Monitoring biosecurity for the Grain Value chain

Dr Marinda Visser
Manager: Grain Research & Policy Centre
Grain SA
15 August 2017
Flow of Grain & Oilseeds
Background

- Strategic & integrated approach encompassing the policy & regulatory frameworks that analyse and manage risks
- Sectors: plant life and health & food safety
- Essential for:
  - Trade
  - Promoting sustainable agriculture, food, nutrition and livelihood security
  - Equitable economic development
Structural framework

International Plant Protection Convention (IPPC)

- International treaty
- Provides framework for international cooperation
- Harmonization & technical exchange between contracting parties
- Prevent and control the introduction and spread of pests of plants and plant products
- Extends beyond protection of cultivated plants (weeds included)
- Also covers: transport vessels (air, water, land), storage containers, soil, etc.
Diagram: Structural framework

International Plant Protection Convention (IPPC)

Regional Plant Protection Organizations (RPPO)
- 9 in total
- AU-Inter-African Phytosanitary Council (IAPSC)
- Established 1954

National Plant Protection Organizations (NPPO)
- National Plant Protection Organisation of South Africa (NPPOZA)
- Import permits (plants & products)
National Plant Protection Organisation of South Africa (NPPOZA)

- Safeguards agriculture & natural resources from risks associated with entry, establishment or spread of plants & pests to ensure high-quality food supply
- Advisory and identification services for pests & diseases
- Conducts relevant laboratory tests as requested by the importing country
- Carries out field inspections
- Database of occurrence of harmful organisms in SA
- Maintains database on import conditions & procedures of various countries
Areas of responsibility

- **IMPORTS** - Regulate imports based on legislation
- **EXPORTS** - Provide certification of commodities
- **PERMITS** - Importation, transit, domestic movement and environmental release of organisms that impact plants and the importation of transit of plants and plant products
- **PEST DETECTION** - Detect harmful or economically important pest & weeds
- **PLANT PEST RESPONSE** - Develop and implement framework for protection against invasive/quarantine pest & disease
Plant Pest Response
- 4 key elements (PPRR)

• PREVENTION – detection at port of entry
• PREPAREDNESS – early detection, timely diagnostics and effective control
• RESPONSE – contain, control & eradicate plant pests and diseases
• RECOVERY – develop and implement systems for regulation, eradication and management plans
SA Legislation

- **Conservation of Agricultural Resources Act, 1983 (Act No. 43 of 1983)**
  - Weeds, invasive with commercial value & invasive plants with ornamental value
  - In repeal process
- **The Plant Health (Phytosanitary) Bill**
  - New bill - In an advanced stage
  - Tabled in Parliament for further processing,
  - New regulations of new Bill still need to be drafted
  - Also includes issues relating to migratory pest & honey-bees
  - Import, export & national control of plant pests (regulated pests)
  - Aligned with the latest international development from IPPC
Import requirements for grain

- Phytosanitary certificates
- Pest Risk analysis (PRA)
- Grain must be free from toxin, pests, odours/colours foreign to the specific grain
- Grain class or grade as specified in Agricultural Product Standards Act, 1990 for different commodities
- Consignment sample (≥ 10 kg) taken randomly & mixed thoroughly
- Chemical analyses
On-Farm Biosecurity

- Six routine practices to reduce threats on farm
  - Be aware of biosecurity threats: Know the normal pests associated with your crop
  - Ensure seed is pest free (preferably certified)
  - Keep it clean/Sanitation
  - Check crop
  - Abide by the law/regulations
  - Report anything unusual
On-Farm Biosecurity

Drivers for current surge of emerging diseases:

- **Changes** in agriculture (intensification, diversification and globalization)
- **Evolution** of diseases i.e. more interaction, more recombination, more selection
- **Climate change** resulting in increases in the occurrence of extreme events
- **Movements** of people and agricultural goods in trade
Key questions in relation to Biosecurity???

<table>
<thead>
<tr>
<th>What is the threat to national agriculture &amp; environment?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Is eradication of the pathogen/pest feasible?</td>
</tr>
<tr>
<td>What safeguards should be built into national ‘Plant Health’ systems?</td>
</tr>
<tr>
<td>Is global trade responsible for new &amp; exotic plant pathogens?</td>
</tr>
<tr>
<td>What will be the impact of global climate change?</td>
</tr>
<tr>
<td>Can we predict the next problem?</td>
</tr>
<tr>
<td>Is the pathogen that arrives or the one that follows more important?</td>
</tr>
</tbody>
</table>
Possible threats to SA

- Maize Lethal Necrosis (MLN)
- Fall armyworm (FAW)
- Red locusts etc.
Maize Lethal Necrosis (MLN)

- Viral disease caused by co-infection of two viruses:
  - *Maize chlorotic mottle virus* (MCMV) and one of the viral pathogens from the Poty viruses *Sugarcane mosaic virus* (SCMV)
  - SCMV already present in SA
- Transmitted mainly by insect vectors: aphids, thrips,
  - Seed transmission very low
Maize Lethal Necrosis (MLN)

- **Symptoms:**
  - Chlorotic spots → leaf necrosis, plant stunting & shortened internodes, dead heart, tassel abnormality, small ears, poor seed set
MLN Survey project

- **MT Project**: ARC-GCI
- **PROJECT**: DAFF/Sansor/GrainSA
  - **Aim**: Identifying all potyvirus species in SA
    - Study diseased plants (mottling/streaking of leaves)
    - Confirm presence of virus in plant
    - Identify viral pathogen
    - Relative prevalence of different potyvirus species
- **Assessment of MLN risk if MCMV enters SA**
Fall armyworm

• FAW (*Spodoptera* genus) - native to the Americas
• Hosts: >80 plant species
  – Primary (main), Secondary and Wild hosts
Life cycle, 24 - 40 days

1. Adult ♀ live up to 21 days, av. 10 days
2. Pre-oviposition period, 3 – 4 days
3. Pupal stage, 7 - 13 days
4. Larval stages, L1 – L6 about 14 – 22 days
5. 100 to 200 eggs mass up to 2000, 2 – 3 days
Plant Pest Surveillance

- Industry/government surveillance program
- Partnerships & support collaborative projects, policy research, outreach & education to protect Southern Africa’s agriculture from the damaging effects of invasive species
- Early Warning System (EWS) for invasive pests, through Pest monitoring on farms & Crop Imaging
Plant Pest Surveillance

Biosecurity Africa portal

Outlay:

Scouting Map (Shown) – Shows actual trap locations (e.g. WC province) and dropped pins give counts of pests collected in pheromone traps (Graphs generated from data).

Additional “heat-map” – Tracks gaps or overlaps of surveillance program i.e. monitors trap placement to inform future projects.
Karnal Bunt

- Quarantine pest globally
  - Different thresholds: Mexico (≥10 telliospores),
  - SA (None)
- SA: 2000 in Douglas (NC), 2015 in Groblersdal
- Inoculum: seed, soil and diseased plants
  - Dispersal by: wind, water, implements, animals & humans
Karnal Bunt

Symptoms:
- Pest is also known as partial bunt because it affects partial kernels/heads
- Fishy smell,
- Powdery spore mass

Hosts:
- Bread wheat (most susceptible)
- Durum wheat
- Triticale
- Rye (via artificial inoculation)
- Barley & Oats (non-hosts)
Karnal Bunt: Control

- Importance of implementation of bio-security measures
- Use only certified seed
- Seed treatment
- Two chemical spray programme
  - 1st at 25% head emergence
  - 2nd spray 10-14 days later
- Destroy debris: Long spore survival period
- Practice crop rotation
Looming threats to grain chain

Western corn rootworm

Khapra beetle
Khapra Beetle

- Devastating globally quarantined storage grain pest
- Losses up to 75%: direct feeding, reduced grain quality & market access
- Danger: Prolonged survival without food, preference to dry conditions & low moisture food, insecticide resistance
Western corn rootworm

- Entered the EU from USA
  - EU could not stop the spread
- Major vector of MLN
- Adults: Feed on exposed maize ear
- Larvae: Feed on root hairs → LODGING

Key:
- Red – Localised
- Blue – Widespread
- Black – Present
- Yellow – Occasional reports
Biosecurity measure implementation

1. Assess

The risks posed by pests that threaten crops are identified and assessed on an on-going basis.

2. Plan

A written plan forms the basis of the biosecurity training program, allows for regular review, updates, and provides a framework for continuous improvement.

3. Implement

A monitoring program and information gathering framework that provides information to adjust the biosecurity plan is developed and implemented.

4. Monitor

Put the plan into action.
Emergency Responses
Eradication vs. Management

• Timely response needed to prevent damage
• Response will depend on the nature of the problem
  – Eradication vs. management
  – First choice is eradication, but there are conditions
    • Insect are not very mobile (some scales)
    • Good baits are available (fruit flies)
    • Insects are confined (as in a greenhouse)
    • Infestation is limited
• If eradication is not possible, then a management program is developed
Recommendations

• Grain value chain to form working group with DAFF
• Information sharing
• Updating PRA’s for grains
• Dedicated grains biosecurity focus within DAFF is crucial
• Pest surveillance
• Regulatory Plan and Initiatives
• Updating regulations to reduce burden on industry
• Provide national leadership and coordination