SEED CLASSIFICATION SYSTEMS, THEIR PRODUCTION REQUIREMENTS AND MAINTENANCE

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Outline of the presentation

• Introduction

• Seed certification classes

• Seed classes standards

• Maintenance of seed classes
Introduction

- Seed certification class is a system that shows the generations involved during seed multiplication.
- It indicates the generation distance of the seed from the original seed produced by the plant breeder.
- Means a stage in a seed multiplication system well defined in respect of parental seed standards of cultivation and seed quality.
The generation system model depends on:

- The rate of genetic deterioration
- Seed multiplication ratio
- The total seed demand
Based on these factors different seed multiplication class models can be derived

- **Three-Generation model**: Breeder seed (BRS), Foundation seed (FS) and certified seed (CS)
- **Four-Generation model**: BRS, FS, Registered seed (RS), and CS or BRS, Pre basic seed (PB), Basic seed (BS), and CS
- **Five-Generation model**: BRS, FS (i), FS (ii), CS(i) and CS (ii)

**NB**: In cross pollinated crops three and four generation model system is used
Introd’ continued

Generally two categories of seed classes nomenclature are recognized,

• Organization for Economic Cooperation and Development (OECD) and;
• Association of Official Seed Certifying Agencies (AOSCA)
SEED CLASSES

The following classes of certified seed of released varieties are recognized by seed certifying agencies

- Breeder
- Foundation/Pre-basic
- Registered/Basic
- Certified
Breeder seed

- It is the progeny of the nucleus seed
- Produced directly under plant breeder supervision
- Produced in one or more stages
- Used for production of pre-basic or basic seed.
- 99.9% genetically and 100% physically pure.
- Labeled upon meeting quality standards
- Pre-controlled to determine its genetic purity.
- Not available for general cultivation
Pre-basic seed

- It is the progeny of breeder seed
- Produced under the supervision of the breeder and seed certifying agency.
- The seed is not available for general cultivation.
- It is the source of basic seed.
- Pre-controlled to determine its genetic purity
- Labelled upon meeting the quality standard
Basic seed

- It is a progeny of pre-basic seed
- Produced under the supervision of the plant breeder and the seed certifying agency
- Not available for general cultivation
- Pre-controlled to determine its genetic purity.
- Labeled upon meeting quality standards
Certified seed

- Progeny of basic seed
- Available to farmers for general cultivation.
- Produced under control of seed certifying agency
- Further generations of certified classes may be produced using this class.
- Labeled upon meeting quality standards
- This class of seed requires post controlling.
## Comparison of seed classes and colour of labels for selected regions

<table>
<thead>
<tr>
<th>Definition</th>
<th>COMESA</th>
<th>SADC</th>
<th>OECD</th>
<th>AOSCA</th>
</tr>
</thead>
<tbody>
<tr>
<td>1st Generation supplied by the breeder</td>
<td>Pre-basic – White with Violet band</td>
<td>Breeder</td>
<td>Pre-basic - White with diagonal violet stripe</td>
<td>Breeder - White</td>
</tr>
<tr>
<td>2nd Generation</td>
<td>Basic - White</td>
<td>Pre-basic - violet band on white</td>
<td>Basic - White</td>
<td>Foundation - White</td>
</tr>
<tr>
<td>3rd Generation</td>
<td>Certified 1st generation - Blue</td>
<td>Basic - white</td>
<td>Certified 1st generation - Blue</td>
<td>Registered - Purple</td>
</tr>
</tbody>
</table>
## Comparative seed classes and colour of labels for selected regions

<table>
<thead>
<tr>
<th>Definition</th>
<th>COMESA</th>
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<th>OECD</th>
<th>AOSCA</th>
</tr>
</thead>
<tbody>
<tr>
<td>4th Generation</td>
<td>Certified 2nd generation - Red</td>
<td>Certified 1st generation - Blue</td>
<td>Certified 2nd generation - Red</td>
<td>Certified - Blue</td>
</tr>
<tr>
<td>5th Generation</td>
<td></td>
<td>Certified 2nd generation - Red</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Others</td>
<td>Quality declared seed - Green</td>
<td>Not finally certified - Grey</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
# Kenyan seed certification classes

<table>
<thead>
<tr>
<th>Class</th>
<th>Colour of Label</th>
</tr>
</thead>
<tbody>
<tr>
<td>Breeder</td>
<td>White</td>
</tr>
<tr>
<td>Pre-Basic</td>
<td>White</td>
</tr>
<tr>
<td>Basic</td>
<td>White</td>
</tr>
<tr>
<td>Certified 1(^{st}) Generation</td>
<td>Blue</td>
</tr>
<tr>
<td>Certified 2(^{nd}) Generation</td>
<td>Pink</td>
</tr>
<tr>
<td>Standard</td>
<td>Grey</td>
</tr>
</tbody>
</table>
## Regional Seed Classes Standards For Hybrid Maize

<table>
<thead>
<tr>
<th>Field Standard</th>
<th>SADC</th>
<th></th>
<th>COMESA</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Basic</td>
<td>Certified</td>
<td>Basic</td>
<td>Certified</td>
</tr>
<tr>
<td>Minimum previous cropping season</td>
<td>1</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Isolaton (M)</td>
<td>400</td>
<td>350</td>
<td>400</td>
<td>200</td>
</tr>
<tr>
<td>Maximum off-types</td>
<td>0.1</td>
<td>0.3</td>
<td>0.1</td>
<td>0.2</td>
</tr>
<tr>
<td>Minimum number of inspections</td>
<td>5</td>
<td>5</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>Head smut at final inspection</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Minimum germination (%)</td>
<td>70</td>
<td>90</td>
<td>80</td>
<td>90</td>
</tr>
<tr>
<td>Minimum pure seed (%)</td>
<td>99</td>
<td>99</td>
<td>99</td>
<td>99</td>
</tr>
</tbody>
</table>
## Standards of various seed classes in Kenya

<table>
<thead>
<tr>
<th>Class</th>
<th>Isolation Distance</th>
<th>Max No. of Offtypes/100 Plants</th>
</tr>
</thead>
<tbody>
<tr>
<td>Breeder</td>
<td>400</td>
<td>0</td>
</tr>
<tr>
<td>Pre-Basic</td>
<td>400</td>
<td>0</td>
</tr>
<tr>
<td>Basic</td>
<td>400</td>
<td>0</td>
</tr>
<tr>
<td>Certified 1\textsuperscript{st} Generation</td>
<td>200</td>
<td>1</td>
</tr>
<tr>
<td>Certified 2\textsuperscript{nd} Generation</td>
<td>200</td>
<td>2</td>
</tr>
</tbody>
</table>
Maintenance of seed classes

• The objective is to maintain the purity and identity of a variety

• Causes of loss of genetic purity of seed
  1. Developmental variation
  2. Mechanical Mixtures
  3. Mutation
  4. Natural Crossing
  5. Genetic drift
  6. Selective influence of Disease
  7. Breakdown of male sterility
  8. Improper Seed Certification
Maintenance of Genetic Purity during seed Production

The following methods have been suggested for maintenance of genetic purity

- Use of approved seed in seed multiplication
- Inspection of seed fields prior to planting
- Field inspection of seed crops
- Sampling and sealing of cleaned lots
- Pre/post control (Grow-out test)
Various steps in genetic purity maintenance

Various steps suggested for maintaining genetic purity are:

- Providing isolation to prevent cross fertilization or mechanical mixtures
- Rouging of seed fields prior to planting
- Grow in adapted areas only to avoid genetic shifts in the variety
- Certification of seed crops to maintain genetic purity and quality
- Adopting generation system
Procedures for variety maintenance

- Maintenance procedures are the extension of normal breeding process but selection is mild and aims not to improve the variety but to keep the identity unchanged.
- The commonly used processes are:
  - Mass selection
  - Ear-to-row/Plant-to-row
Maintenance procedure for self-pollinating crops

• Pure line or Ear-to-row selection method can be used

• Procedure
  • At least 100 true-to-types ears or plants are selected and harvested separately
  • The seeds from each plant are then planted together in a separate rows or small plots
  • Eliminate rows/plots which do not conform to variety description
Maintenance procedure for self-pollinating crops cont’d

• Only row/plots that are uniform and definitely true to the variety are harvested for seed

• The harvested seed from the different uniform-looking rows can be bulked to constitute breeder seed

Self-pollinating crops are easy to maintain
Maintenance procedure for cross-pollinating crops

- Ear-to-row method is used
- Procedure:
  - Select at least 200-500 good looking ears with all the typical characteristics of the variety
  - Plant rows with the seeds of each plant (ears). These rows may consist of at least 10 plants depending on the available field size
Maintenance procedure for cross-pollinating crops cont’d

• Remnant seed from each row should be kept safely
• Eliminate rows with non-conforming plants preferably at flowering
• If enough measures were taken to exclude pollen contamination, seed of selected rows can be harvested and bulked.
• If not, the harvested seed should be discarded and the remnant seed that was spared is used for the next cycle
Conclusion

• Certified seed must relate directly to authentic basic seed of the variety and seed classes makes this possible
• Maintenance of each class is paramount to ensure production of quality seed
Thank You