

Threat of migratory and invasive insect pests to food security in South Africa

National Science and Technology Forum (NSTF),
Plant Health in South Africa

10-11 June 2021

Dr Roger Price,
Agricultural Research Council



ARC • LNR

Excellence in Research and Development



Migratory and invasive pests in South Africa

Locusts: Legislated and notifiable pests in South Africa

- Brown locust, *Locustana pardalina*
- Red locust, *Nomadacris septemfasciata*
- African migratory locust, *Locusta migratoria migratorioides*
- Southern African Desert locust, *Schistocerca gregaria flaviventris*

- Other serious pests
- African armyworm, *Spodoptera exempta*
- Fall Armyworm, *Spodoptera frugiperda*
- Tomato leaf miner, *Tuta absoluta*
- Oriental Fruit fly, *Bactrocera dorsalis*

- Quelea birds
- Invasive alien plants



Impact of pest invasions on farmers

Crop yield losses - direct economic loss to the farmer

Control at farm level – costs of preventive or reactive management

Pest management inputs = additional cost for farmer = less profit

Commercial farmers

- Large farms, high value crops, but high costs of crop protection
- Access to modern pesticides, application techniques, GM crops
- Access to technical information and specialist advice

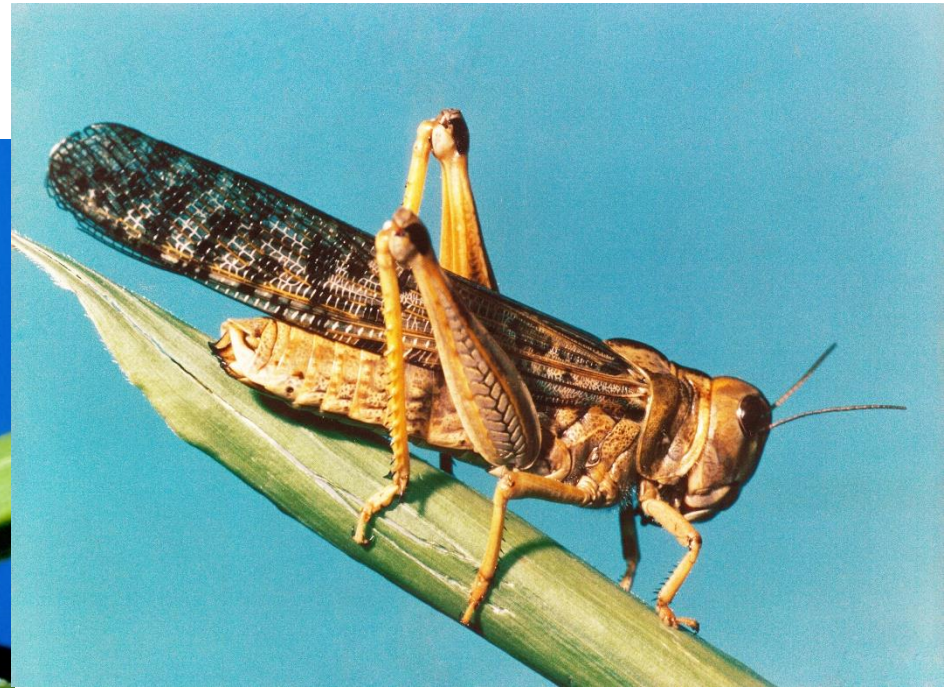
Small-holder farmers

- Small farm sizes and very vulnerable to complete crop loss
- Low yields and high relative costs of fuel, seed, fertilizer, etc.
- Poor access to technical advice, registered pesticides and technologies
- Low resilience to agricultural risks - pests, drought, economic shocks
- Invasive pests are 'the last straw' for millions of smallholders and subsistence farmers across Africa

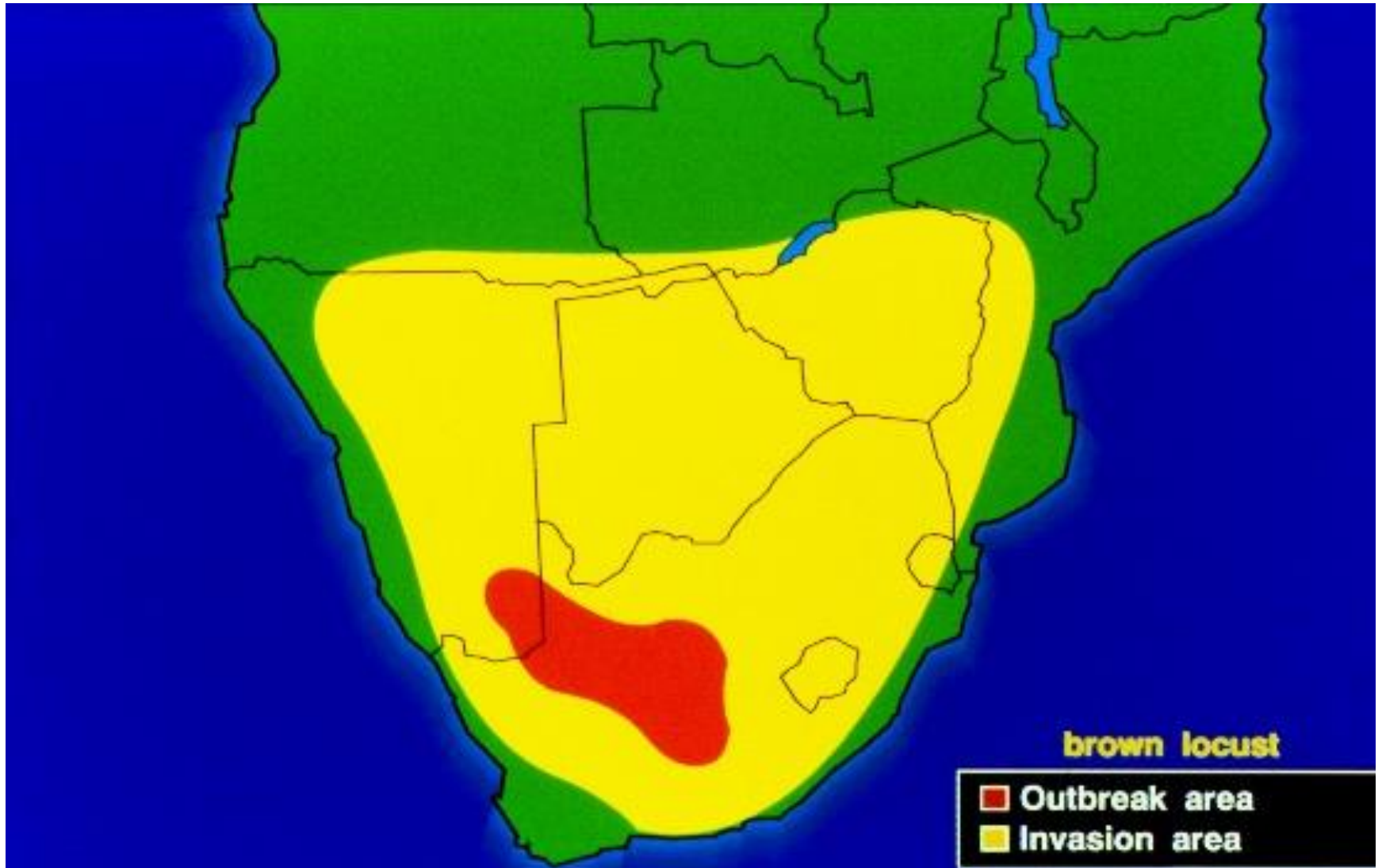


Brown locust

- Outbreak area in semi-arid Karoo
- High fecundity and high outbreak frequency – 90% of years
- Swarms can invade entire southern African region
- Threat to food security



Brown locust outbreak area and invasion area

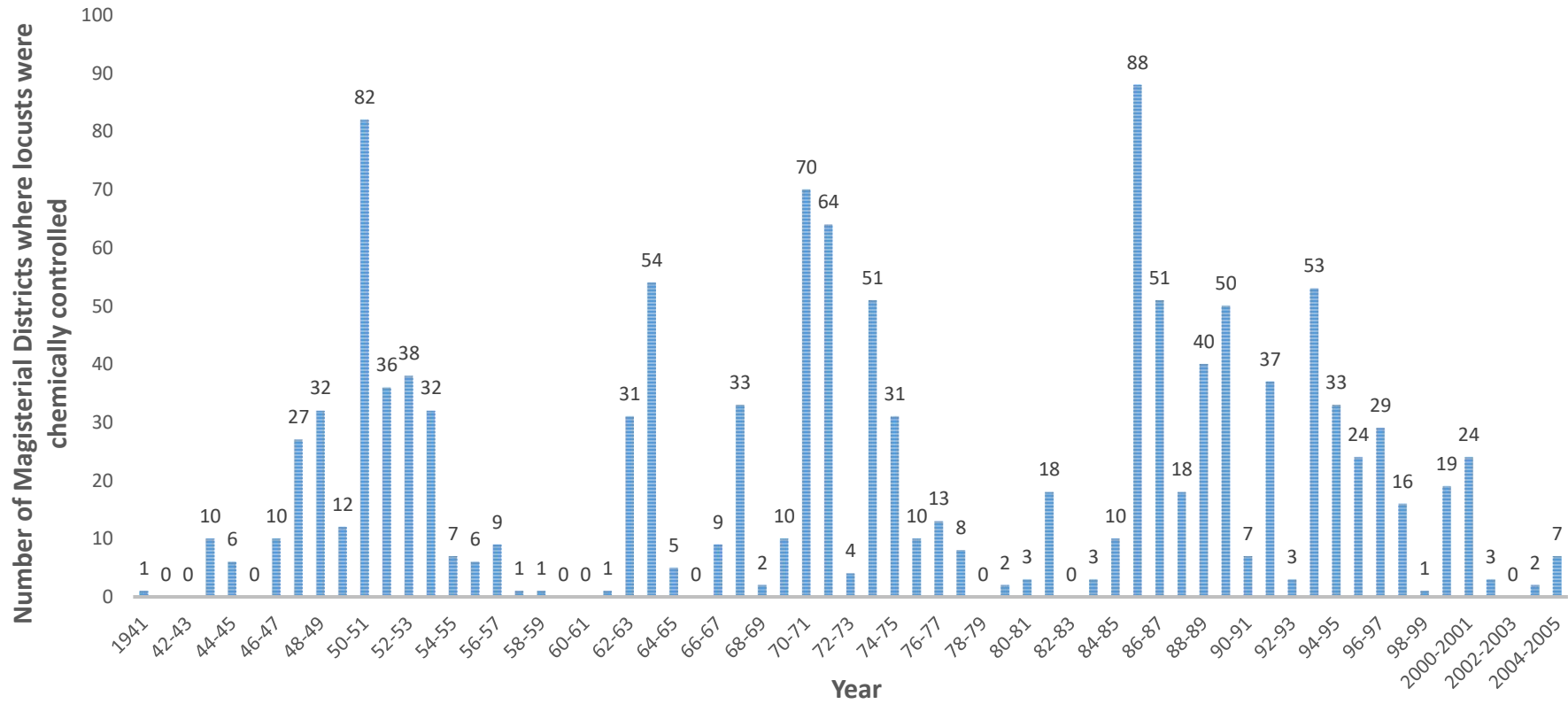


Gregarious outbreaks in the Karoo

Thousands of hopper bands and swarms develop



Brown locust outbreak frequency



African migratory locust

- Local outbreaks in grasslands and cereal cropland areas
- Heavy damage to maize, sorghum and wheat crops



Red locust and desert locust



Red locust swarm over Braamfontein, 1934



African armyworm

Periodic late summer invasions from central Africa



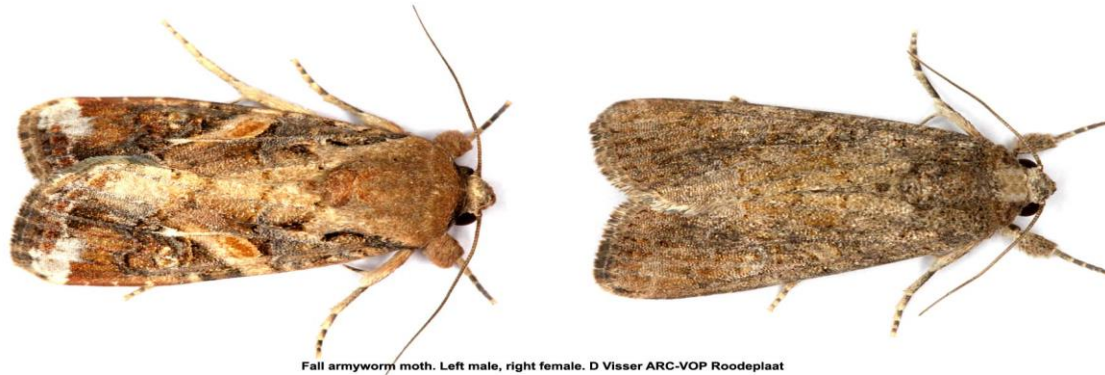
African armyworm. D Visser ARC-VOP Roodeplaat

African armyworm damage to maize in Lesotho
(FAO Lesotho and Prof. Ken Wilson, Lancaster University)

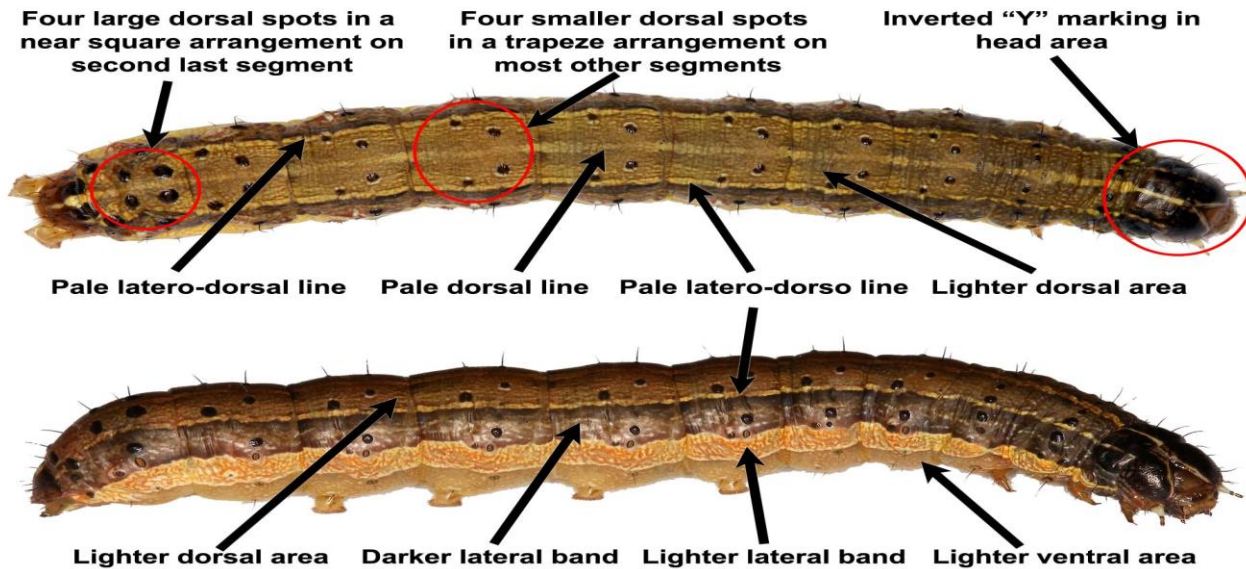


Fall Armyworm

First invasions in early 2017. Now well established in warmer areas.
Severe pest of maize in smallholder areas. Expensive to control.



Fall armyworm moth. Left male, right female. D Visser ARC-VOP Roodeplaat



Fall armyworm characteristic spots, bands and lines. D Visser ARC-VOP Roodeplaat

FAW: signs of infestation and damage

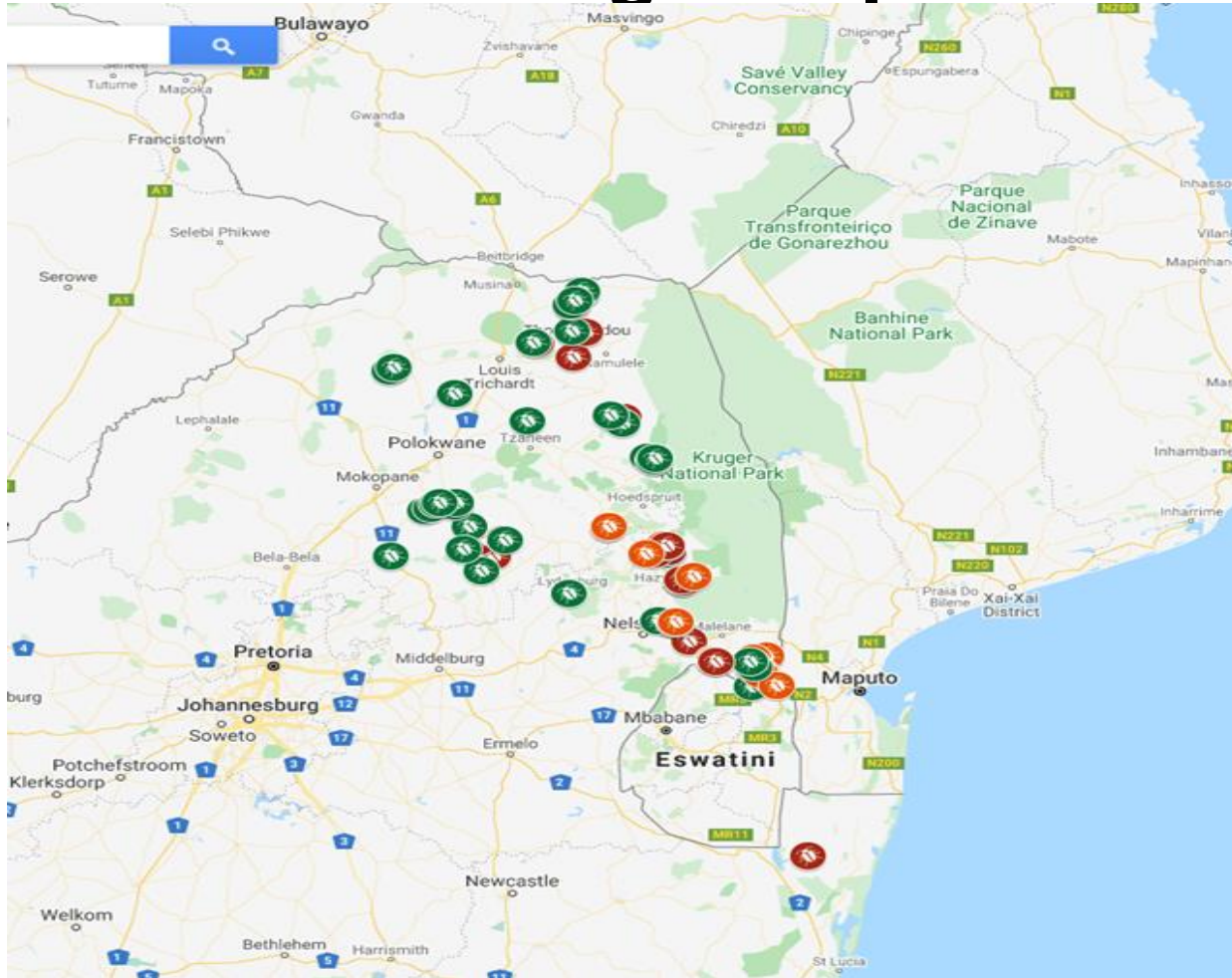


Fall armyworm first instars. D Visser ARC-VOP Roodeplaat



Fall armyworm damage to young maize plants. D Visser ARC-VOP Roodeplaat

FAW overwintering hotspots in SA



FAW outbreaks pose a significant threat to the food security of smallholder rural communities who rely on maize production for homestead food supply and income. Commercial farmers largely protected by Bt maize varieties.

Socio-economic impact of FAW on smallholder farmers in Limpopo Province

- Approx. 3 500 farmers impacted on 40 000ha
- 77% of farmers planted maize on <1ha of land
- Only 3.5% farmed on >100ha
- Plant small areas of maize year-round for cob vendor market
- Most plant open-pollinated maize. Only 1 farmer had Bt maize
- Crop losses 25-100%
- Many farmers had to replant more than once in season
- Replanting - depletion of financial resources
- Rely on Province to provide inputs, ploughing and pesticides.
- FAW was financially crippling with direct impact on homestead food security
- Few skills or resources to plant alternative crops
- Sell livestock, household goods to make money
- Seek employment on other farms / look for work in cities
- FAW pressure will force many farmers to give up farming entirely



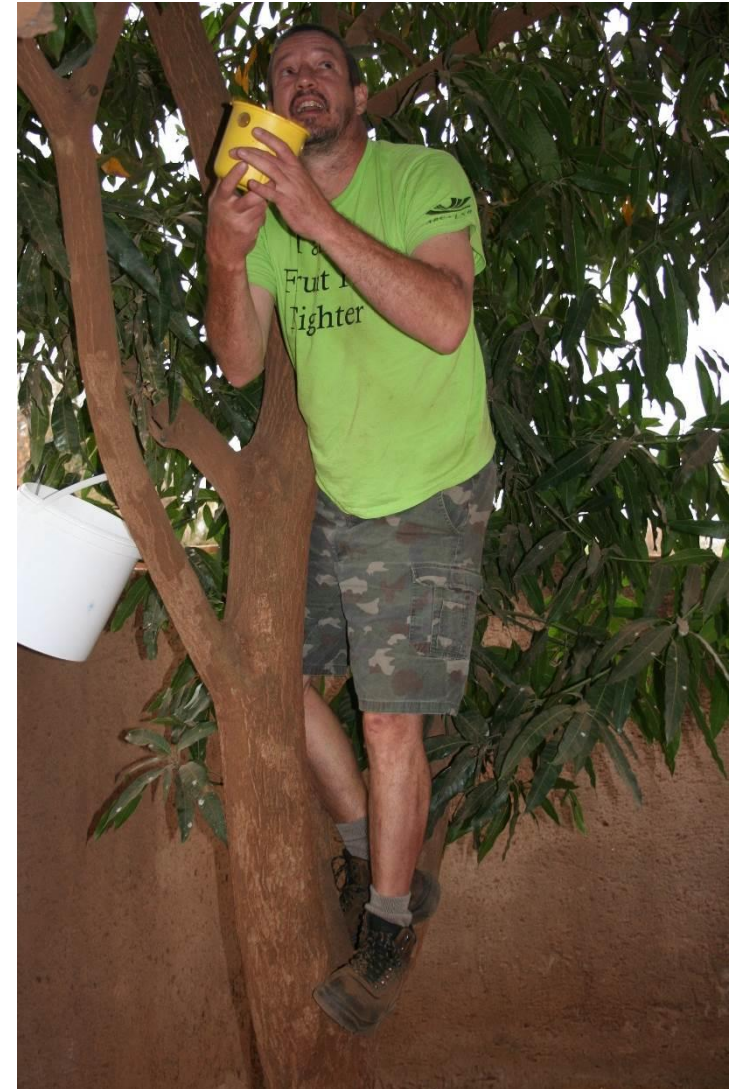
Oriental fruit fly

- At least 4 pest fruit fly species of Asian origin in Africa.
- *Bactrocrea dorsalis* first reported in Africa in 2003.
- First detected in South Africa in 2010.
- Highly polyphagous and major pest of mango, avocado and stone fruit.
- Major pest for smallholder farmers – reservoirs for pest populations
- Yield loss of mango in Africa: 40-90%



Bait traps for fruit fly

Male annihilation technique and population monitoring.



Tuta absoluta

- First reported in Africa in 2006
- Arrived in South Africa in 2016
- Major pest of tomato throughout Africa in tunnels and open fields
- Devastation for smallholder farmers.
- Build up of insecticide resistance



Adult moth and typical larval damage symptoms on tomato

Damage potential of *Tuta absoluta*



A smallholder tomato crop on 4 ha that is completely destroyed by *Tuta absoluta* in the Capricorn District, Limpopo Province. Future viability of tomato production at serious risk in smallholder areas.

Management of Tuta by smallholder farmers

Current problems

- Lack of scouting and early warning.
- Incorrect application techniques.
- Obsolete pesticides.
- Homemade 'cocktails' of pesticides.
- Under and over-dosing of pesticides.
- Lack of personal protection equipment.
- Environmental hazard emergency.

Future needs

- Technology transfer and training.
- Pest level action thresholds.
- IPM strategies.
- Adoption of biocontrol.



Conclusions

- Migratory and invasive pests will continue to threaten food security in Africa. More pest threats are on their way!
- FAW, Tuta and Oriental fruit fly of particular concern for smallholder farmers
- Loss of homestead food security and income
- Escalating input costs and environmental damage from increasing application of pesticides.
- Threat of buildup of insecticide resistance
- Farmers will have to switch production or go out of business.
- Locust monitoring and control in southern Africa is weak
- Need early warning and effective management systems



Management strategies for invasive pests

Phase 1. Know your enemy

Early warning, awareness and communication

- Trap network for early warning. DALARRD, CropWatch, etc.
 - Training, monitoring, identification, reporting and data management
- Communication networks
 - Communication platforms for public awareness
 - Establishing and maintaining information networks
 - Early warning communication for farmers
- Predictive models – outbreaks, migration, damage potential
 - Information to feed into models to enhance early warning.



Phase 2. Proactive management (over the short to medium term)

- Safe and effective insecticides available
- List of approved insecticide products and application methods
- ‘Training of the trainers’ (agricultural extension officers) in pest scouting, optimal application methods and Integrated Pest Management (IPM)
- Training courses and information available to all farmers
- Socio-economic assessment of the impact of invasive pests on smallholder livelihoods
- Adoption of cultural control methods – crop varieties, planting dates, conservation agriculture, alternative control, etc.
- Targeting of pest populations at most vulnerable stages, eg. FAW overwintering areas.



Phase 3. Management strategies (over the medium to the long term)

- Pest management information readily available to all farmers
- Effective outbreak monitoring and early warning service available for specific pests
- Biological control and cultural control strategies evaluated
- Adoption of best-practice IPM strategies for the management of invasive pests
- Environmental risk analysis of insecticide control measures
- Insecticide resistance management strategies adopted



Thank you



