

**A world class
research team**

FABI



**The largest team working on agricultural and forestry biotechnology in
Africa, and for some fields, in the world**

**Strong team and foundation, critical mass, magnet and pipeline for talent,
international networks, strong inter-dependent stakeholder programs with industry
and government, incubator for industry-academia linked programs with impact**

Forestry and Agricultural Biotechnology Institute (FABI)

20 Established research programmes, 300+ researchers, postdocs, postgraduate students and support staff

Eucalyptus and Pine Pathogen Interactions
(S Naidoo)

Tree Health Biotechnology Platform
(8 programmes)

Citrus and Grapevine Virology
(G Pietersen)

Forest Molecular Genetics
(AA Myburg)

Bacterial Genomics and Host Pathogen Interactions
(LN Moleleki)

Seed Science
(TAS Aveling)

Molecular Plant Physiology
(BJ Vorster)

Phytopathology
(TA Coutinho)

Molecular Plant Pathogen Interactions
(DK Berger)

FABI

Zoology and Entomology

Plant and Soil Sciences

Future Africa

Biochemistry, Genetics and Microbiology

Innovation Africa

Management Committee

35 research leaders from FABI and its affiliated Departments

- Biochemistry, Genetics and Microbiology
- Plant and Soil Sciences
- Zoology and Entomology
- Physics & Chemistry

Advisory Committee

Heads/Chairs/Directors of:

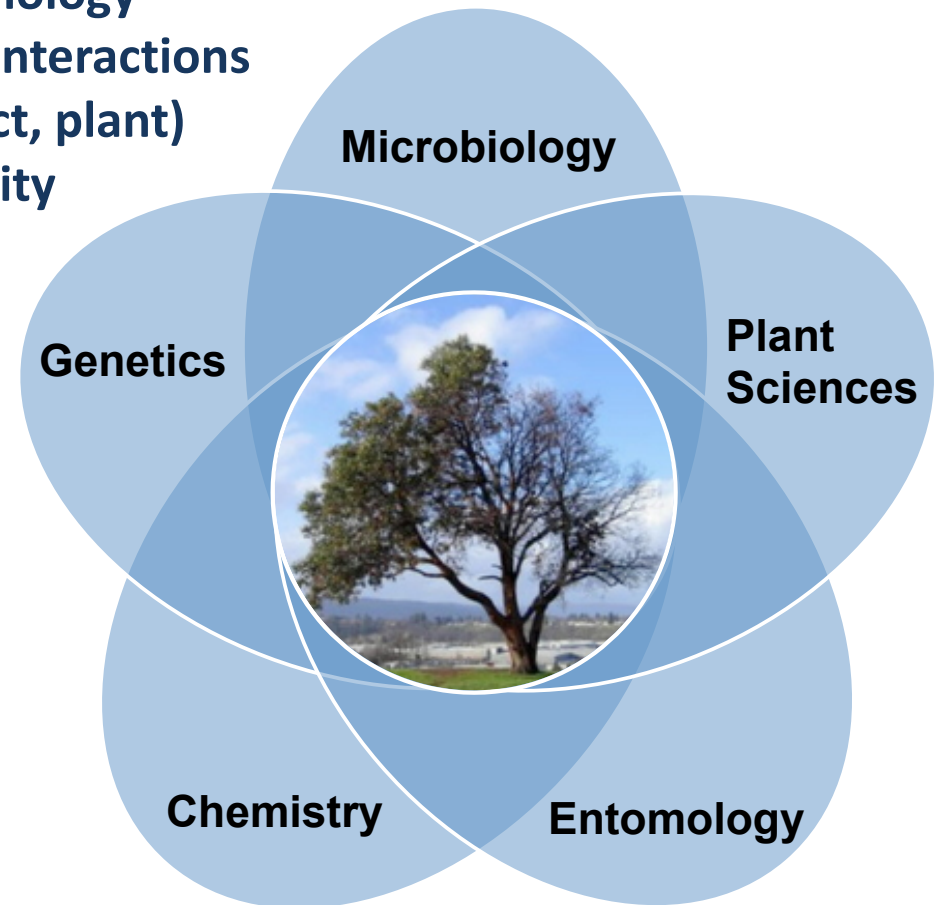
- Biochemistry, Genetics and Microbiology
- Plant and Soil Sciences
- Zoology and Entomology
- Chemistry
- Chemical Engineering
- Civil Engineering
- Mammal Research Institute
- Genome Research Institute
- Center for Bioinformatics and Computational Biology
- Mathematics and Applied Mathematics
- Computer Science

Stakeholder Advisory Board

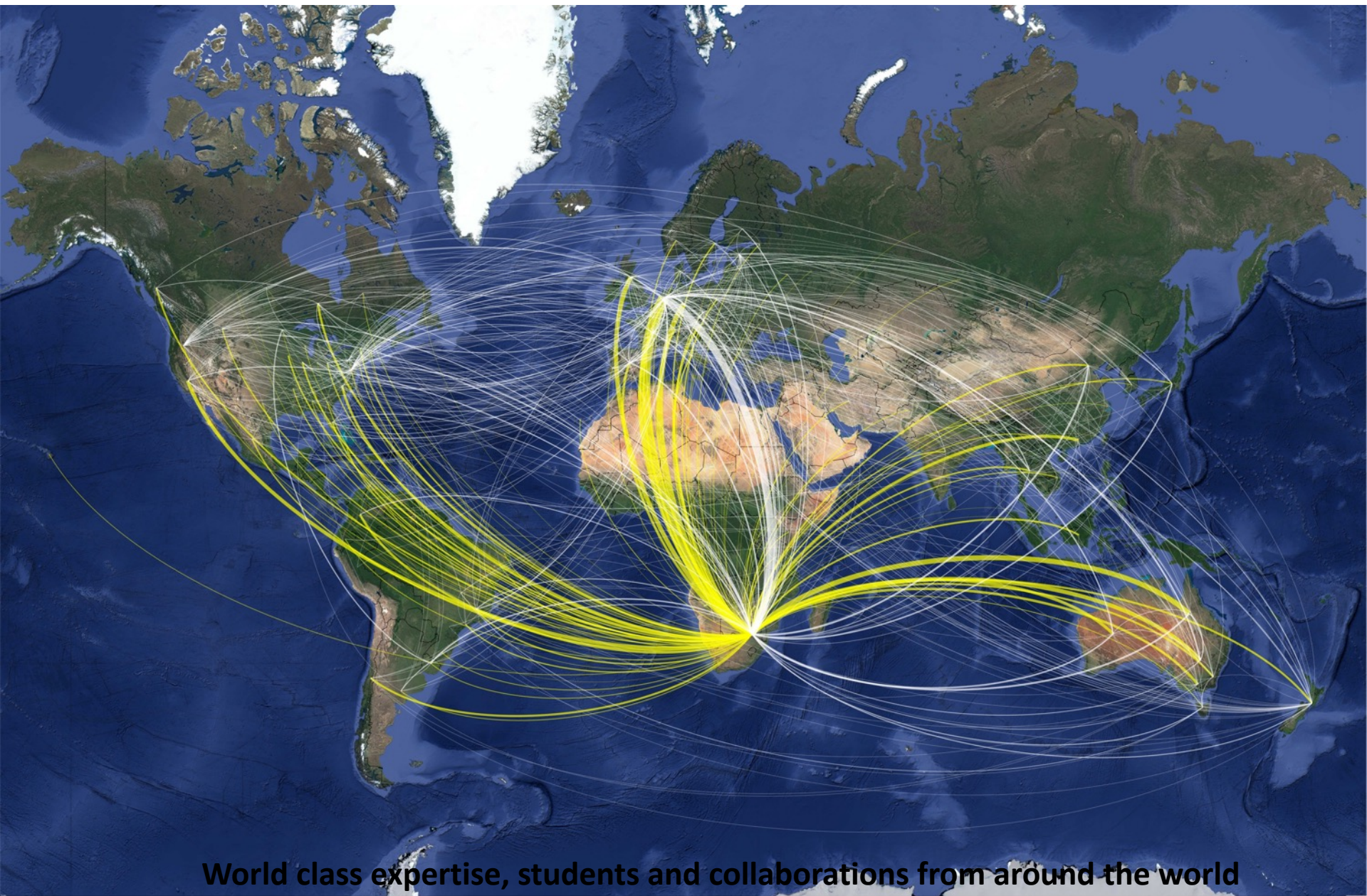
Industry and Government

A problem oriented, team based, interdisciplinary approach

Agricultural and Forest Biotechnology
Forest Entomology and Pathology
Agricultural plant pathology and entomology
Molecular plant-pathogen and -insect interactions
Applied chemical ecology (fungal, insect, plant)
Applied mycology and fungal biodiversity
Modeling of biological systems
Molecular plant physiology
Forest molecular genetics
Phytobacteriology
Seed vigour and pathology
Plant genomics
Synthetic biology
Systems biology
Data Science & Bioinformatics
Sensor technology



FABI research networks



World class expertise, students and collaborations from around the world

Satellite Labs Extend Science

A new type of lab links Western scientists who want to expand with emerging nations seeking access to world-class researchers

Four years ago, Le Quang Minh and Hoang Zung decided to create a cutting-edge chemistry research center at Vietnam National University (VNU), Ho Chi Minh City. The center would also help train the next generation of basic scientists.

But neither Minh, VNU's vice president of international relations, nor Zung, the director of its science and technology department, could think of a domestic researcher with the scientific heft to lead the center. That's not too surprising, given that one of their goals was to strengthen the research capacity of their home institution. So the two men launched a global search, and on a visit to the University of California, Los Angeles (UCLA), they found someone who seemed to fit the bill.

His name was Omar Yaghi, and his scientific achievements clearly qualified him for the job. The Jordanian-born faculty member is one of the most highly cited chemists in the world and an expert on designing novel porous materials. Yaghi had also shown an ability to work with those from another culture, having formed a mentoring relationship with the International Center for Materials Nanoarchitectonics in Tsukuba, Japan. The icing on the cake was a Vietnamese graduate student working in his lab.

Convinced that Yaghi was their man, Minh and Zung invited him to run the center as a satellite of his own lab. Yaghi readily agreed. "Scientists do science to stimulate their mind," Yaghi says. "I want to go into new territories to explore them."

With Yaghi on board, the three men went to work making the center a reality. The university hosted an international conference to flesh out a research agenda for what they called the Center for Molecular and Nanoarchitecture (MANAR). Then they pitched the idea to the Vietnamese government. After countless meetings, Minh and Zung wrung a promise for \$20 million over 5 years for the center, no small feat in a country with a total budget for science and technology of roughly \$700 million a year.

Work began in 2009 on the lab, to be housed on one floor of a newly built high school. Yaghi's graduate student, Anh Phan, began traveling back and forth to Vietnam in 2-month chunks to oversee construction. MANAR officially opened for business in December.

Yaghi is one of several high-profile researchers who in recent years have opened such satellite labs in other countries. It's a hybrid form of international partnership—smaller, more focused, and less bureaucratic than a formal alliance between two institutions, but broader and more structured than a simple agreement between two like-minded researchers to team up on a project.

Western scientists who have set up satellite labs in other parts of the world say the approach provides a relatively easy way to expand their research group and obtain funding without having to run the peer-review gauntlet in the United States and Europe. In return, the host country buys access to a world-class scientist willing to train its students and strengthen its research capacity. That arrangement typically requires less than 20% of a professor's time, comparable

to the amount available to faculty for outside consulting projects. Compensation is also worked out on a case-by-case basis.

Yaghi isn't paid by VNU to direct the center. But VNU has named him a distinguished professor, and the position covers a portion of his travel and administrative costs. Yaghi has also promised to visit as often as needed to keep the research on track and to mentor VNU students. So far he has spent only a few weeks in Vietnam. But e-mail and Skype allow him to stay in close contact with his group of some two dozen students and several senior researchers and professors.

MANAR likely won't be the final satellite lab on his plate. Yaghi is looking into creating labs in several countries in the Middle East, including Qatar, Saudi Arabia, and his native Jordan.

Yaghi, who in January left UCLA to head the Molecular Foundry at Lawrence

Berkeley National Laboratory and join the faculty of the University of California, Berkeley, says he isn't trying to create a global scientific empire. But he would like to help jump-start scientific development in areas that desperately need it.

"These countries are very eager to join the world economy and the world science scene," says Yaghi, who took his satellite arrangements with him when he came to Berkeley. In fact, the three institutions have agreed to back a new center for global mentorship to help other topflight researchers around the world set up their own satellites (see sidebar, p. 1602).

Satellite labs can be a challenge to set up and run, Yaghi and oth-



Satellite Lab Applied Chemical Ecology

Shared projects
Shared postdoctoral fellows
to transfer skills
Shared students
Shared lab facilities
Shared resource mobilization
Advanced teaching modules
Student exchange
Staff exchange



Global reach. Omar Yaghi (top) with the molecular cages he pioneered, and (above) with Anh Phan (far right) and students at MANAR in Vietnam.



36th Annual Meeting of the
International Society of Chemical Ecology

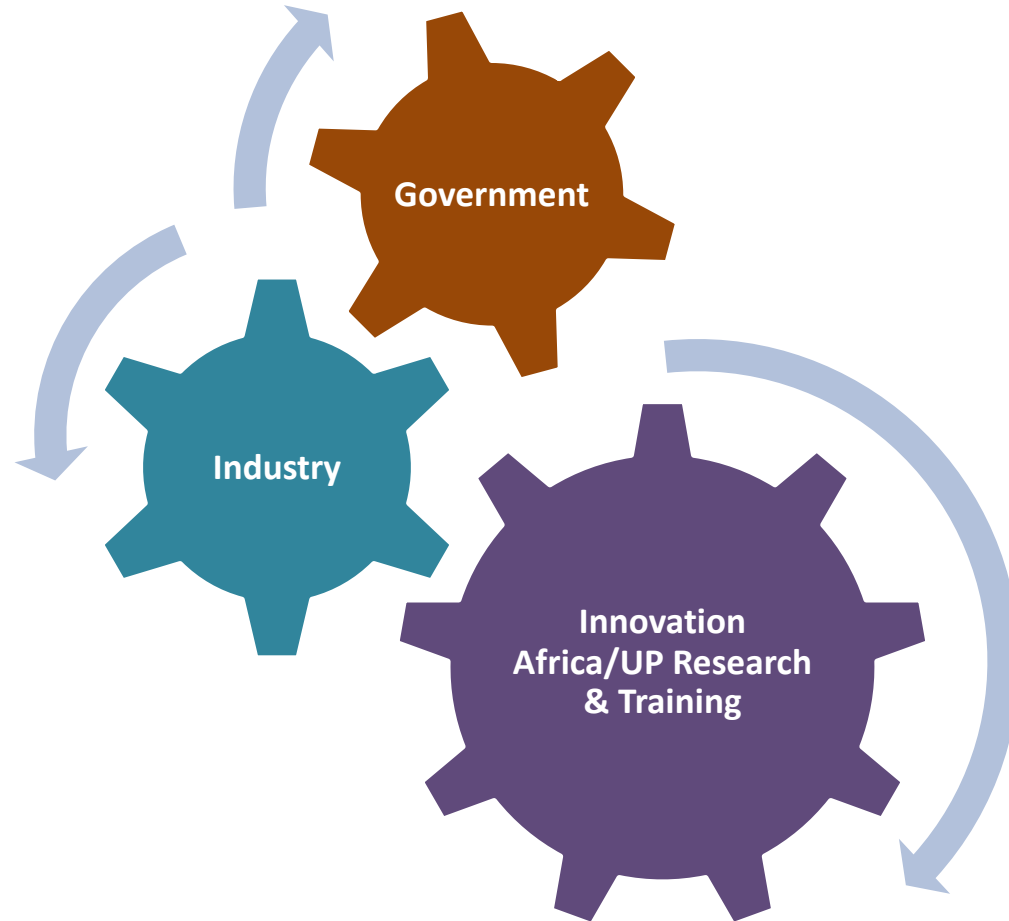
Stellenbosch, South Africa | 6-11 September 2020



CHEMICAL ECOLOGY AND
SUSTAINABLE DEVELOPMENT

isce2020.science

Build strong, long term and inter-dependent stakeholder relationship



Industry support for FABI



FABI Research Groups

Applied Chemical Ecology

Chemical ecology is the study of the role that chemicals play mediating interactions between organisms and organisms and their environment, and the consequences of those interactions in ecological and evolutionary time. It is not an autonomous discipline but rather an approach to ecology, one of viewing ecological interactions through a chemical lens world.



Applied Mycology

In the Applied Mycology Research Programme we are focusing on to better understand the fungi communities that produce mycotoxins in agricultural crops, food and animal feed. Emphasis is placed on the diversity and taxonomy of genera such as *Athelia*, *Aspergillus*, *Fusarium*, *Penicillium* and *Talaromyces*, but many others are also studied. Ultimately, our goal is to secure food and feed from farm to fork for future generations.



Cereal Foliar Pathogen Research

The research group focusses on the interaction between cereal plants and foliar fungal pathogens. Pathosystems currently under study include grey leaf spot in maize (GLS) caused by *Coenophiala zeae*, and northern corn leaf blight (NCLB) in maize and sorghum caused by *Exserohilum funiculosum*. Projects are aimed at studying population structure of these pathogens, identification and functional characterisation of pathogen effectors causing disease, and cereal plants' response to pathogen infection.



Molecular Plant

The Molecular Plant

Phytobacteriology

The Phytobacteriology programme research areas, viz. taxonomy, phylogenetics, molecular biology, and ecology. Several plant pathogens are being characterised and are also being studied to determine their potential for

Seed Science

is actively involved in seed science research fields include seed health and seed pathology, seed vigour and seed quality according to ISTA rules. We are working in industry, or developing sustainable, seed storage and seed processing technologies, seed

Tree Protection Co-operative Programme

The Tree Protection Co-operative Programme (TPCP) represents a cooperative venture between the major players in the South African Forestry Industry and the University of Pretoria, to deal with tree disease problems. The programme is based on a membership concept where forestry organisations are members and contribute to a collaborative effort through the payment of annual fees. The University of Pretoria in turn provides the infrastructure necessary to conduct research into tree pests and diseases, which is technologically complicated and thus expensive.



Research Network

Polypagous Shot-hole Borer (PSHB)
An outbreak in South Africa is the largest geographical outbreak of this beetle in the world. It is affecting trees in all sectors: the agricultural and commercial forestry sector; urban trees (public spaces, streets, gardens), as well as native trees in natural forests. Over the past year or more, researchers at FABI had been in contact with senior academics from seven universities in relation to PSHB research.



Programme

is growing in popularity and is of major economic loss, as well as nut quality. The programme is heavily on the use of integrated pest management (IPM) and chemical control. There is, however, an ongoing continuous build-up of a long-term sustainability of the programme on the use of integrated pest



Forest
Biotechnology
Platform

Fruit & Nut Tree
Biotechnology
Platform

Grain Crops
Biotechnology
Platform

Vegetable Crops
Biotechnology
Platform

CIFB

Long term, multi-stakeholder programs

Tree Protection Cooperative Programme

Partnering with forestry for 31 years



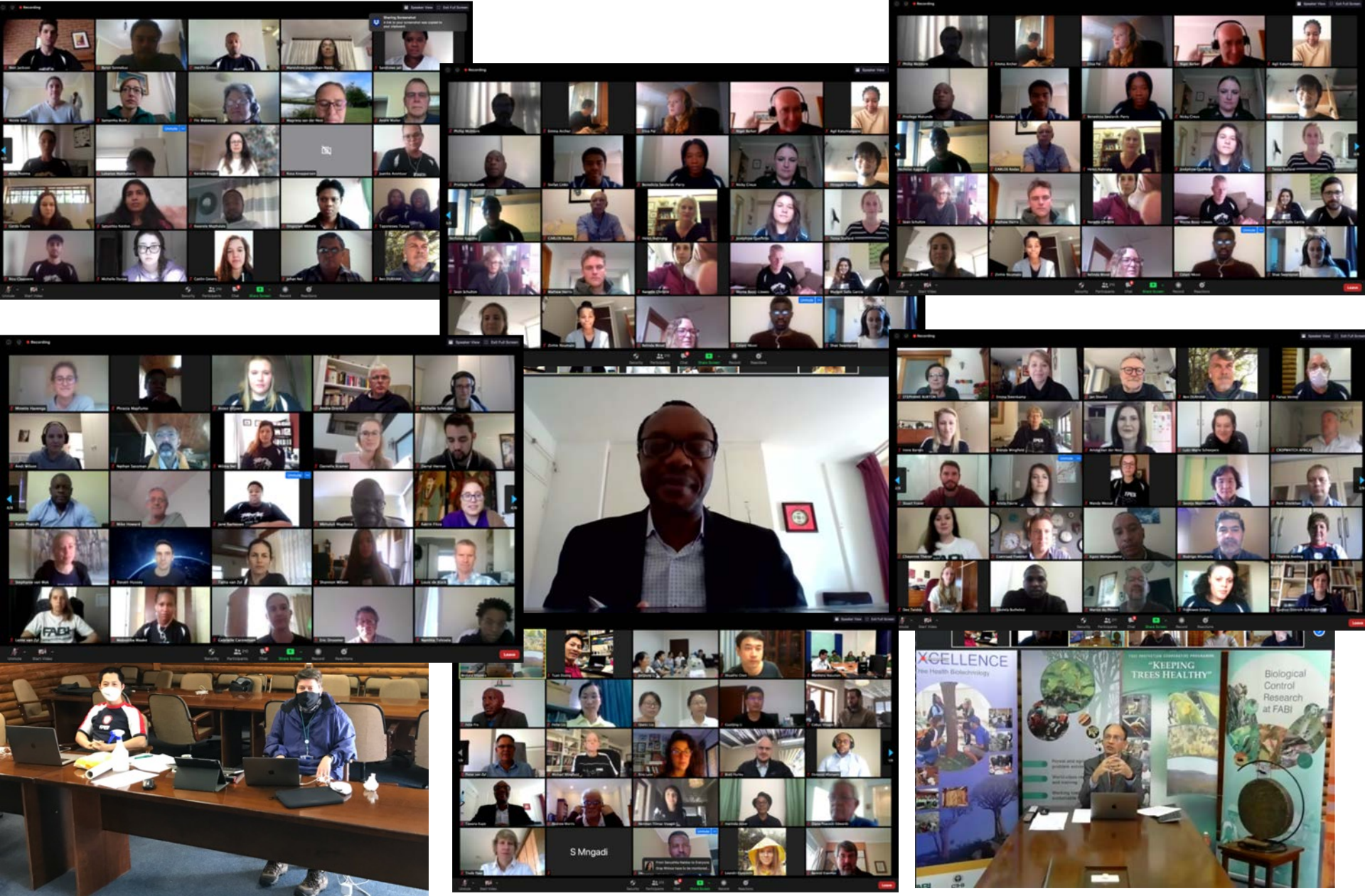
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Stakeholder engagement going online





DSI NRF Centre of Excellence in Plant Health Biotechnology



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science
& technology

Department:
Science and Technology
REPUBLIC OF SOUTH AFRICA



National
Research
Foundation

Tree Health Biotechnology Platform @ FABI

Industry, University and Government-funded

Tree Protection Cooperative Programme (TCP)
 DST-NRF Centre of Excellence in Tree Health Biotechnology (CTHB)
 DST-NRF SARCHI Chair in Fungal Genomics
 Macadamia Protection Programme
 Avocado Research Programme
 Polyphagous Shothole Borer Research Network
 China Eucalypt Research Centre-FABI Tree Protection Programme
 Royal Golden Eagle-FABI Tree Health Programme



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1423 articles



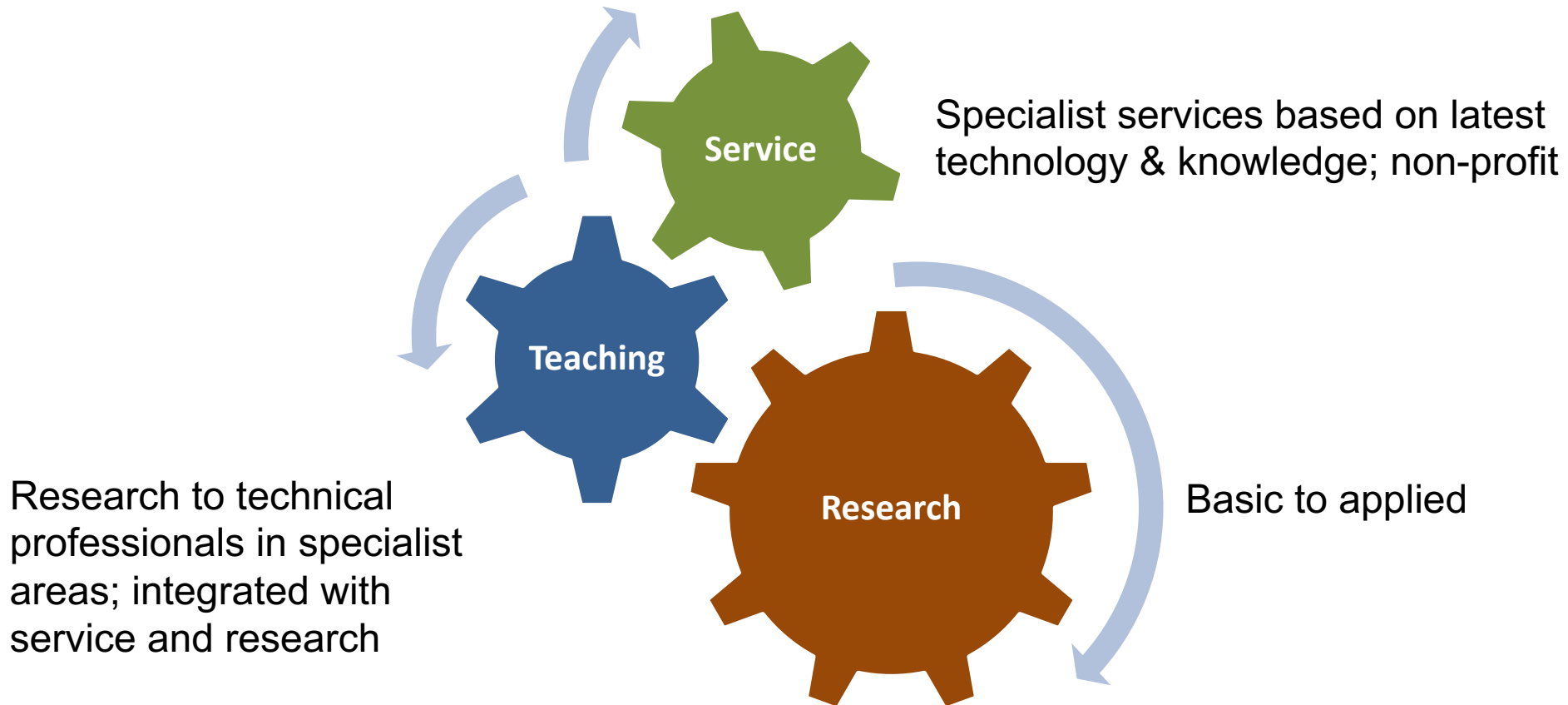
139
MSc

109
PhD

95
Hons



Building on a strong integrated research, training and service focus



Making an impact in industry

TRENDING

BUSINESS

MONEY & MARKETS

TECH

The Sirex woodwasp

specifically targets pine trees to lay their eggs and when doing so, deposit a fungus and a toxin that weakens the trees

These trees eventually die



BUSINESS INSIDER BUSINESS

This tiny worm has saved South African companies more than R400 million

Sarah Wild, Business Insider SA
Aug 06, 2018, 07:07 AM



A microscopic worm, called a nematode. (Getty Images)



The use of these microscopic worms (nematodes) against the Sirex woodwasp is known as a form of

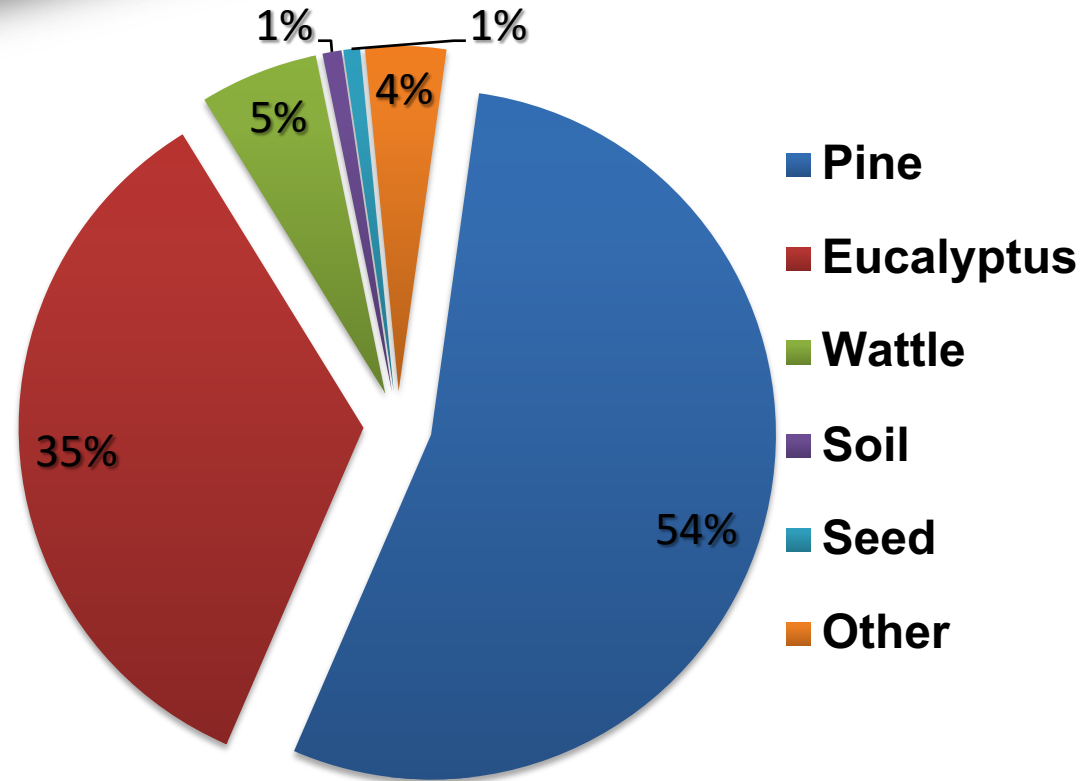
BIOCONTROL



- Scientists are breeding billions of microscopic worms to kill an invasive wasp in plantations all over the country.
- The Sirex wasp is a serious threat to South Africa's pine industry
- Originally from Eurasia and North Africa, *Sirex noctilio* is one of many invasive species that are finding their way to South Africa

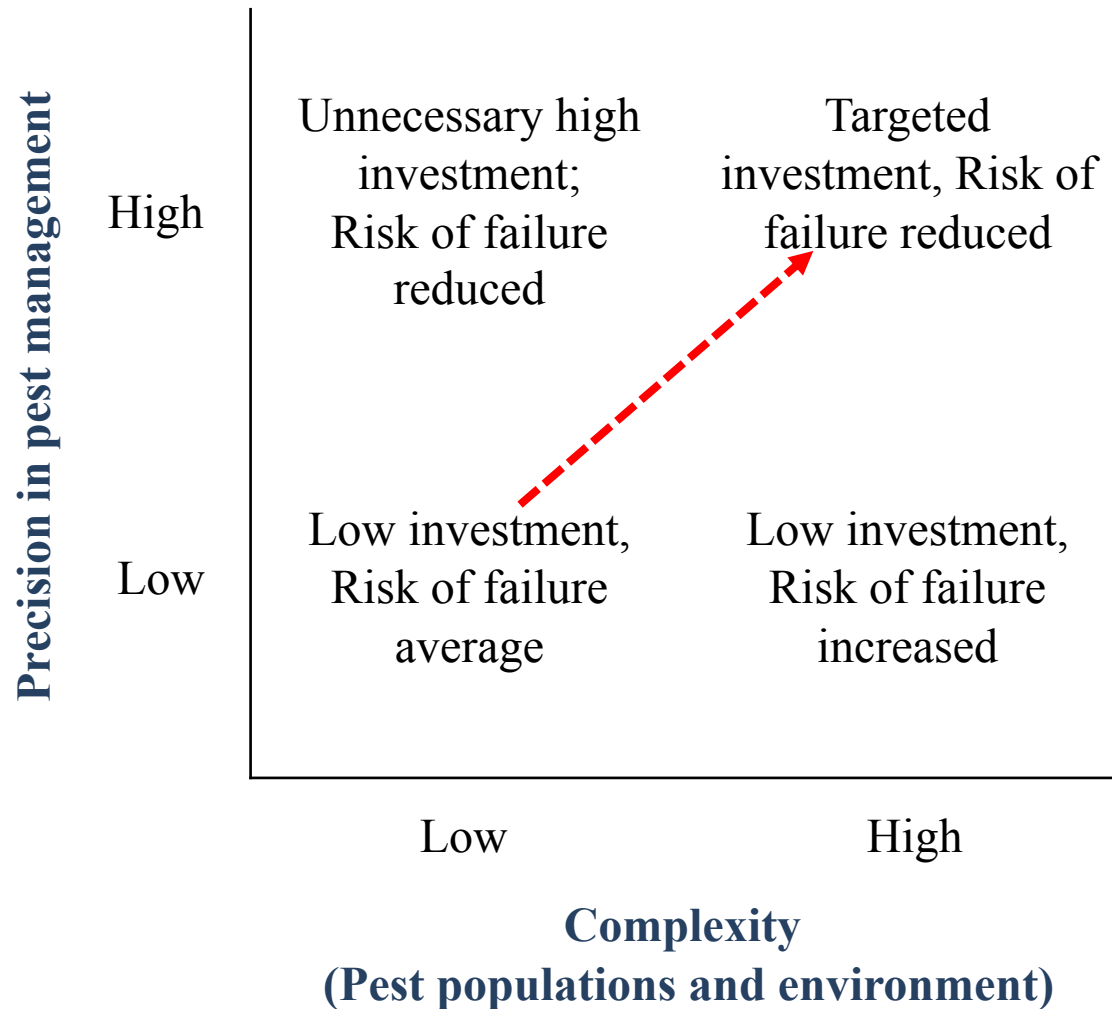
Field extension & diagnostics

1000s samples/yr
>1000 person days in field/yr



Pathology and Entomology samples

Supporting Precision Pest Management



The Future Africa Institute

Transdisciplinary Research Leadership for Innovation



Connecting the best minds around the world, with a particular focus on Africa



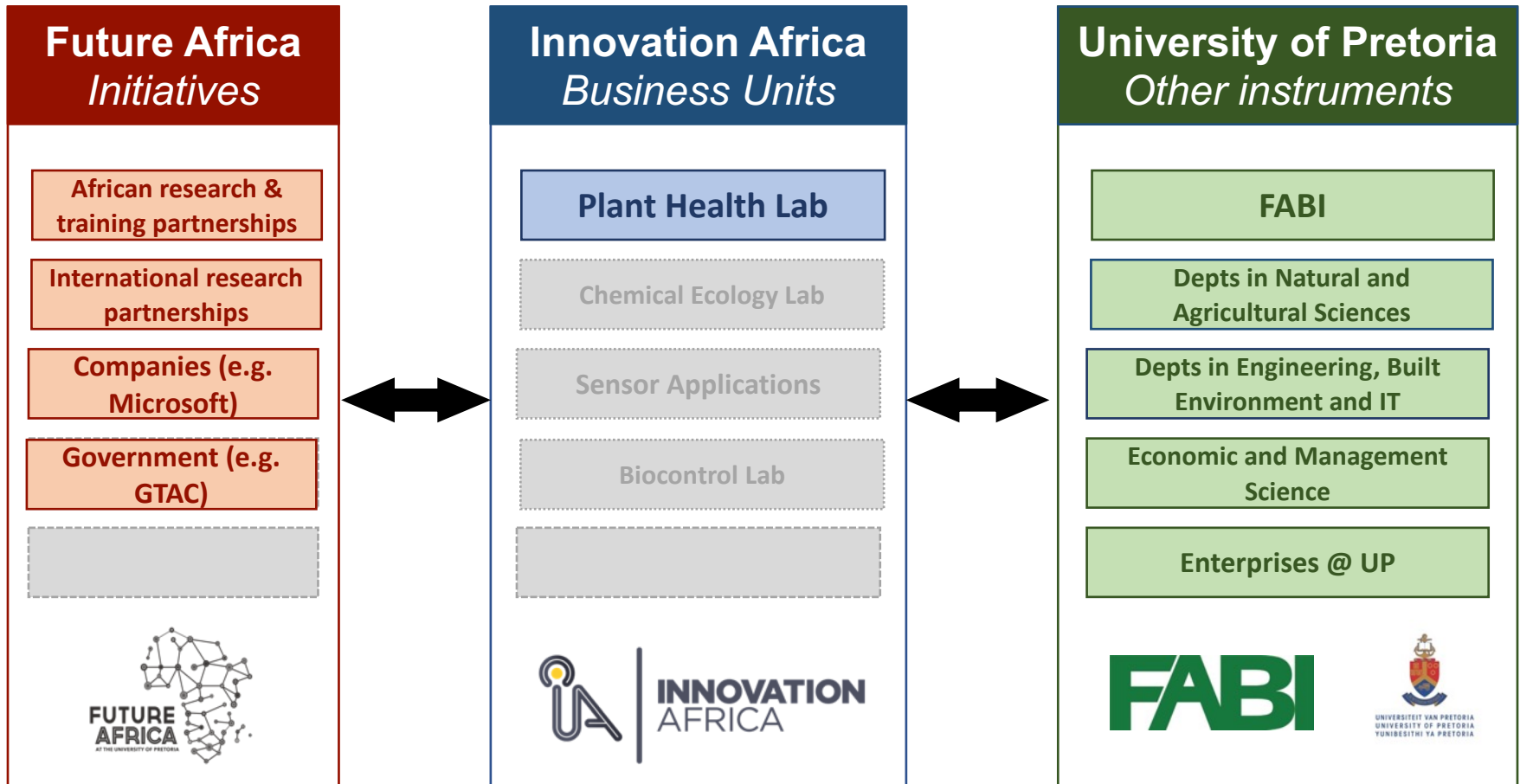
Development of Innovation Africa @UP



Republic of South Africa

- UP Campuses
- Proposed Precinct

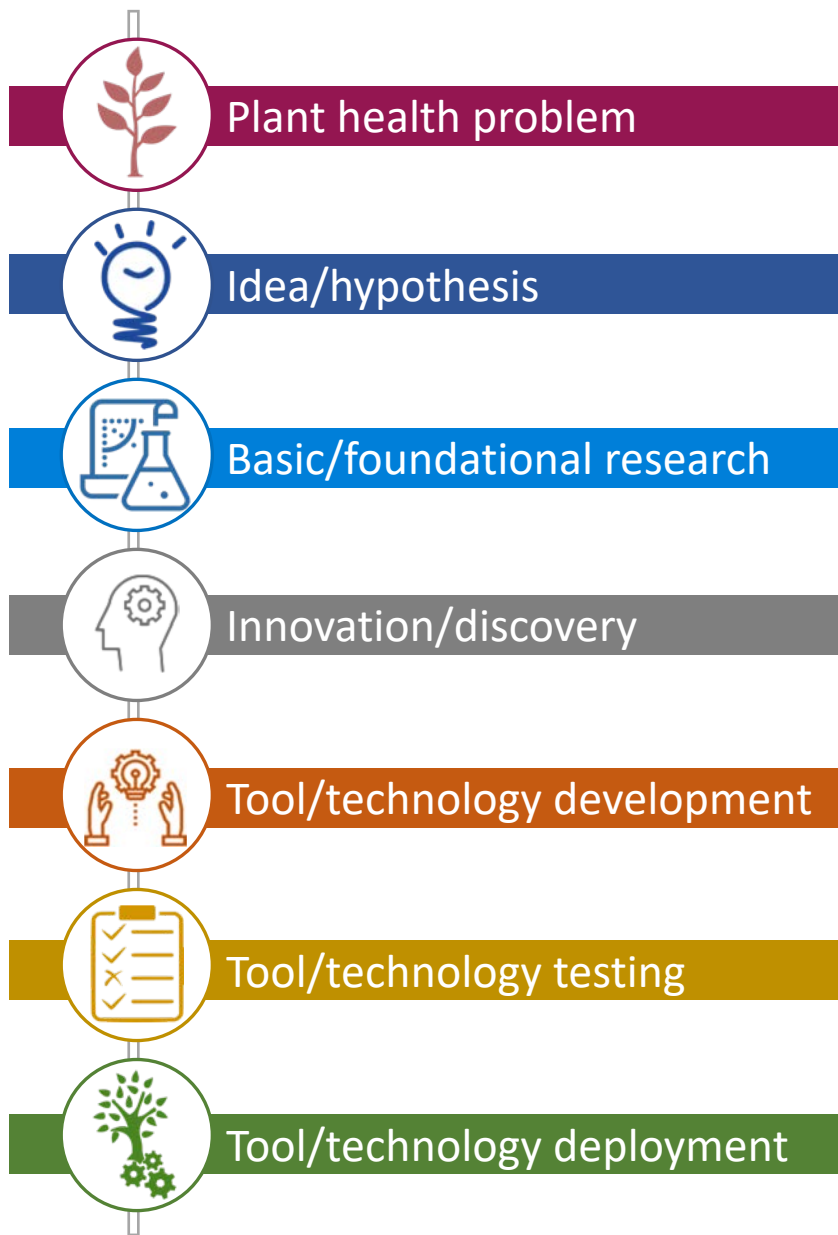
Future Africa, Innovation Africa and future Agriculture and Forestry Research at UP



Platform to support development of structured partnership with Industries, NGOs, Universities, and other relevant agencies

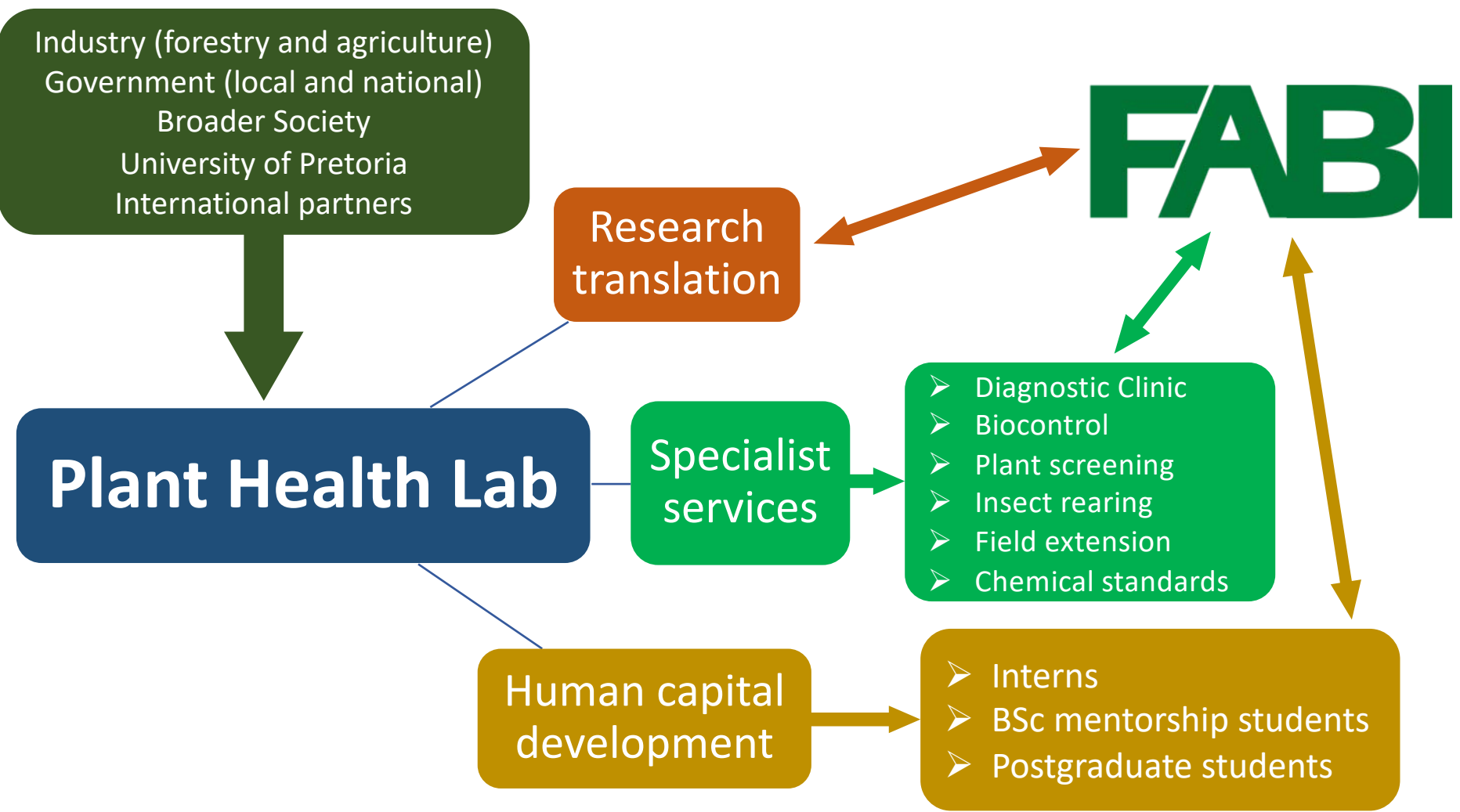
Translational research in Plant Health

FABI



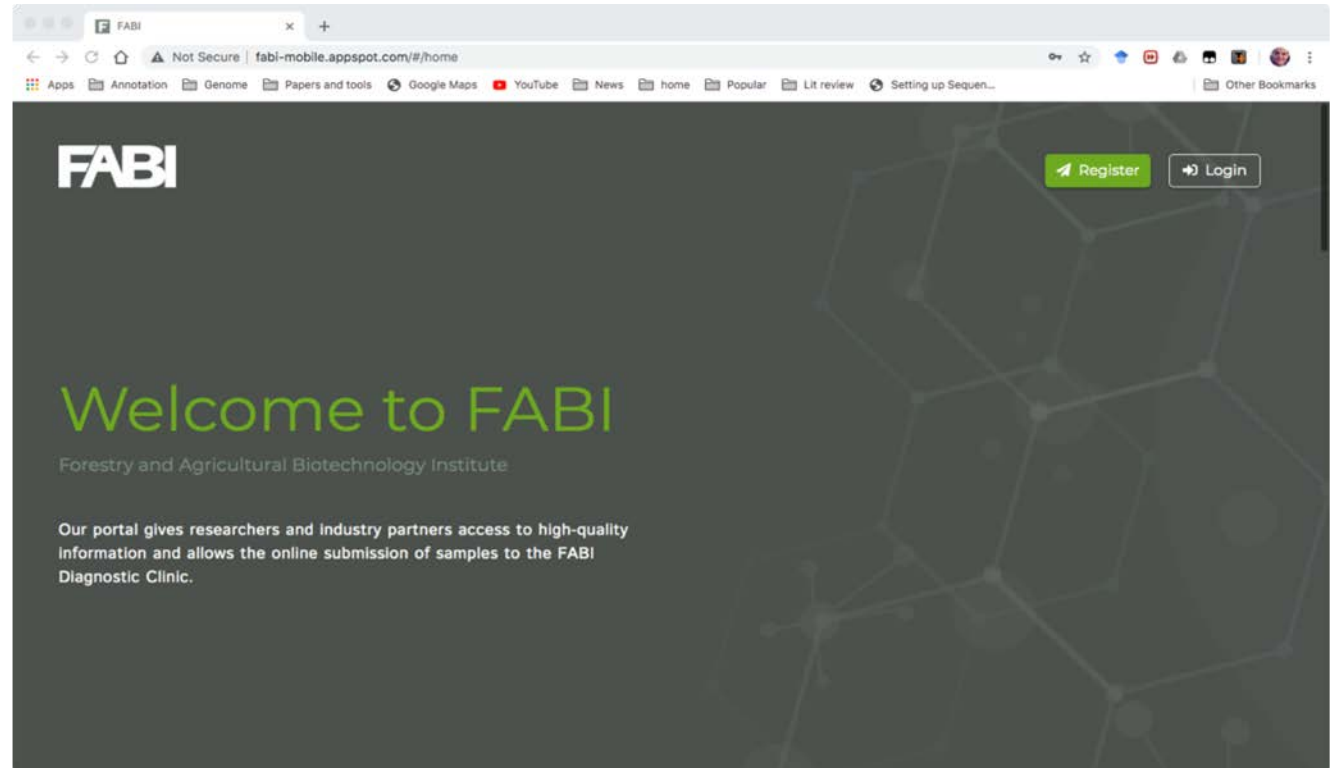
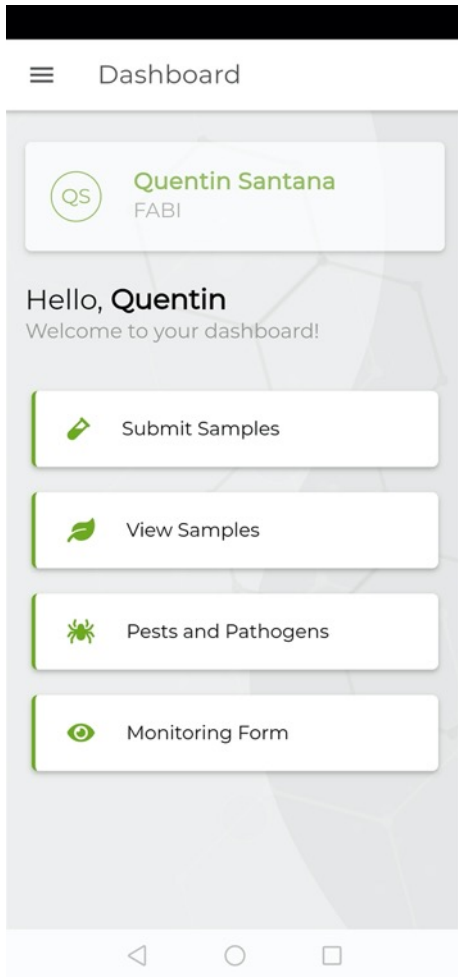
 **INNOVATION
AFRICA**

Plant Health Lab



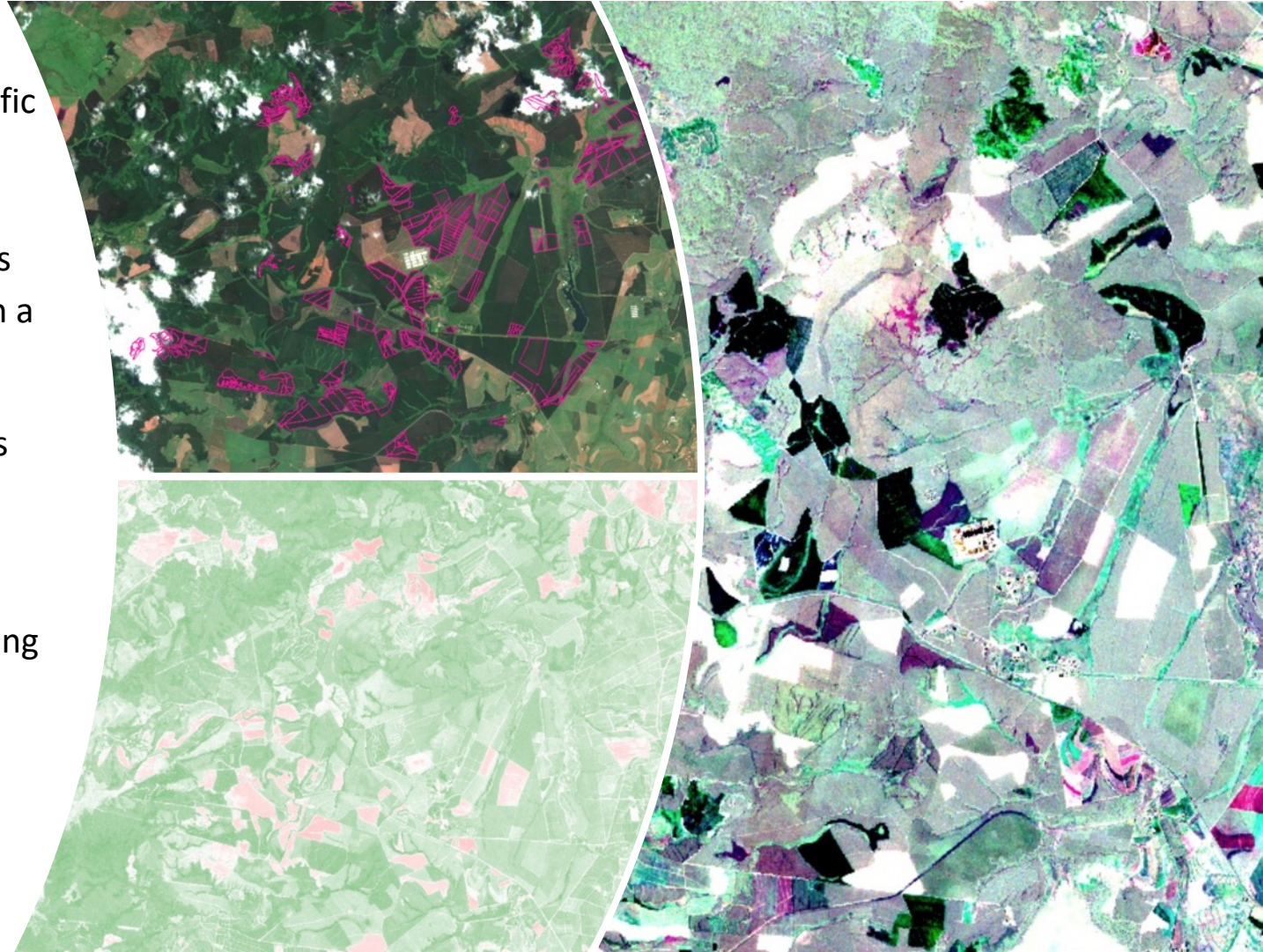
UP's new **Higher Education-Industry Partnership Platform.**

FABI Mobile



Satellite surveillance & diagnostics

- Multi-spectral image analysis to detect specific pests and diseases
- Potential to:
 - Identify outbreaks
 - Predict areas with a high chance of infestation
 - Determine factors linked to high infestation
- Moving forward:
 - Increase monitoring and validation of infestations
 - Higher resolution satellite imagery
 - Both will improve data models



Thank you



FABI

www.fabinet.up.ac.za



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