beans grades that exceed the limits prescribed in Table 2 shall be regarded as

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substandard. Any cocoa beans that exceed the limits prescribed in Table 3 shall not be exported unless a buyer so requests for such categories.

Note: Substandard is marked "SS" for English- and Spanish-speaking countries. For French-speaking countries it is marked "HS" (hors standard).

6.4 Bean size

Bean size is defined by the bean count and is usually expressed by the number of beans per 100 grams.

- a) Premium size bean count of 80-90 grams;
- b) Standard size beans: bean count of 91 – 105 grams;
- c) Medium size beans: bean count of 106 -110 grams;
- d) Small size beans: bean count of 111 - 120 grams;
- e) Very small size beans: bean count greater than 120 grams.

7 Sampling

Sampling shall be carried out in accordance with the requirements of ISO 2292. Annex A shows flowcharts of derivative samples when sampling from bags or bulk.

For all the test methods described in Annexes B to F, the reference sample shall be prepared in accordance with the method described in ISO 2292.

8 Packaging

Bags for packaging shall be clean and strong enough, intended to come into contact with foodstuffs and properly sewn and sealed. Cocoa beans shall be shipped in new bags only. Bags woven from natural fibres (or liners where applicable per international contract) suited to food contact and properly sewn or sealed. Ink or paint used for marking shall be of food grade quality.

9 Marking

Each bag of cocoa beans shall be sewn and sealed. The sewn or sealed bag shall show at least the following information:

- a) the producing country;
- b) the name of the product;
- c) the grade of the product
- d) crop year of the product
- e) shipping marks when applicable;
- f) any other applicable identification marks.
- g) net weight;

Note: National regulations can apply to identification markings for the bags/seals.

10 Test report

The test report is a document that records data obtained from an evaluation experiment in an organized manner and describes the environmental or operating conditions.

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) mention of any details of procedures not specified in this document, or regarded as optional;
- d) any circumstances that may have influenced the result.

11 Principles of traceability

Traceability relates to the origin of the sustainably produced cocoa, processing history or movement of the cocoa supply chain, and addresses at least one step forward and one step back for each actor in the cocoa supply chain. In agreement among the cocoa supply chain actors concerned, it may apply to more than one part of the cocoa supply chain. The cocoa supply chain actor identifies the relevant cocoa for which the objectives of its traceability system for sustainably produced cocoa apply.

Each element of a traceability system for sustainably produced cocoa is considered and justified on a case-by-case basis, taking into account the objectives to be achieved.

Traceability systems for sustainably produced cocoa shall be able to:

- 1) document the history of the cocoa or locate the cocoa in the cocoa supply chain.
- 2) contribute to the identification of the cause of non-conformity.
- 3) improve appropriate use and reliability of information, effectiveness and efficiency of the cocoa supply chain actor.

12 Objectives of traceability

The objective of traceability is to improve transparency and contribute to accountability in the supply chain. The cocoa supply chain actor shall establish specific traceability objectives at relevant functions, levels and processes needed for the traceability system.

The specific traceability objectives shall be:

- a) measurable;
- b) monitored;
- c) communicated to relevant internal and external interested parties;
- d) updated as appropriate.

The cocoa supply chain actor shall maintain documented information on the cocoa traceability objectives.

13 Requirements for traceability

13.1 General requirements

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13.1.1 Traceability system attributes

The traceability system for sustainably produced cocoa shall include:

- a) objectives, including provisions to ensure the integrity of the sustainably produced cocoa;
- b) documented information about the cocoa at every level in the cocoa supply chain, from cocoa farm to export point (Free On Board), as well as at local level for grinders;
- c) procedures needed for the effective operation of the traceability system.

13.1.2 Requirements of Traceability system

The traceability system for sustainably produced cocoa shall be:

- a) verifiable ;
- b) applied consistently and equitably ;
- c) implementable ;
- d) effective and result oriented ;
- e) balance different requirements that are technical feasibility and economical acceptability.

13.2 Organizational requirements

The Regulator/Legal Entity, the Farmer as an Entity/Farmer Group/Cooperative and other cocoa supply chain actors shall demonstrate their commitment to the implementation of a traceability system for sustainably produced cocoa by:

- a) assigning a management representative with the overall responsibility for ensuring that the cocoa supply chain actor, inclusive of all operational units, fulfil the requirements of this document ;
- b) defining and assigning tasks and responsibilities for the effective implementation and operation of the traceability system ;
- c) providing resources necessary for the effective implementation and operation of the traceability system.

The Regulator/Legal Entity, the Farmer as an Entity/Farmer Group/Cooperative and other cocoa supply chain actors shall determine applicable statutory and regulatory requirements relevant in relation to traceability of sustainably produced cocoa. It shall ensure that these requirements are understood and constantly met by its personnel and/or subcontractors.

The Regulator/Legal Entity, the Farmer as an Entity/the Farmer Group/Cooperative and other cocoa supply chain actors shall ensure that the persons/entities performing work under their control that affects the performance and effectiveness of the traceability system are competent on the basis of appropriate education, training and/or experience.

13.3 Specific requirements

13.3.1 Documentation

The Farmer as entity/Farmer Group/Cooperative and cocoa supply chain actors shall determine the

information to be:

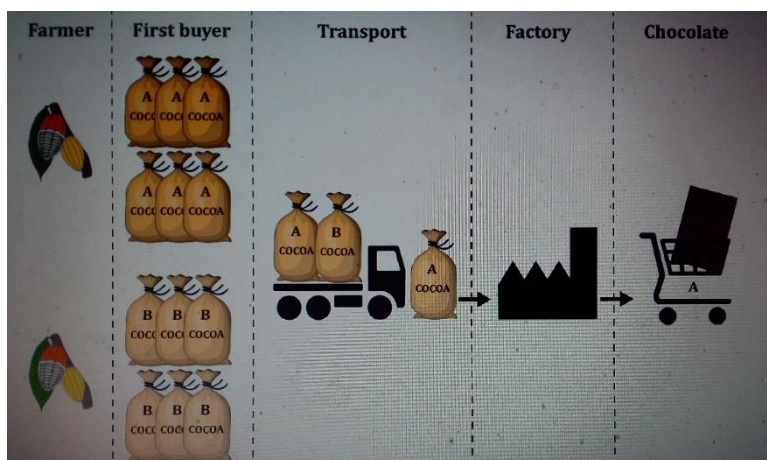
- a) obtained from its suppliers;
- b) collected concerning the cocoa and process history;
- c) provided to its customers and/or suppliers.

In the development and implementation of a traceability system for sustainably produced cocoa, the Farmer as Entity/Farmer Group/Cooperative and cocoa supply chain actors shall take into consideration their existing operations and management systems.

14 Physical traceability — Cocoa segregation

The Farmer as an Entity/group of farmers/cooperative and stakeholder in the cocoa supply chain shall ensure and verify through procedures and documentation that conforming cocoa is separated from non-conforming cocoa from the warehouse of the Farmer as an Entity/Farmer Group/Cooperative to the point of export (Free On Board) (see Figure 1).

Note: Each country shall address traceability within the country implementation guidelines with regards to supply chain of conforming and non-conforming cocoa.



Key
A conforming cocoa B non-conforming cocoa

Figure 1 — Schematic presentation of segregation

15 Monitoring and improvement

15.1 Monitoring

The Farmer as an Entity/Farmer Group/Cooperative and cocoa supply chain actors shall monitor the effectiveness of the traceability system for sustainably produced cocoa.

15.2 Internal audit

15.2.1 The Farmer as an Entity/Farmer Group/Cooperative and cocoa supply chain actors shall conduct internal audits at planned intervals of not more than 12 months to provide information on whether the traceability system:

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- a) conforms to the requirements of this document;
- b) conforms to the cocoa supply chain actor's own requirements;
- c) is effectively implemented and maintained.

15.2.2 The Farmer as an Entity/Farmer Group/Cooperative and cocoa supply chain actors shall:

- a) establish and implement internal audit plan(s) and programme(s), including the frequency, methods, responsibilities, planning requirements and reporting, which shall take into consideration the management objectives, the importance of the processes concerned, changes impacting the farmer group, and the results of previous audits;
- b) ensure that the results of the internal audits are reported to top management;
- c) take appropriate corrective actions within a reasonable timeframe;
- d) retain documented information as evidence of the implementation of the internal audit;
- e) identify opportunities for improvement.

15.3 Improvement

15.3.1 Non-conformity and corrective actions

15.3.1.1 Non-conformity

When a non-conformity occurs, the stakeholder in the cocoa supply chain shall document the entire process of analysis and handling of the non-conformity:

- a) react to the non-conformity, and, as applicable:
 - 1) take action to control and correct it;
 - 2) deal with the consequences;
- b) evaluate the need for action to eliminate the cause(s) of the non-conformity, in order that it does not recur or occur elsewhere, by:
 - 1) reviewing and analysing the non-conformity;
 - 2) determining the causes of the non-conformity;
 - 3) determining if similar non-conformities exist, or could potentially occur;
- c) implement any action needed;
- d) review the effectiveness of any corrective action taken;
- e) make changes to the traceability system for sustainably produced cocoa, if necessary.

15.3.1.2 Corrective actions

- a) Corrective actions shall be appropriate to the effects of the nonconformities encountered.
- b) The Farmer as an Entity/Farmer Group/Cooperative and cocoa supply chain actors shall retain documented information as evidence of:
 - the nature of the non-conformities and any subsequent actions taken;
 - the results of any corrective action.

15.3.2 Continual improvement

The Farmer as an Entity/Farmer Group/Cooperative and cocoa supply chain actors shall continually improve the suitability, adequacy and effectiveness of the traceability system for sustainably produced cocoa.

16 Review

The Farmer as an Entity/Farmer Group/Cooperative and cocoa supply chain actors shall review the traceability system for sustainably produced cocoa at appropriate intervals to ensure continual improvement.

This review shall include, but is not limited to, the following traceability-related aspects:

- a) audit results;
- b) changes to cocoa or processes;
- c) information provided by other cocoa supply chain actors ;
- d) corrective actions;
- e) customer feedback, including complaints;
- f) new or amended regulations affecting traceability

Annex A
(normative)

Flowcharts

Figure A.1 shows flowcharts of derivative samples when sampling from bags or bulk. See ISO 2292 for further descriptions and requirements for the different types of samples. Figure A.2 shows a flowchart of the sequence of testing that shall be followed for the test methods specified in Annexes B to F of this document.

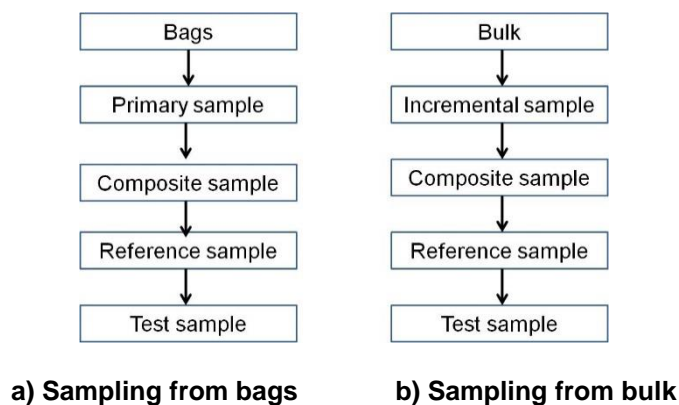


Figure A.1 — Flowcharts of derivative samples when sampling from bags or bulk

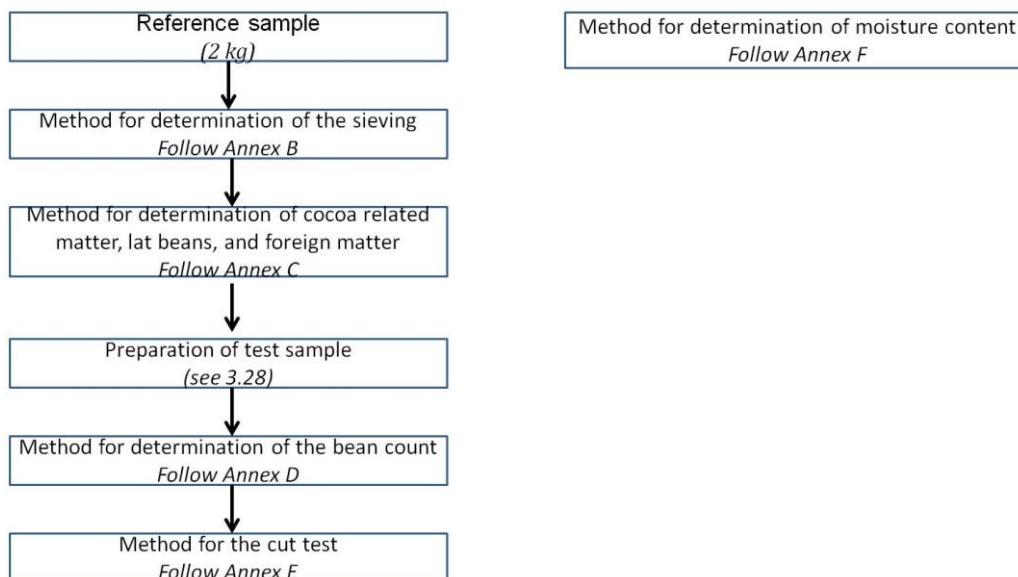


Figure A.2 — Flowchart of sequence of test methods

Annex B (normative)

Method for determination of the sieving note

B.1 Procedure

Weigh the entire reference sample (m_{TOTAL}) and then sieve through a sieve. Collect and weigh the quantity passing through the sieve, which is known as “the sieving”.

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

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 sieving, S (%), is given by Formula below:

$$S = \frac{m \times 100}{m_{\text{TOTAL}}}$$

where

m is the mass of the sieving, in g;

m_{TOTAL} is the total net mass of the reference sample, in g.

Annex C
(normative)

Method for determination of foreign matter including cocoa related matter and flat beans

C.1 Procedure

Empty the remainder of the reference sample in Annex B (Derivative 1) onto a tray of sufficient size to facilitate the measurement of cocoa related matter, flat beans and foreign matter.

Separate, aggregate and weigh each category, i.e. cocoa 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.

Once the measurement has been taken, do not re-integrate the matter that has been extracted for testing into the remainder of the reference sample (Derivative 2).

C.2 Expression of result

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

$$P_{QUALITE} = \frac{m_{QP} \times 100}{m_{TOTAL}}$$

where

$\frac{m_{QP}}{m_{TOTAL}}$ is the mass of the quality parameter, in g;
 m_{TOTAL} is the total net mass of the reference sample, in g.

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 related matter, flat beans and foreign matter in accordance with Annex C, empty the remainder of the reference sample (Derivative 2) onto a clean, dry, flat surface and thoroughly mix. Take a test sample of not less than 600 g cocoa beans from the reference sample by using a flat-bottomed shovel drawn across the middle of the remainder of the reference sample (Derivative 2).

D.2 Determination

Remove any cocoa related matter, flat beans and foreign matter still remaining following the procedure set out in Annex C from the test sample, and then weigh and replace by an equivalent mass of whole beans taken randomly from the remainder of the reference sample (Derivative 2). Then count the total number of beans in the test sample. The resulting number is known as the bean count.

D.3 Expression of result

The bean count, n_{BEAN} , shall be expressed as number of beans per 100 g, as given by Formula below:

$$n_{BEAN} = \frac{n_{WHOLE} \times 100}{m_{WHOLE}}$$

where

n_{WHOLE} is the mass of the number of whole beans;
 m_{WHOLE} is the total net mass of whole beans.

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.

E.2 Determination

Open or cut these 300 beans lengthwise through the middle, so as to expose the maximum cut surface of cotyledons. Visually examine both halves of each bean in full daylight or equivalent artificial light. Count separately each defective type of bean, i.e. those that are mouldy, slaty, insect-damaged (or germinated, flat).

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 gravity, as specified in 6.3.1.

E.3 Expression of result

Express the result for each kind of defect as a percentage of the 300 beans examined.

Annex F (normative)

Method for determination of moisture content (oven method)

F.1 General

This annex specifies the oven 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 oven 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 should as far as possible be correlated therewith.

F.2 Principle

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

F.3 Apparatus

Usual laboratory equipment and the following:

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

F.3.2 Ventilated oven, preferably fitted with a fan, capable of being controlled at $103\text{ °C} \pm 2\text{ °C}$.

F.3.3 Dish with lid, of metal, resistant to attack under the conditions of the test, or of glass, with at least 35 cm^2 of useful surface (for example minimum diameter 70 mm) and 20 mm to 25 mm deep.

F.3.4 Desiccator, containing an efficient desiccant.

F.3.5 Analytical balance, with a readability of 1 mg.

F.4 Procedure

F.4.1 General

Grind a fraction of one quarter of the reference sample with a grinder (F.3.1) to form particles that do not exceed 5 mm, but avoiding the formation of a paste. The beans used shall be representative of the reference sample.

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F.4.2 Test portion

Weigh the previously dried empty dish with lid (F.3.3). After grinding the beans in accordance with F.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 1 mg.

F.4.3 Determination

Place the dish (F.3.3) containing the test portion on its lid in the ventilated oven (F.3.2) controlled at $103\text{ °C} \pm 2\text{ °C}$. Leave for $16\text{ h} \pm 1\text{ h}$, 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 (F.3.4). Allow to cool to ambient temperature (approximately 30 min to 40 min after placing in the desiccator) and weigh, still covered, to the nearest 1 mg.

F.4.4 Number of determinations

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

F.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 weighing.

F.6 Expression of result

F.6.1 Method of calculation and formula

The moisture content of the reference sample, expressed as a percentage by mass, is given by Formula below:

$$\text{Taux d' humidit  (%)} = \frac{(m_1 - m_2) \times 100}{m_1 - m_0}$$

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 F.4.4), provided that the requirement for repeatability (see F.6.2) is satisfied. If not, repeat the determinations. Report the result to one decimal place.

F.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 quartered reference sample.

Annex G (normative)

Storage of bagged cocoa

Cocoa beans should be placed in warehouses constructed and used in such a way so as to maintain the moisture content as specified in 5.2.4.

The beans should be stored on gratings or deckings giving a clear space above ground of at least 7 cm for air circulation.

Measures should be taken to prevent infestation by insects, rodents and other pests.

The bags of cocoa beans should be stacked in such a way that

- a) individual grades and brands are separated by a passage at least 60 cm wide, similar to that which should be left between the bags and the walls of the warehouse
- b) disinfestation by fumigation and/or careful spraying with suitable insecticides can be carried out if necessary (see Annex H), and
- c) contamination by odours or flavours, or by dust from other products such as other foods, or by products such as oil, cement, and tar should be avoided.
- d) Sustainable cocoa must be separated from non-sustainable cocoa

Periodically during storage, immediately before shipment and on discharge outside the producing country, the moisture content of each lot should be checked.

Annex H
(informative)

Disinfestation

The use of pesticides to control insects, rodents and other pests in cocoa is necessary. Great care should 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.

Note: Importing countries have specific food safety regulations.

Annex I (informative)

Procedure and flowchart for preliminary quality analysis

1.1 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 F using preliminary test samples of 500 g or more, quartered from the reference sample. Annex I may be used for preliminary quality analysis to establish whether lots of cocoa beans meet the requirements of this document.

1.2 Procedure

Obtain four preliminary test samples of 500 g or more by splitting/dividing the reference sample into quarter fractions using a splitter/divider. Conical divider quartering irons or other suitable dividing apparatuses are recommended for use. The preliminary test samples should be weighed; the masses of the quartered fractions may be different but should be a quarter of the total mass of the entire reference sample. At least one of the preliminary test samples should be safeguarded from drying out, which can be done by using a plastic bag or air-tight container.

Proceed with the determination of the moisture content using a fraction of the preliminary test sample (the one safeguarded from drying out) as described in Annex F (see Figure I.1). Use one of the preliminary test samples for the analyses as described in Annexes B to E as shown in Figure I.1. The remaining preliminary test samples can be used for the analyses of fat, pH and taste.

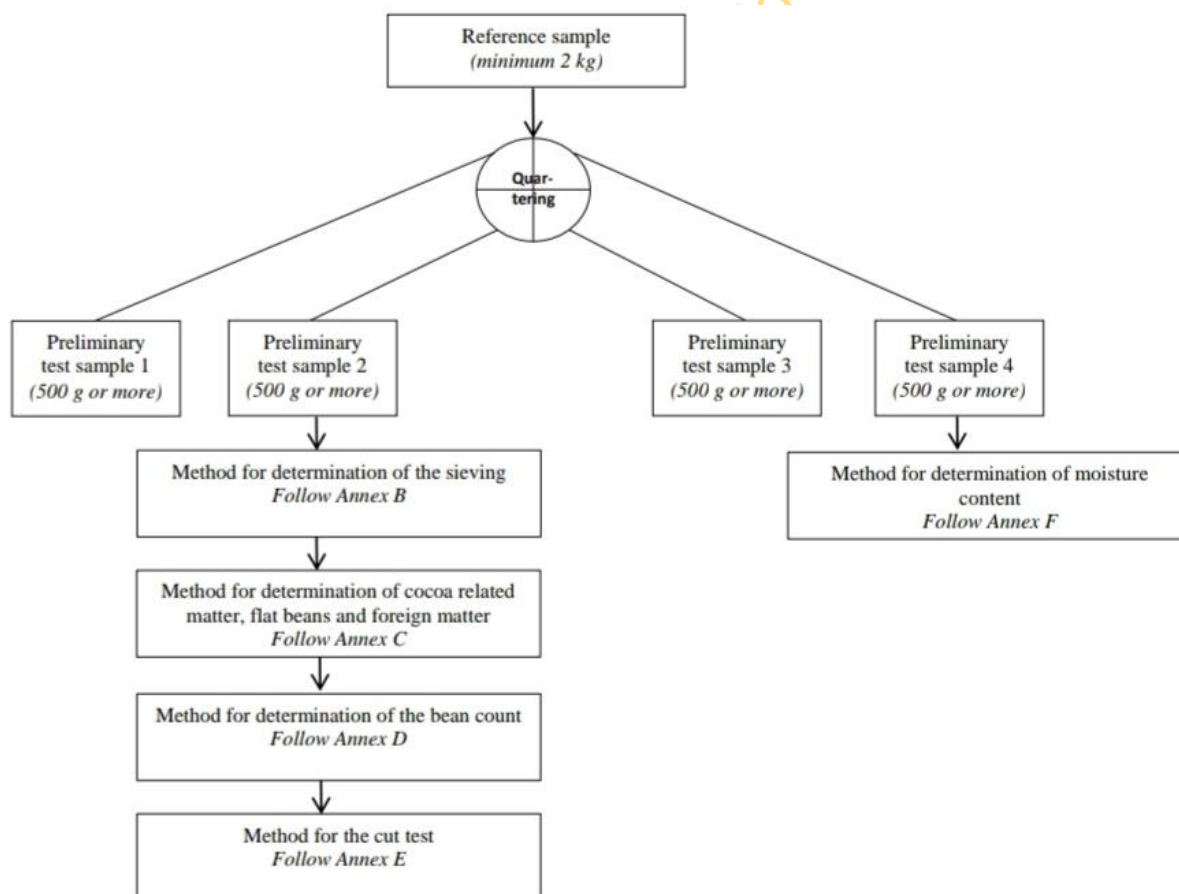


Figure I.1 — Flowchart of the sequence of testing after quartering the reference sample for preliminary quality analysis

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