




CABI
in review

19

Contents

Foreword from the Chair	3
Foreword from the CEO	4
CABI's 20th Review Conference	6
2019 in Review	8
CABI's mission and the Sustainable Development Goals	9
Helping women scientists to tackle global challenges like climate change	11
"We, the women, can do it" – meet Jacinta, a farmer from Bolivia	12
Plantwise helps reduce extreme poverty in Rwanda	13
SMS campaign helps 80% of farmers learn new ways to tackle fall armyworm in Kenya and Uganda	14
Helping maize farmers in Kenya increase their harvests with space-based technology	16
Africa Soil Health Consortium reaches over one million smallholder farmers	18
Music videos help women farmers grow better soybean crops	19
Helping plant protection officers make a difference to agricultural extension	20
Showing investors the big business case in small-scale farming	21
CABI scientists recommend measures to protect East Africa's ecology and economy from woody weeds	22
Helping practitioners make a change for the better in public health	24
Fighting the scourge of Himalayan balsam with cutting-edge protein 'fingerprinting' technology	26
Governance	29
CABI staff	31
Staff publications	32

 Links to open access materials

Front cover image: Peppercorn harvesting, Dak Lak, Central Highlands, Vietnam. ©Binh Dang for CABI



13.1m
farmers

reached by the CABI-led
Plantwise programme in 2019,
44.1m cumulative

Worked in more than
58 countries

in 2019

162

staff publications
published in 2019

Foreword from the Chair

During 2019, the Board focused on developing key elements of the next Medium-Term Strategy especially evolving the Plantwise concept, helping smallholder farmers access markets and adapt to climate change and pursuing new product development to drive future growth in Publishing. The situation with the deficit of the legacy UK Defined Benefit Pension Scheme has been a standing agenda item throughout the year and we have also made sure that plans for the Wallingford office development and delivery of the 2019 Review Conference moved forward successfully.

The new Medium-Term Strategy, which has the input and approval of our Member Countries, is now geared to the delivery of eight of the Sustainable Development Goals with a much stronger focus on climate action and gender equality. A key element of this has been the evolution of our strategy for Plantwise and Action on Invasives, bringing these two flagship programmes together under an integrated programme – Plantwise Plus. This will move towards a more proactive and crop-focused strategy to promote climate-smart approaches to increase the supply of safer and more nutritious food, linking closely with our value chain activities.

The Publishing business has continued to protect the key revenue stream from our core database and compendia activities, at the same time investing in innovative new product development. The *CABI Agriculture and Bioscience* open access journal is now open for business, while the Digital Learning package and BioProtection Portal will be launched in the first quarter of this year.

The deficit in the legacy UK Defined Benefit Pension Scheme is a major risk to CABI's existence and potential serious liability for Member Countries. The Board has monitored the situation closely throughout the year. A Board Sub-Committee has worked positively and productively with the Trustee and the Executive Council Sub-Committee. We would like to thank all of CABI's Member Countries for their support in agreeing to make additional financial contributions, especially to DFID for their commitment of a £12 million lump sum, the first £6 million of which has now been received.

It has been very exciting to see CABI's new Wallingford office emerge over the course of 2019 and, at its meeting in December, the Board was able to put on wellington boots and hard hats to take a tour round the building with the external structure now substantially complete and the interior fit-out well underway. We are looking forward to moving into the new building during the autumn of 2020.

In September, it was a pleasure and a privilege to take part in CABI's 20th Review Conference and to meet delegates from so many of CABI's Member Countries. The event was handled very professionally by the CABI team with informative presentations and lively debate throughout, reflected by the very positive feedback received from the delegates.

At the Review Conference, Trevor Nicholls announced his intention to retire as CEO at the end of 2020 in a planned move which had been agreed by the Board. The succession process has now been completed with the help of an international search consultant, Kincannon and Reed. The search identified a promising list of candidates who were assessed through interviews with a selection panel including Executive Council representation. We have now signed a contract with a high-quality successor who will be in place from September to ensure a good handover by the end of 2020.

CABI entered 2020 in a strong position with good financial security. However, the COVID-19 pandemic has, and will continue to have, significant business impact for CABI in 2020. The organization and its staff have shown creativity and resilience in the face of this challenge. The Board is working closely with management to ensure the safety of staff and to mitigate financial losses, while at the same time delivering our commitments to donors, Member Countries and Partners.

Roger Horton, Chair

Foreword from the CEO

Operating conditions continued to be challenging during 2019 with academic research budgets remaining tightly constrained, the emphasis of donor funding shifting away from agriculture and continued downward pressure on the overheads allowable for international development activities. Nevertheless, the organization made very good progress on a number of fronts. CABI's total income at £37.6 million in 2019 was in line with the prior year (2018: £37.6 million) and the core programmes, Action on Invasives and Plantwise, continued to contribute strongly. Operating surplus was slightly ahead of plan at £126,000 but decreased relative to the prior year primarily as a result of additional direct project costs which increased by over £1 million.

During the year, we continued to deliver against the targets and milestones of our 2017-19 Medium-Term Strategy with 91% of our (116) critical milestones either being on track or showing only minor variance. Scientific output also remained high with a total of 162 peer-reviewed papers, 104 of which were in open access journals and 57 with an impact factor greater than two. We broke ground on the new CABI office in January 2019 and work has proceeded well. We are now confident that the new office will be ready in the autumn of 2020 and within the budget available to us from the sale of land to CALA Homes so as to be delivered on a cash-neutral basis.

We had a number of very successful interactions with our Member Countries through Executive Council, the Africa Regional Consultation and the 20th Review Conference. These meetings provided valuable insight and direction into the development of the Medium-Term Strategy for 2020-22. They also addressed a major corporate issue for CABI which was the financial risk posed by the legacy UK Defined Benefit Pension Scheme. We are very grateful for the support of our Member Countries in providing additional financial contributions, enabling CABI to meet its pension obligations while continuing to support its Member Countries.

The Action on Invasives (Aoi) programme has made good progress towards its goal to protect and improve the livelihoods of over 50 million poor rural households impacted by invasive species in Africa and Asia. Funded by DFID and DGIS, we were pleased the programme received additional top-up funding from both donors for 2019-2020. The original target countries were Ghana, Kenya, Pakistan and Zambia and, in 2019, initial steps were taken to introduce the programme in Bangladesh, Burkina Faso and Rwanda where we can leverage a strong Plantwise platform. Significant progress has been made in identifying and testing potential biocontrol agents against specific pests: fall armyworm, tomato leaf miner and parthenium weed.

Plantwise continues to be a very strong programme with high levels of donor approval and significant international recognition. The cumulative reach

through plant clinics, plant health rallies, mass extension campaigns and farmer-to-farmer sharing has increased to more than 44 million. In total, over 4,500 plant clinics have been established in over 30 countries across Africa, Asia and the Americas, and 11,641 agricultural officers have been trained as plant doctors. During the year, we published impact assessment studies from a number of Plantwise countries which demonstrated how the programme enabled farmers to improve yields and increase their incomes while also strengthening national plant health systems.

In 2020, an evolution of Plantwise and Action on Invasives into a single, global programme will take place with the aim of embedding processes and tools for the sustainable production of safer and more nutritious food. The programme will build upon the networks and governance mechanisms established by Plantwise, with the intention to predict, prepare for and prevent threats to plant health, agriculture and biodiversity and provide climate-smart solutions to farmers, using the power of ICTs to provide advisory services at scale.

Our Medium-Term Strategy 2020-2022 has been developed with a much greater emphasis on the pressing need to address aspects of Sustainable Development Goals 5 (Gender Equality) and 13 (Climate Action). It continues to leverage CABI's core skills in building and strengthening sustainable, climate-resilient value chains for food, fodder, fuel and fibre, thereby contributing to



national economic growth and food security, and providing meaningful employment and involvement for women, youth and marginalized groups. Our key strategic objectives are to:

- improve market access for smallholder farmers within sustainable value chains
- build capacity for delivery of climate-resilient food and nutrition security
- help women and young people gain new opportunities from access to targeted, context-specific agricultural information and technology
- promote the balanced use and conservation of biodiversity and ecosystems

The renewed strategy for our 'value chains and trade' theme, where we have won significant new projects, focuses on improving the productivity, quality and sustainability of crop production systems but has evolved to recognize this as a key area of job creation for women and youth as well as increasing the climate resilience of smallholder farmers who supply these systems. The new DFID-funded programme, Commercial Agriculture for Smallholders and Agribusiness (CASA), is an opportunity to attract fresh investment into smallholder agribusinesses to help them grow.

CABI entered 2020 with more certainty than 2019 with funding for the core Action on Invasives, Plantwise and successor programmes fully secured.

In addition, a number of other significant proposals had either secured funding or were at an advanced stage of contract negotiation and completion. However, in common with a large number of organizations around the world, the COVID-19 pandemic has, and will continue to have, significant financial and operational implications for CABI.

Staff in all the Regional Centres in Europe, Asia and Africa have been working from home. As an organization, CABI has functioned and delivered despite this. Restrictions on domestic and international travel have delayed the implementation of some projects as have local restrictions on in-country partners. However, agriculture and related activities remain a priority for many countries and so project work has largely continued, albeit more slowly and with more restrictions. We believe actions taken to mitigate the financial loss arising from the COVID-19 crisis mean any potential deficit should be covered by cash reserves.

However, we will not simply return to business as usual – the new 'normal' will be significantly different from the pre-pandemic world. Our five 'Plan Ahead' teams will develop response plans for Publishing, Digital Development, Donor Funding, Africa and Asia. In summary, we believe CABI can be resilient and creative in meeting the challenges facing us in 2020 and beyond.

Trevor Nicholls, CEO

CABI's 20th Review Conference

On 12-13 September 2019, CABI held its 20th Review Conference in Egham in the UK. The Review Conference of Member Countries is CABI's most senior governing board, which meets every three years to review the progress of the organization's work programme to date and to determine its future policies and strategies.

Following three Regional Consultations covering Africa, the Americas and the Caribbean, and Asia-Pacific, the 2019 Review Conference saw more than 100 delegates from 33 Member Countries, over 20 partner organizations and CABI come together to endorse the organization's Medium-Term Strategy for 2020-2022. This strategy will respond to the needs of Member Countries focusing on female farmers, youth in agriculture and food systems affected by climate change.

The event focused on an inclusive and sustainable future for millions of smallholder farmers and creating stronger partnerships to help build greater global food security. Delegates from CABI Member Countries and partner organizations discussed how partnerships – with both the public and private sectors – hold the key to reducing inequalities across the food value chain.

“Throughout this conference, we have strengthened our alliances with Member Countries, development partners and private sector partners. Now we can – and indeed must – work collaboratively to drive change effectively and efficiently. These

partnerships cannot be empty expressions of cooperation but will generate action.”

– Dr Trevor Nicholls, CABI CEO

“Governments must facilitate programmes and an environment that can ignite transformation, that can ensure that we witness the inclusivity and sustainability that we so desire.” – Her Excellency Josefa Leonel Correia Sacko, Commissioner for Rural Economy and Agriculture, African Union Commission

CABI will work towards its goal of making smallholder agriculture more resilient to climate change and helping women and young people gain new opportunities in agriculture by applying six areas of expertise: crop health, development communication and extension, digital development, invasive species, publishing and value chains and trade.



3

days

100

delegates

33

member countries



2019 IN REVIEW

JANUARY



CABI wins grant to help boost food security in India and Ethiopia through opening access to data

FEBRUARY



CABI shares expertise on rubber tree blight in major new Amazon documentary series

MARCH



Scientists confirm first report of egg parasitoid in Africa to fight devastating fall armyworm

APRIL



New CASA programme to benefit 565,000 smallholders in Uganda, Malawi and Nepal

MAY



CABI-led £1.6 million collaboration helps reduce China's reliance on harmful pesticides

JUNE



Farmers in Malawi to benefit from space-age technology in fight against devastating crop pests

JULY



CABI teams up with ÉLÉPHANT VERT to fight crop-destroying locusts and grasshoppers

AUGUST



Penicillium fungus grown from original Fleming strain goes on world tour to China and India

SEPTEMBER



Partners step-up efforts to improve Pakistan's food export capabilities to China and beyond

OCTOBER



Plantwise's efforts to increase food security in Bolivia praised by government

NOVEMBER



Stakeholders launch a \$950m initiative aimed at boosting productivity for the African coffee industry

DECEMBER



CABI joins FAO in official launch for International Year of Plant Health 2020

CABI's mission and the Sustainable Development Goals

CABI's mission is to improve people's lives worldwide by providing information and applying scientific expertise to solve problems in agriculture and the environment

By sharing knowledge and science, CABI tackles global issues like climate change, equality, poverty, hunger, education and sustainability. We do this by helping farmers grow more and lose less of their produce, combating threats to agriculture and the environment from pests and diseases, protecting natural habitats from invasive species and improving access to scientific information.

Following the agreement of our Medium-Term Strategy in 2019, we placed an emphasis on the pressing need to respond to aspects of two specific Sustainable Development Goals (SDGs) – SDG 5 (Gender Equality) and SDG 13 (Climate Action) – while continuing to support the delivery of SDGs 1, 2, 4, 12, 15 and 17.

We understand that global problems are too complex and interconnected to be dealt with by any one organization, which is why partnerships are at the heart of everything we do. Answers are found when individuals and organizations, countries and regions, work together to solve problems and build sustainable livelihoods.

CABI is committed to making a difference, playing its part in creating a brighter, more equitable and sustainable future, to being a partner in helping the

world reach the SDGs. As ever, our annual review focuses on these goals and areas where we are helping to make a difference to people's lives.

Helping famers adapt to climate change

Erratic rains, severe frosts, unusually warm winters. The world is witnessing growing incidents of the new 'normal' caused by climate change. No longer regarded as a future challenge to be faced in the next few decades, climate disruption is already causing substantial losses to agriculture, from wheat in Australia to maize in Zambia.

The rise in global temperatures is also leading to greater biodiversity loss and the spread of crop pests and invasive species. The latter are cause for particular concern. After habitat loss, invasive species are the second greatest threat to biodiversity and cost the global economy an estimated US\$1.4 trillion every year.

The delicate balance of the natural world is fundamental to life on Earth, making goals such as SDG 13, Climate Action, all the more important.

In support of this SDG, CABI is working to make climate adaptation achievable for the world's smallholder farmers. Projects like Climate Smart Villages help farmers understand and respond to climactic extremes, while the Pest Risk Information Service (PRISE) helps farmers forecast climate-driven pest outbreaks.

Creating viable futures for women and youth in agriculture

Women and young people have the potential to play an important role in the future of agriculture. Although women rarely control decision-making on family farms, they already make up 43% of the global agricultural workforce. And while young people might look to the cities for careers, their ambition and drive make them an undeniable asset to farming.

The hurdles they face are real. Women often find it harder than men to access agricultural information to generate incomes from farming. Opportunities in rural areas are limited for young people as they often have little access to farming finance, information and land.

We must break down the barriers to employment, pursuing goals such as SDG 5, Gender Equality.

In support of this SDG, CABI is working to help women and young people gain new opportunities in agriculture. Projects like Gender and the Legume Alliance (GALA) help women and young people grow more and better quality soybeans, while the CABI-led Plantwise programme helps deliver agricultural know-how into the hands of female farmers to boost their livelihoods.





© David Talukdar for CABI

OUR STORIES

Helping women scientists to tackle global challenges like climate change

Sylvia Misengo Tembo is a woman making a difference in science. In 2019, she graduated from the [Masters of Advanced Studies \(MAS\) in Integrated Crop Management \(ICM\)](#) – a Plantwise-affiliated course delivered by CABI and the University of Neuchâtel in Switzerland. She describes how the degree has given her career a boost and helped her tackle important global issues.

“In my country, pests have been made worse by climate change,” says Sylvia. “The MAS in ICM course has really helped me to understand climate adaptation.” As a Principal Technical Research Assistant at the Zambia Agriculture Research Institute (ZARI), she describes the value of modules on soil health where she learnt how to prevent soil degradation and erosion as well as manage pest migrations that can result from climate change.

“Swarms of locusts recently arrived in Zambia. Now that I’ve taken the MAS in ICM course, I’m able to make proposals about how to tackle pests like locusts. This course has really brought change to my work. That I can write a proposal means that I’ve moved to a different level. Before the course, I was considered ‘junior’, but now my work is nothing like ‘junior’. With the MAS in ICM degree, I’m able to work at a managerial level.”

The course has given Sylvia practical knowledge to tackle other serious pests in Zambia like the tomato leaf miner, *Tuta absoluta*. “With research on different chemicals, we’ve really contained *Tuta absoluta* in

Zambia. We’re trying to emphasize ICM. Writing my thesis on *Tuta absoluta* was very helpful. This work opened my eyes as to how I can help train Plantwise plant doctors on other invasive pests.”

Sylvia also shares her knowledge with staff at ZARI. She gives presentations to colleagues about protecting maize crops against fall armyworm. “This course has changed the way I work with my colleagues. I’ve shared the information I gained from the MAS in ICM course with my colleagues and they’re applying it. In this way, the course benefits me and my colleagues,” she says.

As a woman working in science, Sylvia is keen to share her experience and passion for agriculture with others. “When I talk to girls and young women, I explain science as a hands-on experience. So, to any girls and women who are talented and have passion, I encourage them to look and find solutions to the problems we have in life, because when you look around, you realize that it’s science that solves problems.”

To date, 59 students have taken the MAS in ICM.

Donors

Canton of Jura
Swiss Agency for Development and Cooperation (SDC)
Co-financed from Plantwise funds

Partners

University of Neuchâtel

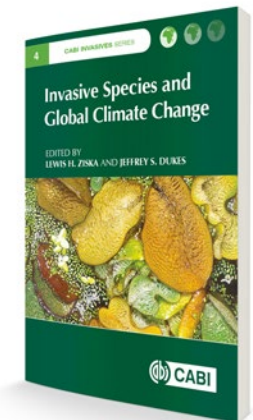
CABI centre

CABI in Switzerland



Sylvia Misengo Tembo, graduate of the Masters of Advanced Studies (MAS) in Integrated Crop Management (ICM), class of 2019

CABI’s Horizon Scanning Tool helps users identify and categorize new invasive species threats to a geographic region. The open access version is available at www.cabi.org/horizonsscanningtool



“We, the women, can do it” – meet Jacinta, a farmer from Bolivia

With increasing threats from climate change, pesticide resistance and invasive species, women farmers are needed more than ever in agriculture. The CABI-led [Plantwise](#) programme is striving to ensure that women in agriculture gain the knowledge they need to participate to their fullest.

For women, farming can be a powerful way to poverty reduction. Plant doctors empower women to take the lead in solving their own farming challenges.

Meet Jacinta Delgadillo, a farmer from Bolivia. She and her family grow beans, peppers and other crops for food and to generate an income. For smallholder farmers like Jacinta, agriculture is her family's livelihood.

“We sacrifice a lot with our work in the fields. We plant everything. We harvest. And also, we are poorly paid. Aside from that, pests harm us a lot too,” says Jacinta.

Women in Bolivia know they need to learn how to adapt to climate change in order to safeguard their crops from pests and diseases, and protect their families' food and nutritional security and overall quality of life. But inequalities in access to agricultural resources like finance, knowledge and land often hinder the progress of women farmers.

Plantwise is working hard to bring more balance to family farming not only by finding ways to encourage more female farmers to attend clinics but also by training more women to become plant doctors.

“In Bolivia, female farmers are always looking out for the well-being of their families. They fight for it. If the fight means receiving more training and overcoming gender barriers, Bolivian female farmers will do it.” – Gabriela Rivadeneira, Plant Doctor

Plantwise ensures that women like Jacinta gain farming knowledge for life. Now, when her crops are attacked by pests and diseases, Jacinta uses the local Plantwise plant clinic to gain knowledge about how to better manage these threats to her livelihood.

Changes are being seen on the ground in Bolivia with women becoming leaders in farming groups and associations, and more women being trained as plant doctors (62 in Bolivia) or as scientists working behind the scenes in the lab. The benefits of this are being seen throughout the community (3,200 female farmers attend plant clinics in Bolivia) and this sets an example to young people too.

The future looks bright for Bolivia's women farmers. As Jacinta says, “Nosotras las mujeres prodemos hacerlo; sí podemos” – “We, the women, can do it; yes we can.”

In 2019, the Government of Santa Cruz Department recognized Plantwise with an award for its sustainable production and positive results at field level.



Jacinta Delgadillo, a farmer from Bolivia

Donors

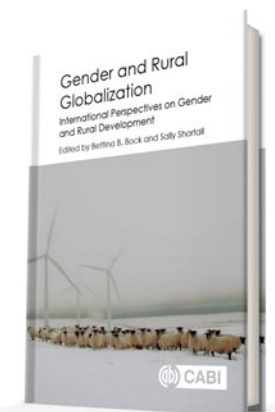
Australian Centre for International Agricultural Research (ACIAR)
Department for International Development (DFID), UK
Directorate General for International Cooperation (DGIS), Netherlands
European Commission Directorate-General for International Cooperation and Development (DG DEVCO)
International Fund for Agricultural Development (IFAD)
Irish Aid
Ministry of Agriculture and Rural Affairs (MARA), People's Republic of China
Swiss Agency for Development and Cooperation (SDC)

Partners

www.plantwise.org/clinicpartners

CABI centres

Global



Plantwise helps reduce extreme poverty in Rwanda

New research into the impact of the CABI-led **Plantwise** programme on smallholder farmers has revealed that its plant clinics have contributed to reducing incidences of extreme poverty in Rwanda by helping farmers manage crop-devastating pests and diseases.

Dr Justice Tambo, CABI scientist and lead author of a paper in the journal *World Development*, has shown how the country's network of plant clinics has helped maize farmers fight fall armyworm and maize stalk borer to achieve crop yield gains of 28% and net income gains of 23%.

Working with the Rwanda Agriculture and Animal Resources Development Board, Dr Tambo and colleagues from CABI's centre in Kenya found the advice given to farmers has contributed to achieving a 5% reduction in the likelihood of a household falling below the extreme poverty line of \$1.25 per day.

The results demonstrate that policies and programmes aimed at establishing and promoting farmers' participation in plant clinics can contribute to increased agricultural productivity and poverty reduction.

Plantwise has set up a sustainable network of over 4,000 plant clinics in more than 30 countries around the world. The clinics are set in places where local agricultural advisory officers, known as plant doctors, advise farmers on the management of plant pests and diseases affecting their crops. In Rwanda, there are now 66 plant clinics and nearly 350 people trained to serve as plant doctors.

Dr Tambo says, "Around 40% of potential global crop production is lost each year to pests and diseases, putting a significant strain on a country's ability to achieve the Sustainable Development Goals of 'No Poverty' and 'Zero Hunger'. This study

complements the increasing body of evidence showing that Plantwise is having a positive impact on farmers' knowledge on plant health, adoption of good agricultural practices and increases in yields and farm incomes."

Donors

Australian Centre for International Agricultural Research (ACIAR)
Department for International Development (DFID), UK
Directorate General for International Cooperation (DGIS), Netherlands
European Commission Directorate-General for International Cooperation and Development (DG DEVCO)
International Fund for Agricultural Development (IFAD)
Irish Aid
Ministry of Agriculture and Rural Affairs (MARA), People's Republic of China
Swiss Agency for Development and Cooperation (SDC)

Partners

www.plantwise.org/clinicpartners

CABI centres

Global



Plant doctors in Rwanda help farmers diagnose problems with their crops before offering advice on how to solve these problems



SMS campaign helps 80% of farmers learn new ways to tackle fall armyworm in Kenya and Uganda

CABI's technology-based information campaigns have delivered agricultural knowledge to over half a million small-scale farmers in Kenya and Uganda, helping them tackle crop pests like fall armyworm. Many smallholders are changing the way they farm as a result.

In only two years, fall armyworm has spread from South America to sub-Saharan Africa, destroying maize and, with that, farmer incomes and food security. Farmers need to know how to manage this non-native, invasive species.

While agricultural support (extension services) help deliver agricultural information, low funding brings limitations; for example, Kenya has only one extension officer for every 1,000 farmers.

But technology can help.

Since 2017, CABI and partners have launched a series of technology-based information campaigns in [Kenya and Uganda](#) using radio, SMS messages and community video screenings to increase pest awareness, knowledge and management practices, and help farmers fight fall armyworm.

The campaigns target maize-growing areas and places where damage by fall armyworm has been severe. The messages cover subjects like pest scouting and actions to take once the pest has been detected.

By sharing knowledge about this non-native pest, CABI is also helping farmers to build resilience against the growing threat of invasive species.

So far, the campaigns have reached a total of over half a million farmers and the impact is clear:

In Kenya, a telephone survey of farmers who subscribed to the SMS service revealed that 80% of subscribers learnt new information about managing fall armyworm, especially about pesticides and when to apply them.

In Uganda, smallholders are changing the way they farm. A field survey found that farmers who received the information were more likely to monitor their crops regularly for pests, plant early, weed frequently and use the right pesticides.

Technology-based information sharing means farmers can grow more and lose less, increase their incomes and prosper from their small-scale and family farms.

Donors

Department for International Development (DFID), UK
Directorate General for International Cooperation (DGIS), Netherlands
International Fund for Agricultural Development (IFAD)
UK Space Agency (through the PRISE project)

Partners

Farm Radio International (FRI)
Hamwe East Africa Limited
Peripheral Vision International (PVI)
Precision Agriculture for Development (PAD)
PRISE project partners ([see page 16](#))

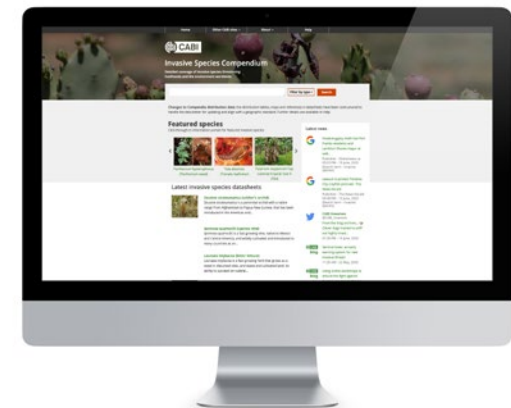
www.plantwise.org/clinicpartners

CABI centres

CABI in Africa, Switzerland and the UK



A community video screening on fall armyworm





80%

of farmers learn new ways
to tackle fall armyworm



Helping maize farmers in Kenya increase their harvests with space-based technology

Pest outbreaks can be devastating for food security in Africa. Insects, mites and plant pathogens can quickly spread across borders destroying crops. Pests and diseases are estimated to cause around 40% of crop losses. Worryingly, pest movements are becoming increasingly unpredictable as a result of climate change.

The **Pest Risk Information Service (PRISE)**, launched in 2017, aims to solve this problem by using data to help farmers manage pests in sub-Saharan Africa. PRISE predicts the timing of the most effective and efficient control against pests using a novel combination of earth observation technology, real-time field observations and plant-pest lifecycle modelling to deliver a science-based service. Expansive, novel crowd-sourcing reports strengthen and validate the system.

Ministries of Agriculture through their extension experts in Ghana, Kenya, Malawi and Zambia are actively involved in PRISE. The system now collects and combines disparate datasets, manipulates data using computational and modelling expertise, and draws on well-established international development networks.

In-country data collected from the field is fed into the model. Risk messages and mitigation measures are communicated to users through bulletins and SMS, helping them to take the right pest management action at the most appropriate time.

We are already seeing results. During the short rains season in Kenya (2019-20), PRISE carried out a pilot in collaboration with partner Precision Agriculture for Development (PAD), sending SMS information about the crop pest, fall armyworm.

A phone survey taken at the end of the season revealed that 86% of the maize farmers questioned said fall armyworm was the biggest problem they faced, and well over half – 60% – reported changing their farming practices based on recommendations made in the SMS messages. The most common outcomes of these changes were a reduction in fall armyworm and an increase in maize harvest.

“Our International Partnership Programme is about building sustainable relationships between the UK’s science expertise and developing countries to help tackle global challenges. PRISE is an exemplar



The Pest Risk Information Service (PRISE) provides pest risk alerts, a novel combination of earth observation technology, satellite positioning and plant-pest lifecycle information

project that provides innovative, long-term solutions to farmers in sub-Saharan Africa. By using satellite-enabled technologies, CABI and its partners are able to lift people out of poverty whilst creating stronger, sustainable businesses.” – Chris Castelli, Programmes Director, UK Space Agency

Donors

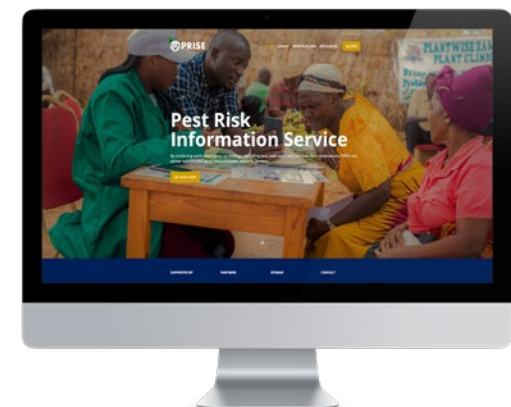
UK Space Agency
co-financed by Plantwise

Partners

Assimila
Centre for Environmental Data Analysis
Department for Agricultural Extension Services (DAES), Malawi
Kenya Agricultural & Livestock Research Organization (KALRO)
King’s College London
Ministry of Agriculture, Livestock and Fisheries, Kenya
Plant Protection & Regulatory Services Directorate (PPRSD), Ghana
Zambia Agriculture Research Institute (ZARI), Zambia

CABI centres

CABI in Africa and the UK





PRISE

Africa Soil Health Consortium reaches over one million smallholder farmers

Poor soil fertility is one of the biggest hurdles preventing small-scale farmers in sub-Saharan Africa from improving their farm's productivity and, therefore, from increasing their incomes. Integrated Soil Fertility Management (ISFM) is an important farming technique that helps farmers make soil healthier and, thereby, grow bigger and better crops.

However, a lack of access to reliable and timely information about ISFM means smallholders cannot easily learn about and put into practice these tried and tested practices, even for the most commonly grown crops such as common beans and maize.

To combat the lack of access to ISFM knowledge, the CABI-led [Africa Soil Health Consortium \(ASHC\)](#), supported by the Bill & Melinda Gates Foundation, was created in 2013. The consortium worked with partners in Ghana, Nigeria, Tanzania and Uganda to develop and launch communications campaigns designed to help farmers understand and adopt ISFM practices in the production of bananas, beans, cassava, maize and soybeans.

Aside from the usual radio and text messages, ASHC and its partners also used novel ways to reach farmers such as comics books, drama productions and music videos with down-to-earth messages about soil health. This strategy proved especially useful for reaching more members of farming families, especially younger people, and encouraging families to share information about soil fertility and good agronomic practices.

ASHC aimed to reach 450,000 farmers but, by 2019, the consortium had far exceeded its goal reaching more than 1.3 million farmers. These smallholders are now more aware of ISFM practices for key crops such as maize, rice and soybean, and the evidence from outcome studies showed that at least 20% of them went on to adopt a range of new soil health practices.

Over the course of seven years, CABI helped to achieve this by cultivating partnerships with over 70 different agencies to plan and implement 18 scale-up campaigns. Between them, the partners helped to create over 600 ISFM materials that are now available on the ASHC website. ASHC information materials and lessons have been shared by many third-party agencies beyond the project's original scope of four countries.

To deliver objectives, ASHC worked as a family of projects including initiatives such as Gender and the Legume Alliance (GALA), Scaling Up Improved Legume Technologies (SILT) and Upscaling Technologies in Agriculture through Knowledge Extension (UPTAKE) funded by DFID, IDRC and IFAD.

To access the free ASHC materials, visit africasoilhealth.cabi.org

Donors

Bill & Melinda Gates Foundation

Partners

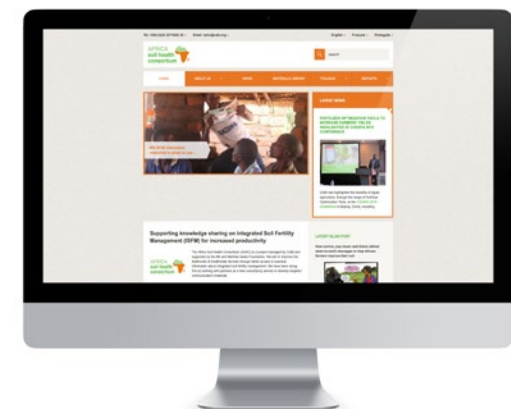
See www.cabi.org/projects/africa-soil-health

CABI centres

CABI in Africa



'Malkia saves the seed' comic strip in Shujaaz – a youth comic published in Kenya and Tanzania



Music videos help women farmers grow better soybean crops

Farmers and agro-dealers – the people who sell inputs like fertilizers and seeds to farmers – are not always well connected: farmers do not necessarily know where to buy the high-quality inputs needed to grow more produce, and agro-dealers are not always aware of what farmers really need or want to grow.

This problem affects women farmers in particular. In Ghana, while women are involved, for example, in soybean production, they struggle to access high-quality seeds and agricultural information and training. This especially affects women speaking minority languages.

Innovative ways of communicating are helping to put agricultural know-how into the hands of women farmers.

Gender and the Legume Alliance (GALA) – a collaboration between CABI and partners – aimed to reach more women farmers in Ghana to help them grow more and better soybeans. The alliance considered ways to widely share valuable farming information knowing that multiple local languages made channels like local radio difficult to use.

GALA took the novel approach of developing music videos about growing soybeans and screened them in 200 villages in northern Ghana.

To build audiences for the screenings, short comedy films were shown before the music videos and other instructional films. The women could attend because the children were allowed to come too. The screening officers noticed that if the video

was good, the mothers would want to stay and the children knew to keep quiet. Q&As after the screenings made the videos popular and meant the information was shared more effectively.

The music videos reached around 41,000 members of farming households, with more women attending than men. In addition, a Facebook campaign reached another 45,000 farmers.

Part of the success was down to carefully crafted music: although contemporary and reflecting the popular culture of 'high life' and 'hip life', the music was also based on traditional folk music rhythms and meant the videos appealed to a wide age range. The videos also reflected the differences in the ways men and women farmed in the different regions.

After the campaign (music videos, conventional videos, SMS and leaflets) farmers reported a greater awareness about soybean farming practices including planting in line, weeding regularly, spacing seeds apart and using fertilizers and inoculants (organisms that help plant health). Data collected showed an increase in the adoption of crop rotation and chemical weeding of 4-16%.

The increase in interest from farmers about farming practices was backed up by numerous queries recorded at local shops. Links built between farmers and agro-dealers contributed towards the push to develop specific legume fertilizer: New Yara Legume. Input provider, Green-Ef, co-invested in

a helpline for farmers as well as an SMS message service to inform farmers about the availability of inoculants at its dealerships.

Donors

Bill & Melinda Gates Foundation
Department for International Development (DFID), UK, through Sustainable Agricultural Intensification Research and Learning in Africa (SAIRLA)

Partners in Ghana

Countrywise Communication, Ghana – film by Anas Inusah and Raymond Vuol
Duncan Sones Associates
El Twist – Dagaare speaking musician
Green-Ef
I-Logix
IITA/N2Africa
Savanna Agricultural Research Institute (SARI)
The Choggu Boys – Dagbani speaking musicians

CABI centres

CABI in Africa



Farmers dancing in the soybean music video recorded in Dagaare, one of eight Ghanaian languages used in the campaign



Helping plant protection officers make a difference to agricultural extension

Using expertise in plant health and diseases, in 2019, CABI launched the first in its range of CABI Academy online courses, [Crop Pest Diagnosis](#). Based on CABI's flagship programme, Plantwise, the course takes a holistic and international approach to pest diagnostics.

The self-study course is designed to give students and agronomists the skills they need to identify new and emerging threats to crops, reducing risks to the food supply chain and improving productivity. Micoy Campbell, who works as an agricultural extension officer with the Rural Agricultural Development Authority (RADA) in Jamaica, says:

"Since completing the Crop Pest Diagnosis course, I have seen changes in my extension delivery in a positive way. I am now better able to identify different types of pests and diseases that might affect crops within my area. As a result of this, I am confident in making recommendations to the farmer and also effectively managing these pests and diseases using an integrated pest management approach."

The training includes the main pathogen groups as well as insect pests and nutrient deficiencies, and lets learners go out directly into the field and apply their learning.

Tamara Coleman, also an agricultural extension officer with RADA, says, "I found the Crop Pest Diagnosis course to be very educational and informative. [It] opened my eyes to a lot of the different insects, fungi and bacteria that I wouldn't

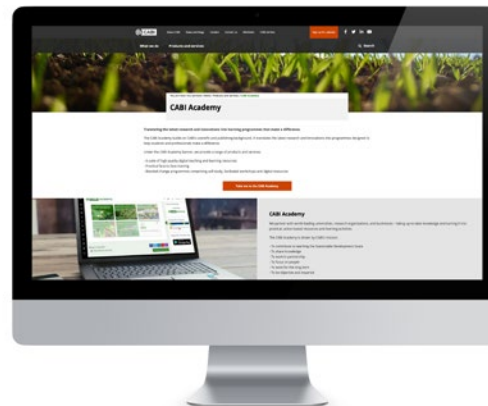
be able to identify out in the field. It is a course that I would recommend to all plant doctors to help us assist farmers in improving their crops. I think [it] will aid me throughout the rest of my career."

During the COVID-19 outbreak, we have opened up the Diagnosis course to a global audience, enrolling over 3,000 participants, of whom 1,200 have successfully completed and received a certificate.

Participants have come from 89 countries including significant contingents from Bangladesh, India, Jamaica, Kenya, Nepal, Nigeria, Pakistan and Rwanda. 98% of participants would recommend the course to a colleague.

For more information about CABI's publishing products, go to www.cabi.org/publishing.

Most of our print books are also available as eBooks through your usual retailer or supplier.



3,000

participants

89

countries including Bangladesh, India, Jamaica, Kenya, Nepal, Nigeria, Pakistan and Rwanda

98%

would recommend the course to a colleague

Showing investors the big business case in small-scale farming

In Africa and Asia, small-scale farms have the potential to boost economies but farmers often find it difficult to grow produce of a high enough quality to sell to commercial markets. This increases the perception among agribusinesses that sourcing produce from smallholders is risky and, ultimately, reduces investors' appetites for financing these businesses.

But a new five-year £30 million DFID-funded programme – [Commercial Agriculture for Smallholders and Agribusiness \(CASA\)](#) – of which CABI is a partner aims to stimulate investment in emerging agricultural markets and improve the livelihoods of over half a million smallholder farmers and their families in Malawi, Nepal and Uganda.

CASA has started to showcase successful business models that source produce from smallholders and pull together the evidence base supporting the commercial and development impact of these business models. In this way, the project is making the commercial and development case for investing in agribusinesses that buy produce from smallholders.

In 2019, CASA started to bridge evidence gaps and collect a database of evidence to ensure that investors and policymakers have access to the right information and people to make inclusive agribusiness models succeed. This innovative approach helps further the goals of international development.

“We are excited to work with investors across the developing world to demonstrate to them and to the wider investor community how investing in agricultural supply chains through inclusive technical assistance produces a win-win outcome for both commercial returns and raising incomes of smallholder farmers.” – Abigail Thomson, Team Lead, CASA Technical Assistance Facility, TechnoServe.

CABI will use its expertise to place knowledge into the hands of agribusiness investors by reaching at least 1,000 government, donor or business stakeholders. By ensuring investors and policymakers have access to the right information and people, CASA will attract more investment into the sector, boosting economic growth and raising demand for smallholder produce.

The programme will commission original research on effective approaches to investment support and hold a series of events for investors such as global summits and tourism missions.

Ultimately, CASA aims to improve the livelihoods of farmers by helping equitable trade to happen in expanding commercial markets while enhancing the sustainability and climate resilience of farming systems and supporting the conservation of biodiversity and ecosystems.



Donors

Department for International Development (DFID), UK

Partners

iied
Malabo Montpellier Panel
NIRAS
Swisscontact
TechnoServe

CABI centres

CABI in the UK

CABI scientists recommend measures to protect East Africa's ecology and economy from woody weeds

East Africa is under attack from a non-native **woody weed** – *Prosopis juliflora*. Brought to the region some 50 years ago from its native Central and South America, the tree, introduced for charcoal, firewood and animal feed, has spread widely becoming a major threat to the environment and to people's livelihoods. In particular, this evergreen tree consumes substantial amounts of water, thereby exacerbating the effects of climate change on water resources.

CABI has been working to shine a light on the extent of the damage caused by prosopis in eastern Africa and to make recommendations about how to manage this noxious weed before it further damages the region's ecology and economy.

In 2019, CABI research helped to reveal that, in the Afar Region of Ethiopia, prosopis had invaded a staggering 1.2 million hectares of cropland and rangeland in 35 years. It also revealed that prosopis was a major reason for losses in annual ecosystem services (the collective benefits that humans gain from the natural environment) in this region estimated at US \$602 million.

In Baringo County, Kenya, CABI scientists reported how the weed has increased by over 2,000% in 28 years, reducing grasslands by a massive 86% and irrigated croplands by 57%. Prosopis is a cause of significant environmental damage and has even

become a source of conflict among pastoralists seeking places for their livestock to graze.

Research reveals that early detection and rapid response, especially in areas that will become more prone to invasions due to climate change, will be essential for slowing down the fast spread of prosopis.

For areas already invaded, a management strategy that clearly defines management goals for target areas, ensures rigorous communication across and within national borders, and includes biological control, is needed to nip the woody weed scourge in the bud.

Donors

Swiss Agency for Development and Cooperation (SDC)
Swiss National Science Foundation

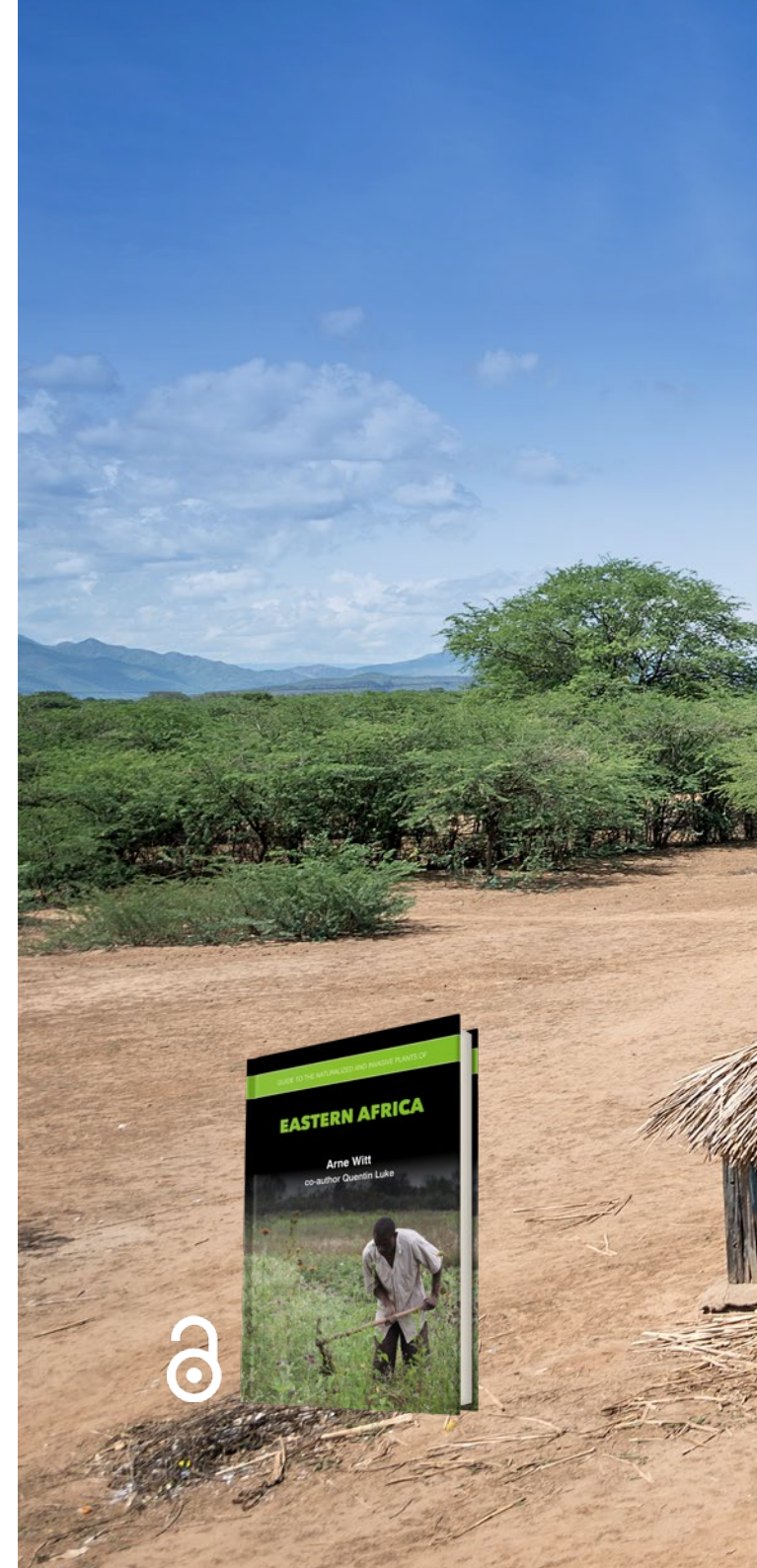
Partners

Center for Development and Environment (CDE), University of Bern, Switzerland
Centre for Training and Integrated Research in ASAL Development (CETRAD), Kenya
Centre of Excellence for Invasion Biology (CIB), University of Stellenbosch, South Africa
Haramaya University, Ethiopia
Kenya Forestry Research Institute (KEFRI), Kenya
Sokoine University of Agriculture, Tanzania
Tanzania Forestry Research Institute (TAFORI), Tanzania
Water and Land Resource Centre (WLRC), Ethiopia

CABI centres

CABI in Kenya and Switzerland

To download CABI's open access books, go to www.cabi.org/open-access-booklist





2,000%

prosopis increase, in Baringo County over 28 years

86%

grassland reduction

57%

irrigated cropland reduction

Helping practitioners make a change for the better in public health

Global health is one of the most important issues facing us today. From nutrition to the global spread of COVID-19, these serious challenges show us the value of understanding and addressing public health.

In 2019, CABI's **Global Health** – the go-to bibliographic database for the study and practice of national, regional and international public health – underwent a major upgrade and now boasts its own interface with more than 3.4 million records dedicated to public health.

Aimed at public health researchers and practitioners, Global Health is helping students of Peoples-uni in their study of public health. Peoples-uni is a UK-based charity that aims to improve the health of people living in low- to middle-income countries using low-cost public health eLearning. Volunteer tutors run the programme for students who join from over 100 countries, many from Africa and Asia.

Dick Heller, Emeritus Professor at the Universities of Manchester, UK, and Newcastle, Australia, and founder and coordinator of Peoples-uni says:

“Global Health is an excellent resource. An evidence-based approach underpins the educational programme, so access to published literature is key. This is particularly important during the dissertation for our Public Health Masters programme where a systematic review of literature is one of the main learning outcomes. Global Health will be a fantastic resource for our students, especially as they conduct their literature reviews.”

Prof Heller talks about how some of his alumnae from countries like Nigeria, Rwanda and Tanzania have benefited from access to Global Health and how he has already added reports found in the database to the university's Public Health Masters programme.

“In the absence of access to a university library, we rely on open source full text materials. CABI's Global Health, with its comprehensive database, will allow our students to identify and access literature that is relevant not only to the health problem they are studying but to the setting in which they work.”

In early 2020, CABI made more than 17,000 relevant coronavirus records from across Global Health and CAB Abstracts available for free to support the international effort to fight the outbreak of COVID-19. This action was aimed at public health professionals, researchers, academics and policy makers who are vital to the response to the outbreak by providing information relevant to the immediate and future needs of those affected. Access has been extended to the end of August 2020.

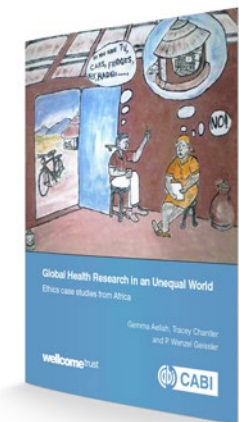
For more information about Global Health, go to www.cabdirect.org/globalhealth

To download CABI's open access books, go to www.cabi.org/open-access-booklist



Prof Dick Heller (left) with Solabomi Babalola, Carole Metekoua and Ian Machingura (from left to right), who are all graduates of the Peoples-uni

Global Health now includes more than **3.4 million records** including over **110,000 full text articles**, dedicated to public health as well as access to **397 book chapters**, around **170 reviews** and over **900 news records**



In 2019, [SciDev.Net](https://www.scidev.net) – the world’s leading source of reliable and authoritative news, views and analysis about science and technology for global development – helped to raise awareness about vital global health issues.

In November 2019, SciDev.Net contributor, Claudia Mazzeo, was honoured by the Argentinean Society of Medical Journalism for her article published by SciDev.Net about the threat of Zika virus in Latin America.

Claudia, a regular contributor to SciDev.Net, who specializes in science, technology and environmental journalism, alongside her role as a professor of science journalism and environmental communication, impressed judges in the ‘Internet Category’ of an annual competition run by the organization.

She highlighted the risk of rural populations’ lack of knowledge about the Zika virus and how it spreads making, as she said, “disease prevention the key missing component in the public health agenda.”

In March 2019, SciDev.Net journalist, Amzath Fassassi, published an exclusive interview with Congolese health minister, Oly Ilunga Kalenga, on the country’s Ebola crisis. Since the start of the outbreak, in August 2018, the Ebola virus has caused 564 confirmed deaths in the Democratic Republic of Congo.

Script

SciDev.Net’s Script is a free training and networking resource for journalists, scientists and anyone who wants to communicate science in an engaging and accurate way. Find out more at www.scidev.net/script

In the interview, the minister explained his plan to gradually transform an Ebola Centre of Excellence into a Centre for Disease Control, which will enhance the Ministry of Health’s capacity to monitor outbreaks, identify public health threats and formulate a response.

SciDev.Net Donors

- Bill & Melinda Gates Foundation
- European Journalism Centre
- International Development Research Centre (IDRC)
- Robert Bosch Stiftung
- São Paulo Research Foundation (FAPESP)
- Swedish International Development Cooperation Agency (Sida)
- Wellcome Trust



SciDev.Net contributor, Claudia Mazzeo, holds her award from the Argentinean Society of Medical Journalism for her article published by SciDev.Net about the threat of Zika virus in Latin America



© Patrick Adams, RTI International

Fighting the scourge of Himalayan balsam with cutting-edge protein ‘fingerprinting’ technology

CABI is using the very latest technology to help lead the fight against one of the UK’s most invasive and problematic weeds – **Himalayan balsam**. This plant was first introduced to the UK as an ornamental by the Victorians but has since spread across the countryside, affecting river banks, in particular, to become a major threat to local ecosystems.

Scientists at CABI’s laboratories in Egham are using a state-of-the-art machine to better understand and, therefore, tackle this weed – a Matrix-Assisted Laser-Desorption and Ionization Time-Of-Flight (MALDI-TOF) mass spectrometer.

Funded by the Crop Health and Protection (CHAP) project, this machine takes a protein ‘fingerprint’ that distinguishes between variants of Himalayan balsam from different regions in the UK – important because this helps scientists understand the best ways of naturally controlling the plant from spreading further.

The technology also allows researchers to quickly identify bacteria and make comparisons between very similar-looking fungi, insects or plants. This is essential to CABI’s mission of helping farmers grow more and lose less to crop pests and diseases as well as helping to solve wider problems in the environment such as invasive weeds.

While several MALDI-TOF mass spectrometer sample-preparation methods are currently available, none can be applied broadly, for example, to insects and plants.

This is why CABI has developed an inexpensive and ‘single-tube’ method of identification, which is being used to find a natural control for Himalayan balsam – in this case, a rust fungus.

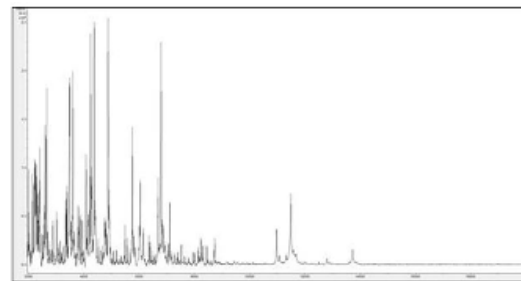
Dr Mike Reeve, CABI’s Innovations and Contracts Manager, says, “We have also adapted this method to distinguish between regional variants of insect species used to control fruit-flies. In collaboration with our colleagues in Switzerland, we discovered an insect population that was thought to be the same species as others collected from China and Japan but was, in fact, significantly different – an observation since confirmed by DNA analysis.”

CABI centres

CABI in Switzerland and the UK

CABI is a leading provider of microbial services. We specialize in microbial identification and verification, and provide professional microbiology services in support of industry, academia and agriculture.

For more information, go to www.bioscience.cabi.org



The MALDI-TOF machine takes a mass spectrometry protein ‘fingerprint’ of the species, which results in data that show where the species comes from





THANK YOU

CABI's ability to improve lives worldwide is made possible by the generous contributions of the many members, donors and partners we work with. For this, we want to say a big thank you.

Your ongoing support has enabled us to help...



...her family



Ministry of Foreign Affairs of the Netherlands



...her farm



...their yield



...her crops



...his orchard



...his business

BILL & MELINDA GATES foundation

Ministry of Agriculture and Rural Affairs (MARA)
People's Republic of China



...her market garden



Schweizerische Eidgenossenschaft
Confédération suisse
Confederazione Svizzera
Confederaziun svizra

Swiss Agency for Development and Cooperation SDC



...her career



Agriculture Department
Government of Khyber Pakhtunkhwa



...his cattle



...their education



...their training



...their knowledge



Australian Government
Australian Centre for International Agricultural Research



...their village



...their soil health



...her future

Governance

CABI Board

The governing board oversees CABI's programmes and guides management on operational and strategic issues.



Dr Lutz-Peter Berg



Dr Ismahane Elouafi



Prof Dame Anne Glover



Mr Roger Horton (Chair)

Review Conference

CABI's high-level governing body is the Review Conference of Member Countries, which reviews CABI's work programmes and determines its broad policies and strategies.

Executive Council

Representatives from each Member Country meet to monitor CABI's affairs and implement Review Conference resolutions. The Council approves the annual budget, the admission of new members, appointment of auditors and key policy decisions.



Mr Andrew Jack



Mr Akhter Mateen



Dr Trevor Nicholls (CEO)



Professor Ruth Oniang'o

Liaison Officers

Each Member Country has at least one Liaison Officer. Their role is to provide a crucial link between their country and CABI.



Mr Rob Sioley (CFO)



Mr Paulus Verschuren



Dr Prem Warrior

CABI's global role



*Associate Member

CABI is an inter-governmental, not-for-profit organization governed through a United Nations treaty-level agreement. We work with countries that represent over half of the world's population, or over four billion people. Many people in developing countries are smallholder farmers.

Much of our work focuses on them. Each of our **49 Member Countries** has an equal role in the organization's governance, policies and strategic direction.

Our membership structure means that CABI's work delivers development and research projects and scientific publishing products that strengthen and complement existing national capabilities, helping to improve people's lives worldwide.

Since its beginnings as an entomological committee in 1910, our organization has grown to the Commonwealth Agricultural Bureaux in 1947, to CAB International in 1987, to its present structure today. The diagram shows when members have joined throughout our long journey.



FINANCIALS

Statement of comprehensive income

for the year ended 31 December 2019

	2019 £'000	2018 £'000
income		
sales and project income	34,696	34,877
member country contributions	1,475	1,306
CABITAX recovery	1,235	1,217
miscellaneous income	208	172
	<u>37,614</u>	<u>37,572</u>
expenditure		
staff costs	(9,914)	(9,950)
direct project costs	(19,973)	(18,892)
production	(3,173)	(3,150)
facilities and maintenance	(1,482)	(1,734)
sales and distribution	(433)	(511)
travel	(707)	(670)
depreciation and leasehold amortisation	(912)	(856)
consultants, freelancers	(355)	(657)
restructuring costs	–	(80)
expected credit losses of member country contributions	(152)	(95)
associated company profit	94	22
(loss) / profit on foreign currency exchange	(58)	263
other costs	(457)	(853)
	<u>(37,522)</u>	<u>(37,163)</u>
operating surplus / (deficit) before interest	92	409
interest receivable	34	14
	<u>34</u>	<u>14</u>
operating surplus / (deficit) for the year before exceptional items	126	423
gain on sale of property	–	4,223
operating surplus / (deficit) for the year	126	4,646
other comprehensive income / (deficit) items that may be subsequently reclassified to operating surplus / (deficit)		
cash flow hedges	362	(322)
movement between funds	(75)	(75)
other (losses) / gains on defined benefit pension schemes	(10,194)	9,691
	<u>(9,907)</u>	<u>9,294</u>
total comprehensive (deficit) / surplus for the year	(9,781)	13,940

Financials

CABI's total income of £37.6m was in line with the prior year with CABI's core Action on Invasives and Plantwise programmes continuing to contribute strongly to the operating performance. In Publishing, although there was a downturn in book sales, income from the scientific database products remained robust with subscription sales of the Global Health database growing by 7% continuing its upward trend. As had been anticipated, the operating surplus (before exceptional items) decreased to £126k, primarily as a result of additional direct project costs, which increased by over £1m on the prior year.

The UK pension liability, included on the CABI balance sheet with the annual movement shown in 'other comprehensive income / (deficit)', increased in 2019 because of a decrease in bond yields. However, our Member Countries have agreed to significantly increase annual membership fees to augment CABI's existing contributions to manage the pension liability. Furthermore, the UK Department for International Development (DFID) approved a £12m one-off payment to the scheme payable in three tranches with the first tranche of £6m transferred in February 2020.

The total cash balance decreased to £5.6m at the end of 2019, primarily due to the cost of construction of the new corporate office. However, with additional funding secured from major donors and the substantial proceeds from the sale of land at Wallingford expected in mid-2020, we believe CABI to be well positioned to meet the very significant challenges of the year ahead.

Statement of financial position

for the year ended 31 December 2019

	2019 £'000	2018 £'000
assets		
non-current assets		
land and buildings	16,840	12,425
plant and equipment	1,326	1,406
intangibles	460	472
intangibles – goodwill	113	113
investments accounted for using the equity method	718	797
	19,457	15,213
current assets		
inventories	2,224	1,757
trade and other receivables, net of provisions:		
– sales receivables	2,882	2,794
– sums owing by project sponsors	2,528	1,108
– from member countries	–	3
other financial assets:		
– derivative financial asset	126	–
– cash and cash equivalents	5,933	11,511
other receivables	3,142	2,514
	16,835	19,687
total assets	36,292	34,900
equity and liabilities		
equity		
revaluation reserve	(4,255)	(4,255)
cash flow hedges	(126)	236
designated fund	(75)	(75)
accumulated deficit	92,518	82,375
total equity	88,062	78,281
liabilities		
non-current liabilities		
post-employment benefits	(108,774)	(98,580)
lease liabilities	(39)	
	(108,813)	(98,580)
current liabilities		
sales income received in advance	(3,996)	(3,719)
member contributions in advance	–	(3)
sums held on behalf of project sponsors	(7,003)	(6,811)
trade and other payables:		
– trade payables	(2,284)	(1,635)
– other payables	(2,258)	(2,197)
other financial liabilities		
– derivative financial liability	–	(236)
	(15,541)	(14,601)
total liabilities	(124,354)	(113,181)
total equity and liabilities	(36,292)	(34,900)

Statement of cash flows

for the year ended 31 December 2019

	2019 £'000	2018 £'000
cash flows from operating activities		
cash (used in) / generated from continuing operations	(667)	1,807
net cash (used in) / generated from operating activities	(667)	1,807
cash flows from investing activities:		
payments to acquire tangible fixed assets	(4,950)	(965)
payments to acquire intangible assets	(82)	(1)
gain on sale of other tangible assets	–	4,223
interest received	34	14
Initial investment for joint venture in Pakistan	–	(48)
dividend received from Conidia	180	–
net cash (used in) / generated from investing activities	(4,818)	3,223
cash flows from financing activities:		
principal elements of lease payments	(93)	–
net cash (used in) / generated from financing activities	(93)	–
net (decrease) / increase in cash and cash equivalents	(5,578)	5,030

NOTES TO THE CASH FLOW STATEMENT

reconciliation of operating surplus to net cash inflow from operating activities

operating surplus before interest	17	309
depreciation and amortisation charges	912	856
share of associated company (profits)	(94)	(22)
loss on disposal of property, plant, equipment	–	384
(increase) in inventories	(467)	(562)
(increase) / decrease in trade and other receivables	(1,505)	2,453
increase in trade and other payables	632	96
increase / (decrease) in income in advance	466	(466)
(increase) in other receivables	(628)	(1,241)
cash (used in) / generated from continuing operations	(667)	1,807

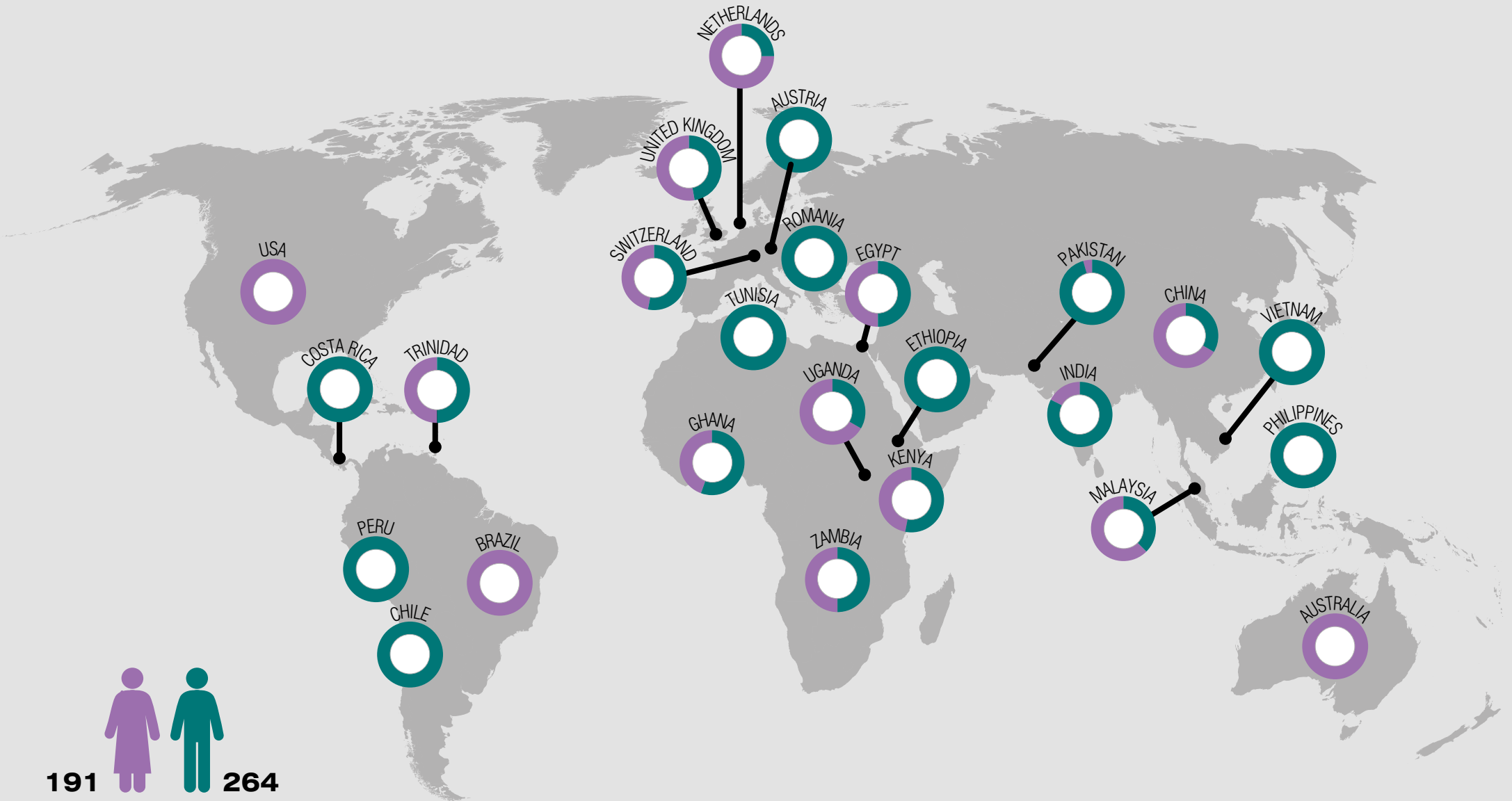
movement in net cash during the year

net cash at 1 January	11,511	6,481
net cash at 31 December	5,933	11,511
movement in net cash during the year	(5,578)	5,030




CABI STAFF


At the heart of CABI's successes are the experts who make it happen. From entomologists to plant pathologists, from content editors to publishers, we have the scientific expertise to help improve people's lives worldwide.




Staff publications


 Available open access


Books, proceedings and manuals

FAO and **CABI** (2019) Community-based fall armyworm (*Spodoptera frugiperda*) monitoring, early warning and management. Training of trainers manual. First edition. FAO, Rome, Italy and CABI, Wallingford, UK, 112 pp. <http://www.fao.org/publications/card/en/c/CA2924EN/> 

FAO and **CABI** (2019) Fall Armyworm Field Handbook: Identification and Management. First Edition. FAO, Rome, Italy and CABI, Wallingford, UK, 38 pp. <https://www.cabi.org/isc/abstract/20197200644> 

Hinz, H., Bon, M-C., Bourdôt, G., Cristofaro, M., Desurmont, G., **Kurose, D.**, Müller-Schärer, H., Rafter, M., **Schaffner, U.**, **Seier, M.**, Sforza, R., Smith, L., **Stutz, S.**, **Thomas, S.**, **Weyl, P.** and Winston, R. (eds) (2019) XV International Symposium on Biological Control of Weeds, 26–31 August 2018, Engelberg, Switzerland. US Forest Service, Morgantown, WV, USA, xix + 331 pp. <https://www.ibiocontrol.org/proceedings/> 

Holmes, K., **Babendreier, D.**, **Bateman, M.**, **Chaudhary, M.**, **Grunder, J.**, **Mulaa, M.**, **Durocher-Granger, L.** and **Faheem, M.** (2019) Biopesticides manual: guidelines for selecting, sourcing, producing and using biopesticides for key pests of tobacco. CABI, Wallingford, UK, xi + 145 pp. 

Kenis, M., Hurley, B.P., Colombari, F., Lawson, S., Sun, J., Wilken, C., Weeks, R. and Sathyapala, S. (2019) Guide to the classical biological control of insect pests in planted and natural forests. FAO Forestry Paper 182. Food and Agriculture Organization of the United Nations, Rome, Italy, x + 96 pp. www.fao.org/3/ca3677en/ca3677en.pdf 

Lou, Q.Z, Li, J. and 52 co-editors, including **Zhang J.P.** (2019) 河北梨园有害生物图谱 [Illustrated pear pests in Hebei]. Hebei Science and Technology Press, Shijiazhuang: , China, 158 pp. [In Chinese.]

Thanarajoo S.S., **Chan H.T.** and Day M. (2019) Abstract book for 9th International Workshop on Biological Control and Management of Eupatorieae and other Invasive Weeds, 19–22 March 2019, Putrajaya, Malaysia. CABI Southeast Asia, Serdang, Malaysia, 47 pp.

van Lenteren, J.C., Bueno, V.H.P., Luna, M.G., **Colmenarez, Y.C.** (2019) Biological Control in Latin America and the Caribbean: Its rich history and bright future. CABI, Wallingford, UK, 550p.

Zhang, T., Wang, B. and **Wan, M.** (2019) 常见作物主要病虫害防治实用技术手册. [Practical Pests Management Technical Manual of Major Pests in Common Crops]. China Agricultural Science and Technology Press, Beijing, China, 140 pp. [In Chinese.]

Peer-reviewed papers

Adhikari, S.R., **Pandit, V.**, Sharma, D.R. and Subedi, R.K. (2019) Perception on biological pesticide by various levels of stakeholders in Nepal. *Journal of Biological Control* 33(3), 173-177. <http://dx.doi.org/10.18311/jbc/2019/22690>

Agboyi, L.K., Mensah, S.A., Clottey, V.A., Beseh, P., Glikpo, R., **Rwomushana, I., Day, R.** and **Kenis, M.** (2019) Evidence of leaf consumption rate decrease in fall armyworm, *Spodoptera frugiperda*, larvae parasitized by *Coccygidium luteum*. *Insects* 10(410), 9 pp. <https://doi.org/10.3390/insects10110410>

Aigbedion-Atalor, P.O., Idemudia, I., **Witt, A.B.R.** and Day, M.D. (2019) First record of the impact of the parasitism of *Cecidochares connexa* (Diptera: Tephritidae) by a solitary larval ectoparasitoid in West Africa: Cause for concern? *Journal of Plant Diseases and Protection* 126(1), 93–95. <https://doi.org/10.1007/s41348-018-0189-x>

Babendreier D., Wan M., Tang R., Tambo J., Liu Z., Grossrieder M., Kansiime M., Wood A., Zhang F. and **Romney D.** (2019) Impact of integrated pest management in rice and maize in the Greater Mekong Subregion. *CABI Study Brief* 32(Impact), [14 pp.]. <https://dx.doi.org/10.1079/cabicomm-62-8117>

Babendreier, D., Wan, M., Tang, R., Gu, R., Tambo, J., Liu, Z., Grossrieder, M., Kansiime, M., Wood, A., Zhang, F. and **Romney, D.** (2019) Impact assessment of biological control-based integrated pest management in rice and maize in the Greater Mekong Subregion. *Insects* 10(226), 16 pp. <https://doi.org/10.3390/insects10080226>

Baker, T., **Whitehead, B., Musker, R.** and Keizer, J. (2019) Global agricultural concept space: lightweight semantics for pragmatic interoperability. *npj Science of Food* 3(16), 8 pp. <https://doi.org/10.1038/s41538-019-0048-6>

Baroncelli, R., **Cafà, G.**, Castro, R.R.L., Bouffleur, T. and Massola Jr, N.S. (2019) Fungal Planet description sheet 1033. *Persoonia – Molecular Phylogeny and Evolution of Fungi* 43, 405–406. <https://doi.org/10.3767/persoonia.2019.43.06>

Bebber, D.P., Field, E., Gui, H., Mortimer, P., **Holmes, T.** and Gurr, S.J. (2019) Many unreported crop pests and pathogens are probably already present. *Global Change Biology* 25(8), 2703–2713. <https://doi.org/10.1111/gcb.14698>

Bhatti, H., Bajwa, B.E. and **Honey, S.F.** (2019) Biological control of aflatoxin causing organisms in agricultural commodities as an integrated environmentally safe approach. *International Journal of Agriculture & Biosciences* 8(4), 190–193. <http://www.ijagbio.com/pdf-files/volume-8-no-4-2019/190-193.pdf>


Bloukounon-Goubalan, A.Y., Saïdou, A., Obognon, N., Amadji, G.L., Igué, A.M., **Clottey, V.A.**, Chrysostome, C.A.A.M., **Kenis, M.** and Mensah, G.A. (2019) Decomposition and nutrient release pattern of agro-processing by-products biodegraded by fly larvae in acrisols. *Archives of Agronomy and Soil Science* 65(11), 1610–1621. <https://doi.org/10.1080/03650340.2019.1572118>

Bloukounon-Goubalan, A.Y., Saïdou, A., Obognon, N., Amadji, G.M., Igué, A.M., **Clottey, V.A.** and **Kenis, M.** (2019) Decomposition and nutrient release pattern of animal manures biodegraded by fly larvae in acrisols. *Canadian Journal of Soil Science* 99(1), 60–69. <https://doi.org/10.1139/cjss-2018-0076>

Boafo, C., Affedzie-Obresi, S., Gbemavo, D.S.J.C., **Clottey, V.A.**, Nkegbe, E., Adu-Aboagye, G. and **Kenis, M.** (2019) Use of termites by farmers as poultry feed in Ghana. *Insects* 10(3):69, 13 pp. <https://doi.org/10.3390/insects10030069>

Boansi, D., **Tambo, J.A.** and Müller, M. (2019) Intra-seasonal risk of agriculturally-relevant weather extremes in West African Sudan Savanna. *Theoretical and Applied Climatology* 135(1–2), 355–373. <https://doi.org/10.1007/s00704-018-2384-x>

Bras, A., Avtzis, D.N., **Kenis, M., Li, H., Véték, G., Bernard, A., Courtin, C., Rousselet, J., Roques, A.** and Auger-Rozenberg, M.-A. (2019) A complex invasion story underlies the fast spread of the invasive box tree moth (*Cydalima perspectalis*) across Europe. *Journal of Pest Science* 92(3), 1187–1202. <https://doi.org/10.1007/s10340-019-01111-x>


Cafà, G., Caggiano, B., Reeve, M.A., Bhatti, H., Honey, S.F., Bajwa, B. and Buddie, A.G. (2019) A polyphasic approach aids early detection of potentially toxigenic aspergilli in soil. *Microorganisms* 7(300), 14 pp. <https://doi.org/10.3390/microorganisms7090300> 


Caldara, R. and **Toševski, I.** (2019) *Rhinusa* Stephens: a taxonomic revision of the species belonging to the *R. linariae*, *R. herbarum*, *R. melas*, and *R. mauritii* groups (Coleoptera Curculionidae). *Zootaxa* 4679(2), 318–340. <https://doi.org/10.11646/zootaxa.4679.2.6>


Carvajal-Yepes, M., Cardwell, K., Nelson, A., Garrett, K.A., Giovani, B., Saunders, D.G.O., Kamoun, S., Legg, J.P., Verdier, V., Lessel, J., Neher, R.A., **Day, R.**, Pardey, P., Gullino, M.L., Records, A.R., Bextine, B., Leach, J.E., Staiger, S. and Tohme, J. (2019) A global surveillance system for crop diseases: Global preparedness minimizes the risk to food supplies. *Science* 364(6447), 1237–1239. <https://doi.org/10.1126/science.aaw1572>


Chen, J., **Zhang, F.** Chen, L., Lou, Q., Shi, S., **Mi, Q.** and **Zhang, J.** (2019) 基于茶翅蝽文献量学的国内外研究现状. [Bibliometric analysis and research progress of *Halyomorpha halys* (Stål).] China Plant Protection Guide (12), unpaginated. [In Chinese with English abstract.]


Cheng, Y., Zhang, Y., Wang, G., Guo, C. and **Li, H.** (2019) 自然环境中地面温度对亚洲小车蝗体温的影响 [Effect of ground surface temperature on body temperature of *Oedaleus decorus asiaticus* under natural habitat]. *Plant Protection* 45(2), 64–67. [In Chinese with English abstract.] <https://doi.org/10.16688/j.zwbh.2018499>

Cock, M.J.W. (2019) Donkey's eyes, *Junonia* spp. (Lepidoptera, Nymphalidae), in Trinidad and Tobago. *Living World, Journal of the Trinidad and Tobago Field Naturalists' Club* 2019, 14–20. <https://ttfnc.org/livingworld/index.php/lwj/article/view/723> 

Cock, M.J.W. (2019) Field-identification of the *Caligo* butterflies (Nymphalidae, Brassoliniinae) of Trinidad and Tobago. *Living World, Journal of the Trinidad and Tobago Field Naturalists' Club* 2019, 37–39. <https://ttfnc.org/livingworld/index.php/lwj/article/view/738> 


Cock, M.J.W. (2019) Unravelling the status of partially identified insect biological control agents introduced to control insects: an analysis of BIOCAT2010. *BioControl* 64(1), 1–7. <https://doi.org/10.1007/s10526-018-09921-1> 

Cock, M.J.W. and Alston-Smith, S. (2019) *Oxyntes corusca* (Herrich-Schäffer) (Lepidoptera, HesperIIDae), an overlooked butterfly record from Trinidad, West Indies, with notes on the caterpillar. *Living World, Journal of the Trinidad and Tobago Field Naturalists' Club* 2019, 45–46. <https://ttfnc.org/livingworld/index.php/lwj/article/view/729> 


Cock, M.J.W., Buddie, A.G. and Cafà, G. (2019) Piloting the use of DNA barcoding in support of natural enemy surveys: new parasitoid records for banana skippers (Erionota spp., HesperIIDae, Lepidoptera) in Malaysia. *Journal of Asia-Pacific Entomology* 22(1), 183–188. <https://doi.org/10.1016/j.aspen.2018.12.019> 


Cock, M.J.W.; Polar, P.; Rutherford, M., **Cafà, G.** and **Buddie, A.** (2019) *Hypercompe trinitatis* (Lepidoptera, Erebidae, Arctiinae) and its caterpillar in Trinidad, West Indies. *Living World, Journal of the Trinidad and Tobago Field Naturalists' Club* 2019, 21–27. <https://ttfnc.org/livingworld/index.php/lwj/article/view/726> 

Costi, E., **Haye, T.** and Maistrello, L. (2019) Surveying native egg parasitoids and predators of the invasive *Halyomorpha halys* in Northern Italy. *Journal of Applied Entomology* 143(3), 299–307. <https://doi.org/10.1111/jen.12590>

Danielsen, S., Kajura, C., **Mulema, J., Taylor, R., Kansime, M., Alokit, C.,** Tukahirwa, B. and Schelling, E. (2019) Reaching for the low hanging fruits: One health benefits of joint crop–livestock services for small-scale farmers. *One Health* 7: 100082. <https://doi.org/10.1016/j.onehlt.2019.100082> 

Day, M.D. and **Witt, A.B.R.** (2019) Weed biological control: challenges and opportunities. *Weeds – Journal of Asian-Pacific Weed Science Society* 1(2), 34–44.

Devos, Y., Craig, W., Devlin, R.H., Ippolito, A., Leggatt, R.A., Romeis, J., **Shaw, R.,** Svendsen, C. and Topping, C.J. (2019) Using problem formulation for fit-for-purpose pre-market environmental risk assessments of regulated stressors. *EFSA Journal* 17(S1):e170708, 31 pp. <https://doi.org/10.2903/j.efsa.2019.e170708> 

Dilipkumar, M., Erwan-Shah, S., Anuar, A. and **Sivapragasam, A.** (2019) A sex pheromone-baited trapping system for management of sweetpotato weevil, *Cylas formicarius* (Coleoptera: Brentidae). *Journal of Applied Entomology* 143, 408–416. <https://doi.org/10.1111/jen.12602> 

Dougoud, J., Toepfer, S., Bateman, M., and Jenner, W. (2019) Efficacy of homemade botanical insecticides based on traditional knowledge. A review. *Agronomy for Sustainable Development* 39:37, 22 pp. <https://doi.org/10.1007/s13593-019-0583-1>

Dowlath, P. and **Ramnanan, N.** [2019] Attitudes, knowledge and practices for Trinidad vegetable farmers and their predisposition to adopting IPM strategies in the management of crop diseases. *Tropical Agriculture* 95(Special Issue 2) (2018), 103–111.

Eschen, R., De Groot, M., Glavendekić, M., Lacković, N., Matosević, D., Morales-Rodriguez, C., Hanlon, R.O., Oskay, F., Papazova, I., Prospero, S. and **Franić, I.** (2019) Spotting the pests of tomorrow—Sampling designs for detection of species associations with woody plants. *Journal of Biogeography* 46(10), 2159–2173. <https://doi.org/10.1111/jbi.13670>

Eschen, R., O'Hanlon, R., Santini, A., Vannini, A., Roques, A., Kirichenko, N. and **Kenis, M.** (2019) Safeguarding global plant health: the rise of sentinels. *Journal of Pest Science* 92, 29–36. <https://doi.org/10.1007/s10340-018-1041-6>

Faheem, M., Saeed, S., Sajjad, A., Wang, S. and Ali, A. (2019) Spatio-temporal variations in wheat aphid populations and their natural enemies in four agroecological zones of Pakistan. *PLoS ONE* 14(9):e0222635, 14 pp. <https://doi.org/10.1371/journal.pone.0222635>

Fang, Y., Wu, H., Wang, J.-X., Dou, W.-J., Zhang, X.-M., **Zhang, F.**, Xiao, C. and Chen, G.-H. (2019) 云南省斑翅果蝇寄生性天敌昆虫种类调查 [Investigation on the species of parasitic natural enemies of *Drosophila suzukii* in Yunnan.] *Journal of Environmental Entomology* 41(3), 592–598. [In Chinese with English abstract.]

Franić, I., Prospero, S., Hartmann, M., Allan, E., Auger-Rozenberg, M.-A., Grünwald, N.J., **Kenis, M.,** Roques, A., Schneider, S., Snieszko, R., Williams, W. and **Eschen, R.** (2019) Are traded forest tree seeds a potential source of nonnative pests? *Ecological Applications* 29(7), e01971, 16 pp. <https://doi.org/10.1002/eap.1971>

Ganda, H., Zannou-Boukari, E.T., **Kenis, M.,** Chrysostome, C.A.A.M. and Mensah, G.A. (2019) Potentials of animal, crop and agri-food wastes for the production of fly larvae. *Journal of Insects as Food and Feed* 5(2), 59–67. <https://doi.org/10.3920/jiff2017.0064>

Gaskin, J.F., Andrés, J.A., Bogdanowicz, S.M., Guilbault, K.R., Hufbauer, R.A., **Schaffner, U., Weyl, P.** and Williams, L., III (2019) Russian-olive (*Elaeagnus angustifolia*) genetic diversity in the western United States and implications for biological control. *Invasive Plant Science and Management* 12(2), 89–96. <https://doi.org/10.1017/inp.2019.16>

Ghosh, S., Taron, A. and **Williams, F.** (2019) The impact of plant clinics on the livelihoods of Bangladeshi farmers. *CABI Study Brief* 29(Impact), [8 pp.]. <https://dx.doi.org/10.1079/CABICOMM-62-8107>

Gillespie, D.R., Broadbent, A.B., Mason, P.G., **Haye, T.,** Clarke, P., Goettel, M.S. and Leung, B. (2019) Use of life tables to predict the impact of introducing exotic parasitoids, against the cabbage seedpod weevil in North America. *Biocontrol Science and Technology* 29(10), 940–964. <https://doi.org/10.1080/09583157.2019.1625028>

González-Moreno, P., and 86 authors, including **Kenis, M.** (2019) Consistency of impact assessment protocols for non-native species. *NeoBiota* 44, 1–25. <https://doi.org/10.3897/neobiota.44.31650>

Gupta, A., Achterberg, C. van, Ballal, C.R., **Maczey, N., Djeddour, D.,** Bhutia, S.G. and Rajeshwari, S.K. (2019) Two new species of *Rhogadopsis* Brèthes (Braconidae: Opiinae) as solitary parasitoids of *Merochlorops* species complex (Diptera: Chloropidae) from India. *Zootaxa* 4550(2), 268–276. <https://doi.org/10.11646/zootaxa.4550.2.7>

Harrison, R.D., Thierfelder, C., Baudron, F., Chinwada, P., Midega, C., **Schaffner, U.** and Berg, J. van den (2019) Agro-ecological options for fall armyworm (*Spodoptera frugiperda* JE Smith) management: Providing low-cost, smallholder friendly solutions to an invasive pest. *Journal of Environmental Management* 243, 318–330. <https://doi.org/10.1016/j.jenvman.2019.05.011>

Heeb, L., Jenner, E. and **Cock, M.J.W.** (2019) Climate-Smart Pest Management: building resilience of farms and landscapes to changing pest threats. *Journal of Pest Science* 92(3), 951–969. <https://doi.org/10.1007/s10340-019-01083-y>

Hernández-Vera, G., **Toševski, I.,** Caldara, R. and Emerson, B.C. (2019) Evolution of host plant use and diversification in a species complex of parasitic weevils (Coleoptera: Curculionidae). *PeerJ* 7:e6625, 21 pp. <https://doi.org/10.7717/peerj.6625>

- Hinz, H.L., Schaffner, U.**, Bouchier, R.S., Schwarzländer, M. and Weed, A. (2019) Comment on Havens and colleagues (2019). *Bioscience* 69(11), 853. <https://doi.org/10.1093/biosci/biz110>
- Hinz, H.L.**, Winston, R.L. and Schwarzländer, M. (2019) How safe is weed biological control? A global review of direct non-target attack. *Quarterly Review of Biology* 94(1), 1-27. <https://doi.org/10.1086/702340>
- Kansiime, M.K., Alawy, A.**, Allen, C., Subharwal, M., **Jadhav, A.** and **Parr, M.** (2019) Effectiveness of mobile agri-advisory service extension model: evidence from Direct2Farm program in India. *World Development Perspectives* 13, 25–33. <https://doi.org/10.1016/j.wdp.2019.02.007>
- Kansiime, M.K., Mugambi, I., Rwomushana, I., Nunda, W., Lamontagne-Godwin, J., Rware, H., Phiri, N.A.**, Chipabika, G., Ndlovu, M. and **Day, R.** (2019) Farmer perception of fall armyworm (*Spodoptera frugiperda* J.E. Smith) and farm-level management practices in Zambia. *Pest Management Science* 75(10), 28400–2850. <https://doi.org/10.1002/ps.5504>
- Kenfack Voukeng, S.N., Coombes, C., **Weyl, P.**, Djeugoue, F. and Hill M.P. (2019) Morphological identification of fungi associated with *Eichhornia crassipes* (Mart.-Solms) Laubach in the Wouri River Basin, Douala, Cameroon. *African Journal of Aquatic Science* 44, 195–208. <https://doi.org/10.2989/16085914.2019.1636760>
- Kenfack Voukeng, S.N., **Weyl, P.**, Hill, M.P. and Chi, N. (2019) The attitudes of riparian communities to the presence of water hyacinth in the Wouri River Basin, Douala, Cameroon. *African Journal of Aquatic Science* 44(1), 7–13. <https://doi.org/10.2989/16085914.2018.1538868>
- Kenis, M.**, Plessis, H. du, Van den Berg, J., Ba, M.N., Goergen, G., Kwadjo, K.E., Baoua, I., **Buddie, A., Cafà, G., Offord, L., Rwomushana, I.** and Polaszek, A. (2019) *Telenomus remus*, a candidate parasitoid for the biological control of *Spodoptera frugiperda* in Africa, is already present on the continent. *Insects* 10(4): 92, 10 pp. <https://doi.org/10.3390/insects10040092>
- Khan, A., **Honey, S.F., Bajwa, B.**, Jamil, N. and **Mazhar, M.S.** (2019) Responses of *Cydia pomonella* (L.) reared on different artificial diets under laboratory conditions. *Sarhad Journal of Agriculture* 35(2), 386-391. <http://dx.doi.org/10.17582/journal.sja/2019/35.2.386.391>
- Kirichenko, N., Augustin, S., and **Kenis, M.** (2019) Invasive leafminers on woody plants: a global review of pathways, impact and management. *Journal of Pest Science* 92(1), 93–106. <https://doi.org/10.1007/s10340-018-1009-6>
- Konopka, J.K.**, Garipey, T.D., **Haye, T., Zhang, J.**, Rubin, B.D. and McNeil, J.N. (2019) Exploitation of pentatomids by native egg parasitoids in the native and introduced ranges of *Halyomorpha halys*: a molecular approach using sentinel egg masses. *Journal of Pest Science* 92(2), 609–619. <https://doi.org/10.1007/s10340-018-01071-8>
- Kosovac, A., Jakovljević, M., Krstić, O., Cvrković, T., Mitrović, M., **Toševski, I.** and Jović, J. (2019) Role of plant-specialized *Hyalesthes obsoletus* associated with *Convolvulus arvensis* and *Crepis foetida* in the transmission of ‘*Candidatus Phytoplasma solani*’-inflicted bois noir disease of grapevine in Serbia. *European Journal of Plant Pathology* 153(1), 183-195. <https://doi.org/10.1007/s10658-018-1553-1>
- Kyaw, H.W.W., Tsuchiya, K., Matsumoto, M., Aye, S.S., Iiyama, K., **Kurose, D.**, Horita, M., Furuya, N. (2019) Molecular characterization of *Ralstonia solanacearum* strains causing bacterial wilt of solanaceous crops in Myanmar by rep-PCR analysis. *Journal of General Plant Pathology* 85(1), 33–38. <https://doi.org/10.1007/s10327-018-0818-z>
- Lamontagne-Godwin, J.**, Cardey, S., **Williams, F.E.**, Dorward, P.T., **Aslam, N.** and **Almas, M.** (2019) Identifying gender-responsive approaches in rural advisory services that contribute to the institutionalisation of gender in Pakistan. *Journal of Agricultural Education and Extension* 25(3), 267–288. <https://doi.org/10.1080/1389224X.2019.1604392>
- Lamontagne-Godwin, J.**, Dorward, P., **Ali, I., Aslam, N.** and Cardey, S. (2019) An approach to understand rural advisory services in a decentralised setting. *Social Sciences* 8(3): 103, 18 pp. <https://doi.org/10.3390/socsci8030103>
- Lamontagne-Godwin, J.**, Dorward, P., **Aslam, N.** and Cardey, S. (2019) Analysing support towards inclusive and integrated rural advisory systems. *Social Sciences* 8(295), 18 pp. <https://doi.org/10.3390/socsci8100295>
- Li, H., Wan, M.**, Gu, R., Liu, L., Nie, F., Wang, Z. and **Zhang, F.** (2019) 基于文献计量学的重大入侵害虫草地贪夜蛾的研究动态分析 [Bibliometric analysis on research progress of invasive insect pest fall armyworm, *Spodoptera frugiperda*]. *Plant Protection* 45(4), 34–42. [In Chinese with English abstract.]

Linders, T.E.W., **Schaffner, U., Eschen, R.**, Abebe, A., Choge, S.K.; Nigatu, L.; Mbaabu, P.M., Shiferaw, H. and Allan, E. (2019) Direct and indirect effects of invasive species: Biodiversity loss is a major mechanism by which an invasive tree affects ecosystem functioning. *Journal of Ecology* 107(6), 2660-2672. <https://doi.org/10.1111/1365-2745.13268>

Liu, Y., Cheng, Y., **Li, H.**, Nong, X. and **Luke, B.** (2019) 不同温度下绿僵菌对东亚飞蝗3龄蝗蛹的致病力影响 [Virulence of *Metarhizium anisopliae* against 3rd instar nymphs of *Locusta migratoria manilensis* under different temperatures.] *Chinese Journal of Biological Control* 35(4), 642–647. [In Chinese with English abstract.] <https://doi.org/10.16409/j.cnki.2095-039x.2019.04.021>

Liverpool-Tasie, L.S.O., Sanou, A. and **Tambo, J.A.** (2019) Climate change adaptation among poultry farmers: evidence from Nigeria. *Climatic Change* 157(3-4), 527–544. <https://doi.org/10.1007/s10584-019-02574-8>

Lohano, H.D., Mari, F.M., **Stewart, J., Ali, I.** and **Romney, D.** (2019) Improving the safety and quality of cotton production in Pakistan. *CABI Study Brief* 30(Impact), [7 pp.]. <https://dx.doi.org/10.1079/cabicomm-62-8106>

Marelli, J.P., Guest, D.I., Bailey, B.A., **Evans, H.C.**, Brown, J.K., Junaid, M., Barreto, R.W., Lisboa, D.O. and Puig, A.S. (2019) Chocolate under threat from old and new cacao diseases. *Phytopathology* 109(8), 1331–1343. <https://doi.org/10.1094/phyto-12-18-0477-rvw>

Martin, E.A., and 64 coauthors including **Stutz, S.** (2019) The interplay of landscape composition and configuration: new pathways to manage functional biodiversity and agroecosystem services across Europe. *Ecology Letters* 22, 1083–1094. <https://doi.org/10.1111/ele.13265>

Min, W., Gu, R., Zhang, T., Zhang, Y., Ji, H., Wang, B., Qiao, Y. and **Toepfer, S.** (2019) Conflicts of interests when connecting agricultural advisory services with agri-input businesses. *Agriculture* 9(10), 218, 19 pp. <https://doi.org/10.3390/agriculture9100218>

Misawa, T. and **Kurose, D.** (2019) Anastomosis group and subgroup identification of *Rhizoctonia solani* strains deposited in the NARO Genebank, Japan. *Journal of General Plant Pathology* 85(4), 282–294. <https://doi.org/10.1007/s10327-019-00848-8>

Morales-Rodríguez, C., and 34 coauthors including **Eschen, R., Franić, I.** and **Kenis, M.** (2019) Forewarned is forearmed: harmonized approaches for early detection of potentially invasive pests and pathogens in sentinel plantings. *NeoBiota* 47, 95–123. <https://doi.org/10.3897/neobiota.47.34276>

Musebe, R.O., Mugambi, I., Williams, F., Mulaa, M., Nambiro, E. and **Chege, F.** (2019) Gender differences in the use of plant health information services: a case of plant clinics under Plantwise Program in Kenya. *African Journal of Agricultural Research* 13(51), 2862–2871. <https://doi.org/10.5897/AJAR2018.13090>

Nahiyoon, A.A., Fayyaz, S. and Kazi, N. (2019) New and known nematodes associated with cotton plantation in Sindh, Pakistan. *Pakistan Journal of Zoology* 51(4), 1309-1314. <http://dx.doi.org/10.17582/journal.pjz/2019.51.4.1309.1314>

Nóbrega, T.F., Ferreira, H.C., B.W., **Evans, H.C.** and Barreto, R.W. (2019) Fungal Planet description sheet 1017. *Persoonia – Molecular Phylogeny and Evolution of Fungi* 43, 373–374. <https://doi.org/10.3767/persoonia.2019.43.06>

Novoa, A., Brundu, G., Day, M.D., Deltoro, V., Essl, F., Foxcroft, L.C., Fried, G., Kaplan, H., Kumschick, S., Lloyd, S., Marchante, E., Marchante, H., Paterson, I.D., Pyšek, P., Richardson, D.M., **Witt, A.**, Zimmermann, H.G. and Wilson, J.R.U. (2019) Global actions for managing cactus invasions. *Plants* 2019, 8(10), 421, 27 pp. <https://doi.org/10.3390/plants8100421>

Ochilo, W.N., Nyamasyo, G.N., Kilalo, D., **Otieno, W.**, Otipa, M., **Chege, F.**, Karanja, T. and Lingeera, E. (2019). Characteristics and production constraints of smallholder tomato production in Kenya. *Scientific African* 2, e00014. <https://doi.org/10.1016/j.sciaf.2018.e00014>

Ochilo, W.N., Nyamasyo, G.N., Kilalo, D., **Otieno, W.**, Otipa, M., **Chege, F.**, Karanja, T. and Lingeera, E.K. (2019) Ecological limits and management practices of major arthropod pests of tomato in Kenya. *Journal of Agricultural Science and Practice* 4(2), 29–42. <https://doi.org/10.31248/JASP2019.124>

Ochilo, W.N., Ruffhead, H., Rumsey, A., Chege, F., Lusweti, C., **Oronje, M.** and **Otieno, W.** (2019) Can you ensure that ICT for development apps are downloaded and used? A case study of the Plantwise Data Collection app for Plant Health in Kenya. *Journal of Agricultural & Food Information* 20(3) 237–253. <https://doi.org/10.1080/10496505.2019.1609967>

Park, I., Schwarzländer, M., **Hinz, H.L., Schaffner, U.** and Eigenbrode, S.D. (2019) A simple approach to evaluate behavioral responses of insect herbivores to olfactory and visual cues simultaneously: the double stacked y-tube device and portable volatile collection system. *Arthropod-Plant Interactions* 13(1), 139–149. <https://doi.org/10.1007/s11829-018-9663-4>

Paterson, I.D., Coetzee, J.A., **Weyl, P.**, Griffith, T.C., Voogt, N. and Hill, M.P. (2019) Cryptic species of a water hyacinth biological control agent revealed in South Africa: host specificity, impact, and thermal tolerance. *Entomologia Experimentalis et Applicata* 167, 682–691. <https://doi.org/10.1111/eea.12812>

Pecchia, S., Caggiano, B., Lio, D.D., **Cafà, G.**, Le Floch, G. and Baroncelli, R. (2019) Molecular detection of the seed-borne pathogen *Colletotrichum lupini* targeting the hyper-variable IGS region of the ribosomal cluster. *Plants* 8(222), 16 pp. <https://doi.org/10.3390/plants8070222>

Pomalégni, S.C.B., Kpadé, C.P., Gbemavo, D.S.J.C., **Clotey, V.A., Kenis, M.** and Mensah, G.A. (2019) Traditional poultry farmers' willingness to pay for using fly larvae meal as protein source to feed local chickens in Benin. *Bio-based and Applied Economics* 7(2), 117–138. <https://doi.org/10.13128/bae-7671>

Pousga, S., Sankara, F., Coulibaly, K., Nacoulma, J.P., Ouedraogo, S., **Kenis, M.**, Chrysostome, C. and Ouedraogo, G.A. (2019) Effets du remplacement de la farine de poisson par les termites (*Macrotermes* sp.) sur l'évolution pondérale et les caractéristiques de carcasse de la volaille locale au Burkina Faso. *African Journal of Food, Agriculture, Nutrition and Development* 19(2), 14354–14371. <https://doi.org/10.18697/ajfand.85.17430>

Prasad, A.K., Roy, S., **Neave, S.**, Sarma, A.J., Phukan, P.J., Rahman, A., Muraleedharan, N. and Mukhopadhyay, A. (2019) Sticky bands as effective tools to manage looper pests (Lepidoptera: Geometridae) in tea crops. *Entomologia Generalis* 39(3–4), 347–351. <https://doi.org/10.1127/entomologia/2019/0735>

Reeve, M.A. and **Bachmann, D.** (2019) A method for filamentous fungal growth and sample preparation aimed at more consistent MALDI-TOF MS spectra despite variations in growth rates and/or incubation times. *Biology Methods and Protocols* 4(1), 3, 1–14. <https://doi.org/10.1093/biomethods/bpz003>

Reeve, M.A. and Pollard, K.M. (2019) MALDI-TOF MS-based analysis of dried seed proteins immobilized on filter paper. *Biology Methods and Protocols* 4(1), bpz007, 12 pp. <https://doi.org/10.1093/biomethods/bpz007>

Reeve, M.A. and **Seehausen, M.L.** (2019) Discrimination between Asian populations of the parasitoid wasp *Ganaspis* cf. *brasiliensis* using a simple MALDI-TOF MS-based method for use with insects. *Biology Methods and Protocols* 4(1), 1–8. <https://doi.org/10.1093/biomethods/bpz002>

Reeve, M.A., Bachmann, D. and **Caine, T.S.** (2019) Identification of *Penicillium* species by MALDI-TOF MS analysis of spores collected by dielectrophoresis. *Biology Methods and Protocols* 4(1), bpz018, 1–15. <https://doi.org/10.1093/biomethods/bpz018>


Reeve, M.A., Caine, T.S. and **Buddie, A.G.** (2019) Spectral grouping of nominally *Aspergillus versicolor* microbial-collection deposits by MALDI-TOF MS. *Microorganisms* 7(235), 15 pp. <https://doi.org/10.3390/microorganisms7080235>

Reeve, M.A., Stewart, H. and **Ryan, M.J.** (2019) MALDI-TOF MS spectral variation is observed between fungal samples grown under identical conditions after long-term storage by cryopreservation, freeze-drying, and under oil. *CryoLetters* 40(3), 145–151.


Roy, H.E., and 43 authors including **Kenis, M.** (2019) Developing a list of invasive alien species likely to threaten biodiversity and ecosystems in the European Union. *Global Change Biology* 25, 1032–1048. <https://doi.org/10.1111/gcb.14527>

Ryan, M.J., McCluskey, K., Verkleij, G., Robert, V. and **Smith, D.** (2019) Fungal biological resources to support international development: challenges and opportunities. *World Journal of Microbiology and Biotechnology* 35(139), 13 pp. <https://doi.org/10.1007/s11274-019-2709-7>


Sabbatini Peverieri, G., Mitroiu, M.-D., Bon, M.-C., Balusu, R., Benvenuto, L., Bernardinelli, I., Fadamiro, H., Falagiarda, M., Fusu, L., Grove, E., **Haye, T.**, Hoelmer, K., Lemke, E., Malossini, G., Marianelli, L., Moore, M.R., Pozzebbon, A., Roversi, P.-F., Scaccini, D., Shrewsbury, P., Tillman, G., Tirello, P., Waterworth, R. and Talamas, E.J. (2019) Surveys of stink bug egg parasitism in Asia, Europe and North America, morphological taxonomy, and molecular analysis reveal the Holarctic distribution of *Acroclisoides sinicus* (Huang & Liao) (Hymenoptera, Pteromalidae). *Journal of Hymenoptera Research* 74, 123–151. <https://doi.org/10.3897/jhr.74.46701>


Sanou, A.G., Sankara, F., Pousga, S., Coulibaly, K., Nacoulma, J.P., Ouedraogo, I., Nacro, S., **Kenis, M.**, Sanon, A. and Somda, I. (2019) Production de masse de larves de *Musca domestica* L. (Diptera: Muscidae) pour l'aviculture au Burkina Faso: Analyse des facteurs déterminants en oviposition naturelle. *Journal of Applied Bioscience* 134, 13689–13701. <https://dx.doi.org/10.4314/jab.v134i1.6> https://m.elewa.org/Journals/wp-content/uploads/2019/02/6.Sanou_.pdf 

Sanou, A.G., Sankara, F., Pousga, S., **Kenis, M.**, Coulibaly, K., Nacoulma, J.P., Nacro, S., Ouedraogo, I. and Somda, I. (2019) Farmers' perception of the use of fly larvae in poultry feed in Burkina Faso. *African Entomology* 27(2), 373–385. <https://doi.org/10.4001/003.027.0373>

Santos, T.B., Luz, E.D.M.M., **Evans, H.C.** and Bezerra, J.L. (2019) *Spermosporella irenopsidis* sp. nov. and *Spermatoloncha maticola*, parasitic on black mildew (*Irenopsis vincensii*) of rubber in Bahia, Brazil. *Rodriguésia* 70: e03342017, 1–4. <http://dx.doi.org/10.1590/2175-7860201970083> 


Seehausen, M.L., Timm, C., Jones, I.M., Bouchier, R.S. and Smith, S.M. (2019) Reproductive life-history traits of the classical biological control agent *Hypena opulenta* (Lepidoptera: Erebididae): Using agent biology to support post release monitoring and establishment. *Biological Control* 135, 95–101. <https://doi.org/10.1016/j.biocontrol.2019.05.010>

Shiferaw, H., Bewket, W., Alamirew, T., Zeleke, G., Teketay, D., Bekele, K., **Schaffner, U.** and Eckert, S. (2019) Implications of land use/land cover dynamics and *Prosopis* invasion on ecosystem service values in Afar Region, Ethiopia. *Science of the Total Environment* 675, 354–366. <https://doi.org/10.1016/j.scitotenv.2019.04.220> 

Shiferaw, H., **Schaffner, U.**, Bewket, W., Alamirew, T., Zeleke, G., Teketay, D. and Eckert, S. (2019) Modelling the current fractional cover of an invasive alien plant and drivers of its invasion in a dryland ecosystem. *Scientific Reports* 9(1576), 12 pp. <https://doi.org/10.1038/s41598-018-36587-7> 


Silvestri, S., Macharia, M. and Uzayisenga, B. (2019) Analysing the potential of plant clinics to boost crop protection in Rwanda through adoption of IPM: the case of maize and maize stem borers. *Food Security* 11(2), 301–315. <https://doi.org/10.1007/s12571-019-00910-5> 


Smith, D., Buddie, A.G., Goss, R.J.M., Overmann, J., Lepleux, C., Brönstrup, M., Kloreg, B., Meiners, T., Brennecke, P., Ianora, A., Bouget, F.-Y., Gribbon, P. and


Pina, M. (2019) Discovery pipelines for marine resources: an ocean of opportunity for biotechnology? *World Journal of Microbiology and Biotechnology* 35(107), 8 pp. <https://doi.org/10.1007/s11274-019-2685-y> 

Stackebrandt, E. and **Smith, D.** (2019) Paradigm shift in species description: the need to move towards a tabular format. (Editorial.) *Archives of Microbiology* 201(2), 143–145. <http://link.springer.com/article/10.1007/s00203-018-1609-9>


Stahl, J., Babendreier, D. and **Haye, T.** (2019) Life history of *Anastatus bifasciatus*, a potential biological control agent of the brown marmorated stink bug in Europe. *Biological Control* 129, 178–186. <https://doi.org/10.1016/j.biocontrol.2018.10.016> 

Stahl, J., Tortorici, F., Pontini, M., Bon, M.-C., Hoelmer, K., Marazzi, C., Tavella, L. and **Haye, T.** (2019) First discovery of adventive populations of *Trissolcus japonicus* in Europe. *Journal of Pest Science* 92(2), 371–379. <https://doi.org/10.1007/s10340-018-1061-2> 

Stahl, J.M., Babendreier, D., Marazzi, C., Caruso, S., Costi, E., Maistrello, L. and **Haye, T.** (2019) Can *Anastatus bifasciatus* be used for augmentative biological control of the brown marmorated stink bug in fruit orchards? *Insects* 10(108), 14 pp. <https://doi.org/10.3390/insects10040108> 

Stahl, J.M., Garipey, T.D., Beukeboom, L.W. and **Haye, T.** (2019) A molecular tool to identify *Anastatus* parasitoids of the brown marmorated stink bug. *Entomologia Experimentalis et Applicata* 167, 692–700. <https://doi.org/10.1111/eea.12809> 

Shyamsundar, P., Springer, N.P., Tallis, H., Polasky, S., Jat, M.L., Sidhu, H.S., Krishnapriya, P.P., Skiba, N., Ginn, W., Ahuja, V., Cummins, J., Datta, I., Dholakia, H.H., Dixon, J., Gerard, B., Gupta, R., Hellmann, J., **Jadhav, A.**, Jat, H.S., Keil, A., Ladha, J.K., Lopez-Ridaura, S., Nandrajog, S.P., Paul, S., Ritter, A., Sharma, P.C., Singh, R., Singh, D., Somanathan, R. (2019) Fields on fire: Alternatives to crop residue burning in India. *Science* 365, 536–538. <https://doi.org/10.1126/science.aaw4085>

Szücs, M., Salerno, P.E., Teller, B.J., **Schaffner, U.**, Littlefield, J.L. and Hufbauer, R.A. (2019) The effects of agent hybridization on the efficacy of biological control of tansy ragwort at high elevations. *Evolutionary Applications* 2(3), 470–481. <https://doi.org/10.1111/eva.12726> 

Tai, H., Guo, J., Yang, S., **Zhang, F.**, Liu, J., Yang, Y., Song, M., Xia, Y., He, K., Lin, Q. and Wang, Z. (2019) 草地贪夜蛾在云南德宏州甘蔗上的生物学习性及为害状观察 [Biological characteristics and damage symptoms of fall armyworm, *Spodoptera frugiperda*, on sugarcane in Dehong prefecture of Yunnan province.] *Plant Protection* 45(6), 75–79. [In Chinese with English abstract.] <https://doi.org/10.16688/j.zwbh.2019488>

Tai, H., Guo, J., **Zhang, F.**, Wang, G., An, Z., Zhang, T., Su, H., Xu, J., Yang, L. and Wang, Z. (2019) 草地贪夜蛾在云南冬季甜玉米上的生物学习性及为害状观察 [Biological characteristics and damage symptoms of the fall armyworm *Spodoptera frugiperda* on winter sown sweet corn in Yunnan province.] *Plant Protection* 45(5), 91–95. [In Chinese with English abstract.] <https://doi.org/10.16688/j.zwbh.2019349>

Tambo, J.A., Aliamo, C., Davis, T., Mugambi, I., Romney, D., Onyango, D.O., Kansime, M., Alokit, C., and Byantwale, S.T. (2019) The impact of ICT-enabled extension campaign on farmers' knowledge and management of fall armyworm in Uganda. *PLoS ONE* 14(8), 21 pp. <https://doi.org/10.1371/journal.pone.0220844>

Tarmann, G.H. and **Cock, M.J.W.** (2019) Zygaenidae from Trinidad, West Indies. *Journal of the Lepidopterists' Society* 73(3), 153–161. <https://doi.org/10.18473/lepi.73i3.a4>

Toepfer, S., Kuhlmann, U., Kansime, M., Onyango, D.O., Davis, T., Cameron, K. and **Day, R.** (2019) Communication, information sharing, and advisory services to raise awareness for fall armyworm detection and area-wide management by farmers. *Journal of Plant Diseases and Protection* 126(2), 103–106. <https://doi.org/10.1007/s41348-018-0202-4>

Trillo, A., Montero-Castaño, A., González-Varo, J.P., **González-Moreno, P.**, Ortiz-Sánchez, F.J. and Vilà, M. (2019) Contrasting occurrence patterns of managed and native bumblebees in natural habitats across a greenhouse landscape gradient. *Agriculture, Ecosystems and Environment* 272, 230–236. <https://doi.org/10.1016/j.agee.2018.11.018>

Vilà, M., Gallardo, B., Preda, C., García-Berthou, E., Essl, F., **Kenis, M.**, Roy H.E. and **González-Moreno, P.** (2019) A review of impact assessment protocols of non-native plants. *Biological Invasions* 21(3), 709–723. <https://doi.org/10.1007/s10530-018-1872-3>

Vincent, C., **Babendreier, D.**, wiergiel, W., Helsen, H. and Blommers, L.H.M. (2019) A review of the apple sawfly, *Hoplocampa testudinea* (Hymenoptera Tenthredinidae). *Bulletin of Insectology* 72(1), 35–54. <https://doi.org/10.1007/s10841-018-9999-9>

Visch, W., Rad-Menéndez, C., Nylund, G.M., Pavia, H., **Ryan, M.J.** and Day, J. (2019) Underpinning the development of seaweed biotechnology: cryopreservation of brown algae (*Saccharina latissima*) gametophytes. *Biopreservation and Biobanking* 17(5), p pp. <https://doi.org/10.1089/bio.2018.0147>

Wan, F. and 58 coauthors including **Tang, R.** (2019) A chromosome-level genome assembly of *Cydia pomonella* provides insights into chemical ecology and insecticide resistance. *Nature Communications* 10(4237), 14 pp. <https://doi.org/10.1038/s41467-019-12175-9>

Wan, M., Gu, R., Zhang, T., Zhang, Y., Ji H., Wang, B., Qiao, Y. and **Toepfer, S.** (2019) Conflicts of interests when connecting agricultural advisory services with agri-Input businesses. *Agriculture* 9(218) 19 pp; <https://doi.org/10.3390/agriculture9100218>

Williams, F., Murphy, S. T., Beseh, P. and **Lamontagne-Godwin, J.** (2019) Have actions taken to control fall armyworm reduced the economic cost experienced in Ghana? *CABI Study Brief* 31(Impact), [10 pp.]. <https://dx.doi.org/10.1079/cabicomm-62-8108>

Witt, A.B.R., Shackleton, R.T., **Beale, T., Nunda, W.** and Wilgen, B.W. van (2019) Distribution of invasive alien *Tithonia* (Asteraceae) species in eastern and southern Africa and the socioecological impacts of *T. diversifolia* in Zambia. *Bothalia – African Biodiversity & Conservation* 49(1), a2356, 11 pp. <https://doi.org/10.4102/abc.v49i1.2356>

Zhang, J., Huang Y., Pu, R., **Gonzalez-Moreno, P.**, Yuan, L., Wu, K. and Huang, W. (2019) Monitoring plant diseases and pests through remote sensing technology: A review. *Computers and Electronics in Agriculture* 165(104943), 14 pp. <https://doi.org/10.1016/j.compag.2019.104943>

Zhang, X., Han, L., Dong, Y., Shi, Y., Huang, W., Han, L., **González-Moreno, P.**, Ma, H., Ye, H. and Sobeih, T. (2019) A deep learning-based approach for automated yellow rust disease detection from high-resolution hyperspectral UAV images. *Remote Sensing* 11(1554), 16 pp. <https://doi.org/10.3390/rs11131554>


Zhou, C.-Q., Zhan, H.-X., Xiao, C. and **Zhang, J.-P.** (2019) 以黑腹果蝇为寄主的蝇蛹金小蜂生长发育、繁殖及功能反应研究 [The development, fecundity, and functional response of *Pachycrepoideus vindemmiae* on the pupae of *Drosophila melanogaster*.] *Journal of Environmental Entomology* 41(3), 599–604. [In Chinese with English abstract.]

Zorić, A.S., Morina, F., **Toševski, I.**, Tosti, T., Jović, J., Krstić, O., and Veljović-Jovanović, S. (2019) Resource allocation in response to herbivory and gall formation in *Linaria vulgaris*. *Plant Physiology and Biochemistry* 135, 224–232. <https://doi.org/10.1016/j.plaphy.2018.11.032>

Book chapters and proceedings papers

Caracciolo, C., Aubin, S., **Whitehead, B.** and Panagiotis, P. (2019) Semantics for data in agriculture: A community-based wish list. In: Garoufallou, E., Sartori, F., Siatiri, R. and Zervas, M. (eds) *Metadata and Semantic Research*. Springer International Publishing, 340–45. https://doi.org/10.1007/978-3-030-14401-2_32


Chaudhary, M. and Ghosh, S.K. (2019) Emerging trends in bio control of soil-diseases concept and capacity building. In: Minh, N.D. and Lii, J. (eds) *Proceedings. International Workshop on enabling capacity in production and application of bio-pesticides and bio-fertilizers for soil-borne disease control and organic farming, 7–9 May 2019, [Hanoi], Vietnam*. The Vietnam Academy of Agricultural Sciences, Hanoi, Vietnam, and Food and Fertilizer Technology Center for the Asian and Pacific Region Taipei, Taiwan, pp. 15-39.

Colmenarez, Y., Corniani, N. and Jenner, W. (2019) Plantwise: improving food security through better Plant Health System. *In: Precision Phytopathology Frontiers of Science*. Fundação de Estudos e Pesquisas Agrícolas e Florestais, Botucatu, Brazil, pp. 187–211. 


Franco, J.P., Crespo, L.V., **Colmenarez, Y.C.** and van Lenteren, J.C. (2019) Biological control in Bolivia. In: van Lenteren, J.C., Bueno, V.H.P., Luna, M.G., Colmenarez, Y.C. (eds) *Biological Control in Latin America and the Caribbean: Its rich history and bright future*. CABI, Wallingford, UK, 64-77.

Hinz, H., Weyl, P., Smith, D. and Djeddour, D. (2019) The Nagoya Protocol: implications for classical biological control of invasive plant species. In: **Hinz, H.**, Bon, M-C., Bourdôt, G., Cristofaro, M., Desurmont, G., **Kurose, D.**, Müller-Schärer, H., Rafter, M., **Schaffner, U., Seier, M.**, Sforza, R., Smith, L., **Stutz, S., Thomas,**

S., Weyl, P. and Winston, R. (eds) *XV International Symposium on Biological Control of Weeds, 26–31 August 2018, Engelberg, Switzerland*. US Forest Service, Morgantown, WV, USA, 206–211. <https://www.ibiocontrol.org/proceedings/> 

Maczey, N., Moore, D., González-Moreno, P. and Rendell, N. (2019) Introduction of biological control agents against the European earwig (*Forficula auricularia*) on the Falkland Islands. In: Veitch, C.R., Clout, M.N., Martin, A.R., Russell, J.C. and West, C.J. (eds.) *Island invasives: scaling up to meet the challenge*. Occasional Paper SSC no. 62. IUCN, Gland, Switzerland, pp. 389–393. <https://doi.org/10.2305/IUCN.CH.2019.SSC-OP.62.en> 

McConnachie, A. and **Witt, A.** (2019) History and management – East and North Africa, and the Middle East. In: Adkins, S., Shabbir, A. and Dhileepan, K. (eds) *Parthenium Weed: Biology, Ecology and Management*. CABI Invasives Series 8. CABI, Wallingford, UK, pp. 287–302.

Negussie, A., Norgrove, L., Achten, W., Nacro, S., **Kenis, M.**, Hermy, M., and Muys, B. (2019) 22. Lessons on alien biofuel crops invasiveness risk assessment: based on practical experiences from *Jatropha curcas* L. in Southern and West Africa. In: Hadgu, K.M., Bishaw, B., Iiyama, M., Birhane, E., Negussie, A., Davis, C.M. and Bernart, B. (eds) *Climate-smart Agriculture. Enhancing Resilient Agricultural Systems, Landscapes, and Livelihoods in Ethiopia and Beyond*. World Agroforestry (ICRAF), Nairobi, Kenya, pp. 243-251. <http://www.worldagroforestry.org/downloads/publications/pdfs/b19055.pdf> 

Shabbir, S., **Rehman, A. and Weyl, P.** (2019) Prospects of classical biological control of weeds in Pakistan: challenges and opportunities. In: **Hinz, H.**, Bon, M-C., Bourdôt, G., Cristofaro, M., Desurmont, G., **Kurose, D.**, Müller-Schärer, H., Rafter, M., **Schaffner, U., Seier, M.**, Sforza, R., Smith, L., **Stutz, S., Thomas, S., Weyl, P.** and Winston, R. (eds) *XV International Symposium on Biological Control of Weeds, 26–31 August 2018, Engelberg, Switzerland*. US Forest Service, Morgantown, WV, USA, 63–67. <https://www.ibiocontrol.org/proceedings/> 

Thakur, M. and Kumar, V. (2019) Management of Stored grain rice pests. In: *Rice production (Modern Techniques)*. AS Panwar (ed.) Biotech books, New Delhi, India, pp. 441-460.

Thakur, M. and Kumar, V. (2019) Pheromones for rice pest management. In: Rice production (Modern Techniques). AS Panwar (ed.) Biotech books, New Delhi, India, pp. 427-440.

van Lenteren, J.C., Bueno, V.H.P., Luna, M.G. and **Colmenarez, Y.C.** (2019) Biological control in Latin America and the Caribbean: Information sources, organizations, types and approaches in biological control. In: van Lenteren, J.C., Bueno, V.H.P., Luna, M.G., Colmenarez, Y.C. (eds) Biological Control in Latin America and the Caribbean: Its rich history and bright future. CABI, Wallingford, UK, 1-20.

van Lenteren, J.C. and **Colmenarez, Y.C.** (2019) Biological control in Barbados. In: van Lenteren, J.C., Bueno, V.H.P., Luna, M.G., Colmenarez, Y.C. (eds) Biological Control in Latin America and the Caribbean: Its rich history and bright future. CABI, Wallingford, UK, 43-57.

Vásquez, C., Ferrer, F., **Colmenarez, Y.C.** and Sanchez, J.M. (2019) Biological control in Venezuela. In: van Lenteren, J.C., Bueno, V.H.P., Luna, M.G., Colmenarez, Y.C. (eds) Biological Control in Latin America and the Caribbean: Its rich history and bright future. CABI, Wallingford, UK, 457-472.

Witt, A. and Belgeri, A. (2019) Impacts on the environment. In: Adkins, S., Shabbir, A. and Dhileepan, K. (eds) *Parthenium Weed: Biology, Ecology and Management*. CABI Invasives Series 8. CABI, Wallingford, UK, pp. 79–104.

Not Peer-reviewed

Cannon, P.F. and **Minter, D.W.** (2019) Fungicolous Hypocreales. [*Hypocreopsis lichenoides*, *H. rhododendri*, *Nectriopsis lecanodes*, *Neobarya peltigerae*, *N. xylariicola*, *Paranectria affinis*, *P. oropensis*, *Pronectria anisospora*, *P. oligospora*, *P. santessonii*]. *IMI Descriptions of Fungi & Bacteria* 220(2191–2200), [44 pp.].

Cherix, D., Ebener, A., **Kenis, M.** and Abderhalden, M. (2019) Asiatische Hornisse – wo stehen wir heute? *Schweizerische Bienen-Zeitung* 2019(3), 16–18.

Cherix, D., Ebener, A., **Kenis, M.** and Abderhalden, M. (2019) Le Frelon asiatique – où en sommes-nous aujourd'hui? *Revue Suisse d'apiculture* 2019(3), 43–47.

Claerebout, S., **Haye, T.**, Ólafsson, E., Pannier, É. and Bultot, J. [2019] Premières occurrences de *Halyomorpha halys* (Stål, 1855) pour la Belgique et actualisation de sa répartition en Europe (Hemiptera: Heteroptera: Pentatomidae). *Bulletin de la*


Société royale belge d'Entomologie/Bulletin van de Koninklijke Belgische Vereniging voor Entomologie 154 (2018), 205–227.

Crozier, J. and **Flood, J.** (2019) The importance of plant health to food security. In: Cangao, C.A.T., Rusman, A., Chandrabalan, D. and Ahmad, Y. (eds) TROPED '18. Proceedings International Conference on Tropical Fruit Pests and Diseases 'Sustainable Solutions for Tropical Fruit Pests and Diseases', Kota Kinabalu, Sabah, Malaysia 25–27 September 2018. International Tropical Fruits Network (TFNet), Selangor, Malaysia, pp. 31–36. <http://itfnet.org/troped2018/index.php> 


Kenis, M. and **Li, H.** (2019) Impact de la pyrale du buis en Europe et potentiel de la lutte biologique par l'introduction de parasitoids. Colloque Scientifique sur les Bioagresseurs du Buis, 16–17 octobre 2018, Tours, France. Végéphyll, Alfortville, France, pp. 167–172.

Minter, D.W. (2019) *Glugea* (Microsporidia). [*Glugea anomala*, *G. atherinae*, *G. capverdensis*, *G. caulleryi*, *G. heraldi*, *G. hertwigi*, *G. plecoglossi*, *G. stephani*, *G. vincentiae*, *G. weissenbergi*]. *IMI Descriptions of Fungi & Bacteria* 221(2201–2210), [46 pp.].

Minter, D.W. and Cannon, P.F. (2019) Ascobolaceae on dung. [*Saccobolus beckii*, *S. citrinus*, *S. eleutherosporus*, *S. minimus*, *S. quadrisporus*, *S. truncatus*, *Thecotheus crustaceus*, *T. holmskjoldii*, *T. keithii*, *T. pelletieri*]. *IMI Descriptions of Fungi & Bacteria* 219(2181–2190), [45 pp.].

Rwomushana, I., Beale, T., Chipabika, G., Day, R., Gonzalez-Moreno, P., Lamontagne-Godwin, J., Makale, F., Pratt, C. and Tambo, J. (2019) Evidence Note. Tomato leafminer (*Tuta absoluta*): impacts and coping strategies for Africa. *CABI Working Paper* 12, 56 pp. 

Sivapragasam, A. (2019) Emerging trends in plant protection for tropical fruit production. In: Cangao, C.A.T., Rusman, A., Chandrabalan, D. and Ahmad, Y. (eds) TROPED '18. Proceedings International Conference on Tropical Fruit Pests and Diseases 'Sustainable Solutions for Tropical Fruit Pests and Diseases', Kota Kinabalu, Sabah, Malaysia 25–27 September 2018. International Tropical Fruits Network (TFNet), Selangor, Malaysia, pp. 136–139. <http://itfnet.org/troped2018/index.php>

Wei, X., Zhao, L., Qiao, Y., Wang, B., **Wan, M.** and **Toepfer, S.** (2019) Implementing agripolicies on pesticide reduction through subsidies and plant clinics in China. *CABI Working Paper* 13, 25 pp. [Also available in a Chinese version.] <https://dx.doi.org/10.1079/cabicomm-62-8118> 



Contact us

Africa

Ghana

CABI, CSIR Campus
No. 6 Agostino Neto Road
Airport Residential Area
P. O. Box CT 8630, Cantonments
Accra, Ghana

T: +233 (0)302 797 202

E: westafrica@cabi.org

Kenya

CABI, Canary Bird
673 Limuru Road
Muthaiga
PO Box 633-00621
Nairobi, Kenya

T: +254 (0)20 2271000/20

E: africa@cabi.org

Zambia

CABI, 5834 Mwangi Close
Kalundu
PO Box 37589
Lusaka, Zambia

E: southernafrica@cabi.org

Americas

Brazil

CABI, UNESP-Fazenda Experimental
Lageado, FEPAP (Escritorio da CABI)
Rua Dr. Jose Barbosa de Barros 1780
Fazenda Experimental Lageado
CEP:18.610-307

Botucatu, San Paulo, Brazil

T: +55 (14) 3880 7670

E: y.colmenarez@cabi.org

Trinidad & Tobago

CABI, 59 Gordon Street,
Curepe, St. Augustine
TUNAPUNA 331323
Trinidad and Tobago

T: +1 868 6457628

E: caribbeanLA@cabi.org

USA

CABI, One Lincoln Street
24th Floor
Boston, MA 02111

T: +1 (617) 682 9015

E: h.jansen@cabi.org

Asia

China

CABI, Beijing Representative Office
Internal Post Box 85
Chinese Academy of Agricultural Sciences
12 Zhongguancun Nandajie
Beijing 100081, China

T: +86 (0)10 82105692

E: china@cabi.org

India

CABI, 2nd Floor, CG Block,
NASC Complex, DP Shastri Marg
Opp. Todapur Village, PUSA
New Delhi – 110012, India

T: +91 (0)11 25841906

E: india@cabi.org

Malaysia

CABI, PO Box 210,
43400 UPM Serdang
Selangor, Malaysia

T: +60 (0)3 894329321

E: cabisea@cabi.org

Pakistan

CABI, Opposite 1-A,
Data Gunj Baksh Road
Satellite Town, PO Box 8
Rawalpindi-Pakistan

T: +92 51 929 2064 / 2063 / 2062

E: cabi.cwa@cabi.org

Europe

Netherlands

CABI, Landgoed Leusderend 32
3832 RC Leusden
The Netherlands

T: +31 (0)33 4321031

E: netherlands@cabi.org

Switzerland

CABI, Rue des Grillons 1
CH-2800 Delémont
Switzerland

T: +41 (0)32 4214870

E: europe-CH@cabi.org

UK

CABI, Nosworthy Way
Wallingford, Oxfordshire
OX10 8DE, UK

T: +44 (0)1491 832111

E: corporate@cabi.org

CABI, Bakeham Lane
Egham, Surrey
TW20 9TY, UK

T: +44 (0)1491 829080

E: cabieurope-uk@cabi.org

E: microbialeservices@cabi.org