I.
Product Knowledge

Topic 20b

Basic Seed Tests

FACT SHEET

I. Product Knowledge

Topic 20 b: Basic Seed Tests

In the commercial farming industry, seeds are tested in laboratories. But there are also simple ways to conduct some of these tests anywhere on a farm or settlement. There may be a wait before the results are known, but a lot of money can be saved in the end.

You can conduct the following tests:

1. **Variety characteristics test**: To know the type of seed.
    a. Length and shape test
    b. 1,000 seed weight test
2. **Moisture test:** To know if the seed is suitable for storage.
    a. Electronic moisture test
    b. Drying oven method
3. **Impurity test**: To know if there are any weed seeds, other crop seeds, or any other matter.
4. **Germination test**: To know if the seed is alive and will germinate.

1. Variety characteristics tests

Variety characteristics consist of **seed factors** (length, shape, and weight) and **crop factors** (adult plant height, time from germination to maturity, plant color, and plant shape). With a basic seed test, the seed sample is compared with the published standards (this is how it should be). Any significant deviation indicates that the sample is not what you thought it was. Below are two simple tests to check variety characteristics:

a. Length and shape test:

1. Collect a random sample from the bag of seeds.
2. Count 20 seeds from the sample.
3. Measure the length of each of the 20 seeds.
4. Check the shape of each of the 20 seeds.
5. Compare the results against the published length and shape of the variety.
6. Draw a conclusion.

Example:

Characteristic	Published	Tested
Length	5mm (short)	15 seeds measure 7.5mm
Shape	Round	15 of the seeds are slender

Conclusion: Three-quarters (75%) of the sample is not in line with the published characteristics. The deviation is significant. It is very likely that this seed is not good quality.

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b. The 1,000 seed weight test:

1. Collect a random sample from the bag of seeds.
2. Count 1,000 seeds from the sample.
3. Weight the 1,000 seeds. This is the sample's 1,000 seed weight.
4. Compare it to the published 1,000 seed weight for this seed variety.
5. Draw a conclusion.

Example:

Characteristic	Published	Tested
1,000 seed weight	750 grams	745 grams

Conclusion: The sample weight is almost the same as the published weight for 1,000 seeds. The outcome of one test does not guarantee good quality seeds, but it is positive that at least one aspect matches the published data.

2. Moisture test

Too much moisture can damage seeds during storage. The **longer** the seeds are to be **stored**, the **lower the moisture** percentage must be. There are two ways to test the moisture content of seeds:

a. Electronic moisture testers

Collect a sample of the seeds and follow the instructions in the tester's manual. Electronic moisture testers are very accurate, but they need to be calibrated periodically.

b. Drying oven method

You will need an oven to conduct this test. This method takes much longer than the electronic tester but it is also very reliable:

a. Set the oven to 130° C.
b. Randomly collect three 100-gram samples from the seeds.
c. Place the three samples in the oven and leave them for 20-24 hours.
d. Weigh each sample separately.
e. Calculate the moisture content of each sample (initial weight minus weight after the oven). The answer is the percentage of moisture in the seed sample.
f. Compare the moisture percentage with the recommended moisture content in your country.

Example:

	Sample 1	Sample 2	Sample 3
Initial weight	100 grams	100 grams	100 grams
Weight after time in oven	75 grams	73 grams	76 grams
Moisture percentage	100 – 75 = 25%	100 – 73 = 27%	100 – 76 = 24%
Recommended moisture percentage	26%	26%	26%
Conclusion	Good	Good	Good

3. Impurity test

This test checks for the presence of weed seeds as well as other impurities such as soil, gravel, etc.

1. Take a random sample of the seeds of 100 gram.
2. Put the sample on a flat surface.
3. Separate the crop seeds from the other seeds, weed seeds, and impurities.
4. Weigh the weed seeds and other crop seeds.
5. Weigh the impurities found in the sample.
6. Compare the results with the published minimum standards for this seed variety.

Example:

	Published	Tested
Total sample	100 grams	100 grams
After separating	97 grams of crop seeds 3 grams of impurities	88 grams of crop seeds 8 grams of weed and other seeds 4 grams of sand and gravel

Conclusion: There are too many impurities in the seed. This is not certified seed.

4. Germination test

A seed's essence is its ability to germinate and become a seedling. Without germination, a seed is useless. The following test can determine if the seed can germinate.

You will need the following equipment:

- Waterproof tray
- Water-absorbent material such as paper towels or cotton wool sheets
- Water

- One plastic bag

Take the following steps:

1. Take a random sample of seeds from the seed bags. A general rule is to take a sample from one-third of the total number of bags. For example, if there are six bags, you will take a sample of two bags.
2. Take at least 20 seeds from every bag.
3. Fold the absorbent material in half to form a double layer and put it on the tray.
4. Moisten the absorbent material, but do not make it too wet.
5. Put the seeds in between the folds of the absorbent material.
6. Put the tray in the plastic bag.
7. Close the bag but do not seal it completely (air has to come in).
8. Check the tray daily and keep the absorbent material moistened.
9. After 10 days, pull the tray out of the bag, and unfold the absorbent material.
10. Count how many seeds germinated.
11. Calculate the germination percentage by:

$$\frac{\text{Number of seeds germinated}}{\text{Total seeds tested}} \text{ X } 100 = \text{germination \%}$$

- A germination percentage of 90% and up is very good.
- A germination percentage of less than 60% indicates serious problems with the viability of the seeds.

Example:

	Sample taken
Number of seeds tested	30
Germinated seeds after 10 days	17
Dead seeds (not germinated)	13
Germination percentage	(17/30) x 100 = 56%

Conclusion: The germination percentage is very low. This seed is not good quality.

INSTRUCTIONS

I. Product Knowledge

Topic 20 b: Basic Seed Tests

Materials needed

- ☑ Flip-sheet board with flip-sheets
- ☑ Markers (1 black, 1 blue, 1 green, 1 red)
- ☑ Colored cards
- ☑ Example of published seed factor information
- ☑ 3 plastic rulers
- ☑ 3 samples of seeds containing 20 seeds each of a specific crop to be used for the length and shape test
- ☑ Small scale
- ☑ 1 seed sample containing 1,000 seeds from a specific crop
- ☑ 3 seed sample of seeds with impurities: seed mixed with weed seeds, small stones, and other seeds
- ☑ An electronic seed moisture tester (if available)
- ☑ A complete germination test kit: waterproof tray, water absorbent material, water and a plastic bag

Time needed:

1 hour and 30 minutes

Preparations:

- ☑ Flip-sheet with the heading *Basic seed tests*
- ☑ Flip-sheet with the heading *Seed tests* and the text:
  - *Length and shape*
  - *1,000 seed weight*
  - *Impurity*
  - *Electronic moisture test*
  - *Drying oven method*
  - *Germination*
- ☑ Kraft paper or other large piece of paper with the following table to note the results of the length and shape test:

Characteristic	Length	Shape
Published		
Group 1		

Group 2		
Group 3		

- ☑ Flip-sheet with the heading *1,000 seed weight test* and the text:
  - *Published weight: 800 gram*
  - *Tested weight:*
- ☑ If possible, prepare a germination test before the session. This will enable you to show the participants the real results of a germination test.
- ☑ The colored cards from topic 20a must remain on the wall

Set up

Attention:	Ask the participants if they would like to be a famous scientist who conducts important tests. Let's hope they say: Yes! Tell the participants that it is their lucky day because today we will conduct some practical tests.
Title:	Tell participants the title while showing the flip-sheet with the title: *Basic seed tests.*
Credibility:	Explain your experience in seed testing.
Objectives:	To demonstrate six different basic seed tests.
Benefits:	With these simple tests, you can test seeds that you buy from suppliers and check if they are good quality. This can save you money.
Direction:	During this session, we will focus on six easy and practical seed tests.

Delivery

Explanation, **D**emonstration, **E**xercise, and **G**uidance:

1. Tell participants that the commercial farming industry uses laboratories to test seeds. But there are some simple tests a dealer or farmer can do as well. Show the flip-sheet with the test and give a short explanation of each:
   a. **Length and shape** test (variety characteristics test).
   b. The **1,000 seed weight** test (variety characteristics test).
   c. **Impurity test**: To determine if there are any weed seeds, other crop seeds, or other matter.
   d. **Electronic moisture tester**: To test the moisture to see if the seed is suitable for storage.
   e. **Drying oven method:** To test the moisture to see if the seed is suitable for storage.
   f. **Germination test**: To determine if the seed is alive and will germinate.

2. Tell the participants that we've learned that seed factors are very important characteristics of seeds. Certified seeds come with **published seed factor information** about the length and shape of the seeds and weight of 1,000 seeds. **Show** an example of published seed factor information.
3. Divide the participants into 3 groups. Tell them that for the duration of this session they will operate in the 3 groups.
4. Tell them that we will first do the **length and shape test**. Hand out the rulers and seed samples containing 20 seeds of a specific crop.
5. Ask the groups to open the samples, and check if they are the same **shape**. Allow a few minutes. They should write the results in their notebooks. The next step is to **measure** the seeds. They should write the results in their notebooks.
6. Ask the groups what they've discovered, starting with group 1. Note the results in the table. Add the published characteristics for the seed (if you do not have the official characteristics, make them up). Together, decide if the seed has **passed** the test.
7. Repeat the **process** for the **length and shape test**:
    a. Collect a random sample from the bag of seeds.
    b. Count 20 seeds from the sample.
    c. Measure the length of each of the 20 seeds.
    d. Check the shape of each of the 20 seeds.
    e. Compare against the published length and shape of the variety.
    f. Draw a conclusion.
8. Collect the rulers and samples again to avoid distraction from the other tests.
9. Tell the participants that the next test is called the **1,000-seed weight test**. Tell them that certified seeds have a published weight for 1,000 seeds. For the test, you will check the weight of 1,000 seeds and compare it to the published weight.
10. Tell them that you will **demonstrate** the 1,000-seed weight. Tell participants that the published weight is, for example, 800 grams. Show the flip-sheet with the heading *1,000-Seed Weight Test*. Take the scale and the sample containing 1,000 seeds, and weigh the sample. Write the weight on a flip-sheet behind the tested weight. Discuss if the seed passes this test.
11. Conclude by explaining the test **process** for the **1,000-seed weight** again:
    a. Collect a random sample from the bag of seeds.
    b. Count 1,000 seeds from the sample.
    c. Weigh the 1,000 seeds. This is the sample's 1,000-seed weight.
    d. Compare it to the published 1,000-seed weight for this seed variety.
    e. Draw a conclusion.
12. Tell the participants that we've learned that **crop factors** are very important characteristics of seeds. Ask if someone can repeat the crop factors: the height of the adult plant, time from germination to maturity, plant color, and plant shape. Tell them that all these factors were already tested before the seed variety was released into the market. This information is available, so the farmer has an idea of what to expect after germination.
13. Tell the participants that we've also learned about seed lot characteristics. Ask if someone can repeat these characteristics. Certified seeds have certain minimum standards for seed purity, moisture content, and germination ability.

14. Tell the participants that we will first discuss the **impurity test**. Hand each group a sample containing seeds mixed with weed seeds, small stones, and other seeds. Ask them to open the samples and sort the contents into three groups: crop seeds, weed and other seeds, and impurities such as stones. Allow a few minutes for the exercise.
15. Ask the groups what they've discovered, starting with Group 1. Ask them to estimate the percentage of crop seeds, weed and other seeds, and impurities. You do not have to write down the results.
16. Tell participants that the next step is to **weigh** all the crop seeds, weed and other seeds, and impurities. Ask one of the groups to give their example. Weigh the crop seeds, weed and other seeds, and impurities, and write the answers on a flip-sheet. Now tell them the published weight and compare it to your results. Draw a conclusion together.
17. Conclude the seed tests for **purity** by explaining the test **process**:
    a. Take a random 100-gram sample of the seeds.
    b. Weigh the sample to ensure that it is 100 grams.
    c. Put the sample on a flat surface.
    d. Separate the crop seeds from other seeds, weed seeds, and impurities.
    e. Weigh the weed seeds and other crop seeds.
    f. Weigh the impurities found in the sample.
    g. Compare the results with the published minimum standards for this seed variety.
18. Tell the participants that we will now discuss the test for **seed moisture**.
19. If you have an example of an **electronic seed moisture tester**, show it to the participants. Tell them that this instrument can measure the moisture in a sample of seeds. Use the seeds in the room to demonstrate the tester. Allow the groups to test the moisture themselves. If you do not have an example of a seed moisture tester, explain the instrument to the participants, and show them a picture.
20. Tell participants that you can also do this test without an electronic seed moisture tester. Explain the process of the **oven test**:
    a. Set the oven to 130° C.
    b. Randomly measure three 100-gram samples from the seeds.
    c. Place the three samples in the oven and leave them for 20–24 hours.
    d. Weigh each sample separately.
    e. Calculate the moisture content of each sample (initial weight minus weight after oven). The answer is the percentage of moisture in the seed sample.
    f. Compare the moisture percentage with the recommended moisture content in your country.
21. Tell the participants that we will now look at the last test: the **seed germination test**. Ask why a seed germination test is important. Lead their answers to: It is vital to know the germination ability of seeds before they are planted. If only half of the planted seeds germinate, the other half are worthless, and you will lose clients.
22. **Demonstrate** the germination test to the participants step by step and explain the process while showing:

a. Take a random sample of seeds from the seed bags. A general rule is to take a sample from one-third of the total number of bags. For example, if there are six bags, take a sample of two bags.
b. Take at least 20 seeds from every bag.
c. Fold the absorbent material in half to form a double layer and put it on the tray.
d. Moisten the absorbent material, but do not make it too wet.
e. Put the seeds in between the folds of the absorbent material.
f. Put the tray in the plastic bag.
g. Close the bag but do not seal it completely (air has to come in).
h. Check the tray daily and keep the absorbent material moistened.
i. After 10 days, pull the tray out of the bag, and unfold the absorbent material.
j. Count how many seeds germinated.
k. Calculate the germination percentage by:

$$\frac{\text{Number of seeds germinated}}{\text{Total seeds tested}} \times 100 = \text{germination \%}$$

- A germination percentage of 90% and more is very good.
- A germination percentage of less than 60% indicates serious problems with the viability of the seeds.

23. If you have prepared a germination test show it to the participants.

Finish

Summary:	Give a summary by using the flip-sheet with all the tests.
Questions:	Ask if anyone has a question or comment.
Evaluation:	Ask them how to test for seed purity. Ask them how to test the moisture content of seeds. Ask them to name the different steps of a simple germination test.
Next step:	Now the participants can test seeds they buy from their suppliers. They can even show farmers how to test their own seeds.

Distribute the **fact sheet** to all participants.