

Participant Handbook

Sector
Agriculture and Allied

Sub-Sector
Agriculture Industries

Occupation
Seed Production and Processing

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**Seed
Processing Worker**

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Shri Narendra Modi
Prime Minister of India

“ Skilling is building a better India.
If we have to move India towards
development then Skill Development
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It is expected that this publication would meet the complete requirements of QP/NOS based training delivery. We welcome the suggestions from users, Industry experts and other stakeholders for any improvement in future.

About this book

This Participant Handbook is a knowledge and skill resource and is helpful in understanding the responsibilities of a Seed Processing Worker as per the Seed Processing Worker Qualification Pack (QP). Seed Processing Worker is responsible for Installation, Testing, and Commissioning of Seed Processing System at farmer's field for better income. The trainee will enhance his/her knowledge under the guidance of the trainer in the following skills:

- **Knowledge and Understanding:** Adequate operational knowledge and understanding to perform the required task
- **Performance Criteria:** Gain the required skills through hands on training and perform the required operations within the specified standards
- **Professional Skills:** Ability to make operational decisions pertaining to the area of work.

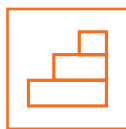
The handbook incorporates well-defined roles for Seed Processing Worker at field level. This job-role requires the participant to work independently and be comfortable in making decisions pertaining to his/her area of work. The participant should be result oriented and responsible for his/her own working and learning. The participant will be able to demonstrate skills of using various tools and decision making for instant problem solving.

We wish all the best to the participants for bright future in the Seed Processing Sector.

Symbols Used



Key Learning Outcomes



Steps



Time



Tips



Notes



Unit Objectives



Exercise



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1. Introduction

- Unit 1.1 – Importance of Seed crop production and processing
- Unit 1.2 – Methods of Harvesting and threshing
- Unit 1.3 – Seed Processing, Storage and Marketing



Key Learning Outcomes

At the end of this module, you will be able to:

- Discuss the importance of quality seed in improving the production level in the country as well as the popularization of newer varieties amongst the farmer.
- Explain about the difference in quality of a seed and the grain of the same crop / variety and to identify the most important character of a seed.
- Discuss the benefits derived by the farmer by using a quality seed.
- Identify the necessity of skill development for the seed processor to undertake quality seed processing

UNIT 1.1: Importance of Seed Crop Production and Processing

Unit Objectives

At the end of this unit, you will be able to:

- Explain the vital role played by quality seed in crop improvement and the critical role of seed in crop productivity as the basic input.
- Discuss as to why any development in the crop production and release of newer variety will not be useful to the farmers in the absence of a good quality seed of that variety.
- Compare the inter relation between seed quality and habitability of commercial produce at a higher price as planned by the farmer.

1.1.1 Introduction

The development of agriculture from olden days to till date is nothing but the history development of seeds of new crops and new varieties. This essentially means that seed is the basic requirement in the development of agriculture and food production. The importance of seed in improving production and productivity mainly depends on the quantity of the seed used by the farmers for crop production. The grain as such can't be taken and used as seed due to various reasons.

The important reasons are:

1. Grain will not have the viability and vigor required for a good germination and crop growth.
2. It will carry all weed seeds and insect eggs / fruiting bodies of fungus which will interfere with and affect the crop production.

In the olden days new variety or crop was introduced from selection of individual plants from a group of plants which are found superior in some character than the others. The introduction of such newly selected varieties however, had not yielded a fruitful result due to segregation in the population of newly introduced kind/ variety. Subsequently the achievements in the field of genetic and plant breeding led to introduction of more superior varieties. However for the farmers all these achievement were of no significance unless, he was given seeds of these varieties which are pure, true to type and resistant to pests and diseases. It has been scientifically proved that a good quality seed if grown with all inputs timely applied will lead to an increase in production by about 25% over a crop raised with non seed

The benefits or importance of quality seed can be summarized as below:

1. The quality seed has high return per unit area as the genetic potentiality of the crop can be fully exploited. The yield will be always higher compared to crop raised by sowing non seed.

2. Less infestation of land with weed seed due to the use of clean seed which is free from weed seed.
3. The incidence / damage due to pests and diseases will also be less due to healthy quality seed.
4. The quantity of seed used can be less due to good germination and uniform emergence of seedling from the quality seed.
5. The crop may escape many diseases and pests attack due to faster and healthier growth.
6. Response to the fertilizer applied to the crop is much significant in case of crop grown by using quality seed.
7. They can adapt well in any extreme condition due to higher viability and vigor as well as by the seed treatment with fungicides. microbial culture treatment.
8. There will be an uniform growth of the crop which will enable the farmers to undertake any of field operation in a systematic manner and covering all the area. Otherwise same operation need to given at different time in patches or in smaller field due to variation in the growth of the plants and difference in the growth stages.
9. The cost of production will be considerably lower due to clean field with not much weed seed and off type plants.
10. Due to the pure / good seed, the crop produced and the commercial produce obtained is also pure and free from any weed seed, insect damaged seed and other inert materials.

This good quality of the seed helps the farmers to make advance plan for post harvest operations.

Some of the advantages are:

1. Due to uniform crop condition farmer can easily assess the field potential of the crop and plan for operation like the harvesting in one go.
2. The cost of post harvest operation will less due to good quality of the grain and market value will also be higher due to quality.
3. He can also plan for marketing the grain at a higher rate due to its quality and organize trading accordingly.

The other aspect of importance of a good seed is that it is the cheapest input in the crop production and this basic input too. Without using a good quality seed for sowing any amount of other input application like the fertilizer, plant protection measures, irrigation etc will have no result in the final crop production.

Differences between seed and grain:

Sl.No	Seed	Grain
1	It should be a viable and vigorous one	Need not be a viable one
2	It should be physically and genetically pure	Not so
3	Should satisfy minimum seed certification standards	No such requirements
4	It can be treated with pesticide /fungicide to protect seed against storage pests and fungi	It should never be treated with any chemicals, since used for consumption
5	Respiration rate and other physiological and biological processes should be kept at low level during storage	No such specifications
6	Should be compulsorily certified	No such condition in grain production
7	It should satisfy all the quality norms	Not considered
8	Seed can be utilized as grain provided if it is not treated with poisonous chemicals	Grain never can be converted into seed.



Fig.1.1.1 Grain As Seed



Fig.1.1.2 Good Seed



Fig.1.1.3 Good Seed

Seed Processing

Seed can seldom be planted in the condition that comes from any seed producer because it contains lot of foreign material like the weed seed, pieces of stems, soil particles etc. The modern farmer needs such a seed which is free from physical mixture to obtain optimum productivity. Therefore the raw seed obtained from any seed production plot need to be cleaned. The quantity of the final seed mostly depends upon the efficiency of the processing methods employed. This depends upon the type of machines used and skill in processing the seed.

Seed processing therefore is an integral part of the technology involved in transforming the crop development.

Seed processing therefore encompasses all the steps involved in the preparation of harvested seed for marketing like handling shelling, preconditioning, drying, cleaning size – grading, upgrading, treating and packaging.

Seed growers and producers are dependant on the seed processor for preparation of their seed for marketing. The quality of the final product regard less of its inherent capacity to produce is directly related to the processors ability to remove contaminants and prepare the low quality seed to properly sized grade for precision planting, to treat the seed effectively and to prevent mechanical mixture of the seed with those of the other varieties / hybrids. In turn the processors ability to render these services efficiently and effectively is greatly affected by the types of processing and handling equipment available to him their arrangement with in the plant, his skill in operating them and his knowledge of seed characteristic and how they relate to processing.

As emphasized seed are processed to remove contaminants, to size- grade for plant ability, to upgrade quality through removal of damaged or deteriorated seed and to apply seed treatments materials. The demands of the seed producer and seed consumer require that these four objectives be achieved effectively efficiently and with minimal damage to the seed.

A variety of equipments are available for processing seed. They range from the simple winnowing tray which is still used in many areas to complex and highly sophisticated equipment such as the electric sorting machines. Although variable in types and design, all of them work on the same principal/ properties of seed processed by them about which we will discuss later in this book.

The choice of seed machines and / or sequence of machines for processing seed depend on the kind of seed being processed, the nature and kinds of contaminants, the quantity of each in the raw seed and the quality standards that must be met. Thus the processor must be as familiar with standard and seed characteristics as he is with processing equipments.



Fig.1.1.4 Seed processing plants of different capacity



Fig.1.1.5 Seed processing plants of different capacity

A flow chart illustrating types of material that are removed from seed during processing is given below.

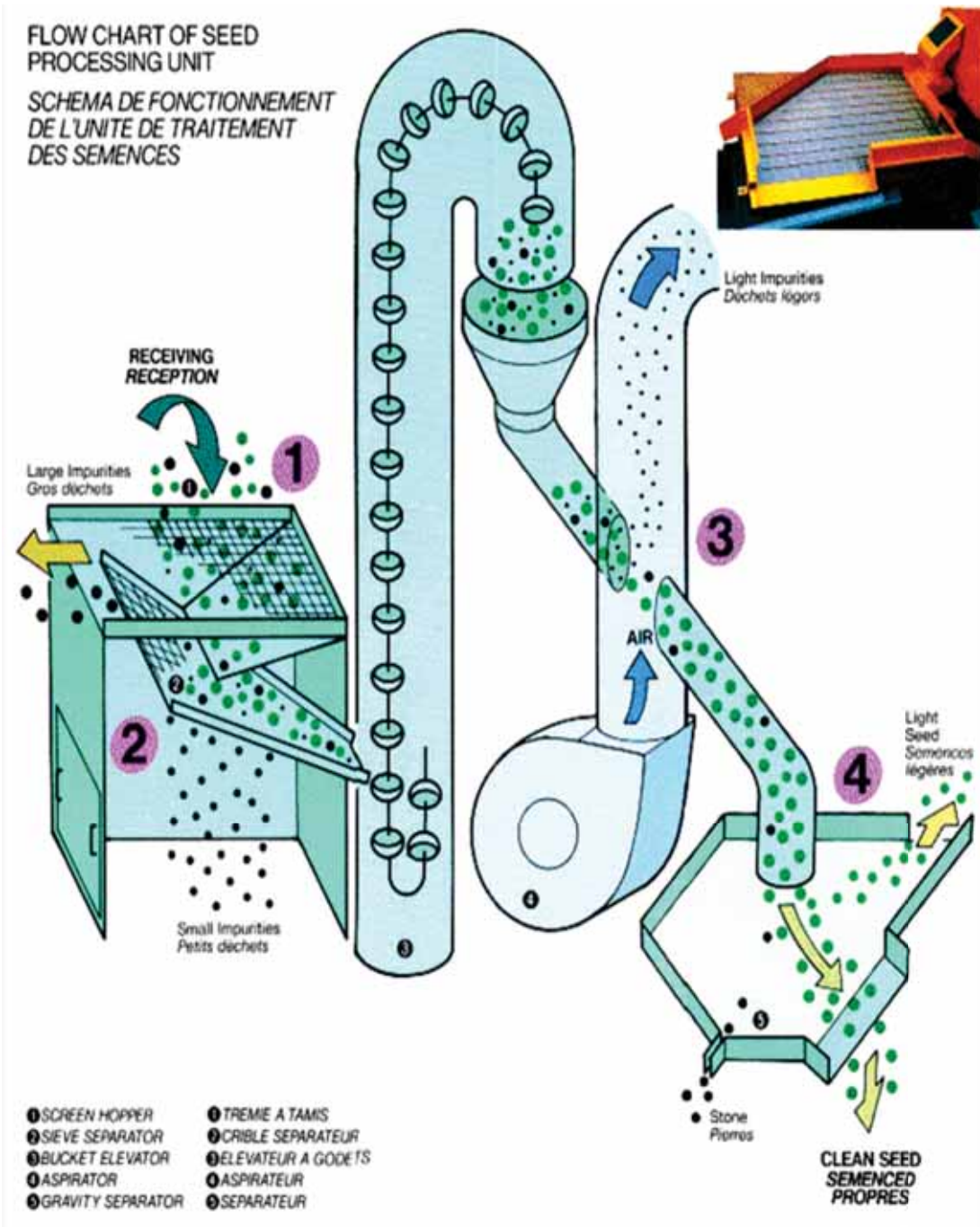


Fig.1.1.6 Seed movement /basic steps in seed processing plant

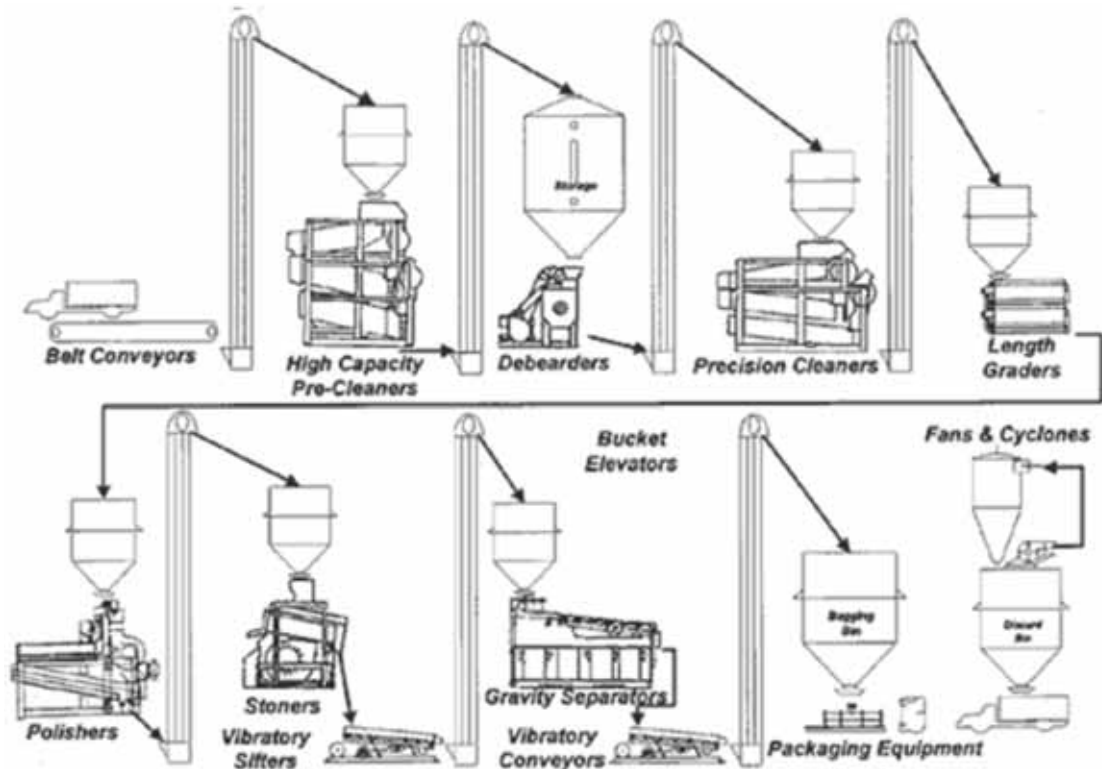


Fig.1.1.7 Seed movement /basic steps in seed processing plant

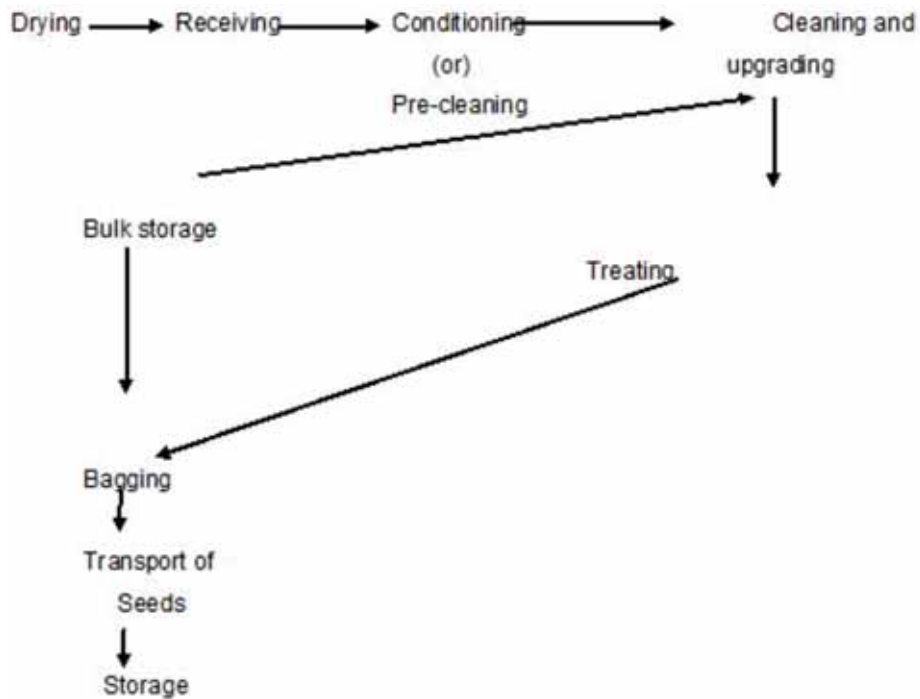


Fig.1.1.8 Seed movement /basic steps in seed processing plant

Summary of procedure for processing of certified / foundation seed.

- a) Seed delivery from the seed producer after harvesting as raw seed should accompany the processing certificate issued by the certification officer.
- b) Storing the unprocessed seed in the temporary storage: It should be maintained lot wise with a label to identify the lot from others.
- c) Main cleaning: Cleaning of the pre cleaner , air screen cleaner and other cleaning equipments to ensure no admixture of other crop seed or variety takes place.
- d) Sampling and uniformity: Seed lot should be properly processed to achieve uniformity and sample should be drawn by the certification officer for testing. The processed seed should be kept in bulk lot wise (If the quantity of the variety is more than the approved quantity for each crop) in bulk with proper labeling.
- e) Packaging and labeling Seeds of those lots passed in the test must be packed as per the approved procedure and attachment of certification label for certified / foundation seed accordingly and attachment of producer label along with the certification tag giving the details of production area, crop, variety etc.
- f) Storing the certified seed in storage godown under scientific condition.
- g) Reprocessing of any lot which failed in the first test. This lot is considered as provisionally rejected lot.

Seed failed in the testing by the seed testing laboratory of the seed certification agency may be reprocessed, if the previous results are within the permissible limit. After reprocessing and retesting, if the seed lot meets the standard , it is taken for packaging and certification by issuing certification tag.

Incase of seeds of the same variety produced by more than one grower and if the quantity exceeds the approved quantity, all the seed is stored in bulk prior to final packing.

Outright rejection of seed:

Seed lot which fails in the second test will be rejected out right and will be allowed only for commercial sale.

The major advantages of seed processing .

1. Uniformity – in planting and rates due to sizing and removal of seed appendages.
2. Increase the value of the seed for marketing due to improved seed standard.
3. Prevention of spread of weed seed in new areas
4. Maintain physical purity by removing other crop seed
5. Protection of the crop against pests and diseases through seed treatment
6. Reduction in seed losses by removing high moisture foreign material and by drying seed which contain high moisture.

The above benefit through processing will amplify the important role of processing in good seed production.

This hand book covers all the above aspects of seed processing. The main features and component parts, principles of separation, uses and operational procedure for some of the machineries and stages of processing have been discussed in the coming chapters.

Exercise



1. How can you assess and confirm whether the seed material given to you for sowing is a quality seed or not.

Answer:-.....
.....
.....
.....

2. What will be the effect of sowing a grain instead of seed on the commercial grain production.

Answer:-.....
.....
.....
.....

3. Can we use a raw seed for planting as seed. If not what are the reason for the same.

Answer:-.....
.....
.....
.....

4. Will you be able to draw conclusion by observing the germination status of a crop in the field as to whether seed or grain was used for sowing? How.

Answer:-.....
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.....
.....

5. Can you list the steps involved in seed processing.

Answer:-.....
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.....
.....

6. What are the requirements for a quality seed processor to be successful?

Answer:-.....
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.....
.....
.....

UNIT 1.2: Methods Of Harvesting and Threshing

Unit Objectives

At the end of this unit, you will be able to:

- Explain basic idea of forming seed lots and the use of the seed lot to trace the actual location of production
- Recognise the parts which makes a seed lot and the procedure for the construction of seed lot
- Discuss about the relevance of seed lot number while receiving the seed from the field for processing and the basic principle involved in deciding the quantity for each seed lot.
- Describe the role of seed certification agency in deciding the seed lot, lot size and further monitor
- Compare the performance of the seed stock after marketing keeping the seed lot as the basic information.

1.2.1 Methods of Harvesting

Harvesting is the process of removal of the fruiting bodies / economic produce from the plant. The knowledge about maturation is essential to maintain quality.

Advantages of correct method of harvesting:

- (a) Seed quality will be more.
- (b) Seed yield will be protected without shattering loss.
- (c) Processing loss will be reduced
- (d) Improves the seed marketability.

What is physiological maturity

Physiological maturation is the stage at which the dry matter accumulation of the seed will be the maximum and it will be associated with maximization of seed germination and vigor.

The attainment of physiological maturation is represented by duration of the crop and by visible symptoms. It is the duration which is the time taken for maturation from fertilization.

Methods

Based on the type of crop, the harvesting may be either single time or multiple times.(eg) harvesting of wheat & rice is done one time when the seed crop matures and multiple harvesting is the harvesting of (picking) of cotton kappas at different times. Now we may see the details of single harvesting.

Harvest

This method may be adopted either manually or mechanically.

Manual harvesting single time.

Manual harvesting is done mainly for smaller area of seed production like nucleus seed or breeder seed. This is done when the crop attains full maturity.



Fig 1.2.1 Manual Harvesting



Fig 1.2.2 Manual Harvesting

Mechanical harvesting

When the seed production area is larger (i.e) large production of wheat, paddy or any other crop which mature evenly at a single time, combine harvester is employed to attend harvesting.



Fig 1.2.3 Mechanical harvesting

Multiple Picking Harvesting

It is practiced in case of vegetables or crops like cotton in which the maturity of the economical crop takes place at different spells.

Even in case of pulses, some time matured pods are picked at different intervals.

Mechanical Harvesting

It is done mainly as a single or as once over harvest. Care should be taken to avoid injury to the seed by adjusting the blade size, space between adjacent blades and speed of harvesting by the machine.

Manual Harvesting

It is done by two methods which is single harvest or periodical harvest. In case of single harvesting, the matured seed crop is harvested once and taken for threshing. In case of more than one harvest which is normally called as picking the same is attended more than one time as and when the economic part of the plant matures.

The criteria used for devising the crop maturing and date of harvesting for some important crops are as follows.

Paddy:- When 90% of the panicle turns yellow, when the moisture of the seed in the panicle is less than 20%.

Wheat :- leaves and stem turns yellow and become fairly dry, when the seed moisture is about 15%

Maize :- The sheath covering the cob (husk) turns yellow 25 – 30 days after tasseling, when grain moisture is less than 20%

After assessing the correct physiological maturity of the crop, proper method should be adopted and seed crop should be harvested.

Threshing

The separation of the seed from the harvested plant is called threshing. Threshing is also done either by manually or by machine like threshers. There are two methods of threshing.

- 1) Removal of the seed from the fruit which is called threshing.
- 2) Extracting which means collecting the seed from fruits.

In manual threshing the harvested plant part with seed as ear head is beaten on the threshing floor by taking it as bundles. Some time the ear head is beaten by wooden pallets to remove the seed or by moving the cattle on the harvested plant part which is spread over the threshing floor. Sometimes tractor with pneumatic wheel is moved on the plant stalk to remove the seed from the ear head.

Mechanical Threshing

This is done by using various types of threshers operated either by electricity or by diesel engines. The threshers with beating arms is operated and the harvested produce is fed in to the thresher where the beating by the rotating arms separates the seed from the ear head. There are various types of threshers for threshing wheat, paddy, soya bean etc.



Fig 1.2.4 Manual Threshing



Fig 1.2.5 Mechanical Threshing

For ground nut, a machine called groundnut stripper is used to separate the pods from the harvested crop.

In case of maize, a Sheller to remove the seed from the cob is used.

There are certain specific extraction techniques which are as follows.

- (a) Shelling of maize
- (b) Ginning of cotton
- (c) Decorticating of cotton seed
- (d) Decorticating which is used to remove the ground nut kernel from the pods.

Extraction of seed from wet fruits:

This is adopted mainly for extraction of seed from vegetables like tomato and fruits like water melon, papaya etc. There are various methods of wet extraction.

- 1) Manual methods :-** in which the seed is scooped out from the cut fruit, cleaned and dried immediately.
- 2) Fermentation method:-** In this method harvested fruits are allowed to ferment by mixing water or acid etc and allowed for sufficient time for the fruits to ferment. After fermentation the seeds are removed from the fruit pulp by repeated washing.
- 3) Mechanical method:-** For large scale seed extraction, mechanical seed extractors are used (e.g) tomato, brinjal, chilies etc.
- 4) Juice and seed extraction method:-** In the methods, calculated quantity of either alkali like sodium carbonate is mixed and allowed to ferment. After 48 hrs the seed is collected through repeated washing.

Similarly acid like hydrochloric acid is mixed at recommended dose with fruit pulp and allowed to ferment for ½ hour. The seeds are collected after repeated washing of the fermented pulp. Both these methods are used for extraction of seed from wet fruits like tomato, brinjal etc.

Post harvest losses of seed

There is a potential for loss of seed throughout the processing and handling of seed.

- (1) Loss may occur if the seed is harvested when it is over matured due to shattering and berating of the seed
- (2) In cases like maize, the loss may be more when the shelling by maize Sheller is undertaken. This may be due to over drying of the grains or due to improper stripping of the seed from the cobs.
- (3) There is a dangerous of threshing loss as a result of spillage, improper threshing of the ear heads.
- (4) It can also occur due to improper separation of seed from the chaff during cleaning or winnowing.
- (5) In case of using improper cleaning machine for proclaming or basic cleaning of the seed, there is ashtrays a risk of more loss of seed and reflect.
- (6) During drying there is a risk of cracking of seed due to over drying and the crashed seed will be flown away during. Harvey filature to dry the seed to optimum moisture level may lead to serious losses due to growth of mold and decay.

If the drying of smaller seed lot is done on the threshing floor, there is always a possibility of loss due to wind blow, strutting of the seed in the crevices. In sun drying using the threshing floor, loss due to rain, for / darn or unexpected heavy wind is also a possibility.

(7) Use improper screen sieves, old and ineffective processing machine may lead to serious loss either due to rejection of more of good seed as the under size or blowing of good quality seed through air duct.

(8) There is always a danger of loss in stages due to the following causes.

(a) Unhygienic storage condition storage godown which do not meet the standard for seed stage the oil mill godown, commercial produce stages places will lead to heavy growth of stages pest and stage fungus the mold through cross infestation / infection and will lead to exterior action of the seed. The factors which lead to loss during storage are being discussed in detail in the relevant chapter.

(b) Further storing the seed with and proffer verfilition in the storage godown and with ant proffer insulation of the roof of the storage structure will also lead to heavy loss.

(c) Another serious cause of post harvest loss is the damage by rodents.

(d) Improper staking or stanching of the seed in the storage godown with and using pallets or stanching of more bags beyond the permissible limit may also lead to germination failure of the seed or may lead to physical deterioration due to penetration of moisture frothier floor.

Methods to Avoid the Loss

There are number of steps to be taken to avoid the post harvest loss which are mainly as a preventive measure rather than prophylactic measure.

They are as follows.

1. Harvesting the seed crop at the appropriate time when the seed moisture is at optimum to allow very low loss.
2. Employing proper methods of harvesting i.e either manual or mechanical depending upon the nature of crop and area of seed production to be harvested
3. Arrangement for proper drying either sun drying or forced air drying to bring the seed moisture level on the safe limit.
4. Use of appropriate seed cleaning equipments to ensure minimum seed loss.
5. Attending seed treatment is required to ensure safe stages of the seed lot
6. Storage of the seed in a scientific and godown having proper system to monitor and maintain the temperature and relative humidity to avoid seed deterioration.
7. Precaution to protect the seed from rodent damage.
8. Regular and proper inspection of the seed lot and taking protective spray if the seed lot is found having insect or fungal damage.

Exercise



1. What is the need for allotting seed lot number

Answer:-.....

2. How many parts are there in any seed lot.

Answer:-.....

3. If there are a number of smaller quantity of seed produced by each seed producer, how will we make the seed lot?

Answer:-.....

4. What is the lot size for maize seed?

Answer:-.....

5. What is the maximum quantity permitted for one seed lot for crops whose seed is smaller than paddy?

Answer:-.....

6. If a seed lot fails at the field level after sowing, can you identify the source of that seed? How?

Answer:-.....

7. Who will permit you to move the seed from the storage after packing and tagging?

Answer:-.....

8. What is the name of the form issued for movement of the seed from storage? Who issues that form?

Answer:-.....

9. What would you do in case a seed gets rejected?

Answer:-.....

10. Why do you think that it is important to wait for test result?

Answer:-.....

UNIT 1.3: Seed Processing, Storage and Marketing

Unit Objectives

At the end of this unit, you will be able to:

- Explain how to check the raw seed received from the field keeping the lot number and total quantity of seed in each lot as reference
- Outline the basic principle involved in fixing the quantity for each lot for various crops
- Use lot number in identifying the location of seed production and details about the producer and processing plant.
- Explain why the seed need to be processed in the presence of seed certification officer as per his schedule

1.3.1 Seed Processing Storage and Marketing

Importance of Seed Lot

A seed lot is a physically identifiable quantity of seed which is homogenous in nature. Further it provides a number of information about the seed from the time of sowing the seed crop till processing and packing. The lot number has four parts and each will signify and conform to the details given as under.

- First part shall be called “Month – year” code
- Second part shall be called” production location code For the purpose each state / union territory has been given are numerical by the authority.
- Third part shall be called the “Processing plant” code for the purpose each state seed certification agency shall allot a numerical starting with 01- to each processing plant with in the state irrespective of to whom it belong to shall be.
- Four part shall be called “Seed produced code”. This will indicate ultimate serial number of a seed lot. (e.g.) Lot. No May 99 – 12.01.04.

The explanation is as follows:

MAY 99

Seed crop was harvested in May 99, – 12 The seed crop was raised in Madhya Pradesh

No 12- refers to MP state.

01- Seed processed in processing plant identified as number by the MP state seed certification agency.

04- Seed produce code which will trace to the particular unit of certification.

Lot size

A seed lot would represent any quantity of agricultural seed up to a maximum of 20000 kg for seed of the size of rice or larger (except maize, potato, sweet potato, yams, taw and chow chow for which the maximum size of the lot may be 40000 kg) and 10000 kg for seeds smaller than rice subject to a maximum tolerance limit of 5%. The quantity in excess of the above limit shall be subdivided and a separate lot identification shall be given. Seed processed shall not have seed of the size lower than the bottom screen used beyond 5% by weight.

Role of certification agency in issuing label and seed packing

In the process of certified seed production, the role of seed certification agency is of utmost importance as they are the authority to ensure that all seed standards are followed in the seed production. While their role in ensuring quality of field level ends with the harvesting of the seed crop, the role at the processing level starts when the harvested seeds are transported to the processing yard / plant for cleaning, packing and storing. The harvested seed can be moved only to the processing plant approved by the agency. Each lot of such seed must accompany with a harvesting report in the format given below.

Unless the harvesting report is provided by the agency, the raw seed can't be taken for further processing. Further the seed needs to be processed only in the presence of the seed certification officer concerned who will issue a schedule for processing in advance. The schedule however can be modified on the request of the producer / seed processor. The agency official can only draw the samples for testing from the cleaned lots to finalize the quantity of seed to be packed as certified / Foundation seed. As explained above, the lot number and other relevant information can be provided only by the agency to issue the tag.

Tips

- Same lot number may be given for the seed produced by different seed producers if the quantity of seed obtained from each producer is less than the maximum limit allotted for the crop.
- The second part of the lot number which represents the production location code has a lot number for each state. Even the union territories have also been given separate lot numbers.
- In case of crops like ground nut, potato, sweet potato etc the individual center where the grading and sorting is attended instead of a processing plant is treated as processing plant for assigning the processing plant code.

Exercise



1. What is the need for allotting seed lot number?

Answer:-.....

2. How many parts are there in any seed lot.

Answer:-.....

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8. What is the name of the form issued for movement of the seed from storage? Who issues that form?

Answer:-.....

9. What would you do in case a seed gets rejected?

Answer:-.....

10. Why do you think that it is important to wait for test result?

Answer:-.....

Notes



A large rectangular area with a thin orange border, containing 30 horizontal lines for writing notes.