Pre-and Postharvest Management of Mycotoxins in Rice

### Mycotoxins and trade
Mycotoxins impair trade, owing to the strict tolerance levels set by various regional blocks or countries. The legal limit for common toxins in Kenyan foods are: aflatoxin (10 ppb) and fumonisin (1,000 ppb). Kenya is a net importer of rice, importing 90% of the rice consumed. There is need to regularly monitor levels of mycotoxins in imported rice by KEBS.

### Mycotoxin management and control

#### Pre-harvest management strategies
- Avoid drought stress during grain filling.
- Enhance optimal soil fertility by application of synthetic fertilizer or manure.
- Eradicate insect pests.
- Timely harvesting; avoid exposing mature grain to rains during harvesting.
- If disease symptoms are observed, apply fungicides and bactericides to reduce plant stress.
- During harvest, minimize contact of the harvested produce with the soil.

#### Post-harvest management strategies
- Minimise grain damage during threshing as damaged grain is vulnerable to colonization by moulds.
- Rice paddy should be dried to a moisture content of 13-14% for safe storage and milling. Stores should be kept at temperatures and relative humidity in which molds do not grow (cool dry place).
- Sort out mouldy grain from clean grain.
- Prevent insect infestation in stored grain (paddy and milled rice).
- Cooking of rice at high temperatures, >150°C, as this degrades fumonisin.

### What are mycotoxins?
Mycotoxins are poisonous substances produced by some molds, which grow on foods such as cereals, oil crops, fruits under moist and humid conditions.

### Mycotoxigenic fungi and toxins in rice

<table>
<thead>
<tr>
<th>Major producer</th>
<th>Mycotoxin</th>
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<tbody>
<tr>
<td>Aspergillus</td>
<td>Aflatoxins</td>
</tr>
<tr>
<td>Aspergillus &amp; penicillium</td>
<td>Ochratoxins</td>
</tr>
<tr>
<td>Fusarium species</td>
<td>Fumonisins</td>
</tr>
<tr>
<td></td>
<td>Trichothecenes</td>
</tr>
<tr>
<td></td>
<td>Deoxynivalenol (DON)</td>
</tr>
<tr>
<td></td>
<td>Zearealenones</td>
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</tbody>
</table>

### Conditions favouring mycotoxins
- Inappropriate drying; moisture content > 14%.
- High relative humidity (>65%) during storage.
- Drought during grain filling.
- Delayed harvesting, when it is raining.
- Inappropriate threshing and milling, leading to broken grains.

### Mycotoxins and public health
Ingestion of mycotoxins cause cancer, immunosuppression, stunted growth in children, and deaths.

### Mycotoxins and food security
Mycotoxins directly affects food availability, as mycotoxin contaminated food is unfit for human consumption and is destroyed.

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**Fig 1. Mouldy rice grains. Source: Francis Wayua**

**Fig 2. Mycotoxin contaminated rice grains. Source: Samuel Muliga**

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