Monitoring biosecurity for the Grain Value chain

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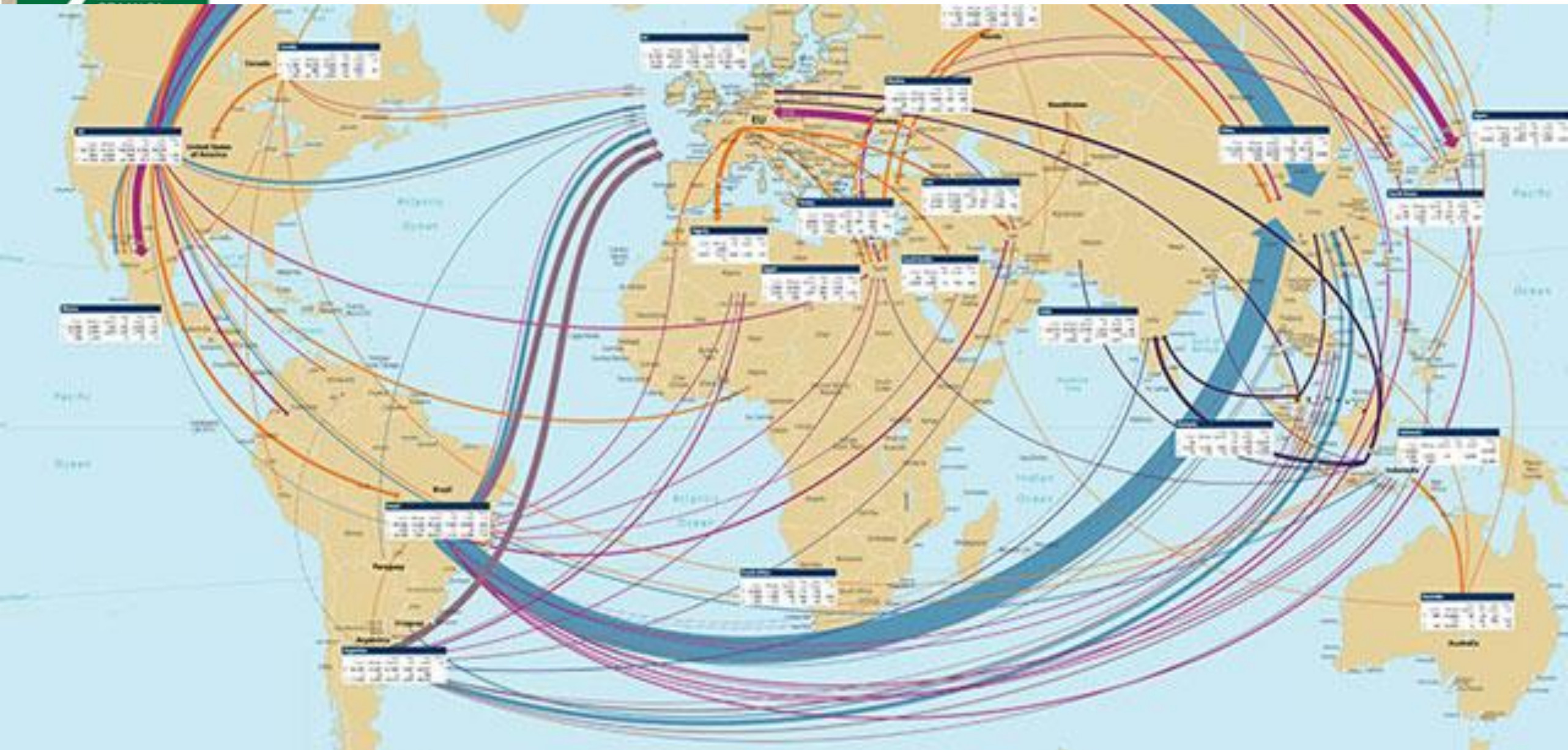
Flow of Grain & Oilseeds



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)

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

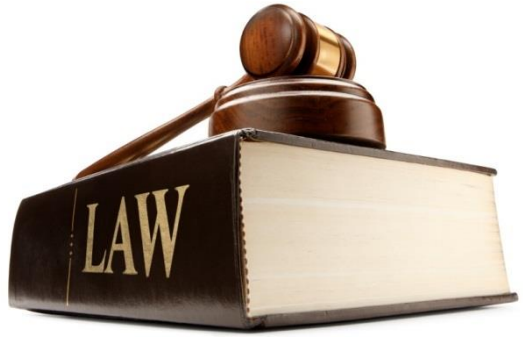
- **IMPORTS** - Regulate imports based on legislation
- **EXPORTS** - Provide certification of commodities
- **PERMITS** - Importation, transit, domestic movement and environmental release of organisms that impact plants and the importation of transit of plants and plant products
- **PEST DETECTION** - 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
- **Agricultural Pests Act, 1983 (Act No.36 of 1983)**
  - 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???

What is the threat to national agriculture & environment?

Is eradication of the pathogen/pest feasible?

What safeguards should be built into national 'Plant Health' systems?

Is global trade responsible for new & exotic plant pathogens?

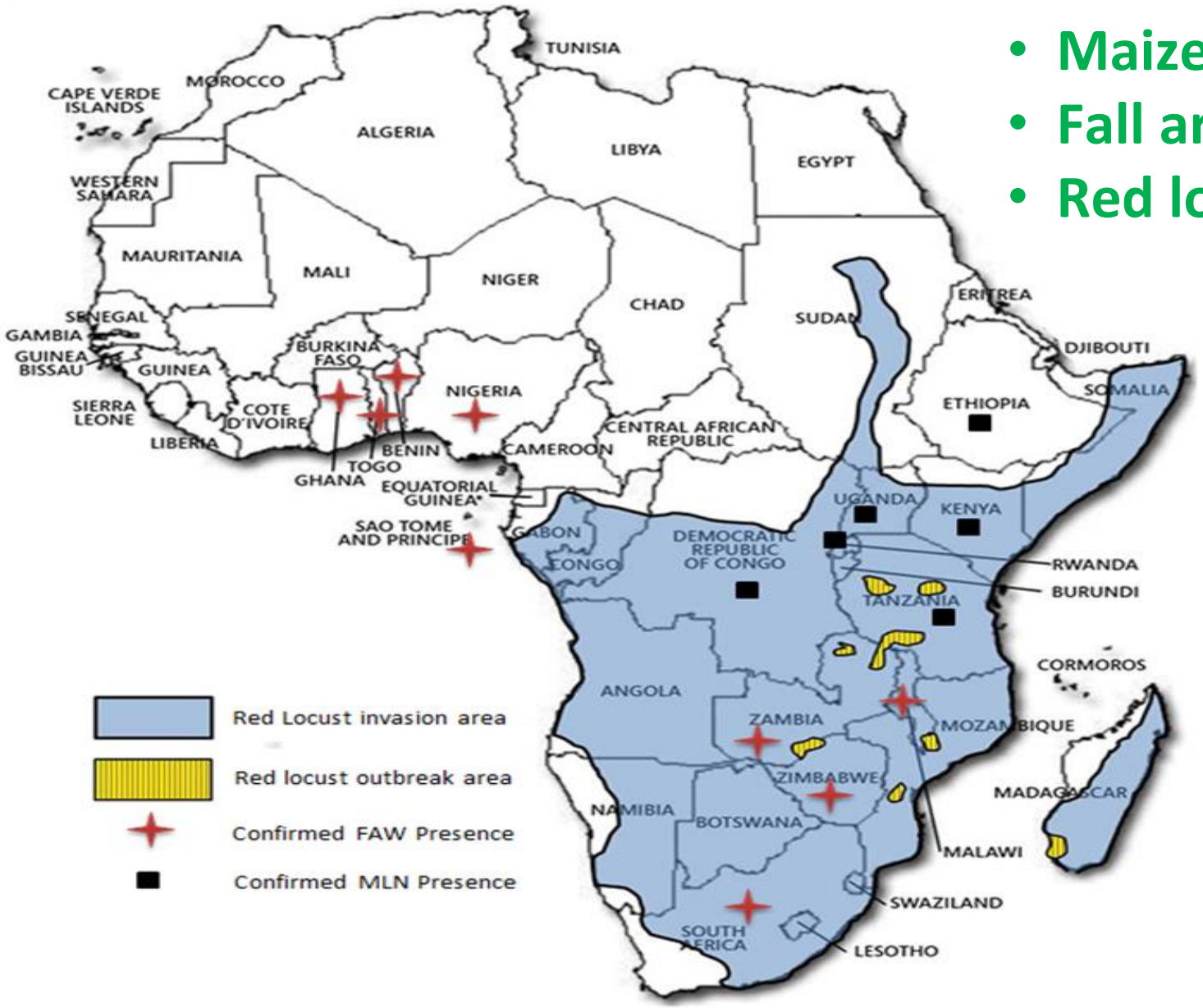
What will be the impact of global climate change?

Can we predict the next problem?

Is the pathogen that arrives or the one that follows more important?

Possible threats to SA

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

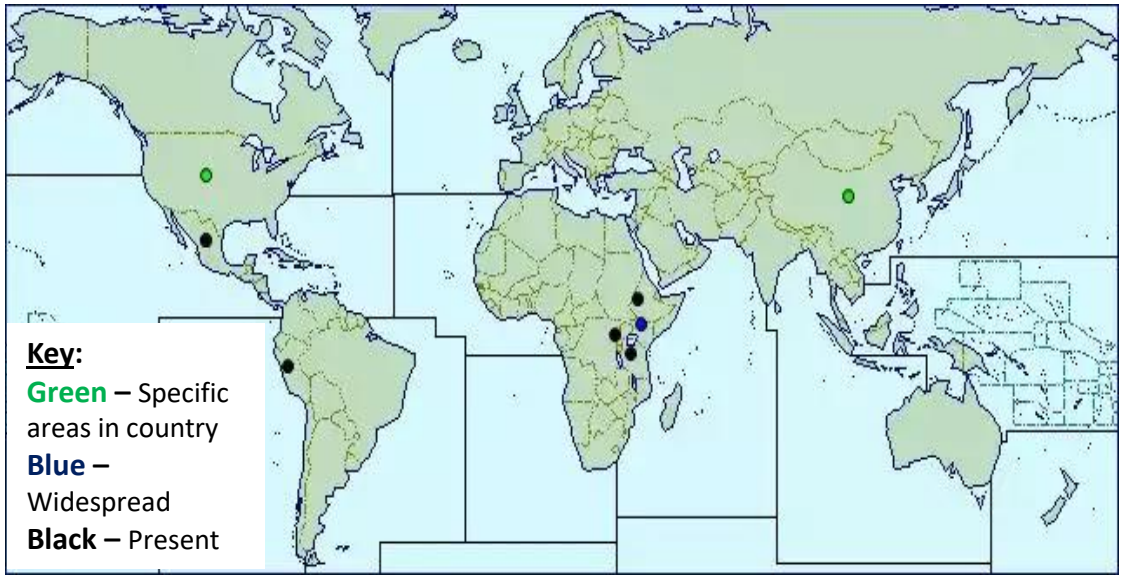


Maize Lethal Necrosis (MLN)

- **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

Adult ♀ live up to 21 days, av. 10 days

Pre-oviposition period, 3 – 4 days

100 to 200 eggs mass up to 2000, 2 – 3 days

larval stages, L1 – L6 about 14 – 22 days

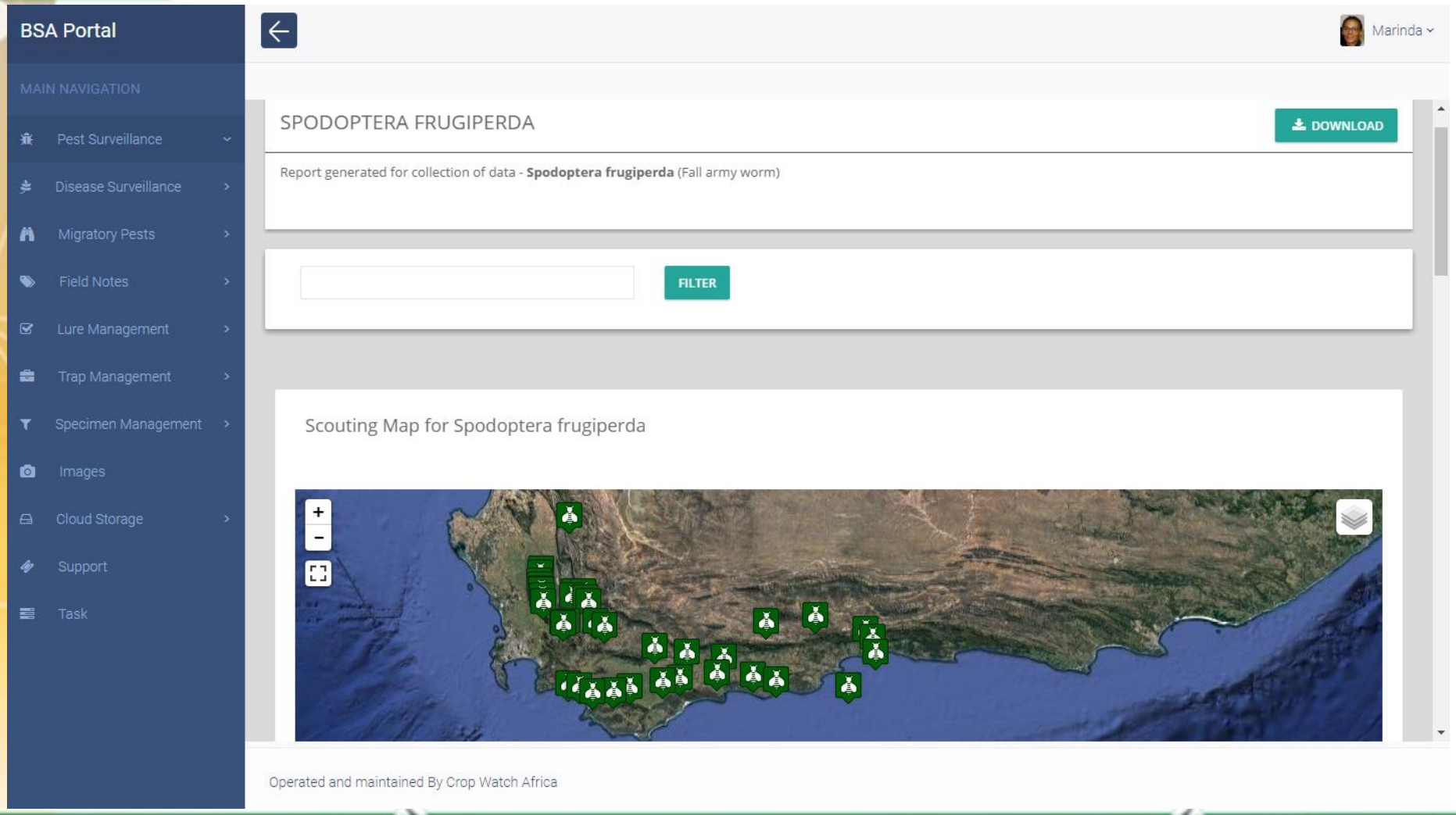
pupal stage, 7 - 13 days

photo David Almquist

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**

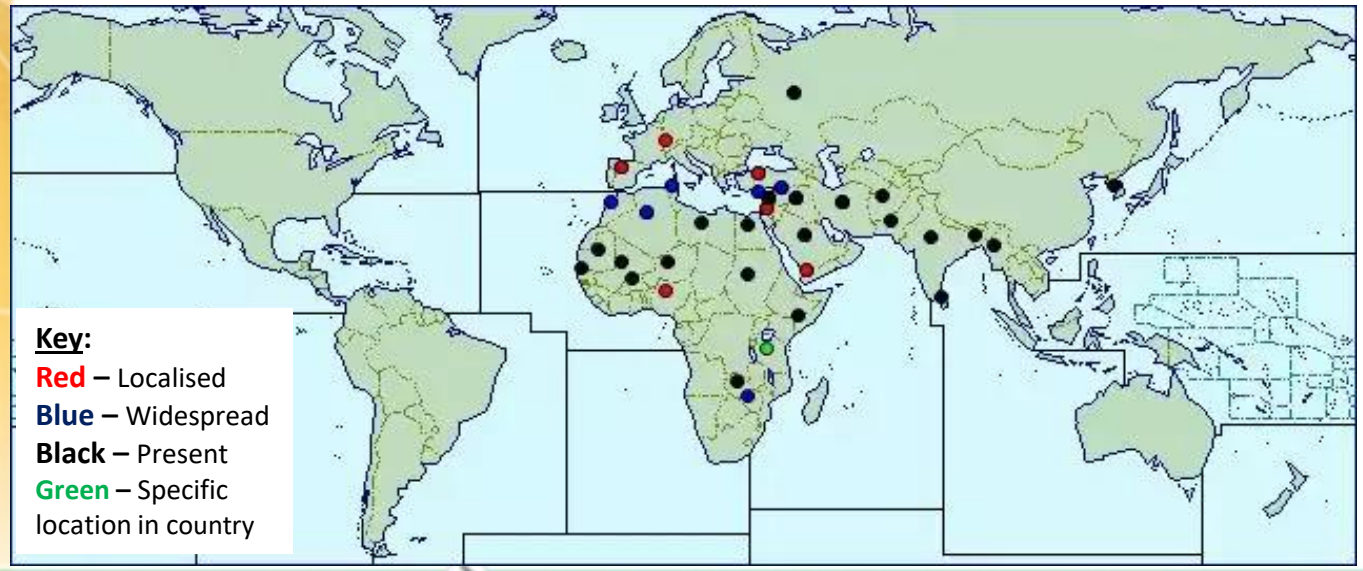
Looming threats to grain chain

Western corn rootworm

Khapra beetle

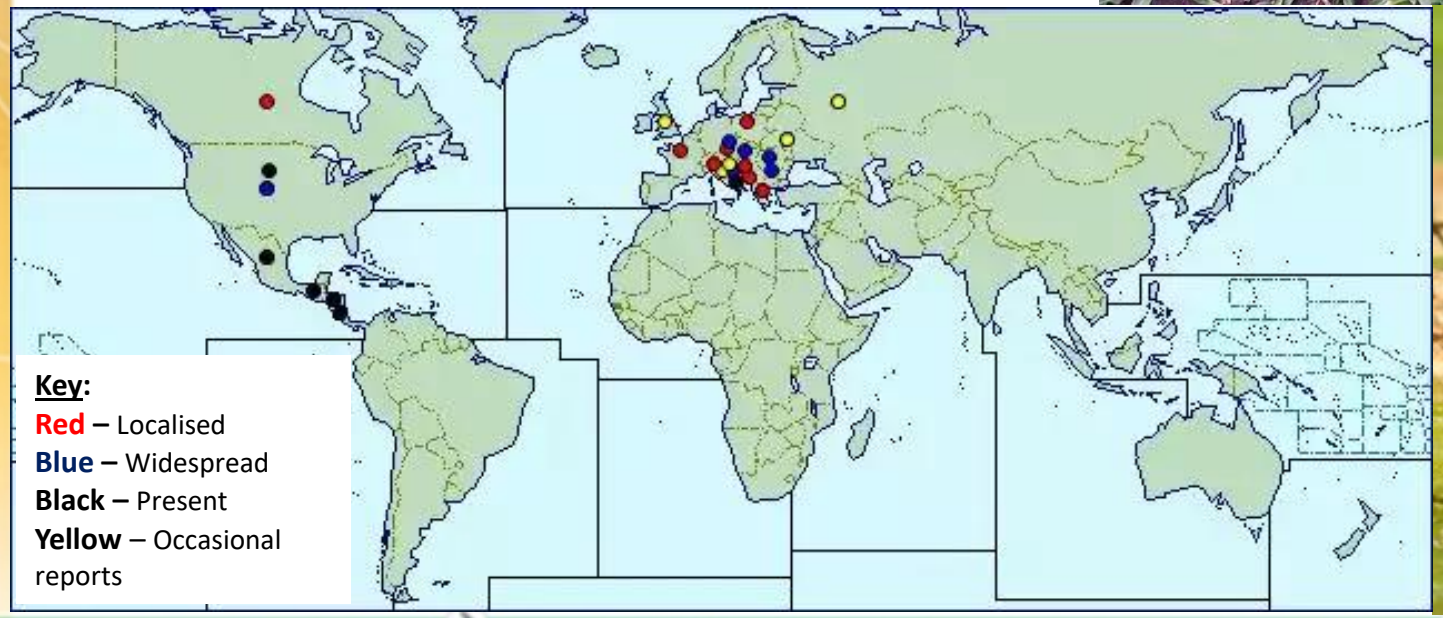
Khapra Beetle

- 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

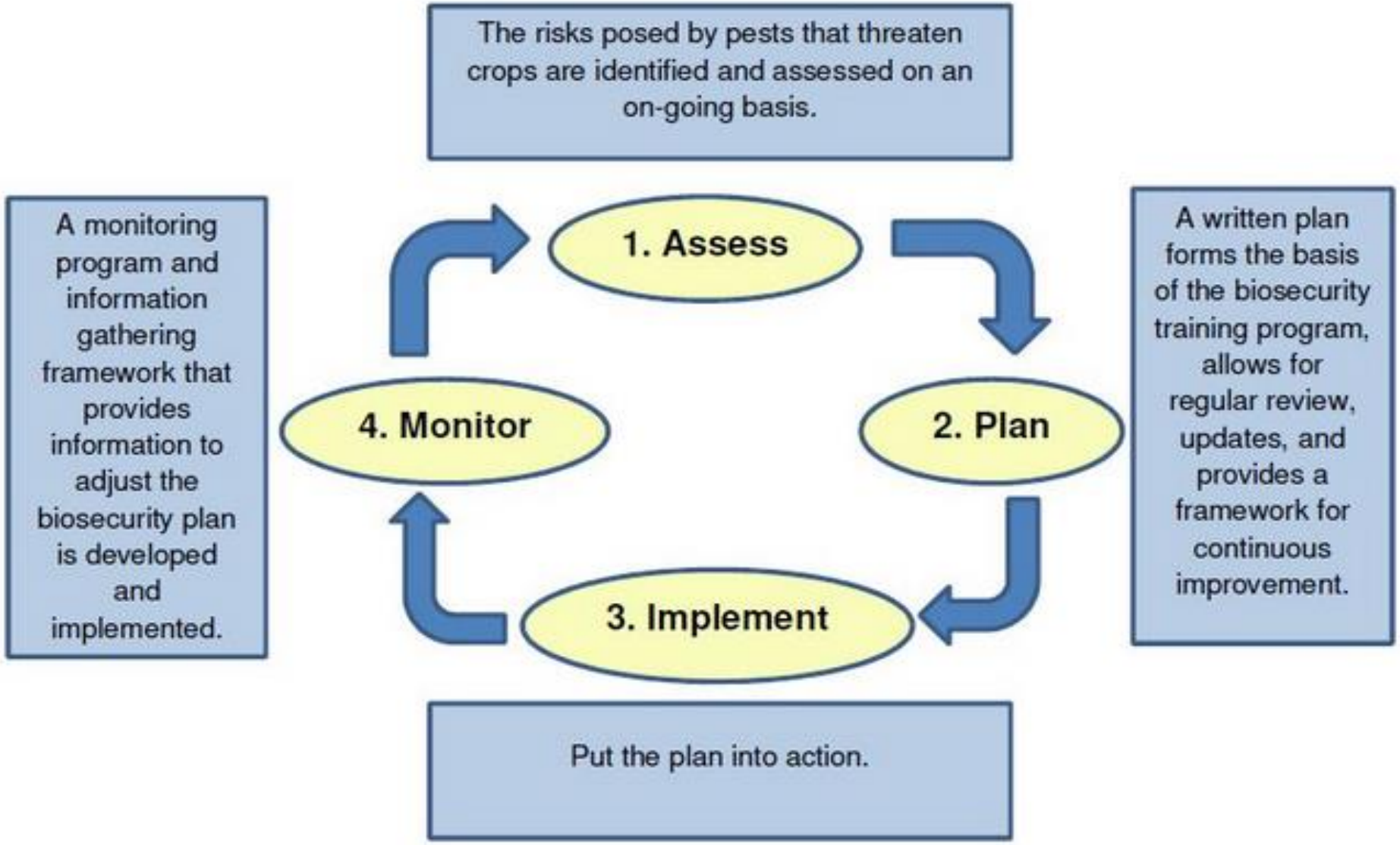


Western corn rootworm

- 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



Biosecurity measure implementation



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

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