Government of Canada
Gouvernement du Canada

Sampling Methods and Procedures Guide

CGC Procedure 3.0.1

Version 3

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Canada

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1. Introduction

This manual was developed collaboratively by the Canadian Food Inspection Agency (CFIA) Grains and Oilseeds Section, the CFIA Seed Section, the Canadian Seed Institute (CSI) and the Canadian Grain Commission (CGC). Its purpose is to describe agreed-upon methods and procedures for obtaining seed or grain samples for testing and/or grading for one or more of the following programs:

- the Canadian Grain Sampling Program (CGSP) administered by CFIA Grains and Oilseeds Section.
- the Licensed Seed Sampler Program (LSSP) administered by the CFIA Seed Section
- the Certified Container Sampling Program (CCSP) and the Accredited Container Sampler Program (ACSP) administered by the CGC

The goal of this document is to ensure that seed and grain facilities that may be involved in one or more of the programs listed above have a guide to assist in the design of their own sampling procedures.

This document describes the general principles of sampling and the approved sampling equipment and procedures common to all programs. Required sampling intensities, maximum lot sizes, and other factors unique to the individual programs are highlighted in this document and are provided in the appendices or in other referenced program-specific documents.

2. Scope

The scope of this document is limited to:

- the general principles of sampling,
- ensuring the appropriate conditions for sampling,
- determining the sampling intensity and sample size,
- the appropriate sampling equipment and procedures,
- the appropriate methods of mixing and reducing samples for submission, and
- the procedures and required documentation for packaging, sealing and submitting samples to CFIA, CGC or a laboratory.

3. Acronyms and Definitions

AASCO	Association of American Seed Control Officials
Authorized	Includes licensed, approved, accredited, designated, recognized
Composite sample	Sample formed by combining and mixing all of the primary samples taken from a lot in such a manner that homogeneity is as thorough and even as possible
Heterogeneous	Not relatively uniform
Homogeneous	Adequately or practically uniform
ISTA	International Seed Testing Association
Facility	An entity that has received authorization to have sampling services provided
Grading, testing, analysis	Activities performed on a submitted sample
Primary sample	A small portion taken from a lot during one single sampling action
Sealed lot	The containers of the lot in which the product is held are closed in such a way that it cannot be opened to gain access to the product and closed again without either destroying the seal or leaving evidence of tampering.
Sampler	The authorized sampler which includes Licensed Seed Sampler, Accredited Container Sampler, Grain Sampler and Authorized Exporter Sampler
Submitted sample	A portion of a composite sample obtained by mixing and dividing the composite sample by an approved method

4. References

4.1 Licence Seed Sampler Program (LSSP)

- CSI Technical Manual for Approved Conditioners and Bulk Storage Facilities

4.2 Certified Container Sampling Program (CCSP) and Accredited Container Sampler Program (ACSP)

- CGC GSS STAN 3.0 – Grain Sampling System Standard
- CGC ASP STAN 4.0 – General Requirements for Accredited Service Providers of Sampling Program Services (Accredited Container Sampler Program and Certified Container Sampling Program)
- CGC QSP 1.2.0 – Conducting Technical Reviews of Audit Reports Submitted by Accredited Service Providers
- CGC GSS QSP 3.1.0 – Certification and Registration of Grain Companies under the CCSP and the ACSP
- CGC GSS QSP 4.1.0 – Accreditation and Monitoring of CGC Third Party Samplers and Sampling System Auditors
- CGC GSS QSP 4.3.1 – Conducting an Audit of a Grain Sampling System

4.3 Canadian Grain Sampling Program (CGSP)

- D-10-02 – The Canadian Grain Sampling Program (CGSP)
- R-006 – Canadian Grain Sampling Program – Audit Manual

4.4 Other Sampling References

- CFIA Official SWI 132.1.1 Seed Sampling and its amendments
- CGC Sampling Systems Handbook and Approval Guide
- AASCO Handbook on Seed Sampling

5. General Principles of Sampling

The objective of sampling a lot of seed or grain is to obtain a representative sample of a size suitable for the required testing and/or grading. It is expected that the test results and grading will reflect the average quality of the seed or grain lot from which the sample was taken.

The principles of sampling and the methods and procedures described in this document are science-based and reflect current international methods for sampling seed or grain. The sampler plays a critical role in sampling lots for testing and/or grading as the accuracy of the sampling and the information submitted with the sample are vital to the validity of any subsequent test results.

The principle of random sampling is that each particle in the population being sampled has an equal chance of being chosen. Ordinarily, the size of the sample tested is minute compared with the size of the lot which it represents. It is essential that the sample be taken with care and in a manner which provides confidence that the sample is truly representative of the lot. Likewise, in reducing the composite sample, every effort must be made to obtain a representative submitted sample. No matter how accurately the analytical work is done, the results can only reflect the quality of the sample submitted for analysis.

The accuracy with which the results of analyses represent the lot depends upon:

a) the homogeneity of the lot from which the sample is drawn;
b) whether the sampling is done in a manner that ensures that the sample is randomly selected;
c) the use of sampling equipment appropriate to the crop type and the program for which the sampling is taken;
d) the care used in drawing the samples;
e) the care with which the primary samples are mixed to obtain the composite sample;
f) the care used in mixing and dividing the composite sample to obtain the required sub-samples for testing; and
g) the integrity of the primary, composite and submitted sample(s) and the information provided with the submitted sample(s) (sample submission form).

6. Conditions for sampling

6.1 Preparation for Sampling

Before sampling begins, the sampler should be familiar with safe sampling procedures, the facility where sampling will occur, and any applicable health and

safety policies and practices at the facility. The sampler must also determine the purpose for which the sample is drawn and the specific program's sampling requirements.

When preparing to sample a lot, the sampler must determine the correct lot to be sampled by verifying that the information on the tags, bags or labels is correct and complete. The lot size and identification should be verified by consulting the documentation for the lot.

If sampling a static lot (e.g. bags, totes), the sampler must verify that all containers within the lot are the same product and approximate weight, and are accessible for sampling. If manual stream sampling, the sampler must ensure that the entire stream is accessible to facilitate appropriate sampling procedures.

If the sample is to be submitted under the CGSP to support a future request for a CFIA phytosanitary certification, the sampler should ensure that the lot is sampled not more than 1 month prior to the receipt of the application for phytosanitary certificate at a CFIA Office.

6.2 Maintaining the Integrity of the Lot

The facility must ensure that the integrity and identity of the sampled lot is preserved and does not change. The facility must be able to link a particular sample to the lot through documentation and procedural controls.

For seed (LSSP) and grain (ACSP and CCSP) certification purposes, the lot must either be sealed prior to the time of sampling or, if stream or vertical sampled, sealed immediately after sampling. "Sealed" means that the container in which the product is held is closed in such a way that it cannot be opened to gain access to the product and closed again without either destroying the seal or leaving evidence of tampering. This includes product in bins, bags, totes and shipping containers, either by tamper-proof metal or other seals, or by single stitching through a tag or label.

For phytosanitary certification purposes (CGSP), physical sealing of containers or storage bins may not be required if the facility's sampling manual outlines the procedures that will be followed to prevent contamination of sampled product or commingling with other product and to ensure that the identity and integrity of the sampled product is maintained up to the time that the export conveyance is loaded.

6.3 Homogeneity of the Lot

Homogeneity or uniformity of the lot is an important principle when sampling seed and grain. To verify the uniformity of the lot, the sampler must assess each primary sample for uniformity with the samples drawn previously before adding it to the composite sample. Samples drawn by automatic samplers should be examined periodically throughout the lot if possible. Uniformity can be assessed by verifying that the colour, size and shape of the seed or grain, the amount of chaffy material and the presence of visible impurities are relatively uniform within and between each primary sample.

If the samples are not uniform and where there is evidence that the lot is not reasonably uniform, the sampler must discontinue sampling and corrective action must be taken.

6.4 Maximum Lot Size

6.4.1 Specific to Seed (LSSP)

There are no mandatory maximum lot sizes designated for seed sampled for testing and grading for domestic sales. See Section 3.3.1 of the CSI Approved Conditioner and Bulk Storage Facilities Technical Manual (Version 3.0) for domestic lot size recommendations and appropriate industry good manufacturing practices.

6.4.2 Specific to Grain (CCSP and ACSP)

The maximum lot size that can be represented by one composite sample for grain grading by the CGC is 10 shipping containers, 300 totes, or 5000 bags.

6.4.3 Specific to Phytosanitary Certification (CGSP)

For the purposes of phytosanitary testing and certification, a single submitted sample of seed or grain can represent a maximum of 300 metric tonnes (MT). Where the size of a lot is in excess of 300 MT, submitted samples representative of each 300 MT increment must be submitted.

7. Sampling Procedures

Samples taken from the stream of a seed or grain lot must be drawn at regularly timed intervals from the beginning to the end of the transfer. The samples may be taken off the conditioning equipment, or as the product is transferred into a shipping container or bagged.

Stream sampling eliminates the need for probing a sufficient number of bags to obtain the composite sample. When stream sampling is not possible, the manual static methods for sampling described in Section 7.3.1 may be used. Though the sampling procedure may be described in general terms in the facility's quality manual, a CFIA- or CGC-authorized evaluator must verify during the on-site assessment that the procedures and equipment used are acceptable and appropriate for the specific programs.

7.1 Sampling Intensity

Sampling intensity refers to the number of primary samples taken from a lot of seed or grain. Each primary sample is obtained by passing the sampling equipment through or into the seed or grain once. The required sampling intensity varies depending on the CFIA or CGC program (see section 1). Sampling intensities for the different programs, sampling procedures (static or stream), and different containers (bags, totes or bulk) are presented in Appendix 1.

If sampling for more than one program, samplers should take samples at the highest sampling intensity to ensure that multiple program requirements are met.

7.2 Composite and Submitted Sample Sizes

7.2.1 Specific to Seed (LSSP)

Sample size depends on crop type, the tests required, and the type of certification requested. See Appendix 2.

7.2.2 Specific to Grain (CCSP and ACSP)

7.2.2.1 For the Flax Shipping Container Protocol

For lots exceeding 500 MT, a minimum composite sample size of 50 kg must be taken. For lots between 50 and 500 MT, a sample equal to 0.01% of the lot size must be taken. For lots less than 50 MT, a minimum sample size of 5 kg must be taken. The composite sample must be reduced to 2.5 kg prior to submission as described in Section 5.

7.2.2.2 For CGC Certification

The composite sample must be reduced to 1 kg prior to submission as described in Section 8.

7.2.3 Specific to Phytosanitary Certification (CGSP)

It is the responsibility of the exporter to determine country-specific import and phytosanitary requirements for export commodities by contacting the CFIA in advance of sampling. As a general guideline, a submitted sample size of 1 kg will be sufficient to meet the testing requirements.

For excessively bulky crops such as brome grass, needle grass, etc., a sample size of 2 litres may be submitted.

The specific phytosanitary requirements of some importing countries may require additional testing. These additional tests could include analysis for soil, insects, disease pathogens, nematodes and weed seeds and may require additional samples.

7.3 Sampling from a Static Lot

Seed or grain can be sampled from containers such as totes and bags. Bags are considered to be grain or seed sacks generally weighing 100 kg or less. Totes are considered to be grain or seed sacks generally weighing more than 100 kg (Figure 1). Seed can be sampled from other containers such as a tins, bins or trucks.

Figure 1. Totes (left) and Stacked Bags (right)

7.3.1 General Procedures for Sampling a Static Lot

1. Select the appropriate method for sampling based on the crop kind, the packaging of the product, and where necessary, the importing country's requirements.
2. Determine the sampling intensity as specified in Appendix 1 and the required size of each primary, composite and submitted sample. Please note that unsealed totes are considered to be bulk seed for purposes of the pedigreed seed program and the appropriate sampling intensity is to be used.
3. Sample using the appropriate technique for the selected method or trier as described in Section 7.3.2.
4. For stacked bags:
    - randomly select the bags for sampling in a well distributed pattern
    - start sampling at the bottom of the stack of bags and work upwards to prevent cross-contamination of the primary samples from seed/grain spilling from above
    - the lower stacked bags can be struck with the large end of the trier to relieve the pressure on the bag and prevent it from bursting
    - the sampling pattern should be varied from bottom, middle and top bags on the pallet, and between pallets
    - ensure that the bags selected for sampling and those above or adjacent to the bag being sampled are clean and free from debris to prevent contamination of the sample
    - any extraneous material should be brushed or swept from the bags and the area before inserting the trier
    - do not insert triers through labels or printed labelling on bags.
    - A hole in jute or poly bags made by the trier must be closed by running the point of the trier across the hole a few times in opposite directions to pull the threads together. A hole in a paper bag must be sealed by a suitable adhesive patching tape or label

5. For bags sampled immediately after filling (CGSP, CCSP and ACSP only):
    - Determine how often a bag needs to be sampled from the line based on the sampling intensities specified in Appendix 1.
    - Sampling must occur immediately after filling and before stitching, using the same sampling tool.
6. When sampling containers over 100 kg (totes), draw the samples from different locations or angles in each container. When sampling vertically, the sampling tool should reach the bottom of the tote.
7. Before each primary sample is drawn, completely empty the container where the individual sample is to be placed when checking for homogeneity.
8. If samples are uniform, collect them in a second emptied container to obtain the composite sample.
9. If the samples are not uniform as described in Section 6.3, discontinue sampling and take corrective action.

7.3.2 Manual Static Sampling Equipment and Procedures

When selecting the appropriate sampling equipment the sampler should consider the commodity being sampled, the size and type of the containers, whether sampling is to be done vertically or horizontally, the number of primary samples to be drawn, and the required composite sample size.

Manual sampling of a static lot is often done using a trier. The sampling device should not select the product by size or damage the product being sampled. See Appendix 3 for a list of approved triers by crop type for grain and seed.

Figure 2. Nobbe Trier

7.3.2.1 The Nobbe Trier

This trier (Figure 2) is a pointed tube with an oval opening near the pointed end. It is relatively compact, making it easy to transport. The risk of contamination is low as the trier is easy to keep clean. A Nobbe trier is suitable for sampling free-flowing product in bags (e.g. legumes, timothy, canola, mustard, wheat, corn) but only where the trier can reach to the centre of the container. It may only be used horizontally and its use is limited to penetrable containers.

Follow these steps to use the Nobbe Trier:

1. Insert the trier gently into the centre of the bag with the trier opening facing downwards and the trier tilted upwards at an angle of approximately 30 degrees to the horizontal.
2. When sampling from the end of a bag, the opening of the trier must reach the centre of the bag. Insert the trier as close to the bottom edge of the bag as possible (i.e. below stitching).
3. When sampling from the side, the opening of the trier must reach the opposite side of the bag. Insert the trier at the bottom edge of the bag such that the 30 degree angle is achieved.
4. Rotate the trier through 180 degrees, bringing the slot to face upwards.
5. Withdraw the trier with gentle agitation to help maintain an even flow of product into the collecting pan.
6. The trier must not be agitated without withdrawing.
7. When sampling from the end, withdraw with decreasing speed so that the quantity of product obtained from successive locations increases progressively from the centre to the bag.
8. When sampling from the side, withdraw with a constant speed.
9. Each primary sample must be placed into a suitable clean container(s) (pan, pails) to allow for checking for uniformity.
10. Readjust the bag fibres to close the gap by running the point of the trier across the hole a few times in opposite directions.

Figure 3. Double Sleeved Trier

7.3.2.2 The Double Sleeve Trier

This type of trier (Figure 3) is suitable for sampling static bulk lots in standard or large containers of both small and large crop kinds. The double sleeve trier consists of a hollow tube with a solid pointed end and a close fitting inner tube such that the product cannot slip between the two sleeves. The inner tube may be with or without partitions (fixed or removable plugs) between the slots. Double sleeved triers without partitions may only be used horizontally. Partitioned double sleeve triers may be used horizontally or vertically.

Multiple openings (slots/holes) are cut into both the inner and outer tubes so that turning the inner tube aligns the openings of the inner and outer tubes. There is a greater risk of contamination with this type of trier. Care must be taken to ensure that all the openings in both the inner and outer tubes are clean and no small seeds or particles are lodged between the two tubes. When closing the openings there is a risk of damaging the product trapped between the edges of the slots but this damage can be reduced by closing the openings slowly to the point where resistance is felt.

The contents of the entire tube represent one primary sample. There is no possibility of varying the amount of product obtained from the inner and outer part of the container by adjusting the speed with which the trier is withdrawn as the trier draws the same size of sample in each sampling action. When sampling horizontally, the trier must be long enough to reach the opposite end of the container or bag. When sampling vertically, a partitioned trier must be used and the trier must be long enough to reach the bottom of the container or bag.

Follow these steps to use the double sleeve trier (with or without partitions) <u>horizontally</u>:

1. Carefully insert the trier on the horizontal plane into the container in the closed position until it reaches the opposite corner of the container. The outer tube opening must be facing upward. Care should be taken not to push the trier through the opposite corner of the container.

2. Open the trier until the inner and outer openings are aligned, then agitate it slightly to allow the openings to fill.

3. Close the trier gently (to the point of resistance) and then withdraw it.

4. Place each primary sample into a suitable clean container(s) (pan/pail) to allow for checking for uniformity.

Follow these steps to use the double sleeve trier (with partitions) vertically:

1. Insert the closed trier through the top of the container on an angle until it reaches the bottom of the container.

2. Turn the inner sleeve until the inner and outer openings align and agitate the trier slightly to allow the openings to fill.

3. Gently close the trier to point of resistance and withdraw.

4. collect the sample on a clean, long piece of paper or into a clean container that is the same length as the trier.

5. Check for uniformity with the primary samples already drawn before adding to the composite sample.

7.3.2.3 Specific to Grain (ACSP, CCSP and CGSP)

Scoop sampling from bags

Facilities bagging grain after cleaning and processing may sample with a hand scoop off the top of bags once filled if the following conditions are met:

- the same sampling tool is used to sample the entire lot,
- the sampling tool is large enough to ensure that the composite sample is a minimum of 1000 grams *, and
- sampling is done at structured intervals at a frequency determined by the number of bags to be sampled as set out in in Appendix 1.

7.3.3 Specific to Seed (LSSP and CGSP)

7.3.3.1 Sampling by hand

For chaffy, non-free-flowing grasses, hand sampling is the only alternative where it has been determined that the seed would be damaged or there could be separation and selection of the seed when using triers.

* Note that the composite sample may be divided for multiple purposes (e.g. CGC certification, CFIA phytosanitary certification and retention for company's own use). It is important that the total composite sample size is determined based on all purposes prior to determining sampling tool size.

All positions inside the container must be accessible. Where it may be impossible to obtain samples from the lower parts of bags or containers, the containers must be partially or completely emptied to allow access to all positions of the container. The sampler must be able to reach the bottom of the container.

Use the following procedure:

1. Insert your open hand through the top of the container with fingers held tightly together, until the desired depth is reached.

2. Close your hand with the fingers held tightly together to ensure that few, if any, particles escape, and slowly withdraw your hand.

Repeat this process in different parts of the lot and at different depths, to obtain the required number of primary samples as specified in Appendix 1.

7.3.4 Cleaning and Care of Triers

All equipment used for manual sampling, including triers, buckets and other tools, must be thoroughly cleaned before each use, and free from all extraneous matter including crop and weed seeds, diseased bodies or spores, any seed parts, chaff, dust and inert foreign bodies, and chemical residues such as seed treatments. Triers with residues of extraneous matter could cause cross-contamination of other lots.

The more polished the inner surface of the trier is, the more freely the product will flow. The rough edges and points of double sleeve triers should be occasionally dressed (removing sharp edges) with a file, emery or very fine sandpaper. This will greatly improve their ease of use for probing jute or poly bags.

The cleaning method will be based on the type of equipment. Recommended cleaning methods are: cleaning wipes, cleaning solutions such as hand or dish soap, citric acid, rubbing alcohol or water, compressed air, bottle cleaning or gun-cleaning tools.

7.4 Automatic Stream Sampling

There are many types and designs of automatic sampling devices. Automatic samplers take the most representative sample from the lot because there is no human bias involved. They draw a sample automatically by removing a portion of the product from the flow at regular intervals. An automatic sampling device is to be used and maintained within the facility's quality management system (QMS).

7.4.1 Specific to Grain Quality Certification (CCSP and ACSP)

Where an automatic cross-stream diverter-type sampling device is used to take samples for submission to the CGC for certification, the automatic sampler must be approved by the CGC as required by Chapter 2 of the CGC Sampling Systems Handbook and Approval Guide http://grainscanada.gc.ca/guides-guides/ssh-mse/sshm-mmse-eng.htm).

Chapter 3 of the CGC Sampling Systems Handbook and Approval Guide also permits the use of "Conditionally Approved Automatic Samplers" for sampling grain shipped in containers. The CGC will approve these types of samplers on a case-by-case basis if the following criteria have been met:

- The sampling tube may be either installed permanently in the grain stream or the tube may extend into the grain stream intermittently.
- The sampling tube must extend to at least 75% of diameter of the grain stream.
- The combined length of the sampler tube openings on the sampling tube must be at least 55% of the probe length.
- One sampling tube opening must be within ¾ of an inch of the spout wall where the product is flowing.
- The dimensions of the sampling tube openings must be at least ¾ of an inch wide and 3 ½ inches long and be in a uniformed pattern along the length of the tube.
- Automatic samplers must have an adjustable timer. Sampler timers may be either analog or digital, and must have a maximum 1-second dial or timer interval setting.

In addition, the CGC will consider deviations from these criteria on a case-by-case basis.

7.4.2 Specific to Phytosanitary Certification (CGSP)

Where an automatic cross-stream diverter-type sampling device is used to take samples for submission to the CFIA for phytosanitary certification, the CFIA will recognize automatic samplers that are CGC-approved or self-approved based on the calibration, condition and efficiency standards established by the CGC in Chapters 2 and 3 of the CGC Sampling Systems Handbook and Approval Guide and completion of Appendix 9 of CFIA Directive D-10-02.

7.5 Manual Stream Sampling

7.5.1 General Procedures for Manual Stream Sampling

1. Select the appropriate location to take the stream sample. Optimally, this should be at the last step after conditioning and just before the product enters the container to be sealed.

2. Determine the sampling frequency required as specified in Appendix 1.
3. Ensure that the equipment does not select or separate the seed or grain during sampling due to size, buoyancy or chaffiness.
4. The entire cross-section of the stream must be sampled. Each pass of the sampling tool through the stream is defined as one sampling action to obtain one primary sample.
5. Sampling should be at regular intervals and should reflect the entire lot from the beginning of the lot to the end.

Compare each primary sample with the previously drawn samples to check the homogeneity of the lot, before adding to the composite sample. If the primary samples are not uniform as described in Section 6.3, discontinue sampling and take corrective action.

7.5.2 Manual Stream Sampling Equipment and Procedures

7.5.2.1 Hand scoop

The hand scoop (Figure 4) is a sampling device consisting of a rigid material scoop attached to a 50-100 centimetre-long handle which is stiff and durable. The sample collector capacity must be a minimum of 50 grams and not more than 200 grams.

- When manual stream sampling with a hand scoop off a belt, insert the sampling tool into the stream at an alternate point across the stream (left, middle, right) for each sampling action. The scoop should be placed into the flow of product "upstream" and matching the belt speed, moved "downstream", as the scoop is turned to fill with grain. Moving the scoop with the flow allows sampling of the appropriate location on the belt without splashing product or overflowing the scoop.

- When manual stream sampling free-flowing product, the scoop should be placed into the flow of product upside down, then rotated 180 degrees to fill, and then pulled out of the product flow.

Note: Each sampling action described above represents one sampling action.

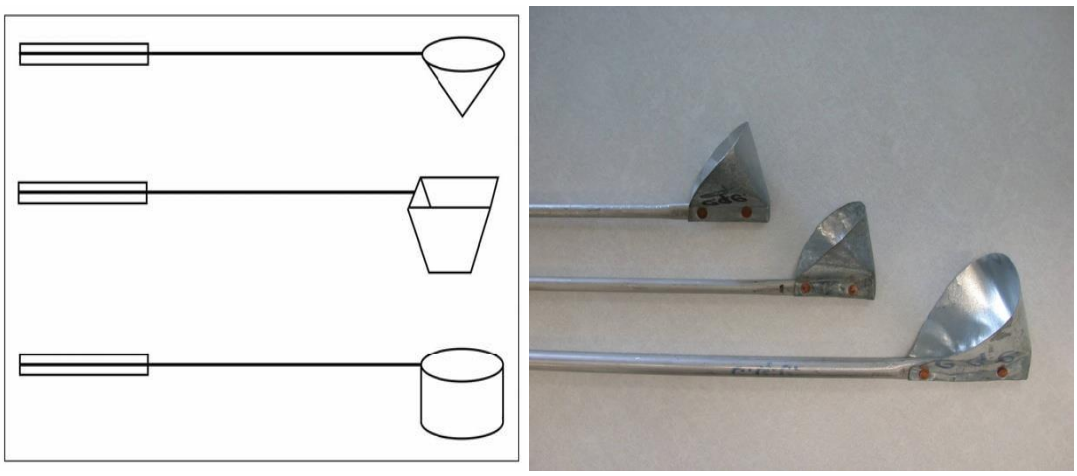


Figure 4. Hand scoops

7.5.2.2 Specific to Seed (LSSP and CGSP)

Pelican Type Sampling Tool

A Pelican-type sampling tool (Figure 5) can be used to sample seed for domestic sale or seed/grain for phytosanitary certification. To be acceptable, it must:

- have an opening at least two times larger than the largest diameter of the particles (seed and contaminants) in the lot;
- have sides tall enough to prevent particles from bouncing out;
- be of sufficient length to span the complete cross-section (side to side) of the stream;
- be of sufficient capacity to prevent any overflow when taking a primary sample; and
- be such that it can be cleaned properly between lots.

The Pelican-type sampling tool is often not acceptable for grain sampling because of the width of the stream is likely greater than the length of the tool.

To use the Pelican-type sampling tool, draw it once through the stream from back to front to ensure the entire cross-section of the stream is sampled. This is one primary sample.

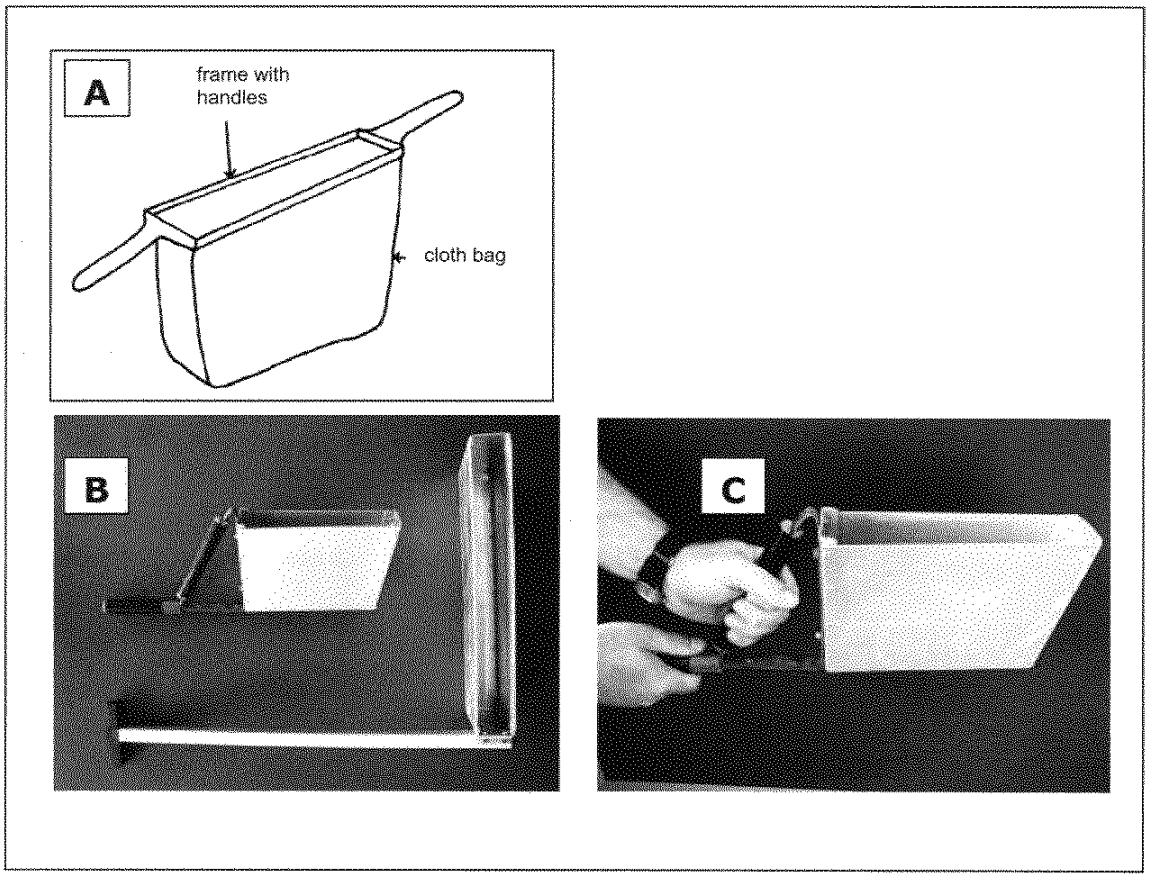


Figure 5. Pelican-type sampling tool

8. Reducing Samples for Submission

A composite sample is obtained by combining all the primary samples taken from a lot in such a manner that the composite sample is as homogenous as possible. The composite sample is normally more than the amount of product required for analysis and must therefore be reduced to an appropriate size for testing and/or grading. This must be done by mixing and dividing in a way that ensures the sub-sample obtained is representative of the composite sample.

If dividing a composite sample into various submitted samples for more than one program, ensure that the highest sampling intensity is used to meet the requirements of multiple programs.

8.1 Specific to Seed (LSSP)

The acceptable methods of mixing, reducing and dividing seed samples are provided in Appendices 4 and 5.

8.2 Specific to Grain (CCSP and ACSP)

The only acceptable method for mixing, reducing and dividing grain samples is provided in Appendix 5.

8.3 Specific to Seed and Grain (CGSP)

Acceptable methods for mixing, reducing and dividing samples for phytosanitary certification include all those listed in Appendices 4 and 5. Additional methods acceptable under the CGSP can be found in Section 4.5 of D-10-02.

9. Sample Packaging, Sealing, Labelling and Submission

9.1 Specific to Seed (LSSP)

See Chapter 3 of CSI Technical Manual for Approved Conditioners and Bulk Storage Facilities.

9.2 Specific to Grain (CCSP and ACSP)

All samples shall be submitted in sealed, tamper-proof containers. The most suitable container is an unused, clean cloth bag.

Each individual sample must be legibly labelled with the following information on the sample container or an attached tag:

- Container number(s) and lot number
- Sampling Location (facility)
- Shipper
- Date

Samples should be packed in sturdy containers to protect the samples and documents during transit, e.g. cardboard box, with packing materials such as newspaper, bubble pack, etc. or other shipping containers ensuring that the integrity of the sample is maintained.

If CGC inspection and certification of the lot is required, a 1-kilogram sample can be sent to the nearest CGC office. A submitted sample submission form must accompany the submitted sample. This form can be found on the CGC web site: http://grainscanada.gc.ca/pva-vpa/progams-programmes/sampling-echantillonnage/accspf-peaccl-eng.htm

9.3 Specific to Phytosanitary Certification (CGSP)

See sections 4.5 and 4.6 of CFIA D-10-02, The Canadian Grain Sampling Program.

Appendix 1
Sampling Intensity

Seed (LSSP)

Sampling seed lots in containers greater than 15 kg and less than 100 kg
Each sealed container (e.g. poly bag, paper bag, tin, and carton) is considered to be a unit for determining the number of containers in the lot. The pallets on which the product is stored are not considered separate units. The sampler must randomly select the containers for sampling based on the number of samples required as detailed Table A1.1 below.

Table A1.1 Primary samples required for seed lots in containers greater than 15 and less than 100kg

Lot Size	Minimum Number of Primary Samples to Be Taken
1 - 4 containers	Three (3) samples from each container
5 - 8 containers	Two (2) samples from each container
9 – 15 containers	One (1) sample from each container
16 - 30 containers	Fifteen (15) samples from the seed lot
31 - 59 containers	Twenty (20) samples from the seed lot
60 or more containers	Thirty (30) samples from the seed lot

Sampling seed lots in containers greater than 100 kg or from streams of product entering containers
The minimum number of primary samples to be taken is shown in Table A1.2. When sampling a seed lot of up to 15 containers, all containers must be sampled, and the same number of samples must be taken from each container.

Table A1.2 Primary samples required for seed lots in containers greater than 100kg

Lot Size	Minimum Number of Primary Samples to be Taken
up to 500 kg	At least five (5) samples
501 - 3,000 kg	One (1) sample for each 300 kg, but not less than five
3,001 - 20,000 kg	One (1) sample for each 500 kg, but not less than 10
20,001 kg and above	One (1) sample for each 700 kg but not less than 40

Example: The seed lot is 6 containers of 1200 kg each (6 x 1200 = 7200 kg).

One primary sample must be drawn for each 500 kg.

7200 kg/500 kg = 14.4 samples which must be rounded up to 15.

15 samples from 6 containers = 2. 5 samples from each container which must be rounded up to 3. Therefore, 3 samples must be taken from each container.

Example: The lot is 25 MT sampled by manual or automatic stream sampling just prior to bagging.

One sample must be drawn for each 700 kg.

25,000kg/700 = 35.7 samples rounded up to 36.

The flow of the stream is such that the 25 MT lot will be finished bagging in 45 minutes.

45 minutes/35 samples = a sample must be drawn every 1.3 minutes.

Samples must be drawn from the beginning of the flow of the product until the end of the run, encompassing the full contents of the source container.

Sampling seed lots in containers smaller than 15 kg
For lots in containers smaller than 15 kg capacity, containers must be combined into sampling units not exceeding 100 kg, and each sampling unit of 100 kg be regarded as one container in Table A1.1.

Sampling Intensity – Grain (CCSP and ACSP)

Grain in Bags

Table A1.3 Primary samples required for grain lots in bags

Lot Size	Minimum Number of Primary Samples to be Taken
1 - 20 bags	All bags must be sampled
21-1000 bags	6% of all bags in the lot, but not less than 20 samples randomly selected throughout
> 1000 bags*	3% of all bags in lot, but not less than 60 samples randomly selected throughout

* Up to the maximum lot size of 10 containers

The composite sample must be a minimum of 1000 grams for submission to the CGC. However, if the sample is to be divided for multiple uses, the composite sample must be larger to ensure there is sufficient sample for all uses. Depending on the size of the primary sample taken by the sampling device, additional primary samples may be required to obtain a composite sample that is sufficient for all uses.

Grain in Totes

All totes must be sampled with a minimum of two (2) primary samples per tote whether stream sampling while the tote is being loaded or probed after the tote is filled, (maximum of 300 totes per lot).

Stream Sampling Bulk Grain in Containers

The sampling frequency is determined by the how much time is needed to load the grain and the lot size. The CGC requires a minimum of 5 samples per container, collected systematically at timed intervals, at least every 4 MT (maximum 10 containers per lot). If a larger composite sample is required, reduce the interval between primary sample collections throughout the entire loading process.

Example:

The grain lot is 2 containers of 20 MT each and will be loaded in about 30 minutes.

A minimum of 10 samples are required (40 MT ÷ 4 MT = 10).

A sample will be taken every 3 minutes (30 minutes ÷ 10 samples = 3)

The hand scoop to be used has a capacity of 200 grams. 10 x 200 grams = 2000 gram sample will be collected.

Sampling Intensity – Grain, Grain products and Seed for Phytosanitary Certification (CGSP)

Table A1.4 Primary samples required for grain, seed and grain products in bags*
Bags are generally considered to weigh <100 kg.

Number of bags	Number of Primary Samples
1 - 14	One sample from each bag
15 - 19	15
20 - 21	16
22 - 27	17
28 - 35	18
36 - 37	19
38 - 46	20
47 - 56	21
57 - 66	22
67 - 77	23
78 - 105	24
106 - 136	25
137 - 187	26
188 - 299	27
300 - 799	28
800 - 999	29
>1000	30

***** Under the CGSP, the maximum lot size that can be represented by a submitted sample is 300 MT for all sampling types.

Sampling of product in totes*

Totes are grain sacks generally weighing >100 kg.

All totes must be sampled, collecting a minimum of two (2) primary samples per tote. These samples may be taken using a trier/probe or by stream sampling during the loading of each tote.

* Under the CGSP, the maximum lot size that can be represented by a submitted sample is 300 metric tonnes for all sampling types.

Stream sampling* (automatic or manual)

The sampling frequency for stream sampling of bulk grain during the loading or filing of containers, railcars, trucks is determined by how much time is needed to load the grain and the total lot size. During the loading of a truck, container, railcar, or bin, samples should be collected systematically at timed intervals with a least one sample take for every 4 metric tonnes loaded. If a larger composite sample is required, the interval between primary samples should be reduced or a larger sampling cup used (applicable to manual stream sampling).

Example: The grain lot is 2 containers of 20 metric tonnes each, and will be loaded in about 30 minutes and will be stream sampled using a hand scoop.

A minimum of 10 samples is required (40 mt / 4 mt = 10 samples).

A sample will be taken every 3 minutes (30 minutes to load 2 containers / 10 samples = 3 minutes).

The hand scoop to be used has a capacity of 200 grams. 10 samples x 2000 grams = 2000 gram sample will be collected.

* The maximum lot size that can be represented by a submitted sample is 300 metric tonnes for all sampling types.

Appendix 2
Weights for Submitted Seed Samples
(LSSP)

At a minimum, the quantity specified for the test(s) requested must be submitted for testing.

When the composite sample submitted to the laboratory is for two or more of the following tests in this table, the size of the submitted sample must be, as a minimum, the total of the quantities stated for each test. For grade table XX, Purity and Germination have been separated into the testing required including ISTA, AOSA and M&P.

LEGEND:
P / G Purity and/or Germination
VV Variety Verification
ISTA International Seed Testing Association
AOSA Association of Official Seed Analysts
M&P Canadian Methods and Procedures for Testing Seed

Grade Tables	Crop Kind	P/G	VV
I	Wheat (common, durum)	1000	500
II	Barley, buckwheat, emmer, oat, rye, spelt, triticale, lentil, lupine, mung bean	1000	500
II. I	Sainfoin, vetches (hairy, Hungarian, common)	1000	300
III	Cereal mixtures	1000	n/a
IV	Industrial hemp	600	300
IV	Sorghum	900	125
IV	Sorghum-sudan grass hybrids	500	125
IV	Canarygrass	200	125
IV	Sudan grass	250	125
IV	Flax	150	125
V	Field bean, bean (broad, horse, tick and faba), corn (open-pollinated, synthetic), field pea, safflower, soybean, sunflower (open-pollinated), chickpea, cowpea	1000	500
VI	Corn (hybrid), sunflower (hybrid)	1000	500
VII	White mustard	200	100
VII	Oilseed rape, canola	100	100
VII	Cultivated mustard *(Brassica juncea*)	50	100
VII	Radish (oilseed or forage)	300 or 600	100
VIII	Subterranean clover	250	100
VIII	Proso and pearl millets	150	100
VIII	Cicer milk-vetch, crown vetch, foxtail or Italian millet	100	100
VIII	Crimson clover	100	100
VIII	Japanese millet	90	100
VIII	Kidney vetch	60	100
VIII	Red and sweet clovers, alfalfa and *Lespedeza spp.*	50	100

Grade Tables	Crop Kind	P/G	VV
IX	Black medick	50	100
IX	Strawberry clover	50	100
IX	Alsike, hop, Persian and white clovers, timothy	25	100
X	Bird's-foot trefoil	30	100
XI	Bromegrass (sweet), tall wheatgrass	300	100
XI	Intermediate and pubescent wheatgrasses	225	100
XI	Beardless wheatgrass	80	100
XI	Meadow and smooth bromegrasses	150	100
XI	Slender, streambank, northern wheatgrasses, tall oatgrass	80	100
XI	Western wheatgrass	150	100
XI	Various leaved fescue, annual, intermediate and perennial ryegrasses, crested and Siberian wheatgrasses, Russian wildrye	60	100
XI	Meadow and tall fescues, Altai and Dahurian wildryes	50	100
XI	Red and creeping red, Chewings, sheep, fine-leaved and hard fescues, meadow and creeping foxtails, orchardgrass, reed canarygrass	30	100
XII	Bentgrasses and redtop (*Agrostis* species), bluegrasses (*Poa* species), weeping alkaligrass, crested dogtail	25	100
XIII	Mixtures of forage seeds (kinds listed in Grade Tables VIII to XII)	200	n/a
XIV	Lawn or turf grass mixture	200	n/a
XV	Ground cover mixtures	200	n/a
XVI	Sugar beet, beet, Swiss chard, mangel	500	100
XVII	Cantaloupe, melon, cucumber, gherkin, pumpkin	150	100
XVII	Citron, squash, watermelon	1000	100
XVIII	Pop and sweet corn, garden, broad, lima and runner beans, garden pea, chickpea, soybean, sunflower and safflower	1000	500
XIX	Radish, forage rape (except oilseed), spinach mustard, mustard greens, rutabaga (swede)	300	100
XIX	Broccoli, Brussel sprouts, cauliflower, cabbage, collard, kale, kohlrabi	100	100
XIX	Chinese cabbage, turnip	70	100

Grade Tables	Crop Kind	P/G ISTA	P/G AOSA	P/G M&P
XX	Artichoke	900	500	25
XX	Asparagus	1000	500	25
XX	Cardoon	900	500	25
XX	New Zealand spinach	1000	500	25
XX	Spinach	250	250	25
XX	Okra	1000	500	25
XX	Rhubarb	450	420	12.5
XX	Salsify	400	380	25
XX	Eggplant	150	110	12.5
XX	Pepper	150	150	12.5
XX	Parsnip	100	50	25
XX	Cornsalad	70	50	12.5
XX	Garden cress	60	50	12.5
XX	Chicory	50	30	12.5
XX	Endive	40	30	12.5
XX	Dill	40	30	12.5
XX	Parsley	40	50	12.5
XX	Carrot	30	30	25
XX	Celtus/celtuce	30	30	12.5
XX	Dandelion	30	20	6.26
XX	Lettuce	30	30	12.5
XX	Sorrel	30	20	6.26
XX	Sage	20	210	12.5
XX	Chives	30	50	12.5
XX	Leek	70	60	12.5
XX	Onion	80	70	25
XX	Celery	10	12	6.26
XX	Celeriac	10	12	6.26
XX	Water cress	5	5	3.12
XX	Thyme	5	7	3.12
XX	Savory	20	15	6.26
XX	Tomato	15	50	12.5
XX	Chervil	60	65	12.5
XX	Rampion	1	0.6	3.12
XX	Tobacco	5	5	3.12

Appendix 3
Approved Triers by Crop Type
for Grain (CCSP and ACSP) and Phytosanitary (CGSP)

Table A3.1 Approved Triers by Crop Type for Grain (CCSP and ACSP)

Trier Size

Small	Nobbe or Double-sleeve trier with slot size width 8 mm to 14 mm
Medium	Nobbe or Double-sleeve trier with slot size width 15 mm to 19 mm
Large	Nobbe or Double-sleeve trier with slot size width 20 mm or greater

Crop Kind	Trier Size
Barley	Large
Bean, Field	Large
Bean, Faba	Large
Buckwheat	Large
Canola	Small
Chickpea	Large
Corn	Large
Flaxseed	Medium
Lentil	Medium
Mixed grain	Large
Mustard Seed	Small
Oat	Large
Pea	Large
Rapeseed	Small
Rye	Large
Safflower seed	Large
Solin	Medium
Soybean	Large
Soybean, Natto	Medium
Sunflower seed	Large
Triticale	Large
Wheat, Durum	Large
Wheat, Common	Medium

Table A3.2 Approved Triers by Crop Type for Grain and Seed (LSSP and CGSP)

Trier Size

Small	Nobbe or Double-sleeve trier with slot size width 8 mm to 14 mm
Medium	Nobbe or Double-sleeve trier with slot size width 15 mm to 19 mm
Large	Nobbe or Double-sleeve trier with slot size width 20 mm or greater

Crop Kind	Trier Size
Alfalfa	Small
Alkaligrass, Weeping	Small
Barley	Large
Bean, Field	Large
Bean, Faba	Large
Beet	Medium
Bentgrass	Small
Bluegrass	Small
Brassica spp.	Small
Bromegrass, Sweet	Large
Bromegrass, Meadow	Medium
Bromegrass, Smooth	Medium
Canarygrass, Reed	Small
Canarygrass	Medium
Chickpea	Large
Clover, alsike	Small
Clover, crimson	Small
Clover, red	Small
Clover, hop	Small
Clover, Persian	Small
Clover, strawberry	Small
Clover, subterranean	Small
Clover, sweet	Small
Clover, white	Small
Corn	Large
Cowpea	Large
Fescues	Medium
Flax	Medium
Foxtails	Medium
Lentil	Medium
Lespedeza spp.	Small
Medick, Black	Small
Milk-vetch, Cicer	Small
Millet, Proso	Small
Millet, Foxtail or Italian	Small
Millet, Japanese	Medium
Mustard, black	Small
Mustard, Oriental or Indian	Small
Mustard, white	Small
Oat	Large
Oatgrass, Tall	Medium
Orchardgrass	Medium
Pea	Large
Rape, forage	Small
Rapeseed, Oilseed Rape including Canola	Small
Redtop	Small
Rye	Large
Ryegrass	Medium
Sainfoin	Medium
Sorghum spp.	Medium
Soybean	Large
Soybean, Natto-type	Medium
Sudan grass	Medium
Sunflower	Large
Sweet clover	Small
Timothy	Small
Trefoil, Bird's-foot	Small
Triticale	Large
Vetch, Crown	Small
Vetch, Kidney	Small
Vetches	Medium
Wheat, Durum	Large
Wheat, Common	Medium
Wheatgrass	Medium
Wheatgrass, Crested	Medium
Wild-rye	Medium
Very chaffy grasses - Hand or stream sampling	

Note: Where sampling crop kinds other than those in this table, contact the CFIA.

Appendix 4
Obtaining Seed Samples
(LSSP and CGSP)

If multiple samples from one seed lot are required for different tests (e.g. P&G, VV, disease), the samples may be taken by mixing and dividing the entire composite sample to obtain each sub-sample required.

Mixing and Dividing Method

Sample reduction by appropriate mixing and dividing methods ensures that no more variation is introduced than what would be expected in simple random sampling. The following methods are acceptable to mix and divide the composite sample into approximately equally sized sub-samples which can be further divided until the desired weight for the submitted sample is reached.

Riffle Divider Method

A Riffle divider consists of a hopper with attached channels or ducts, a frame to hold the hopper, four receiving pans and a pouring pan. Alternating ducts or channels lead from the hopper to the collecting pans on either side. This divider is suitable for most kinds of seeds. Riffle dividers are available with a range of channel sizes; large channels for large-seeded crop kinds and smaller channels for small-seeded crop kinds.

The Riffle divider should always be used in a level position and be in good repair without any rough edges or deformations that may bias the mixing and dividing of the sample.

The composite sample must be removed from the container in which it was placed in such a manner that all seeds are retained. Therefore, if the composite sample is in:

- a cloth bag - carefully remove the contents and turn the bag inside out and check the seams for seeds. Seed with barbs, awns, hairs, etc. may adhere to the bag or become caught in the seams;
- containers (e.g. pails) - carefully remove contents and check for seeds adhering to the sides and bottom of the container.

The entire composite sample should be placed into a clean pail/seed scoop or one of the Riffle divider collection containers. Care should be taken when mixing and dividing pulses crops such as peas and soybeans, as the impact of the seed in the pan may cause seed breakage.

Weigh the Composite Sample

Weigh the composite sample before beginning the mixing and dividing process so that you can easily gauge the weight of the sub-samples obtained from each dividing step. Make sure that the weigh scale or balance is free of contaminants or other seeds.

Figure A4.1 Riffle Divider

Mixing Operation

Follow the following steps for mixing the composite sample:

Before starting

- Before each use, verify that the divider and four collection pans are clean by checking all channels, joints and seams of the divider and collection pans to ensure there are no seeds or other plant matter present.
- Place the riffle divider on a firm, level clean surface.
- Place two clean, empty containers under the channels to receive the seed.

Placing the Seed into the Divider for Mixing

- Pour the whole sample into the divider by running the collection pan back and forth along the edge of the divider so that all the channels of the divider receive an equal amount of seed.
- Replace the two full containers with two clean, empty containers.

This step is not considered a mixing step, but rather just loading the Riffle divider.

Mixing Process Now Begins

Pour the contents of one full collection pan into the divider by holding the long edge of the pan against the long edge of the riffle hopper and then rotating the bottom up so that the seeds pour across all channels at the same time; followed by the other full container using the same procedure. This is the first mixing step. Repeat this process of mixing the entire composite sample a minimum of two more times for a total of three times before beginning the dividing process.

Dividing

Once the sample is thoroughly mixed, the next pass through the divider begins the process of dividing the composite sample into sub-samples. Half of the sample (the contents of one of the two pans) may be set aside at any step such that smaller and smaller quantities are passed through the divider at each step until the desired weight is achieved.

The set aside portions can be re-combined and passed through the divider as necessary to obtain the required weights of the sub-samples for submission as long as the full amount of the set aside portion is used. It is incorrect to further sub-divide a sub-sample by pouring off a portion from it from the collection pan. Only a pass through the Riffle divider may be used to reduce the sample size at any step.

It is acceptable and even preferable to submit more than the stated sample weight for testing. The analyst will further subdivide the submitted samples to obtain appropriate sub-samples for their analyses. It is logistically impossible to obtain the exact weight prescribed for the submitted samples from a composite sample of a random weight. Using the correct procedure for dividing the sample to obtain sub-samples of approximately the right weight (a little over) is far more critical than obtaining an exact final sample weight.

Dividing to Obtain the Sub-Samples for Submission to the Laboratory

Follow these steps to divide the composite sample to obtain the required sub-samples.

- Set aside the contents of one full collection pan. Place clean, empty collection pans under each outlet and pour the contents of the other collection pan into the hopper by holding the long edge of the pan against the long edge of the riffle hopper and then rotating the bottom of the pan up so that the seeds pour across all channels at the same time.
- Repeat and continue the successive halving process until a sub-sample of not less than the minimum weight required is obtained.
- Set aside sub-samples can be recombined and/or re-loaded into the Riffle to obtain the required sub-sample weights provided that the whole of the sub-sample is used for re-combining or re-loading the Riffle divider (don't pour off a portion of the sub-sample, use the Riffle to mix and divide at every step).
- Continue this process until the all the required sub-samples are obtained.
- Ensure that the divider and containers are clean after each mixing operation. Check all channels of the divider, the joints and seams.

Care and Handling of the Riffle Divider

The Riffle divider must be placed on a firm, level surface when in use, and otherwise stored in a clean, dry environment. The divider and the collection pans must be un-damaged. Do not clean the divider or the collection pans by banging together or by using tools such as a mallet, hammer or knife. Wherever possible clean the divider and collection containers with compressed air. If the divider is being transported, it should be packaged in a padded box or carrying case. If the divider or collection pans are dirty or oily, they can be washed with warm water and mild detergent. The divider and the pans should be dried thoroughly with a soft lint free cloth that will not leave any residue and left to dry at least overnight.

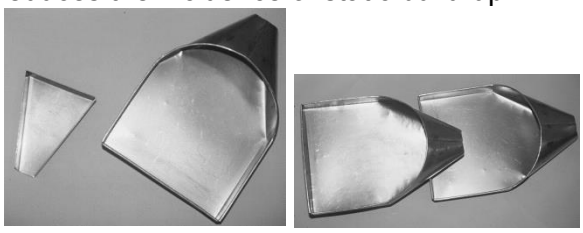
Hand Mixing/Spoon Method

This method is suitable for seed samples of a single species that are smaller than *Triticum* spp.. A tray, a spatula and a spoon with a straight edge are required. Pour the seed evenly over a tray (e.g. large cake pan) which is kept level at all times with a side-to-side swing, alternately in one direction then in right angles to it. This preliminary mixing should be repeated a minimum of three times. After the preliminary mixing, the seed is distributed evenly over the tray. The depth of the seed in the pan shall not exceed the height of the vertical sides of the spoon. Do not shake or bump the tray thereafter. With the spoon in one hand, the spatula in the other, and using both, remove small portions of seed/grain in the tray from a minimum of five (5) random places. Sufficient random sub-samples are taken to constitute a working sample of the required size (see Appendix 2).

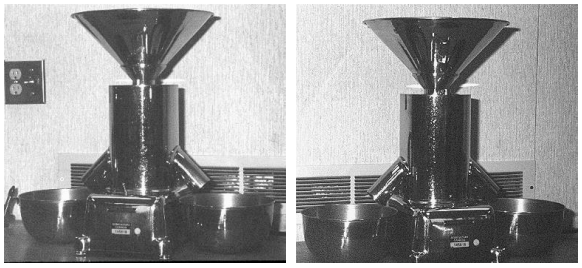
Note: Use of the Boerner-type divider (see Appendix 5) is also permitted for seed.

Figure A4.2 – Tools for mixing and reducing domestic seed samples

Seamless scoops, pans/pails Stainless steel or metal is recommended as this material reduces the incidence of static build-up.



Mixer/Divider Mechanical Gamet Type



Seamless Bread-Type Pans Stainless steel is recommended.

Appendix 5
Reducing Samples

A Boerner-type divider (Figure A5) is the only divider approved for use for samples submitted under the ACSP and the CCSP. It is a gravity-operated dividing apparatus that reduces a grain/seed sample. The sample is placed in the upper hopper and released by opening the valve in the hopper throat. The sample flows downward and is evenly dispersed over a cone with evenly spaced separations. The divided sample is reformed into two grain/seed streams which empty into two collecting pans at the bottom.

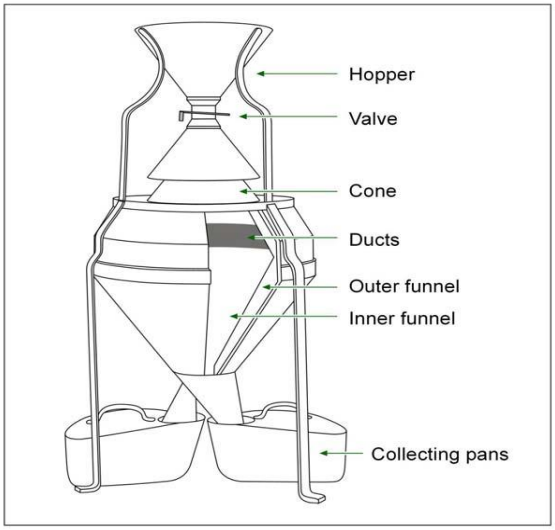


Figure A5. Boerner-type divider

Procedure for reducing samples using a Boerner-type divider:

1. Clean the divider and the collection pans.
2. Close the valve at the bottom of the hopper and place a collecting pan under each of the two outlets.
3. Pour the grain/seed into the hopper.
4. Open the valve quickly. The grain/seed will fall by gravity over the cone where it will be evenly distributed through the channels and spaces. The grain/seed is divided into two halves, with each part being collected in one of the two collecting pans.
5. To mix the grain/seed, take the collecting pans and repeat steps 2 to 4 at least once for free-flowing grain and at least twice for chaffy grain/seed.
6. For sample reduction, repeat steps 2 to 4. This will result in about one-half of the sample in each collecting pan.
7. If smaller sub-samples are required, repeat steps 2 to 4 with the content of one of the collecting pans. Always use the collecting pan from the same side.

Recommended procedure for cleaning a Boerner-type divider:

1. Clean the divider between reductions of different samples with a vacuum cleaner or compressed air.
2. To keep the surfaces smooth, wash the conical divider once a year with soap and water. Instruments made of brass can be kept bright by wiping with citric acid.