FIELD INSPECTION OF SEED UNIT

A Unit Standard for the Seed Industry

Unit Standard 114680
NQF Level 4
Credits: 9

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SAN S O R

Learner Name:
Learner Number:
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### US: Field inspection of seed unit

#### Unit Standard Specific Outcomes

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UNIT 1: FIELD INSPECTION OF SEED UNIT

1.1 Purpose

The field inspection of growing seed crops is important to ensure that the seed crop shows the characteristics of the variety which it claims to be and to ensure there are no circumstances which might be prejudicial to the quality of the seed to be harvested. The function of the inspector is to regularly report the state of the crop at the time of inspection. Field inspection is important in assisting the seed grower with technology and know-how to:

- Grow vegetative material e.g. bulbs and transplants, where applicable
- Store and transport vegetative material, where applicable
- Prepare the crop land
- Plant the crop
- Grow the crop and spot problems
- Deal with isolation and contamination issues pre-emptively
- Deal with pollination issues
- Bring the seed crop to maturity
- Harvest the seed crop
- Dry the seed adequately
- Pre-clean the seed
- Deliver the crop

These aspects require frequent visits, good record keeping, communication with grower and work site colleagues, follow up on agreements with the grower, adherence to undertakings to assist and a commitment to life-long learning.
1.2 Preparing for Crop Inspection

Various different instruments and documentation must be collected and prepared prior to a field inspection. The person responsible for such an inspection should follow the appropriate work site procedures to prepare accordingly for a field inspection. Listed below are some general items to prepare and collect prior to inspection, but a complete list must be compiled using the appropriate work site procedures.

- Measuring devices such as hand counter and/or wheel counter.
- Writing pad, clipboard, pens, notebook.
- Specific Work Site Instructions for the crop kind to be inspected.
- All applicable regulations and procedures.
- Variety description for the crop to be inspected.
- Detailed map of the assigned area.
- Plastic bags and envelopes for saving plants/heads for confirmation of identity, hand lens/magnifying glass.
- Report of Seed Crop Inspection.
- Required personal protective equipment.

1.3 Frequency of inspection

The area of production should be inspected before planting and crop material. Seed crops must be inspected frequently during the growing season, at harvest and after harvest. There must be at least one inspection which is timed to allow the best opportunity to assess the seed unit overall. With many crops the ideal time for field inspections to be carried out is during the flowering period or immediately before dehiscence of the anthers. With some crops a vegetative inspection is also required and with others, observations at full maturity are essential. The various inspections that are required it will be clearly stated by the work site procedures.

The person conducting any field inspection should be provided with all information about the seed unit. The field inspector should be an expert in recognising the characteristics of the species which are used for distinguishing varieties, and have a sound knowledge of the varieties to be inspected and how to produce seed. The information provided should
include a description of the seed unit. Among others the cropping history of the field for previous years, if available, should also be provided.

For some crop species, there are minimum species purity standards in addition to those for varietal purity and these must be assessed at the time of crop inspection as prescribed in the work site procedures and statutory requirements.

### 1.4 Inspection principles

The field inspector should be provided with all the information about the seed crop he/she will be inspecting. The inspector should be an expert in recognising the characteristics of the species which are used for distinguishing varieties, and have a sound knowledge of the varieties to be inspected. The information provided should include a description of the variety or of the parental lines/components in the case of hybrid production. If applicable the cropping history of the field should also be available to the inspector.

The function of the inspector is to report the state of the crop at the time of inspection. The timing of the inspection may be such that some off-types may be hidden or difficult to identify, in which case a second or subsequent inspection might be required before a decision can be reached.

Although the technique of field inspection differs in detail depending on the particular features of each seed unit, the main principles for checking at field inspection are as follows:

(a) The previous cropping history of the field should be such that the risk of undesirable volunteer plants of the same or related species contaminating the seed crop is reduced to a minimum.

(b) The seed crop should be sufficiently isolated from other crops to reduce the risk of contamination with undesirable pollen.

(c) The crop should be physically isolated to prevent mechanical admixture at harvest.

(d) The seed crop should be isolated from sources of seed-borne disease.

(e) The seed crop should be reasonably free from weeds and other crop species, especially those whose seeds may be difficult to separate from the seed crop during seed processing.

(f) The seed crop should be free from seed-borne diseases.

(g) The seed unit should have the correct crop type.
(h) There should not be more off-type plants present than the statutory requirements and work site procedures allow.

(i) There should not be more plants of other species present than the statutory requirements and work site procedures allow.

(j) For hybrid varieties the proportion of male to female plants should be satisfactory and as defined by work site procedures. The physical or genetic emasculation (to remove the male reproductive organs (stamens) from a flower, for example to prevent self-pollination) of female seed-bearing plants should be effective.

1.5 Authentication

In order to authenticate the identity of the seed sown, growers should retain at least one label from each seed lot used to sow the crop. The grower must also display a second label of each seed lot used in the field, to be clearly visible to the inspector.

For hybrids, labels of the seed lots used for male parent and for female parent must be kept and verified. The purpose of this procedure is to check the details provided on the label against those on the crop inspection form, and to confirm the identity of the variety.

1.6 Previous cropping

The crop inspector should interview the grower of the seed crop concerning details of the previous cropping of the field. The grower should provide details relating to the crops grown on the field for the previous five years. Information about possible sub-division of a field in previous years, or any previous cropping with the same variety, can also be established at this time.

In the case of hybrid production, the same field cannot be used consecutively for the same species, to avoid the growth of fertile volunteers from hybrid seed production of previous years.

1.7 Identify crop type

The first function of the field inspection is to examine the seed crop as a whole to ensure it is consistent with the characteristics of the crop type and variety given in the official description. This is usually done by walking into the seed crop and examining a reasonable number of plants.
In the case of hybrid varieties, the inspector must be able to identify without difficulty the male parental line and the female parental line. He/she must check the varietal identity of each parental component using the corresponding official descriptions.

1.8 Condition of the seed crop

The field inspector should ensure that the crop are manage is such a way to give good yields of healthy and high germinating seed. In order to ensure good management practices the appropriate work site procedures and especially the application of work site know-how must be applied.

The difference between a good seed grower and a great one is the value they place on small details. The field inspector must ensure that seed growers focus on being timely in the field to carry out actions such as fertilisation and weed control.

After having examined the field as a whole, the inspector should examine the field in more detail, especially around the perimeter. Observations should be made for signs which would indicate that part of the field might have been sown with different seed or might have become contaminated, for instance, in field gateways or on headlands. Places in the field where sowing started should be located to check that the equipment used to sow the crop had been properly cleaned before use. Particular attention should also be given to the presence of other crop species, weeds, seed-borne diseases, and verification of isolation from sources of contaminating pollen. The field inspector should be able to identify seed units which are severely lodged, badly infested with weeds, stunted or poorly grown because of disease, pests or other causes.

1.8.1 Isolation

Isolation of the seed crop should be checked whilst walking around its perimeter. For crop species which are cross-pollinated by insects or wind, this will involve checking all surrounding fields for any crops lying within the minimum prescribed isolation distances which might cross-pollinate with the seed crop.

Where the isolation distance between the hybrid seed crop and a source of contaminating pollen is insufficient to satisfy the minimum requirements, the inspector must request partial or total destruction of the contaminating source so that the desired isolation distance is met.

When isolation is satisfied by the existence of a pollen barrier of the male parent of the hybrid around the crop to produce the hybrid seed, the inspector must be assured of the
coincidence (nicking) of flowering between the male and female parents. The minimum isolation distances should be given in the provided statutory requirements and work site procedures. A map of the seed crop and the surrounding crops, provided by the grower, should alert the inspector to potential sources of foreign pollen.

1.8.2 Variations

The variety description lists the morphological characteristics of the plant, variants within the variety, and their maximum acceptable population levels. Field inspection should not take place unless the inspector has a variety description for the crop being inspected.

Variations include but are not limited to the following:

- Volunteers
- Off-types
- Rogues
- Other deviating plants as described by work site procedures
- Row ratios male / female in hybrid seed production of certain crops
- Isolation distances

Other variations which relate to how the crop is growing, pollination conditions, harvest conditions, post harvest procedures should also be observed, reported and acted upon according to work site procedures.

The inspector should also look for volunteer plants (a cultivated plant, especially a crop plant that grows without having been intentionally sown or planted) or weeds, both in the seed crop and neighbouring crops, which could also be a source of contaminating pollen.

Checks should also be made to ensure that seed crops are isolated from other crops which may be infected with seed-borne diseases.

The variations within the seed crop will differ considerably in the ease with which they can be observed. Differences such as height, colour, shape, maturity are clearly identified but less obvious variations for example leaf shape, leaf hairiness, flower and seed characters may only be detected by examining a particular part of the plant. Larger samples can be examined for obvious variations than for those which are less obvious and these should be taken at random and from as wide an area of the field as possible.

The number of plant variations observed in the sample areas has to be related to the plant population. An estimate of the plant population can be obtained by counting the number
of plants or ear-bearing tillers in a row of 1 metre length, but in the case of broadcast crops in 0.5 m² areas.

The population per hectare for crops in rows can be calculated using the following formula:

\[ P = 1,000,000 \times M \times W \]

where \( P \) = the plant population per hectare

\( M \) = the mean number of plants per metre length of row

\( W \) = the width between rows (in centimetres)

Sampling procedures are based on the following assumptions: off-type plants and plants of other species are randomly distributed throughout the crop, and the counts of impurities follow the Poisson distribution. In probability theory and statistics, the Poisson distribution is a discrete probability distribution that expresses the probability of a number of events occurring in a fixed period of time if these events occur with a known average rate, and are independent of the time since the last event.

If there are patches of impurities in some parts of the field then the above assumptions become invalid. In such cases these patches should be excluded from the sampling areas and inspected separately.

In the design of sampling procedures when inspecting a maximum number of impurities per area standards, the risk of making a wrong decision is biased in favour of the seed grower, with a lower risk of the crop being wrongly rejected and greater risk that the crop might be wrongly accepted. In order to avoid this bias behaviour standing work site procedures and statutory requirements should be strictly adhered to.

### 1.9 Varietal purity: Requirements for all crops

Assuming crop location, authenticity, varietal identity, isolation and crop condition are all satisfactory, the final stage in the inspection is the assessment of varietal purity.

To do this it is necessary to follow a sampling procedure which will focus attention on small areas of the seed crop for detailed examination.

The number and size of these areas have to be related to the specific minimum varietal purity standards appropriate to the crop species and the category of seed being produced.

In deciding how many sample areas should be examined it is necessary to balance the requirements for statistical accuracy and the need for reasonable confidence in the result.
on the one hand, against the time available for making inspections on the other hand. This may involve a compromise in favour of reducing the workload for practical reasons and, as a result, the risk of reaching the wrong decision is increased. Generally, there is a bias in favour of accepting a crop which may have an impurity level greater than the desired standard, but this can be justified since the standards set for varietal purity are normally higher than is strictly necessary for commercial crop production.

The location of the sampling areas should be such that the whole field is effectively covered and means that the inspector should work by a pre-determined procedure. This, however, may have to be adapted to the shape and size of each field, to the particular features of each species, but in particular whether the standard for varietal purity is expressed as a percentage or as a maximum number of off-types per unit area.

The distribution of the sampling areas should be random and widespread so as to represent the whole crop and there should be no conscious selection of areas which appear to be any better or worse than the average for the crop. This can be achieved in practice by deciding on a pre-determined distance between each sample area but should also take account of the direction of drilling so that each sampling area should attempt to include a different pass of the seed drill.

### 1.10 Varietal purity: Additional requirements for hybrid crops

When inspecting crops to produce hybrid varieties, the inspector must be assured, before verifying the varietal purity of the male and female components, that there has been no accidental mixing of the two component rows.

In the case of maize, sorghum and sunflower hybrid seed production, purification by roguing is an acceptable method for obtaining varietal purity for one or other of the two parents. In this case, the removal of plants aberrant for one or several characteristics must be done before any pollen is shed.

In the case of using the male sterility, the inspector must be assured of the absence of male fertile or partially male fertile plants in the female parent rows.

In the case of mechanical removal of the parent plant for the production of maize hybrid seeds, the inspector must be assured that it is applied before the female plants have shed any pollen, and above all before the stigmas of the female plants are receptive.
During the field visits, the inspector must be informed by the seed grower of the harvesting conditions to ensure there will not be any risk of mixing between the male parent and the female parent.

### 1.11 Sampling areas

The size and number of sampling areas will vary depending on the species to be inspected, the size of the field, whether the crop is drilled or broadcast, whether it is self or cross-pollinating and the geographical area in which the crop is being grown. In practice, the work site procedures will determine the appropriate size and number of sampling areas for each crop to guarantee that sufficient plants are examined in order to apply minimum standards for varietal purity.

In some crops grown for hybrid seed production, it is essential to examine all plants in the sample and to check not only for varietal purity but also that the standard for male sterility of the seed-bearing parent has been achieved.

For some crop species, there may be important distinguishing characters, which are described in the official description, but which are too small to be examined under field conditions. These characters could be critical in the assessment of uniformity of a variety and could indicate out-pollination, segregation or mutation in the seed lot. In such circumstances, plants could be examined more easily under laboratory conditions.
ANNEXURE 1: REFERENCES

This document does not claim to be an original publication. Various sources of information and documents were used when compiling this document. Any neglect to make reference of any source, including an author, web site or publication is not through intent. Such omissions should be brought to the attention of SANSOR, who will gladly rectify the omission.

www.inspection.gc.ca
www.oecd.org
www.seednews.inf.br
www.zsr.hr/seed
www.ilcrop.com
www.kscrop.org
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PURPOSE OF THE UNIT STANDARD

A learner who has achieved this unit standard will be competent in:

- Execution of field inspection on a seed unit for production of quality seed.

LEARNING ASSUMED TO BE IN PLACE AND RECOGNITION OF PRIOR LEARNING

To enter a learning programme for this unit standard or to be assessed against this unit standard, the learner is assumed to have:

- Understanding of the basic agronomic and breeding principles.
- Basic knowledge of seed production principles.
- Understanding of relevant statutory safety requirements in the workplace at NQF level 4.
- Literacy, numeracy and communication at NQF level 4.
- Introduction to seed industry and relevant workplace.

UNIT STANDARD RANGE

The learner is expected to perform the specific outcomes as reflected in this unit standard without direct supervision, but with access to work-site procedures, operating instructions and statutory requirements.

- Planting plan includes, but is not limited to: timing, actual dates, site map, parent ratios and plant populations.
- Variations include, but are not limited to: volunteers, off-types, rogues, other deviating plants, row ratios and isolation distances.
- Quality in seeds includes, but is not limited to: physical and genetic purity, vigour and high germination.
- Occupational Health and Safety (OHS), Act 36 of 1947 as amended and other relevant statutory health and safety requirements and work site procedures.

Specific Outcomes and Assessment Criteria:

SPECIFIC OUTCOME 1 Prepare for inspection.

OUTCOME NOTES Acquiring the planting plan, instructions and documentation according to work site procedures.

- Planning inspection, route and sequence according to work site procedures and statutory requirements.
- Selecting appropriate personal protective equipment (PPE) according to work site procedures and statutory requirements.
ASSESSMENT CRITERIA

ASSESSMENT CRITERION 1 Assessors will observe, confirm and evaluate evidence that will indicate that learners have demonstrated competence in each of the specific outcomes. In this unit standard the following specific criteria should be used:

- Consequences of not acquiring the planting plan, instructions and documentation according to work site procedures are explained.
- Consequences of not planning the inspection, route and sequence according to work site procedures and statutory requirements are explained.
- Importance of advising accurately on corrective action to be taken according to work site procedures is explained.
- Importance of advising accurately on the use of appropriate equipment according to work site procedures is explained.
- Implications of not identifying and reporting on deviations and informing relevant parties according to work site procedures are explained.
- Consequences of not completing documentation according to work site procedures are explained.

SPECIFIC OUTCOME 2 Inspect the seed unit.

OUTCOME NOTES Inspecting the seed unit at various stages according to work site procedures and statutory requirements.

- Informing relevant parties of variations according to work site procedures and statutory requirements.

ASSESSMENT CRITERIA

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- Importance of advising accurately on the use of appropriate equipment according to work site procedures is explained.
- Implications of not identifying and reporting on deviations and informing relevant parties according to work site procedures are explained.
- Consequences of not completing documentation according to work site procedures are explained.

SPECIFIC OUTCOME 3 Implement corrective action.

OUTCOME NOTES Advising on corrective action to be taken and appropriate equipment to be used according to work site procedures and statutory requirements.
Ensuring that corrective action is taken according to work site procedures and statutory requirements.

ASSESSMENT CRITERIA

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- Importance of advising accurately on the use of appropriate equipment according to work site procedures is explained.
- Implications of not identifying and reporting on deviations and informing relevant parties according to work site procedures are explained.
- Consequences of not completing documentation according to work site procedures are explained.

SPECIFIC OUTCOME 4 Complete inspection process.

OUTCOME NOTES Completing documentation and informing relevant parties according to work site procedures and statutory requirements.

ASSESSMENT CRITERIA

ASSESSMENT CRITERION 1 Assessors will observe, confirm and evaluate evidence that will indicate that learners have demonstrated competence in each of the specific outcomes. In this unit standard the following specific criteria should be used:

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- Implications of not identifying and reporting on deviations and informing relevant parties according to work site procedures are explained.
- Consequences of not completing documentation according to work site procedures are explained.

UNIT STANDARD ACCREDITATION AND MODERATION OPTIONS

An individual wishing to be assessed against this unit standard may apply to an assessor accredited by SETASA.

Any training provider offering learning that will enable achievement of this unit standard must be registered and accredited by SETASA.

Moderation of assessment will be done by SETASA in its ETQA capacity at its discretion.
UNIT STANDARD ESSENTIAL EMBEDDED KNOWLEDGE
General knowledge of seed production and inspection principles.
  ➢ Knowledge and theory of operation of cultivation equipment.
  ➢ Knowledge and theory of applicable software and or methods for recording data.

Critical Cross-field Outcomes (CCFO):
UNIT STANDARD CCFO IDENTIFYING
Identify and solve problems by applying seed production principles.

UNIT STANDARD CCFO WORKING
Work effectively with others with whom the relevant function interfaces.

UNIT STANDARD CCFO ORGANIZING
Organise and manage oneself when preparing for inspection.

UNIT STANDARD CCFO COLLECTING
Collect, analyse and organise information when recording data on inspection.

UNIT STANDARD CCFO COMMUNICATING
Communicate with others in the process of reporting variations to relevant parties.

UNIT STANDARD CCFO SCIENCE
Use science and technology when inspecting.

UNIT STANDARD CCFO DEMONSTRATING
Understand the world as a set of related systems, when working with chemicals and genetic material.
UNIT STANDARD NOTE

Values

All learners should demonstrate:

- An application of company ethics, values as well as general safety and customer care principles.
- An awareness of expectations and obligations of basic worker/management and industrial relationships.