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Agricultural food products -- Layout for a standard method of sampling from a lot

Produits agricoles alimentaires -- Présentation d'une méthode normalisée d'échantillonnage à partir d'un lot

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67.040 Živilski proizvodi na splošno Food products in general

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International Standard 7002

INTERNATIONAL ORGANIZATION FOR STANDARDIZATION•МЕЖДУНАРОДНАЯ ОРГАНИЗАЦИЯ ПО СТАНДАРТИЗАЦИИ•ORGANISATION INTERNATIONALE DE NORMALISATION

Agricultural food products — Layout for a standard method of sampling from a lot

Produits agricoles alimentaires — Présentation d'une méthode normalisée d'échantillonnage à partir d'un lot

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Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work.

Draft International Standards adopted by the technical committees are circulated to the member bodies for approval before their acceptance as International Standards by the ISO Council. They are approved in accordance with ISO procedures requiring at least 75 % approval by the member bodies voting.

International Standard ISO 7002 was prepared by Technical Committee ISO/TC 34, *Agricultural food products*.

Users should note that all International Standards undergo revision from time to time and that any reference made herein to any other International Standard implies its latest edition, unless otherwise stated.

Agricultural food products — Layout for a standard method of sampling from a lot

1 Scope and field of application

This International Standard establishes a general layout for standard methods of sampling from lots of agricultural food products.

It gives only general rules for drafting standard methods of sampling. It cannot be used itself, therefore, for sampling products; testing, inspection and acceptance procedures are dealt with to such an extent as to make the user aware of the meaning of further references.

2 General

2.1 Use of the layout

In making use of the layout (see clause 3), it should be remembered that it is for guidance only, and it will have to be adapted in each case to suit individual requirements. Thus, some of the clauses or headings may be omitted in certain instances whilst, in others, additions may be needed in appropriate places to cater for special requirements.

2.2 Plan of the document

In all cases, when drafting a method of sampling, clauses should be arranged in the order given in the layout, if they are to be included in the document.

In this way, the drafter of the method will find it easier to set out systematically all the information needed, with less risk of overlooking any important item. Moreover, the user of the document, knowing that it conforms to this layout, will be able more readily to refer to any clause, whatever may be the origin and scope and field of application of the method. (This is particularly important when considering a partial translation of a method, and in comparing different methods or different versions of a method.)

2.3 Numbering of clauses and sub-clauses

Clauses and sub-clauses shall be numbered consecutively throughout the document, in accordance with the point numbering system described in ISO 2145, *Numbering of divisions and subdivisions in written documents.*

No provision should be made in this sequence of numbers for numbers referring to clauses or sub-clauses of the layout which have not been included in the document (see 2.1).

This consecutive numbering scheme is also recommended when dealing with a broadly based document embracing several methods of sampling, or variants of a given method, constituting different sections of a document.

2.4 Terminology

Use should be made of standardized sampling teminology, including statistical concepts, in particular that given in the International Standards prepared by ISO/TC 69, *Applications of statistical methods.*

In some cases, terms other than those standardized by ISO/TC 69 are used in trade in agricultural food products; definitions relating to the sampling of agricultural food products are given in annex A, and a list of the equivalent English and French terms in annex B. Where traditional usage differs from the standardized terminology, a reference should be made to the standard term, for example by including it as a synonym for the traditional term.

When several synonyms may express the same concept in one of the official ISO languages, preference should be given to that most closely corresponding to the term or terms in the other official ISO languages.

Where there is no similarity of terms in the different languages to express the same concept, and where there exist internationally recognized symbols or abbreviations, these should be used after the terms in the different languages, in order to assist readers of all languages.

2.5 Choice and wording of methods of sampling

As far as possible, the same sampling methods, used as a basis for the assessment of a given characteristic for a given product, should be adopted in all International Standards for related products; the wording used should be as similar as possible. An exception may be made where, in the field in question, this will be contrary to a reasonable and well-established practice which it is desired to retain.

3 Preferred arrangement (for comments on individual headings and clauses, see clause 4)

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- 15.1 Administrative details
- 15.2 Details of unit packs or enclosure containing the lot
- 15.3 Material sampled
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- 15.5 Marking and sealing of samples

16 Annexes

4 Rules for drafting individual elements and clauses

NOTE — The following rules supplement those laid down in Parts 2 and 3 of the *Directives for the Technical Work of ISO*.

4.1 Title

The title of the International Standard shall express as concisely as possible, and without ambiguity, the contents of the document, indicating in the following order:

a) the product concerned, in the form in which it figures in the lot to be sampled;

b) the category of samples finally to be obtained, and the purpose for which the sample(s) is/are intended (if specific).

Example:

ISO 6670, *Instant coffee in cases with liners — Sampling*.

4.2 Introduction

The introduction, if any, to the International Standard shall be drafted to suit the user, giving, as appropriate, a short background to the choice of the method selected, and of the layout adopted, together with any other information required for the understanding and use of the International Standard.

4.3 Scope

This clause shall define the content of the International Standard, i.e. the features of the operations called for, and the product or products to which it applies. It shall reflect and amplify the title of the International Standard.

For convenience, this element should be combined with element 4.4 under the heading "Scope and field of application".

Mention shall be made, where appropriate, of the purposes for which the sample(s) is/are required. These may, in particular, relate to one or more of the following purposes of sampling:

a) **commercial purposes**: for example, to procure or prepare a sample:

1) to serve as a basis for an offer for sale,

2) for examination to verify that the material to be offered for sale satisfies the manufacturer's sales specification,

3) for examination as to whether the delivery complies with a contract specification;

b) **technical purposes**: for example, to procure or prepare a sample:

1) for examination to determine one or more of the characteristics of the material, including those affecting health and safety (for example, for foods, the presence of harmful contaminants from agriculture or processing, the presence of bacteria or their metabolites causing various diseases or food deterioration),

2) for quality control or quality inspection during the process of production or manufacture,

3) for control and inspection of the net contents of unit packages,

4) for examination to establish the identity of an unknown material,

5) for examination to confirm the identity of a supposedly known material,

6) for examination to determine, from its characteristics, the source of a given material,

7) to determine the normal and natural composition of materials so that significant deviations may be detected,

8) for examination to verify that a given material is of the type or quality suitable for the purpose for which it is intended or suggested to be used,

9) to monitor the changes in a property with time;

c) **legal purposes**: for example, to procure or prepare a sample:

1) for examination to verify that the material being offered for sale, or for admission to a country, satisfies statutory requirements (consumer protection, hygiene control, etc.),

2) for retention as a reference sample,

3) for examination in connection with criminological investigations,

4) for examination in connection with processes which discharge the material into the surroundings, and for which statutory control exists as to their nature and composition.

NOTE — The preparation of test samples from laboratory samples does not fall within the scope of a method for sampling from a lot.

4.4 Field of application

This clause shall contain all the information required to enable the user to judge whether the International Standard is applicable to the product or products being considered, or whether limitations exist, bearing in mind:

a) the purpose for which the samples are required;

b) the maximum acceptable sampling error if this purpose is to be achieved within the precision limits deduced from, for example, probability levels, using these samples and taking into account the tests to which they are to be submitted.

It shall contain in particular an indication of the product or products to which the method applies, and the limits between which the method can be used without alteration. The limits shall take into account the incidence of variability within the lot and the need, for instance, to insert ancillary operations, such as sorting into sub-lots, and particular examinations on the site or in the laboratory. The various factors to be considered in defining the field of application of the document include the following:

a) intended purpose of the product (for example, direct consumption, raw material, intermediates, process additive, by-product for disposal, or finished material);

b) physical state of the product (for example, liquid, powder, coarse lumps, gas);

c) size of the consignment or lot;

d) whether the method is applicable to bulk or packed material; in the latter case, if necessary, the size, nature and number of containers should also be indicated;

e) the type of examination for which the samples are required (for example, physical, chemical, sensory, bacteriological or combined tests);

f) the level of distribution in trade (for example, wholesale or retail).

4.5 References

This clause shall give a complete list of other documents which are indispensable for the application of the International Standard.

NOTE — This list is not intended to include documents which have merely served as references in the preparation of the standard; such documents can be mentioned, if necessary, in the clause or sub-clause concerned.

4.6 Definitions

The terms used in the document shall be selected as far as possible from those defined in annex A to this International Standard, to which reference shall be made. Any such terms, and any additional terms, shall be given with their definitions in this clause, if it is desired to reproduce them for the convenience of the user of the document, or if they are required for the proper understanding of the text. (See also 2.4.)

4.7 Principle (of the method of sampling)

This clause should briefly define the essential steps of the method to be used, giving the reasons that justify the choice of the particular procedures. The nature of the product to be sampled, the purpose of sampling and an appropriate sampling plan set at the desired level of inspection, often determine the method to be used.

This clause should include the operating characteristic of the sampling plan used, and any assumptions made in calculating this characteristic. The method of sampling selected is dependent on the principle that has been adopted, as well as on the field of application. Examples of different purposes for which sampling is carried out are:

a) sampling to assess the heterogeneity of a bulk lot;

b) sampling to assess the variability between individuals of a lot and the type of frequency distribution in that lot;

c) sampling to assess the mean of a characteristic of a lot;

d) sampling to assess the variability between different parts of a lot (zone sampling, stratified sampling);

e) sampling to assess the number of defects in a lot, taking into consideration the severity of defects;

f) sampling to assess the variability, with time, of a product in movement (continuous, kinetic, or periodic systematic sampling);

g) sampling as part of other more complex schemes such as:

1) quota sampling, which involves, in the case of a heterogeneous lot, taking aliquot parts from each of the several groups constituting a lot,

2) sequential sampling, which involves inspection, testing, or both, as well as sampling.

The reasons shall also include an indication as to whether the method of sampling is based partly or completely on statistical principles, or follows an established scheme of an arbitrary nature based on experience or expediency (composite sample, multiple sampling, multi-stage sampling etc.). Wherever possible, sampling should be based on statistical principles, and if so the estimated or assessed sampling errors shall be stated. To enable the sampling risks to be assessed in the case of products where the distribution of the variable is unknown, an assumption of normal distribution is often made.

4.8 Administrative arrangements

This clause shall briefly indicate the necessary administrative arrangements, if any, to which it is desired to draw the attention of the user of the International Standard.

4.8.1 Sampling personnel

Under this heading, particulars of the number and type of sampling personnel required, including requirements for specialist and supervisory staff, may be given. Where appropriate, an indication of the training and qualifications should be given. In the case of sampling for statutory purposes, attention shall be drawn to the need for officially appointed sampling officers.

NOTE — In certain cases, it may be useful to refer to the existence of specialized sampling organizations which undertake sampling under contract for commercial or arbitration purposes.

4.8.2 Representation of parties concerned

Where the standardized method of sampling is to be used, or may be needed, in connection with enforcement legislation, disputes, arbitration proceedings etc., for which appropriate evidence is necessary of the authenticity of the samples taken, this shall be clearly stated and arrangements for representation of the parties concerned, for witnessing the sampling operations themselves, shall be indicated. Recourse may often be made to independent sampling agents to represent certain parties.

The following are a few examples of the parties, or their agents, by whom representation may be required:

a) owners, manufacturers, processors, producers or vendors, of the product constituting the lot;

b) owners of the container in which the product is stored or transported;

c) transporters of the lot;

d) the insurers involved;

e) the purchasers of the lot.

If sampling is aimed at determining compliance with statutory requirements, sampling shall be carried out in accordance with the terms laid down by government. If the lot is involved in litigation, permission of the authorities may be required for further sampling and for the presence of any of the parties listed.

4.8.3 Health, safety, and security precautions

When appropriate, provision should be made in the International Standard for suitable instructions to minimize any health and safety hazards, and security risks, during sampling. For this purpose, reference should be made to any relevant codes of hygiene or safety concerning the handling of the products in question, and to operations in the area where sampling is to be carried out; mention should also be made of essential safety equipment, sanitary facilities, etc. Instructions for dealing with spillages, breakages, waste materials, or residues should be provided where necessary, including advice on antidotes, fire-fighting measures, etc. These instructions may affect the marking requirements referred to in 4.13 and 4.14.

4.8.4 Signing of sampling report

Attention should be drawn to the need, in the cases referred to in 4.8.2, for the signing and countersigning of sampling reports by the parties concerned. Moreover, reports issued by sampling officers taking part — on request — in sampling for other than statutory purposes are required to state whether or not the methods by which the samples are taken are in accordance with statutory requirements.

4.9 Identification and general inspection of the lot prior to sampling

This clause should recall the need to:

a) identify the lot in question before any samples are taken, and for this purpose to compare, as appropriate, the number, mass or volume of the lot, and the markings on containers and labels, with the entries on the relevant documents;

b) note any features concerning the condition of the lot and of the surroundings, relevant to the taking of representative samples which are required for the sampling report;

c) segregate damaged portions of the lot and/or, if the lot is unduly heterogeneous, divide it into portions with more similar properties, which will then be treated as separate lots;

d) specify how to mark, if required, individual units or parts of the lot, with consecutive serial numbers for use subsequently in the taking of random samples using random number tables; usually, the numbering of items is arbitrary or a conceptual convenience, but selection of items should be based on the numbering scheme employed;

e) specify the intervals or stipulations on the rules of acceptance or rejection when the relevant sampling methods are applied;

f) specify how to deal with adventitious contaminants that can be easily removed, if desired, before sampling commences, and if necessary retained for examination.

4.10 Sampling equipment and ambient conditions

This clause should specify all the equipment and apparatus required to carry out the specified sampling operations, these items being listed in a logical order.

The equipment or apparatus specified should be suitable for use under the sampling conditions envisaged, and with the product in the physical state in which it is to be sampled. It shall be applied so as to maintain the initial physical state of the product. It should, wherever possible, be equipment or apparatus which is the subject of an existing International Standard and, for this purpose, the reference of the International Standard should be given. Special types of apparatus and their assembly may usefully be illustrated by a diagram or drawing which, in appropriate cases, should be in accordance with the relevant International Standards prepared by ISO/TC 10, *Technical drawings*.

Mention should also be made in this clause of any requirements (for example for sterilization, for the control of the atmospheric conditions, lighting, freedom from dust or draught, etc.) that may be necessary for the efficient conduct of the sampling operations, and for the protection of the product being sampled, including the samples themselves, from any deleteri-

ous effects of the environment. The setting up of the equipment and its maintenance throughout its period of use, during and immediately before and after the sampling, should also be described.

4.11 Sample containers and special packing

This clause should specify all the necessary requirements for the containers in which the samples are to be placed and kept, in relation to their type, size, and suitability for the purpose. This specification may also, therefore, refer to the materials of construction, including their physical and chemical properties, and to the method of closure. Wherever any of these requirements is already covered by an International Standard, the reference should be given. If special packing of the containers after filling is required, for example for temperature control, protection in transit, conformity with statutory regulations, etc., its specification should be given in a clause or sub-clause "Packing samples for storage and/or transport" (see 4.13.3).

When selecting the characteristics to be specified, attention should be given in particular to the following general requirements:

a) Cleanliness of the container (it may be necessary to specify special cleaning, drying, sterilizing, or other treatment, prior to filling with the sample).

b) Quality of the container, in particular:

1) inertness, of all parts of the container, to the sample;

2) suitability for withstanding, where appropriate, the various special treatments mentioned in a);

3) robustness of the container to withstand hazards during the selected method of transport and, if a hazardous material is in the container, compliance with the regulations in force governing its transport, for example in the case of pressure vessels used as containers for the sample, the selection of suitably pressure-tested units;

4) suitability for preserving the sample unchanged for the necessary period, for example by preventing any undesirable access of light, heat, or other radiation, and the passage of moisture or other gases or vapours into or out of the sample;

5) choice of quality of the sample container to hold samples of a given material, depending on the use to which the sample is to be put; for example, while an airtight container may be required for a sample for determining the volatile matter content of the material, a plastic film bag may be adequate for a sample of the same material intended only for particle size analyis.

c) Ullage (headspace) in the container after introducing the sample, including elimination of headspace that might cause unfavourable change in the state of the sample (for example churning of cream).

4.12 Sampling procedures

4.12.1 Sample size

This sub-clause should specify the size and number of samples of each category required (increments, bulk samples, laboratory samples, etc.) in terms of the nature and size of the lot, and in accordance with the terms of lot acceptance if statistical interpretation is needed, and should specify the position in space or time at which the samples are to be taken.

4.12.2 Taking of increments

This sub-clause should give adequate instructions for the operations leading to the collection of all the increments required. Instructions should also be given, if necessary, for the recording of information which will specifically identify individual increments, for the filling of containers (if required at that stage) with these samples, and for the protection or disposal of the portions of the lot which have been sampled.

These operations include the checking and use of the equipment and apparatus, as required, and any other preliminary operations required prior to the actual taking of the increments (for example mixing, melting, etc., of the lot in bulk, or of the contents of individual containers to be sampled).

4.12.3 Preparation of bulk sample, and reduced samples

This sub-clause should describe the production of the bulk sample by bringing together all the increments, followed, if required and if relevant to the product concerned, by blending to produce a homogeneous bulk sample, or by blending and reduction to produce a reduced sample, entailing, as may be required, intermediate operations (mechanical or otherwise) of blending, particle size reduction, and division. The primary blending of increments should of course be avoided when sampling has aimed at the estimation of any heterogeneity of lots or variability of characteristics as referred to in 4.7. If required, provision for the placing of the resulting sample(s) into a container should be included.

This sub-clause should also describe the method of production, and, where appropriate, placing in sample containers, of the required number of as closely as possible identical replicate laboratory samples of suitable size, from the samples obtained as described previously, the number being sufficient for reference, arbitration, contractual, statutory and test purposes.

4.12.4 Selection of samples of prepacked products

4.12.4.1 How to apply sampling plans

The statistical criteria to be used for acceptance or rejection of a lot on the basis of the sample should mainly apply to prepacked products if they have been produced under the conditions of good manufacturing practice (GMP).

Any quality assessment by statistical principles normally requires all data relevant to the product or property concerned, such as the results from plant quality control services rendered

prior to sampling. By means of a systematic disclosure and interpretation of the statistical characteristics (for example process average, standard deviations, distribution of selected properties or homogeneity of lots) of these production data, a suitable sampling plan, or an adaptation to a special case, can be chosen.

Selection of a sampling plan shall take full account of any information which may be available (as previously mentioned) concerning the distribution of the property under consideration. In selecting a scheme from those listed in ISO 2859[1] or ISO 3951[2], due account shall be taken of any special characteristics of the foodstuff or product concerned. Where the schemes are not taken from ISO 2859 or ISO 3951, the subclause should include a full explanation for choosing a different scheme, as the reasons for choosing any sampling plan, including those from International Standards, should always be given.

As a consequence of the various objectives that can exist simultaneously in food sampling, different sampling plans may be needed to estimate commodity defects (attribute plans), net contents (special variable plans), compositional criteria (variable procedures with unknown standard deviation), and health-related properties (for example contaminants, by plans applicable to heterogeneous conditions).

When inspection by variables (ISO 3951) is adopted, preference should be given to plans based on the variance with respect to the most heterogeneous aspect. On advanced level of inspection or at the disposal of sufficient complementary information on the process average, the rules of switching the level of inspection may be introduced. (To give an overview of sampling inspection, a flowchart is presented in annex C.)

4.12.4.2 How to draw samples

When practical, items should be taken in compliance with a random number technique. It is most desirable that any lot should be sampled only once, regardless of the type of sampling applied. Resampling is allowed only in case of spoilage or loss of the items taken.

The withdrawal of items should take place in accordance with that sampling plan which requires the largest number of items. During the sampling procedure, smaller groups of items, intended to yield data for other assessments, should be selected by denoting at random the respective items from that population, as specified in distinct sampling plans. If the mass of such an item is insufficient for multi-purpose examinations, additional items next to it should be drawn.

If possible, take items during handling of the lot (following the expedient exercise of quality control in drawing items from conveyor belts).

In general, sampling plans at the usual level are recommended. When destructive examinations are involved, due consideration should be given to reduced sample sizes (alternative plans). When large samples are drawn, consideration should also be given to mixing and reducing at the sampling site so that excess sample can be returned to the lot.

4.12.4.3 Critical and limiting defects

Sampling methods aimed at inspection for critical defects (for example to obtain evidence of the negligible occurrence of food safety risks) are often applied under heterogeneous conditions.

Critical defects form a special category. The solution generally adopted when non-destructive inspection is involved is to lay down that a sample size equal to the lot size be applied with an acceptance number of zero. If it is ever thought that any particular defect does not warrant this procedure, then serious consideration should be given to having it reclassified as a major defect (see ISO 2859).

Where the only possible inspection for critical defects is destructive (and agricultural food products often fall into this category) a sample which is 100 % of the lot cannot be used. Sample size can be calculated by connecting the percent defective (that quantity of products in which the critical or limiting defect is found once on the average) and the risk we are prepared to take of failing to find a defective (see ISO 2859).

Usually, critical or limiting properties are distributed in an anomalous way; they can only be judged on the basis of inverse J-shaped OC-curves (acceptance number 0). If the forbidden property (essentially it is an attribute) were uniformly distributed, the quality of the lot could be assessed on the basis of a single item.

4.12.4.4 Economic aspects

After the type of sampling plan and the actual sampling method have been decided, it is advisable to estimate the total person-hours per lot in taking and processing the samples and the costs of the overall procedure, including the cost of the sample itself. It will help the parties concerned to balance reliability requirements in relation to economy.

NOTE — **Health and safety precautions**

Special instructions or warnings should be included in the above instructions 4.12.2 to 4.12.4), whenever operations involve hazards to health or safety. (See also 4.8.3.)

4.13 Packing, sealing and marking of samples and sample containers

4.13.1 Filling and sealing of sample containers

This sub-clause shall specify the method of filling, closing, securing and sealing the sample containers, including any special precautions or care to be taken in these operations. It is important that each sample should be unequivocally identifiable. Hence, to avoid any mistake, the sample or the container into which it is to be placed should be given an identification marking immediately before or after the taking of the sample.

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1) ISO 2859, *Sampling procedures and tables for inspection by attributes.*

2) ISO 3951, *Sampling procedures and charts for inspection by variables for percent defective.*