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# Contents

- ▶ Overview Of Seed Quality Assurance Systems – Stages In Life Of Seed Plant, Elements Of Seed Quality In The Field And Laboratory
- ▶ Plant Variety Protection
- ▶ Registration Of Seed Related Institutions

# OVERVIEW OF SEED QUALITY ASSURANCE SYSTEMS – STAGES IN LIFE OF SEED PLANT, ELEMENTS OF SEED QUALITY IN THE FIELD AND LABORATORY

SEMIS COURSE ON  
NATIONAL PLANT PROTECTION ORGANISATIONS  
(NPPOs) AND SEED QUALITY HELD ON

14<sup>th</sup> to 19<sup>th</sup> Sep 2015 AT UoN

PRESENTED BY

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# INTRODUCTION

- Quality assurance (QA) is the means by which a seed company is satisfied that its product and service are:
  - a. maintained and enhanced
  - b. meet the customer and
  - c. corporate expectations
- Seed QA program provides a uniform and unbiased quality control system and marketing tool for their seeds
- Seed QA system makes everybody in the seed production and marketing chain responsible for seed quality.

# Introduction cont'd

- QA is usually achieved by:
  - a. Documented systems comprising policies and procedure, and defining the corporations quality position and policies
  - b. Setting formal standards for the characteristics of products and processes

# Introduction cont'd

- c. Formal monitoring processes provided by each company systemic review of the respective process to identify steps where defects or failure could be introduced into the process
- d. Development of process control around these critical points
- e. Auditing product and process to ensure compliance to and effectiveness of the program

# Introduction cont'd

- Purpose of seed QA
  - ❑ provide the customer with a sense confidence that factors impinging on the quality of seed have been identified and managed in a formal manner that is reflected at all levels in the seed company
  - ❑ Within the company, it provides employees with measurable performance objectives that tie in with the objectives and interest of the company

# Introduction cont'd

- QA provides protection by early warning of a disaster
- In QA systems quality is measured in the ability of a product or service to fulfill the needs of the customer



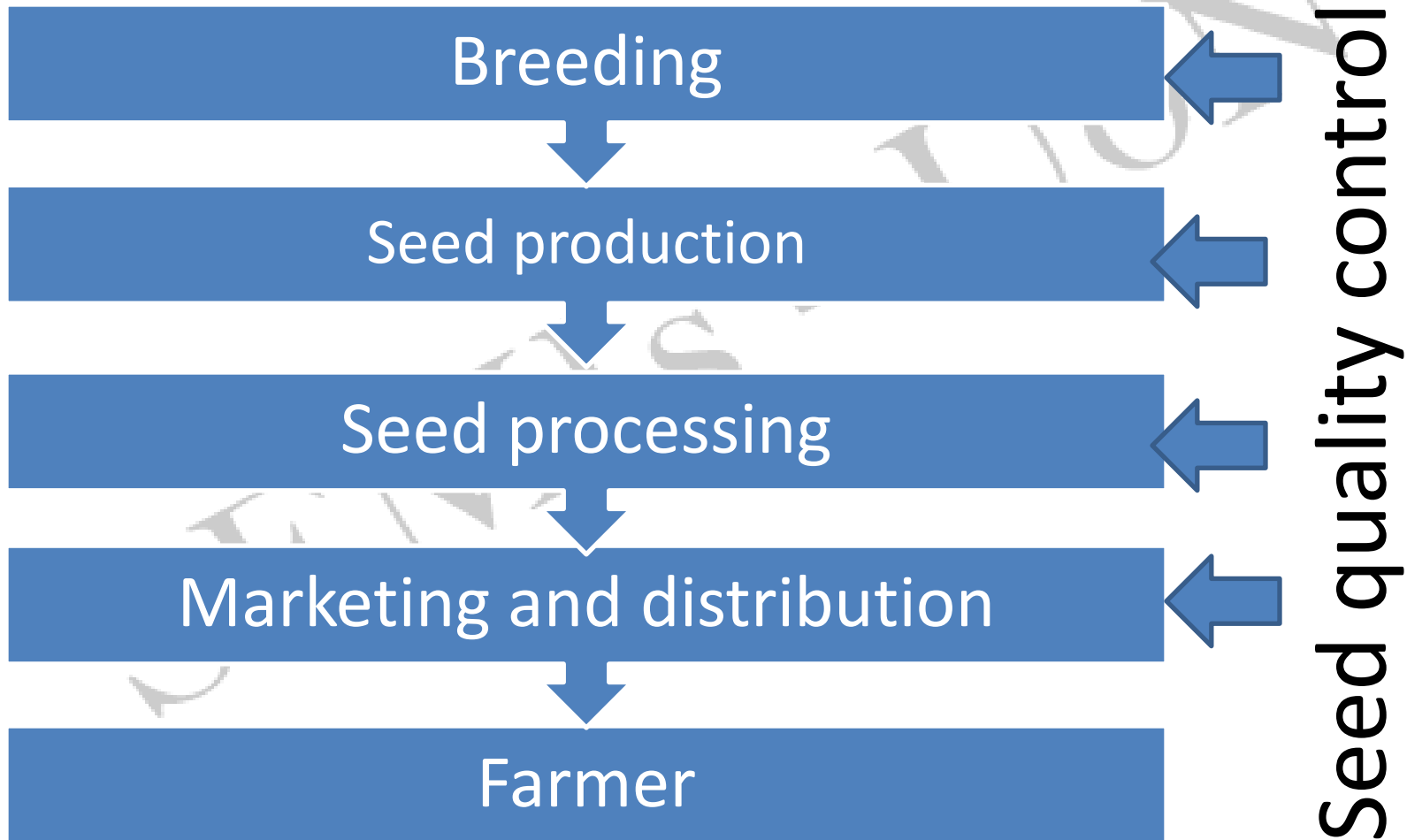
# Objectives of seed QA

- The objectives of QA are to provide:
  - a. unbiased field inspection and laboratory testing for quality control in seed production, processing and marketing
  - b. Unbiased system for use in meeting National laws requirements
  - c. A marketing image of sound quality control for selling varieties
  - d. Seed buyers with assurance that a designated variety has met quality standards

# Why do we need seed QA?

- Many of the important attributes of seeds cannot be assessed visually or instantly at the end of purchase
- To prove such guarantee, there is need for a quality control system that provides comprehensive checks at all levels to ensure that seed quality is maintained

# Seed quality control



# SEED QUALITY

- Seed quality is a multiple concept comprising of several components and their relative importance in different circumstances. It puts much emphasis on :
  - a. Physical quality
  - b. Genetic quality
  - c. Physiological quality
  - d. Phytosanitary quality

# Seed quality assurance

- Quality assurance is the overall management plan to guarantee the integrity of data while quality control refers to series of analytical measurements used to assess the quality

# Seed quality assurance

- Seed quality assurance systems are comprised:
  - a. Field inspection of seed crops during active growth – Based on Association of Official seed certifying Agencies (AOSCA) or Organization for Economic Corporations and Development (OECD) Seed Schemes.

# Seed quality assurance

- b. Representative sampling of each seed lot in accordance with internationally accepted protocol – Association of Official Seed Analyst (AOSA) and International Seed Testing Association (ISTA)
- c. Laboratory evaluation of each seed lot for germination, pure seed, noxious weeds and varietal purity in accordance with internationally accepted protocol – ISTA /AOSA
- d. Post control grow out tests

# Quality assurance/control during active growth

- The causes of deterioration of seed quality:-
  - a. pests and diseases
  - b. mechanical mixtures
  - c. natural crossing
  - d. volunteer plants from the previous season



# Quality assurance/control during active growth

- e. poor detasseling
- f. poor synchronization of female and male plants and mutations

Fields inspection during active growth ensures that the quality of seed is maintained by adhering to field inspection standards.

# Quality assurance/control during active growth cont'd

- Quality during active growth is ensured through :
  - a. Selection of appropriate seed growers
  - b. Proper handling of seed during planting to avoid mixing – colour coding of parental lines
  - c. Roguing of offtypes and diseased plant

# Quality assurance/control during active growth cont'd

- d. Providing adequate isolation
- e. Proper detasseling in maize seed crop
- f. Planting appropriate female to male ratio
- g. Application of good agricultural practices –  
weed control, crop protection, fertilizer  
application

# Quality control/assurance at harvest

- Achieved through:
  - a. Harvesting seed crop at the right moisture content
  - b. Separating male parent from seed parent before harvesting to avoid mechanical mixing
  - c. Sorting of cobs and pods
  - d. Marking of cobs and or pods and keeping them separately

# Quality Assurance/control during drying

Quality is assured during drying process through:

## a. Controlling drying temperatures

- Low temperatures delay drying process resulting in damaged seed caused by disease, insects and excessive respiration seed.

# Quality Assurance/control during drying

- b. Drying seed on/in appropriate place –  
Never dry seed on rocks, iron sheet or black polythene papers to avoid heating
- c. Drying one variety at a time to avoid mixing
- d. Having appropriate seed depth

# Quality control during processing

Particular attention should be paid to:

a. Cleaning processing

- Regular lot sampling for inspection to ensure rough cleaning is done

b. Seed grading

c. Dressing of the processed seed  
(appropriate pesticide should be used)

d. Moisture content of seed

# Quality control during seed sampling

- Ensure that:
  - a. Representative sample is taken in according with ISTA OR AOSA procedures
  - b. Seed lot presented for sampling is accessible from all sides.
  - c. Seed lot is homogenous.



# Seed testing

- The seed testing laboratory should have a quality system that guarantee quality testing. This can be secured through accreditation of the seed laboratory

# Seed testing

In the seed testing laboratory seed are tested for the following quality parameter

- a. Purity
- b. Germination
- c. Viability
- d. Health
- e. Vigour

# Quality control in packaging and handling

- Appropriate packaging material should be used
- The packaging material should be able to maintain the viability of the seed
- Seeds should be handled more like eggs than like stones

# Quality control of seed in storage

- Seed store should be clean, dry and cool
  - Temperature and moisture affect seed viability
- Cleaning and fumigation of seed stores before storing seed

# Quality control in marketing and transport

- Seed should be transported in a dry and cool condition so as to maintain its ability to germinate
- Monitor the quality of seed at points of sale to ensure that farmers are accessing quality seed

# Quality control in grow out tests

- The genetic quality is controlled through grow out tests
- Purity standards in field inspection are used to evaluate genetic purity of seed in grow out tests

# conclusion

- Seed QA provides protection by early warning of a disaster

Thank you

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# PLANT VARIETY PROTECTION

SEMIS COURSE ON  
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# What is a variety?

A plant grouping within a single botanical taxon of the lowest known rank, which grouping, irrespective of whether the conditions for the grant of a breeder's right are fully met, can be:

# What is a variety?

- a. defined by the expression of the characteristics resulting from a given genotype or combination of genotypes,
- b. distinguished from any other plant grouping by the expression of at least one of the said characteristics and
- c. considered as a unit with regard to its suitability for being propagated unchanged

# Why variety protection ?

- The development of a new variety is usually a long and costly undertaking and the investor needs a chance to recoup costs and profit from the breeding investment
- Without the legal protection of rights, breeders can lose control of the commercialization of new varieties to persons who did not contribute towards the breeding costs.

# Why variety protection ?

- The rights scheme also allows countries access to internationally bred varieties which would not be available to them without legal protection thus allowing farmers gain access to an increased number and range of improved varieties.

# Types of IP Protection

A crop variety can be protected by more than one form, and often two or more forms of protection can be used simultaneously

- a. Plant variety rights
- b. Patents
- c. Trade secrets
- d. Trademarks
- e. Biological protection
- f. Contracts

# Legislations on variety protection

- Ethiopia: Legal Regime on Plant Variety Protection
- Zimbabwe: TITLE 18: Chapter 18:16 Plant breeders rights act
- Zambia: Chapter 236 the plant variety and seeds act
- Kenya: Seeds and Plant Varieties Act (Cap 326)
- Tanzania: Protection of New Plant Varieties (Plant Breeders Rights) Act (2002)
- Uganda: Plant Variety Protection Bill, 2010:

# Plant Variety Protection

This is generally covered under guidelines provided by the UPOV (International Convention for the Protection of New Plant Varieties)

- It is an intergovernmental organization with headquarters in Geneva (Switzerland)
- The Convention was adopted in Paris in 1961 and it was revised in 1972, 1978 and 1991



# UPOV - Revisions

UPOV Conferences	Operative
1961	1968
1972	1977
1978	1981
1991	1998

# What is the difference?

<b>UPOV Convention</b>	<b>1978</b>	<b>1991</b>
<b>Requirements</b>	Distinct, Uniform and Stable	Distinct, Uniform, Stable, New
<b>Protects</b>	Commercial use of reproductive material of the variety	All plant varieties and products including plants that are derived
<b>Duration of Protection</b>	15 years from application date for most species. 18 years for trees and vines	20 years from application date for most species. 25 years for trees and vines
<b>Breeder's Exemption</b>	Yes. Acts for breeding and development of other varieties are not prohibited.	Optional. The decision to include an exemption is dependent on each member's national legislation.

# Requirement for plant protection under TRIPs

▶ In 1994

- Trade-Related Aspects of Intellectual Property Rights (TRIPS) was signed and obligated WTO members to offer some kind of IP protection for plant varieties, whether through patents, “an effective *sui generis* system,” or both.

# Plant Variety Protection (PVP)

- PVP confers IP rights, known as *Plant Breeder's Rights (PBR)*, which provide an *incentive to plant breeders* for the development of new varieties of crops

# What are Plant Breeders Rights?

- Plant Breeders' Rights (PBRs) are rights granted by the State to protect the proprietary rights of plant breeders with regard to breeding and discovery of new plant varieties
- A protected variety with its grant of rights, like other personal property, may be sold, mortgaged or assigned to another person

# Who can apply for PBR?

- Only the owner of a new variety is entitled to apply for a grant of PBRs.
  - The owner is the breeder or the discoverer of the variety, his/her employer or his/her successor in title. An application may however be made by an agent on behalf of the owner

# What variety qualifies for PBR application?

Four criteria are used:

– **New (Novelty)**

- For Kenya: Not cultivated or offered for sale for more than 1 year from date of application, or 4 years outside the country with consent of the owner

– **Distinct**

# What variety qualifies for PBR application?

- At the time of application, the variety must be different in at least one character in morphology (e.g. shape, color); physiological (e.g. disease resistance); or other (e.g. protein content).
- **Uniform**
  - Variety must be sufficiently uniform
- **Stable**
  - Variety must have repeatedly reproducible characteristics from one generation to another



# Extension of PBRs

- ▶ In addition to the original plant variety protection is extended to:
  - a. Any plant variety that is essentially derived from the original plant variety.
  - b. Any plant variety that is not distinct from the original plant variety; and
  - c. Any plant variety where the production requires the repeated use of the original plant variety.

<http://www.ipos.gov.sg/AboutIP/TypesofIPWhatisIntellectualProperty/Whatisplantvarietiesprotection.aspx#>

# Term of grant for plant breeders rights

- Plant Breeders' Rights are granted for a term of 20 years beginning from the date on which the grant of the PBR takes effect.
- As regards fruit trees and their rootstocks, forest and ornamental trees and grape vines, the period prescribed for protection is 25 years

# What are the limitations to these rights?

Exemptions:

1) research exemptions

- A research exemption allows breeders to use the variety as breeding stock to develop new varieties.

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# What are the limitations to these rights?

## 2) farmers' exemptions

– A farmers' exemption allows farmers to save seed of a protected variety for the sole purpose of replanting their own land.

## 3) Grow or use a protected variety for non commercial purposes

# Patents

- A plant patent is granted by the Government to an inventor (or the inventor's heirs or assigns) who has invented or discovered and asexually reproduced a distinct and new variety of plant, other than a tuber propagated plant or a plant found in an uncultivated state.
- The grant lasts for 20 years from the date of filing the application

# Patents...

## ▶ Patent laws :

- do not allow farmers to save seeds or breeders to use a plant variety as parental stock for breeding new varieties.
- cover more inventions and discoveries than do PVPs (plants, seeds, genetic constructs, and enabling technologies )

# Patents protection vs PVP

Subject	Patent Protection	Plant Variety Protection
Holder of Protection	Inventor	Plant Breeder
Ease of making application	Requires involvement of patent specialists/lawyers	User friendly; breeder can make the application.
Object of protection	(Industrial) invention	Plant Variety
Field examination	Not required	Required
Plant material for testing	Not required	Required
Conditions for grant of rights	a) Novelty b) Industrial applicability c) Non-obviousness (inventive step) d) Enabling disclosure	a) Novelty b) Distinctness c) Uniformity d) Stability e) Appropriate denomination

# Patents protection vs PVP

Subject	Patent Protection	Plant Variety Protection
Determination of scope of protection	Determined by the claims of the patent	Fixed by the national legislation (by UPOV Convention in the case of UPOV member States)
Use of a protected variety for breeding further varieties	May require the authorization of the patentee.	Does not require authorization of the right holder.
Term of protection	20 years from date of application (as per TRIPS Agreement)	25 yrs for trees and vines, 20 yrs for other plants, from date of grant (1991 Convention)

*Source: Wachira F. & Ngwediagi 2006*



# Trade Secrets

- A trade secret prevents the unauthorized use and disclosure of secret information
- Trade secret protection, unlike patent protection, requires no formal application, and lasts indefinitely— so long as the information is kept secret!

# Trade Secrets

- Trade secrets do not provide any protection against someone who reverse-engineers or independently discovers the information in question
- A classic example of a plant-based trade secret is the genetic information contained in the seeds of the parental inbred lines that are used to produce proprietary hybrid varieties

# Trademarks

- Trademarks and geographical indications may also be used to protect plant material, but they are generally less useful than trade secrets, utility patents, and plant patents.

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# Trademarks

- Geographical indications are words or phrases that indicate the region from which the plant material originates; they are valuable because they suggest to consumers that the plant material has beneficial traits that are commonly associated with plant material from that region

# Individual breeders protection

- Coding of inbred lines
- Coding of materials in Regional Trials
- Hiding of pedigrees in trial entries
- Restricted access to nurseries by unauthorized persons
- Information passed on only “need to know” basis

# Biological protection

- **Prevent** multiplication, e.g. because a variety is sterile or does not produce viable seeds
- Guarantee that the **characteristics of a variety get lost upon multiplication** (as is the case with hybrids);

# Contracts

- **Material Transfer Agreements**
  - Material Transfer Agreements (MTAs) are legal agreements made between a provider and a recipient party when research material is being transferred between institutions.
  - The MTA itself contains a written description of the material to be transferred and any limits on the material that the provider wishes

# Contracts

- **Bag Labels**

- An explicit contract is described on a bag label which is normally sewn into the seal of a bag. By opening the bag and breaking the seal, the purchaser agrees to comply with the contract.



# Nullity and Cancellation of the Breeder's Right

## **Nullification**

- A breeder's right must be declared null and void if it is established:
  - (i) that the variety was not novel or distinct at the time of the grant of the breeder's right,

# Nullity and Cancellation of the Breeder's Right

- (ii) that, where the grant of the breeder's right has been essentially based upon information and documents furnished by the breeder, the variety was not uniform or stable at the time of the grant of the breeder's right, or
- (iii) that the breeder's right has been granted to a person who is not entitled to it, unless it is transferred to the person who is so entitled.

# Nullity and Cancellation of the Breeder's Right

## **cancellation**

- A breeder's right may be cancelled if it is established that the variety is no longer uniform or stable.

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# Nullity and Cancellation of the Breeder's Right

- In addition, a member of the Union may cancel a breeder's right granted by it if, after being requested to do so and within a prescribed period,
  - (i) the breeder does not provide the authority with the information, documents or material deemed necessary for verifying the maintenance of the variety,

# Nullity and Cancellation of the Breeder's Right

- (ii) the breeder fails to pay such fees as may be payable to keep his right in force, or
- (iii) the breeder does not propose, where the denomination of the variety is cancelled after the grant of the right, another suitable denomination.

THANKS

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# REGISTRATION OF SEED RELATED INSTITUTIONS

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# REGISTRATION OF SEED RELATED INSTITUTIONS

- There are a number of seed related institutions which need registration to deal in seed business. These are basically the Seed companies, and his agents, subagents, stockists, and seed growers.

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# Registration of seed companies

- Requirements for registration as a Seed Merchant are as follows:
  - a. The applicant must be a registered company in Kenya, to be eligible for application as a seed merchant.
  - b. Be conversant with and be ready to comply with the conditions as set out in the seed Act and the seed regulations (The Seed and Plant Varieties Act: Cap 326, Laws of Kenya).
  - c. Have adequate and knowledgeable personnel who are conversant with seed matters.

# Registration of seed companies

Specific requirements for production, processing, marketing and distribution are as follows:

## 1. Production:

- i. One must have adequate land and equipment to handle basic seed or proof of availability.
- ii. Contractual agreement with growers to grow seed.
- iii. Adequate field officers to advise growers

# Registration of seed companies cont'd

- 2. Processing:
  - i. Equipment and machinery to process seed.
  - ii. Storage space.
  - iii. Capacity to print and label packets / containers as required by the seed regulations.
  - iii. Marketing
  - iv. Adequate distributive channels that covers all the agriculturally important region of the country.
  - v. Have agreement with agents / sub-agents / stockist to distribute seed on one's behalf.

# Registration of seed companies cont'd

## 3. Marketing and Distribution

- i. The merchant's appointed agents/sub-agents/stockists should be identifiable as such
- ii. They should have understanding and knowledge on seed issues
- iii. They should have adequate storage.

# Registration of seed growers

Selection and registration criteria includes

- Farm size – larger farms more desirable
  - Adequate isolation within the farm and with neighbours

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# Registration of seed growers

- Achieve sound crop rotation
- Farm location relative to seed processing factory
  - Inspection and transport costs
  - Some companies recruit growers within a 200km radius from the seed factory

# Registration of seed growers

- Agro-ecological potential
  - Target most productive agro-ecologies – ensure high yields
  - High probability of production success every season
- Farm accessibility:
  - Easily accessible especially during the rainy season
  - Effective seed inspections at all critical stages and ensures production of quality seed

# Registration of seed growers

## Adequate farm infrastructure

- Tractors and implements .....
- Functional irrigation facilities .....
- Irrigation mitigates rainfall variability risk and ensures success every season
- Suitable storage/shed facilities
- Well ventilated, cool and secure



# Registration of seed growers

- Adequate labour:
  - Especially at critical stages
  - Ability to hire from the neighbourhood at peak periods
  - Labour availability ensures high quality seed

# Registration of seed growers

- Sound farm management ability
  - Seed production is a specialised process
  - Labour management and quick decision making skills
  - Experience in growing seed or respective commercial crops
  - General up keep of the farm – soil & moisture conservation practices, state of fences, farm security & controls, innovativeness

# Registration of seed growers

- Ability to fund the seed crop:
  - Labour intensive activities such as on-farm processing
  - High inputs & mgt
  - Availability of funding ensures high yields and seed quality

# Registration of Seed Stockist in Kenya

- Requirements for one to be a Seed Stockist in Kenya:
  - The applicant must have knowledge, ability and facilities to maintain the quality and viability of seed offered for sale
  - One must own or lease a permanent business outlet suitable for selling seed
  - Be appointed by a registered seed merchant as their seed stockist

# Registration of Seed Stockist in Kenya

- Collect application forms (SR 12) from the nearest KEPHIS regional office and pay the prescribed fees per application.
- The applicant and seed merchant should fill in the forms and return them to the KEPHIS regional office.

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# Registration of Seed Stockist in Kenya

- Upon fulfillment of the registration requirements, the stockists are issued with a seed seller's licence

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Thank for listening

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