JIRCAS International Symposium 2019

International research collaboration to tackle transboundary plant pests:

Contributions to Sustainable Development Goals

Proceedings

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Abbreviations found in program

JIRCAS: Japan International Research Center for Agricultural Sciences

MAFF: Ministry of Agriculture, Forestry and Fisheries

NARO: National Agriculture and Food Research Organization

SDGs: Sustainable Development Goals

JIRCAS International Symposium 2019
Tsukuba International Congress Center, Ibaraki, Japan
November 26,

Opening Remarks

Masa Iwanaga

President, JIRCAS

Distinguished guests, participants, ladies and gentlemen, good afternoon. It is my great honor and privilege to open the JIRCAS International Symposium 2019, "International research collaboration to tackle the transboundary plant pests: Contributions to Sustainable Development Goals."

This symposium is organized by Japan International Research Center for Agricultural Sciences -- JIRCAS -- together with the National Agriculture and Food Research Organization, NARO.

First of all, I would like to extend a warm welcome to all our distinguished guests and participants to this symposium. I would also like to express my special appreciation to the keynote speakers, Dr. Xia of the International Plant Protection Convention, FAO, and Dr. Kuhlmann of CABI, and then the session speakers, Dr. Baudron from CIMMYT, Dr. Godoy from Embrapa Soybean in Brazil, and all of the other speakers from Japan.

Thank you very much for taking your time out from your very busy schedule to join us today here in Tsukuba and share your expertise, in-depth knowledge, and insight on tackling transboundary plant pests in this symposium.

As a research institute in Japan that plays a key role in international collaboration in the field of agriculture, forestry, and fisheries, JIRCAS aims to provide solutions to global environmental problems and food insecurity, and to contribute to the United Nations Sustainable Development Goals in addressing the global challenges we face, including those related to poverty, hunger, climate change, and environmental degradation.

As part of our program on stable agriculture production in the tropics and other adverse environments, we are pursuing a research collaboration towards the development of technologies for the control and management of plant pests and diseases. We focus on some of the world's most destructive migratory insects and devastating plant diseases, in collaboration with countries and regions in Southeast Asia, Africa, and South America, where these pests and diseases continue to cause significant losses to agriculture production.

Global efforts to improve food security and to meet the demands of the world's growing population are now threatened by the emergence and spread of transboundary plant pests and diseases. Recent estimates indicate that the damage in crops by pests accounts for 20% to 40% of losses in global food production.

In recent years, this threat has become even more frequent and severe due to globalization, reduced resilience in agriculture production systems, and advancing climate change or climate crisis.

Global warming in particular has contributed a great deal to the increasing spread of transboundary pests and diseases, with outbreaks in regions and countries not previously affected, and causing damages and huge losses to major crops. And it is expected that this threat will continue to intensify in the coming years and beyond.

At the Meeting of G20 Agricultural Chief Scientists, G20 MACS, held in Tokyo on the 25th and the 26th of April 2019, transboundary plant pests and climate change were recognized as the two major issues that pose a serious threat to global food security.

It was also emphasized that in dealing with transboundary plant pests, effective actions through international collaboration in areas such as diagnostic technologies, epidemiology, monitoring technology, introduction of border measures, and measures for prevention and control, should be implemented with initiatives that include developing countries.

We have therefore organized this JIRCAS International Symposium in line with G20 MACS' interest in order to get an overview of the current status of research on transboundary plant pests and diseases at the regional and international levels, and to identify various initiatives for prevention and control that needs immediate action at both the regional and global levels.

In conjunction with the observance of the International Year of Plant Health next year, 2020, this symposium is also aimed at raising awareness in how protecting crops from pests can help end hunger and poverty, protect the environment, and boost economic development.

Ladies and gentlemen, today our keynote and session speakers will share with us the challenges involved in tackling this global program, the impacts to our society, measures to help affected countries and farmers, and programs to mitigate the damage of crops in developing countries.

We will also hear talks on emerging pests and diseases, risk analysis and technologies for forecasting of migratory insect pests, research networks and quarantine procedures to prevent the spread of plant pests.

I hope that this symposium increases not only awareness on this global problem, but also strengthens the commitment among us in the research field to put this issue at the forefront of agriculture and environmental research, leading to coordinated and multidisciplinary efforts, as well as regional and international cooperation, and preparedness to effectively respond to new and emerging transboundary pests and diseases.

Finally, I would like to express my sincere wishes to everyone for an inspirational, productive, and successful symposium. Thank you very much.

Welcome Remarks

Kazuhiko Shimada

Deputy Director General,

Agriculture, Forestry and Fisheries Research Council Secretariat, MAFF

Good afternoon, ladies and gentlemen. I am Kazuhiko Shimada, Deputy Director General of the Research Council Secretariat of the Ministry of Agriculture, Forestry and Fisheries.

According to the International Plant Protection Convention, crop damage due to plant pests is estimated to account for 20% to 40% of losses in food production worldwide. Transboundary plant pests are now a threat to sustainable food production and environmental conservation throughout the world. This is an urgent issue that each country should take the initiative to solve.

In 2018, the United Nations General Assembly designated 2020 as the International Year of Plant Health, to increase awareness on the importance of issues and to stimulate action towards plant pests.

Here in Japan, the occurrence of the Fall Armyworm, a plant pest capable of destroying an extremely wide variety of crops and transferring long distances, was found for the first time in June of this year. We at the ministry are now working with related organizations on measures to prevent its spread and damage.

This April, Japan hosted the eighth meeting of the G20 Agricultural Chief Scientists. In that meeting, Japan, as the G20 chair country, proposed the holding of an international workshop on transboundary plant pests and the strengthening of international cooperation in that regard. This proposal was supported by the G20 countries.

The international workshop is going to be held as a closed meeting to serve as a forum to exchange information and experiences between researchers from different countries at the same venue for three days from tomorrow.

It is very timely to hold this international symposium entitled the "International research collaboration to tackle transboundary plant pests: Contributions to Sustainable Development Goals" as a part of this series of activities.

I would once again like to express our thanks to JIRCAS for hosting this symposium. I sincerely hope that the participants of this international symposium will also gain a deeper understanding of the current risk and threats of transboundary plant pests, as well as future approaches for effective international research collaborations.

And in closing, I'd like to express my hope that today's discussion will serve to strengthen international globalization, protect crops from transboundary plant pests, and lead to stable supply for food worldwide.

Thank you very much for your kind attention.

Keynote Speeches

Chair:

Kazuo Nakashima, JIRCAS

RECENT CHALLENGES IN FIGHTING AGAINST TRANSBOUNDARY PLANT PESTS AND THE FAO STRATEGIES FOR HELPING FARMERS IN DEALING WITH THOSE PESTS

Jingyuan Xia

Secretary, International Plant Protection Convention (IPPC) Secretariat, Italy

Jingyuan Xia has been the Secretary to the Food and Agriculture Organization of the United Nations (FAO)-based International Plant Protection Convention (IPPC) in Rome since 2015. He holds a Ph.D. in Production Ecology from the Wageningen Agricultural University in the Netherlands. His experience includes work as Permanent Representative and Ambassador of the China Mission to UN Agencies (CNAFUN) in Rome, Italy; Director General of the National Agro-tech Extension and Service Center (NATESC) of the Chinese Ministry of Agriculture (MOA) in Beijing, China; and Director General of the China Cotton Research Institute (CCRI) at the Chinese Academy of Agricultural Sciences (CAAS) in Anyang, China.

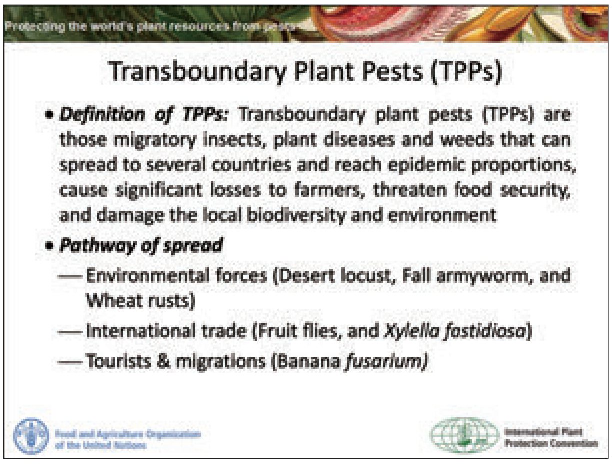
ABSTRACT

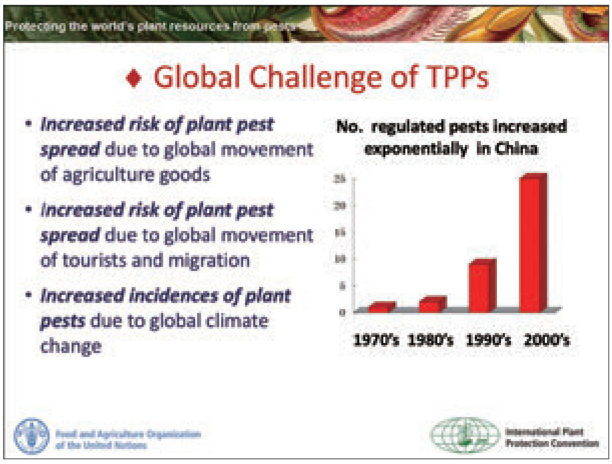
Transboundary plant pests (TPPs) are those migratory insects, plant diseases and weeds that can spread to several countries and reach epidemic proportions, cause significant losses to farmers, threaten food security, and damage the local biodiversity and environment. There are three major pathways for the spread of TPPs, such as environmental forces (Fall armyworm), international trade (Fruit flies), and tourists & migrations (Banana fusarium).In recent decades, TPPs are becoming more and more important than ever before due to global movement of agriculture goods, global movement of tourists and migration, and global change of climate. Among the most important TPPs, five of them are briefed in this presentation.Locust plague is one of the three major natural disasters in history (Drought, Flood and Locust plague). Among all kinds of locusts, desert locust (Schistocerca gregaria) is the most destructive, with a wide range of host plants and distribution in over 50 countries, mainly in Africa and Central Asia.Fall Armyworm, which is native to the Americas but now spreads to 65 countries in Africa (47), Near East (3) and Asia (15), is the most recent emerging TPP. It feeds on more than 80 crop species, but mostly prefers maize.Wheat rust is a recurrent problem with its epidemics amplified with increased rains, seriously threatening wheat in all regions. It is distributed worldwide wherever wheat is grown (America, Africa, Europe, Asia and Australia).Banana Fusarium wilt, caused by Fusarium oxysporum, is an important disease of banana in almost all banana-producing countries of the world. Currently, a new strain of the fungus, Tropical Race 4 (TR4), is posing the most serious threat to banana production in Asia, Africa, Near East, Latin America and the Caribbean (most recently in Colombia). Bacterium Xylella fastidiosa, a vector-borne pest that can lead to the death of the infected plants, is a threat to agriculture, the environment and the economy. It occurs primarily in America, but has recently appeared in many countries such as Italy, France, Spain, Iran and China. Xylella has over 500 host plants, mainly olive, grapevine, citrus and coffee.The first major impact of TPPs is on food security. Globally annual crop losses due to plant pests and diseases are estimated to be 20–40%, while those due to the TPPs are frequently even worse. For example, desert locust outbreak in West Africa for 2003–2005 resulted 80–100% of losses of cereal, 85–90% of legume, and 33–85% of pasture.The second major impact of TPPs is on biodiversity. All TPPs, in particular invasive alien species, are very destructive to biodiversity. For instance, Xylella is a major threat to forest biodiversity in many regions of Europe, and water hyacinth (Eichhornia crassipes), one of the most destructive invasive alien aquatic plant pests in the world, is a strong killer of aquatic biodiversity.The third major impact of TPPs is on farmers' livelihood. All TPPs often cause significant reduction in crop yield and quality, imposing a great effect on farmers' livelihood. Thus, 400 million people in the world depending on banana for staple food, jobs and livelihoods are under threat from Banana Fusarium wilt, especially the Tropical Race 4 (TR4) strain.The fourth major impact of TPPs is on safe trade. Transboundary plant quarantine pests, such as fruit-flies and Cassava virus diseases, are major barriers to safe trade, often causing the closing of trade borders. The FAO, in cooperation with the IPPC, is playing a very important role in helping member countries and farmers in their fight against the TPPs in the following five key areas:

i) Coordination, such as legislation and policy advice, scientific guidance, project development and management, resource mobilization, and information sharing
ii) Prevention, such as prevention of introduction, prevention of spread, and prevention of damage
iii) Early warning and quick response, such as increasing the capacity to predict the occurrence or spread of TPPs, and to make quick reactive responses to contain or eliminate their risk
iv) Monitoring and sustainable management, such as strengthening/refreshing of technical capacities, preparedness, attention to human health and the environment, as well as regular financial support
v) Capacity development, such as improving national capacities to deal with TPPs through applying the tools of Phytosanitary Capacity Evaluation (PCE) and the Farmer Field School (FFS)

Based on the above discussion, ten recommendations are proposed for the global plant protection com-munity to work hand in hand in fighting against the TPPs.Finally, the briefing materials on the promotion and celebration of the international year of plant health (IYPH) in 2020, including the overall objective, approach, and promotion at global, regional and national levels, as well as the expected outcomes, have already been made.


Protecting the world's plant resources from pests
Recent Challenges in Fighting against Transboundary Plant Pests and the FAO Strategies for Dealing with Them
Dr. Jingyuan Xia, the IPPC Secretary
26 Nov. 2019, Tsukuba, Japan
Food and Agriculture Organization of the United Nations
International Plant Protection Convention


Protecting the world's plant resources from pests
Transboundary Plant Pests (TPPs)
• Definition of TPPs: Transboundary plant pests (TPPs) are those migratory insects, plant diseases and weeds that can spread to several countries and reach epidemic proportions, cause significant losses to farmers, threaten food security, and damage the local biodiversity and environment
• Pathway of spread
—Environmental forces (Desert locust, Fall armyworm, and Wheat rusts)
—International trade (Fruit flies, and Xylella fastidiosa)
—Tourists & migrations (Banana fusarium)
Food and Agriculture Organization of the United Nations
International Plant Protection Convention


Protecting the world's plant resources from pests
◆ Global Challenge of TPPs
• Increased risk of plant pest spread due to global movement of agriculture goods
• Increased risk of plant pest spread due to global movement of tourists and migration
• Increased incidences of plant pests due to global climate change
No. regulated pests increased exponentially in China
25
20
15
10
5
0
1970's 1980's 1990's 2000's
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Protecting the world's plant resources from pests
Outline
1. Recent Trend of TPPs
2. Major Impacts of TPPs
3. FAO Strategy of TPPs
4. Key Recommendations
5. Briefing on IYPH 2020
Food and Agriculture Organization of the United Nations
International Plant Protection Convention


Protecting the world's plant resources from pests
1. Recent Trend of TPPs: Desert locust (1)
• Description: Locust is one of three major natural disasters in history (Drought, Flood and Locust). Among all kinds of locusts, desert locust (Schistocerca gregaria) is most destructive with a wide range of host plants
• Distribution: Desert locust is distributed in over 50 countries mainly in Africa and Central Asia
• Outbreaks: Frequent outbreaks can be better controlled; but failure in regular monitoring and implementation of preventive strategy can result in upsurges and plagues
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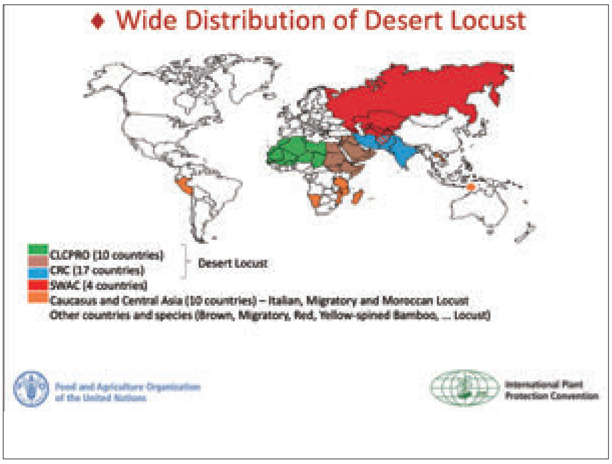
International Plant Protection Convention


◆ Wide Distribution of Desert Locust
CLCPRO (10 countries)
CRC (17 countries)
SWAC (4 countries)
Desert Locust
Caucasus and Central Asia (10 countries) – Italian, Migratory and Moroccan Locust
Other countries and species (Brown, Migratory, Red, Yellow-spined Bamboo, ... Locust)
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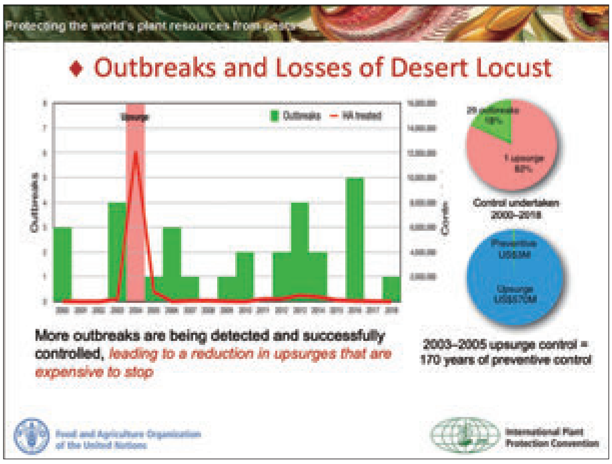
Protecting the world's plant resources from pests
◆ Outbreaks and Losses of Desert Locust
Upsurge
Outbreaks
HA treated
Outbreaks
Control undertaken 2000–2018
More outbreaks are being detected and successfully controlled, leading to a reduction in upsurges that are expensive to stop
2003–2005 upsurge control = 170 years of preventive control
Food and Agriculture Organization of the United Nations
International Plant Protection Convention


Protecting the world's plant resources from pests
1. Recent Trend of TPPs: Fall armyworm (2)
• Description: FAW is the most recent emerging TPP
• Distribution: FAW is native to the Americas but now spreads to 65 countries in Africa (47), Near East (3) and Asia (15)
• Host plants: FAW feeds on more than 80 crop species, but mostly prefers maize
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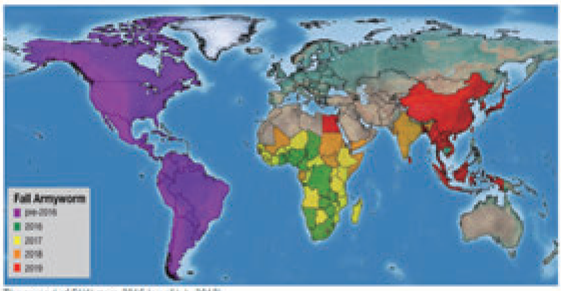
International Plant Protection Convention

Protecting the world's plant resources from pests

♦ Rapid Spread of Fall Armyworm



The spread of FAW since 2016 (as of July 2019)

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1. Recent Trend of TPPs: *Wheat rust (3)*

- ***Description:*** Wheat rust is a recurrent problem with its epidemics amplify with increased rains, seriously threatening wheat in all regions
- ***Distribution:*** Wheat rust is worldwide distributed wherever wheat is grown (America, Africa, Europe, Asia, Australia)
- ***Host plants and damage:*** Annual global average yield loss of bread wheat and durum wheat is 6.2%, or 20-40% in rainy seasons

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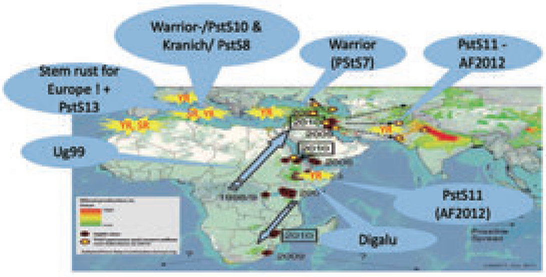
♦ Wide Spread of Wheat Rust Diseases



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1. Recent Trend of TPPs: *Banana fusarium wilt (4)*

- ***Description:*** Banana *Fusarium* wilt, caused by *Fusarium oxysporum*, is an important disease of banana in almost all banana-producing countries in the world. Currently, a new strain of the fungus, Tropical Race 4 (TR4), is Currently, present in 17 countries in Asia & Pacific (Australia), Near East (Jordan), Africa (Mozambique), and Latin America & the Caribbean (Colombia)
- ***Damage:*** The disease could cause 100% loss, with 100,000 ha abandoned for production. By 2040, TR4 has potential to spread to 17% of current banana area producing fruits worth $10 billion

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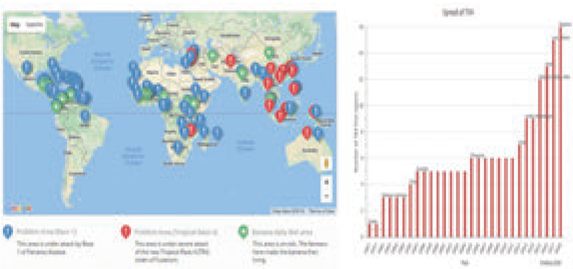
♦ Wide Distribution of Banana Fusarium Wilt



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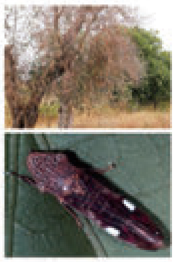
1. Recent Trend of TPPs: *Xylella fastidiosa (5)*

- ***Description:*** Bacterium *Xylella fastidiosa* is a vector-borne pest which can lead to the death of the infected plants and threat to agric., environment and economy
- ***Distribution:*** *Xylella* occurs primarily in America, while recently appears in many countries such as Italy, France, Spain, and Iran
- ***Host plants and damage:*** *Xylella* has over 500 host plants, mainly on olive, grapevine, citrus and coffee; and 40 million hectares of olive trees in Mediterranean basin would be destroyed by this potential disease



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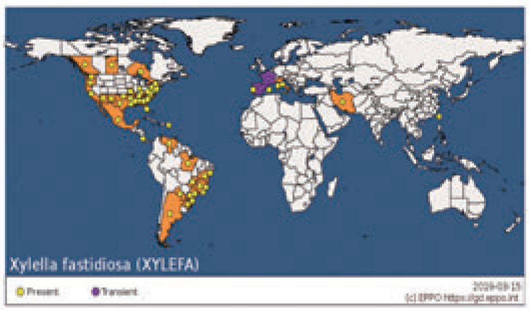
Protecting the world's plant resources from pests

♦ Wide Distribution of *Xylella fastidiosa*



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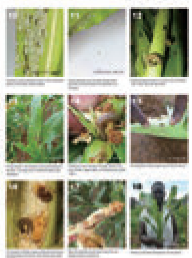
2. Major Impacts of TPPs: *Food security (1)*

- ***General situation:*** Globally annual crop losses due to plant pests and diseases is estimated to be 20–40%; and those due to the TPPs are frequently even worse
- ***Desert Locust outbreak (2003–2005) in West Africa:*** 80–100% of losses for cereal, 85–90% for legume, 33–85% for pasture
- ***FAW:*** National averaged loss of maize for 2017 was 45% in in Ghana, and 40% in Zambia
- ***Wheat rust:*** Annual averaged yield loss is around 50 million tons worth USD 12 billion



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2. Major Impacts of TPPs: *Biodiversity (2)*

- ***General situation:*** All TPPs, in particular for invasive alien species, are very destructive to the biodiversity
- ***Xylella:*** It is a major threat to forest biodiversity in many regions of Europe
- ***Water hyacinth:*** Water hyacinth (*Eichhornia crassipes*), is one of the most destructive invasive alien aquatic plant pests in the world, is a strong killer of aquatic biodiversity

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2. Major Impacts of TPPs: *Farmers' livelihood (3)*

- ***General situation:*** All TPPs often cause significant reduction crop yield and quality, thus imposing great effect on farmers' livelihood
- ***Desert locust in West Africa (2003–2005):*** 8.4 million people affected with 60% of indebted households in Mauritania and 45% in Mali, as well as 90% of food aid received in Mauritania, and 75% in Mali
- ***Banana Fusarium wilt*** 400 million people in the world depending on Banana for staple food, jobs and livelihoods are under threat of this disease. A single outbreak of this disease in Mozambique has put livelihoods of 2,000 local jobs at risk

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2. Major Impacts of TPPs: *Safe trade (4)*

- ***General situation:*** Transboundary plant quarantine pests are the major barriers for safe trade, often causing in closing of trade borders, such as fruit-flies and Cassava virus diseases
- ***Implementation of the ISMPs*** increased agro-trade by over 40% in Kenya, and 26% in Australia
- ***In case of sea containers and e-Commerce:*** Phytosanitary risk accounts for over 70%

Taxon	Exterior	Interior (empty or full)	Refrigeration unit	Unknown location (in or on container)	Total	
Plants	113	102	515	466	1304	71%
Insects and arachnids	41	106	1	122	366	20%
Molluscs	70	4		20	100	6%
Other	12	8	2	19	58	3%
Grand Total	236	220	518	627	1828	

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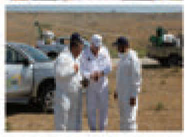
Protecting the world's plant resources from pests

3. FAO Strategy of TPPs: *Coordination (1)*

- ***Legislation and policy advice:*** Phytosanitary issues by IPPC; pesticide and IPM issues by AGP; and emerging TPP issues by EMPRES
- ***Coordination mechanism:*** Scientific committees, technical work groups, task forces, and networks, such as 3 FAO Desert Locust Commissions
- ***Project development and management:*** Organizing relevant stakeholders to apply projects at global, regional and national levels
- ***Resource mobilization:*** FAO-TCI, AGP, IPPC and EMPRES, such as US$ 57 million for FAW
- ***Information sharing:*** Essential to improve monitoring, early warning and timely response



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Protecting the world's plant resources from pests

3. FAO Strategy of TPPs: *Prevention (2)*

- ***Prevention of introduction:*** Take the Phytosanitary Measures on Import Regulation based on the pest risk analysis (PRA), and ISPMs
- ***Prevention of spread:*** Take the Phytosanitary Measures on Quarantine Arear for the infected region (containment) and of Pest-free Area for the non-infected region
- ***Prevention of damage:*** Take IPM Measures of Host Plant Resistance and GMOs

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3. FAO Strategy of TPPs: *Early warning and response (3)*

- ***Early warning:*** Capacity to predict occurrence or spread of a pest and propose and reactive responses
- ***Emerging response:*** Capacity to implement reactive responses to contain or eliminate the risk
- ***Showcase:*** A recent rregional project on wheat rust monitoring and management in Central Asia and Near East has been funded by FAO-Turkey Partnership Programme (5 years, 1.067 m USD) with ccollaboration of Turkey, ICARDA & CIMMYT

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Protecting the world's plant resources from pests

3. FAO Strategy of TPPs: *Monitoring and sustainable management (4)*

- ***Monitoring:*** Is the cornerstone of early warning and essential but not sufficient for sustainable management; this requires an institutional framework, regional cooperation, strengthening/refreshing of technical capacities, preparedness, attention to human health and the environ. as well as regular financial support
- ***Sustainable management:*** System approach and agro-ecology
- ***Showcase:*** Several Desert Locust outbreaks successfully contained in the Western Region between 2012 and 2018

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3. FAO Strategy of TPPs: *Capacity Development (5)*

- ***Global tools:*** Improvement of national capacities to deal with TPPs through PCE (IPPC) and FFS (AGP)
- ***National capacity:*** Personnel, Institutional and System
- ***Showcase:*** The IPPC International Symposium for Pest Free Areas and Surveillance was organized in Japan form 28 October to 1 November 2019, for capacity development and awareness raising of international framework on Pest Free Areas and Pest Surveillance

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Protecting the world's plant resources from pests

4. Key Recommendations: *01-06*

1. ***Challenge*** of TPPs is becoming more and more important than ever before
2. ***Prevention and preparedness*** pay positive dividends
3. ***Risk assessment, risk management and risk communication*** are equally important
4. **Sustainable funding** is badly needed at global, regional, national levels
5. **Awareness raising** is vital including private sector and the broader public (global mobility)
6. ***Research priorities*** are requested to address gaps in prevention and management of TPPs

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4. Key Recommendations: *07-10*

7. ***New technologies*** in monitoring & early warning and management should be innovated, e.g., AI, ICT, detection toolkits
8. ***International collaboration*** is key for combating against TPPs, e.g., EUPHRESCO, Fall Armyworm, R4D Consortium
9. ***FAO*** should paly more roles in developing global standards and providing technical support to regions and countries
10. ***International Year of Plant Health (IYPH)*** in 2020 will provide a unique opportunity for advocacy of importance of plant health at global, regional and national levels

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5 Briefing on IYPH 2020: *Objective (1)*

- *To raise the awareness of the public and political decision makers at the global, regional and national levels about plant health`s contribution to achieving the UN sustainable development goals, in particular:*

→ **ending hunger**
→ **reducing poverty**
→ **protecting the environment**
→ **boosting safe trade and economic development**

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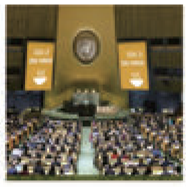
5 Briefing on IYPH 2020: *Approach (2)*

- ***April 2015:*** Proposed by Finland at the CPM-10
- ***July 2017:*** Adopted by 40th Session of the FAO Conference
- ***December 2018:*** Endorsed by UN General Assembly (UN Resolution A/RES/73/252, proclaiming 2020 the IYPH and calling upon FAO, in collaboration with the IPPC, to lead the implementation of the Year)



CPM 2015 → CPM/FAO 2016 → FAO 2017 → UN 2018 → Prepare 2019 → IYPH 2020

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5 Briefing on IYPH 2020: *Global promotion (3)*

- *2 December 2019:* **IYPH launch events** in FAO-HQs and possibly at the same time in UN-HQs
- *30 March – 3 April 2020:* **IPPC CPM-15** in FAO-HQs with a Ministerial segment at 2 April 2020
- *5-8 October 2020:* **International Conference on Plant Health (First)** in Helsinki, Finland
- *16 October 2020:* **World Food Day** focused on Plant Health
- *December 2019 – December 2020:* **IYPH photo competition**
- *January 2021:* **IYPH closing event** in Rome

INTERNATIONAL YEAR OF PLANT HEALTH 2020

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♦IYPH Visual Identities

INTERNATIONAL YEAR OF PLANT HEALTH 2020 | AÑO INTERNACIONAL DE LA SANIDAD VEGETAL 2020 | ANNÉE INTERNATIONALE DE LA SANTÉ DES VÉGÉTAUX 2020

IYPH visual identity guidelines:

السنة الدولية للصحة النباتية 2020 | МЕЖДУНАРОДНЫЙ ГОД ОХРАНЫ ЗДОРОВЬЯ РАСТЕНИЙ 2020 | 国际植物健康年 2020

For IYPH logos, write to: iyph@fao.org

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♦IYPH Series of Gadgets

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5 Briefing on IYPH 2020: *Regional promotion (4)*

- ***Organizing:*** FAO Regional conferences in 2020, and other regional workshops on plant health-related themes
- ***Establishing:*** regional capacity development programmes on emerging pests
- ***Liaising with:*** FAO Regional Offices to organize side events at FAO Regional Conferences in 2020, as well as with IPPC-RPPOs to organize some regional activities
- ***Coordinating with:*** regional institutions in relevant fields to include plant health in their agendas

INTERNATIONAL YEAR OF PLANT HEALTH 2020

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5 Briefing on IYPH 2020: National promotion (5)
• Organizing: national launch events, a national plant health day, national IYPH conferences
• Investing in: education, such as creating an educational dossier on plant health for primary and secondary schools, plant health fellowships, citizen science
• Issuing: coin, stamps, etc.
• Running: memorial events, i.e. planting trees and caring for them
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5 Briefing on IYPH 2020: Expected outcomes (5)
• Awareness of the importance of plant health towards UN SDGs and major topics in the international agenda is raised
• importance of plant health is realized by citizens in relation to their daily lives and their behavior
• Knowledge, research and partnerships on plant health are encouraged and coordinated
• National, regional and global plant health efforts and their resources are strengthened in light of increasing trade and reducing new pest risks due to climate change
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Acknowledgements
• High appreciation: to Hans, Shoki, Annie, Allan, Fazil, and Keith from FAO-AGP for sharing information on the Plant Protection Issue
• Sincere gratitude: to Sarah, Mirko, Ketevan and Masumi from the IPPC Secretariat for sharing information on the IPPC Issue, as well as to Lihui and Craig for integrating information
• Many thanks: to the organizer for the kind invitation and financial support
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Thanks for your kind attention
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CABI'S EXPERIENCES OF TRANSBOUNDARY PLANT PEST MANAGEMENT: STRENGTHENING PLANT HEALTH SYSTEMS AND THE IMPORTANCE OF ADVISORY SERVICES

Ulrich Kuhlmann

Executive Director, Global Operations, CABI, Switzerland

Ulrich Kuhlmann is the Executive Director, Global Operations of CAB International (CABI).
He is responsible for fostering collaborations between CABI centres and international partners and developing new opportunities to improve agricultural production, alleviate poverty and enhance nutrition and food security. He is also responsible for overseeing the strategic direction and delivery of CABI's scientific programmes. CABI is an international, inter-governmental, not-for-profit organization that improves people's lives worldwide by providing information and applying scientific expertise to solve problems in agriculture and the environment.

ABSTRACT

Five hundred (500) million smallholder farmers in developing countries in Asia, Africa and Latin America are at risk from environmental shocks, crop pests and other threats to food and nutrition security and food safety. There is continuous emergence and rapid spread of new invasive species (e.g. fall armyworm, tomato leaf miner) and ongoing transboundary pest threats (e.g. banana fusarium wilt, citrus greening, Asian fruit fly), driven by climate change and global movement of goods. Particularly in medium- and low-income countries, there is often no consistent mechanism for surveillance, rapid detection (including technical support for confirming causes) and response with effective solutions. Poorly planned and ill-timed reaction to new outbreaks often leads to the indiscriminate use of pesticides, in some cases highly toxic products, which poses environmental and health risks and decreases the resilience of land use systems to pests. Another attribute of medium- and low-income countries is that the opportunity to detect new pests is at the farming community level and therefore the role of public extension and community-based advisory services is instrumental. These rural advisory services play a key role in technology and management information transfer. Some of the most relevant and appropriate information isn't high-tech or innovative, but that doesn't mean the farmer knows about it. A number of complementary CABI-led programmes, such as Action on Invasives and Plantwise have established a strong foundation of experience, partnerships and infrastructure to respond to the above-mentioned threats. The Action on Invasive programme focusses on strengthening national and regional capacity to respond to emerging invasive pests. This includes identifying and managing risks before invasion occurs, and improving coordinated response to invasions through effective communication and deployment of sustainable technologies. In terms of technologies, (classical) biological control must be considered and promoted in integrated pest management approaches. Action on Invasives champions an environmentally sustainable, cross-sectoral and regional approach to dealing with transboundary plant pests. The programme is building national and regional capacities to prevent, detect and control invasive species in order to protect and restore agricultural and natural ecosystems, adapt to climate change, remove trade barriers, and reduce degradation of natural resources and vulnerable areas. Plantwise aims to provide a data-driven rapid response network connecting farmers with advisors and other support services, enabling early detection, diagnosis and management of pest problems at farm level. Over the past few years, Plantwise has built the resilience of smallholder farmers in coping with emerging plant health threats, enabling them to produce and earn more while being less dependent on high-risk pesticide-based plant protection practices. For example, in Rwanda, advisory service advice has led to a 5% reduction in the likelihood of a household falling below the poverty line of USD 1.25 per day. In Kenya, Plantwise demonstrated a benefit/cost ratio > 2.0 (internal rate of return on investment > 50%). This success has, in turn, enhanced farmers' confidence in public and private advisory services. A key focus of Plantwise is to put research into use, translating scientific knowledge into actionable best practice, delivered through simple, practical methodologies that are accessible at community levels. The efficiencies, delivered through digital development and the promotion of equity in accessing services, are additional factors that have helped to strengthen interactions between farmers and local advisory service providers.


CABI's experiences of transboundary plant pest management: Strengthening systems and the importance of advisory systems
Ulli Kuhlmann, Roger Day, Washington Otieno & Wade Jenner
JIRCAS International Symposium, 26 November 2019
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CABI
not-for-profit intergovernmental organisation, established by a United Nations-level agreement
owned by 49 member countries, which have an equal role in the organisation's governance, policies and strategic direction
over 480 staff worldwide
addresses issues of global concern such as food security and food safety, through research and international development cooperation
major publisher of scientific information – books, ebooks, full text electronic resources, compendia and online information resources
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Transboundary plant pests/ invasive alien species are a global issue impacting the lives of millions of people right now
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Transboundary plant pest and invasive species threat
Known species, new mobility
Pests and invasive species disregard national borders and are regional or global in their impact
Globalisation of trade (and tourism) accelerate mobility
Impacts of climate change
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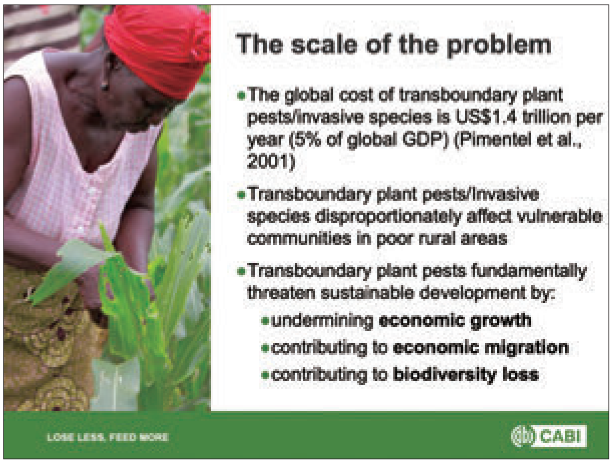
The scale of the problem
The global cost of transboundary plant pests/invasive species is US$1.4 trillion per year (5% of global GDP) (Pimentel et al., 2001)
Transboundary plant pests/Invasive species disproportionately affect vulnerable communities in poor rural areas
Transboundary plant pests fundamentally threaten sustainable development by:
undermining economic growth
contributing to economic migration
contributing to biodiversity loss
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Losses attributable to just 5 invasive species in East Africa amount to $0.9-1.1 billion/annum
"Economic impacts of invasive alien species on African smallholder livelihoods" by Pratt, Constantine and Murphy in Global Food Security 2017
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100 million women in Africa spend 20 billion hours weeding per annum
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The estimated total annual losses attributed to invasive alien species in SE Asia is on average $33.2 billion or $55 per capita
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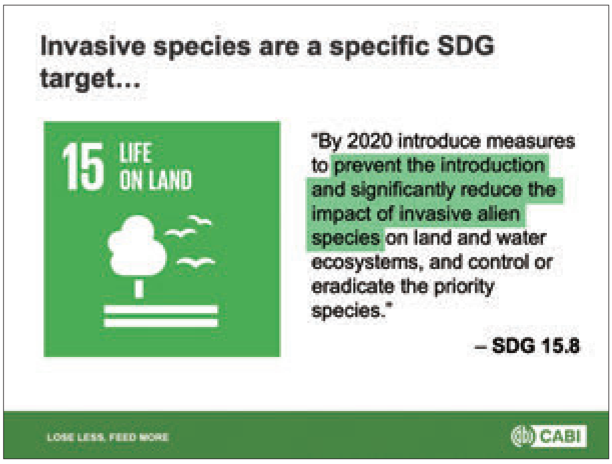
Invasive species are a specific SDG target…
15 LIFE ON LAND
"By 2020 introduce measures to prevent the introduction and significantly reduce the impact of invasive alien species on land and water ecosystems, and control or eradicate the priority species."
– SDG 15.8
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…but they impact almost all SDGs
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The challenges………..
•Transboundary plant pests/ invasives species have to be tackled collaboratively across the Environment, Trade and Agriculture sectors but the enabling communications, structures and evidence to prioritise action are lacking
•Concerted actions are needed at a local and national level but also at a regional one but the mechanisms for this are missing, or weak
•Effective products and technologies must be made available but this requires overcoming prohibitive regulatory setups, and lack of engagement from stakeholders
•Lack of access in developing countries/ regions to information and expertise
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Taking action
CABI's Action on Invasives programme adopts a systems-based approach to managing biological invasions:
•Prevention: developing and implementing biosecurity policies and raising awareness of potential threats
•Early detection and rapid response: developing surveillance and emergency action plans for detecting and eradicating new invasions
•Control: scaling up existing invasive species management solutions, embedding them in policy and making sure that rural communities have access to them
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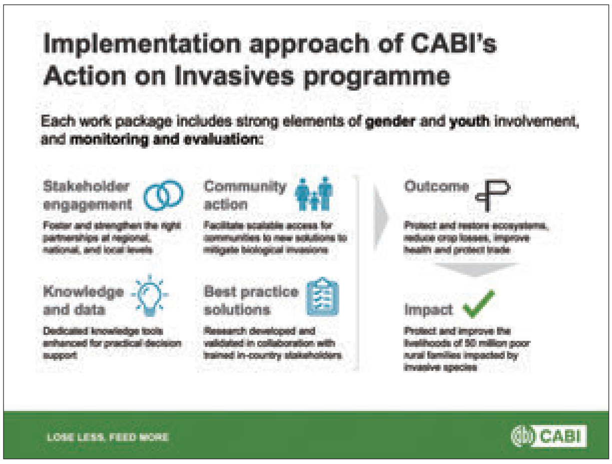
Implementation approach of CABI's Action on Invasives programme
Each work package includes strong elements of gender and youth involvement, and monitoring and evaluation:
Stakeholder engagement
Foster and strengthen the right partnerships at regional, national, and local levels
Community action
Facilitate scalable access for communities to new solutions to mitigate biological invasions
Outcome
Protect and restore ecosystems, reduce crop losses, improve health and protect trade
Knowledge and data
Dedicated knowledge tools enhanced for practical decision support
Best practice solutions
Research developed and validated in collaboration with trained in-country stakeholders
Impact
Protect and improve the livelihoods of 50 million poor rural families impacted by invasive species
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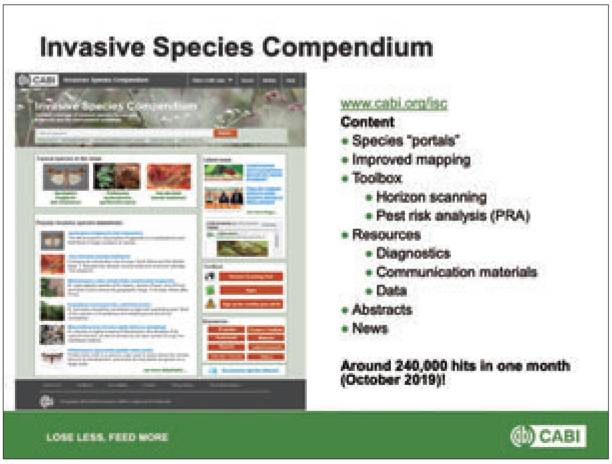
Invasive Species Compendium
www.cabi.org/isc
Content
• Species "portals"
• Improved mapping
• Toolbox
• Horizon scanning
• Pest risk analysis (PRA)
• Resources
• Diagnostics
• Communication materials
• Data
• Abstracts
• News
Around 240,000 hits in one month (October 2019)!
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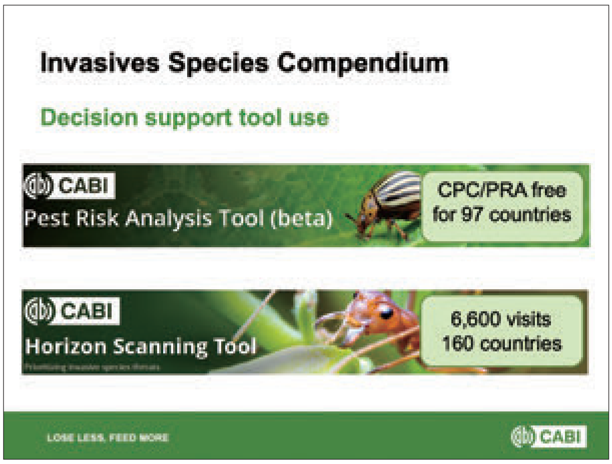
Invasives Species Compendium
Decision support tool use
CABI
Pest Risk Analysis Tool (beta)
CPC/PRA free for 97 countries
CABI
Horizon Scanning Tool
6,600 visits 160 countries
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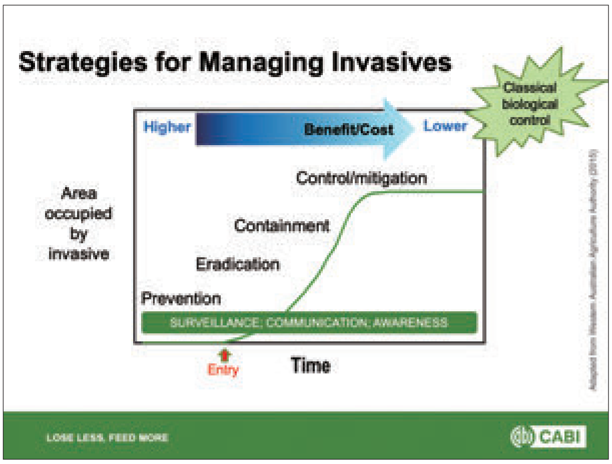
Strategies for Managing Invasives
Classical biological control
Higher
Benefit/Cost
Lower
Control/mitigation
Area occupied by invasive
Containment
Eradication
Prevention
SURVEILLANCE; COMMUNICATION; AWARENESS
Entry
Time
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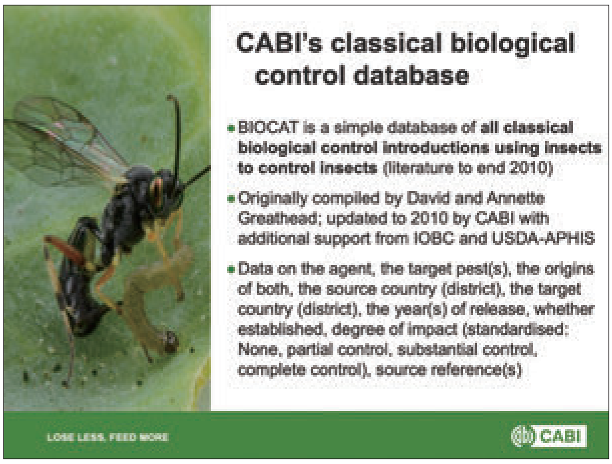
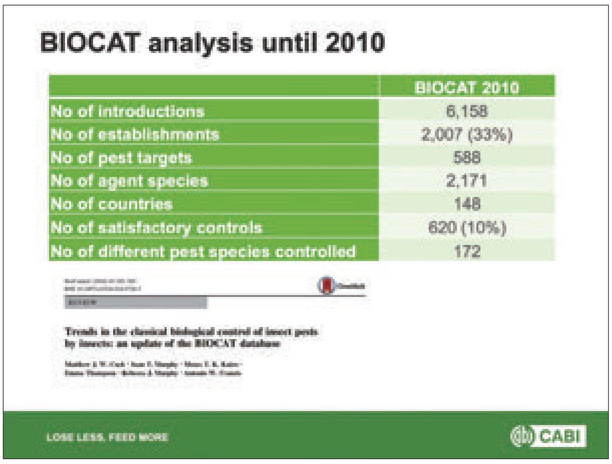
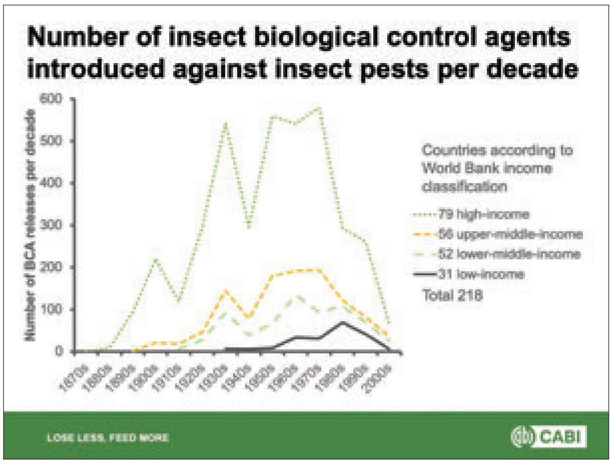
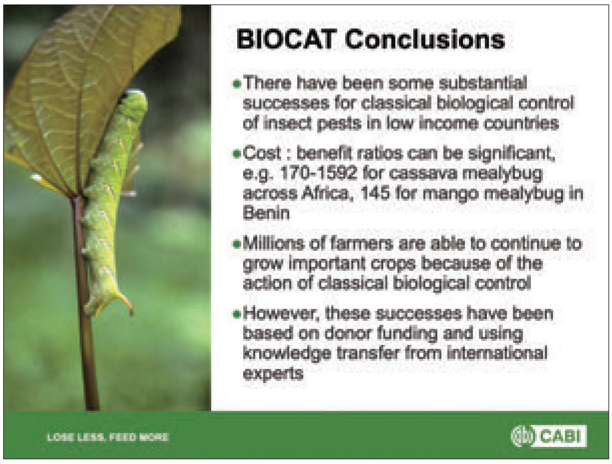


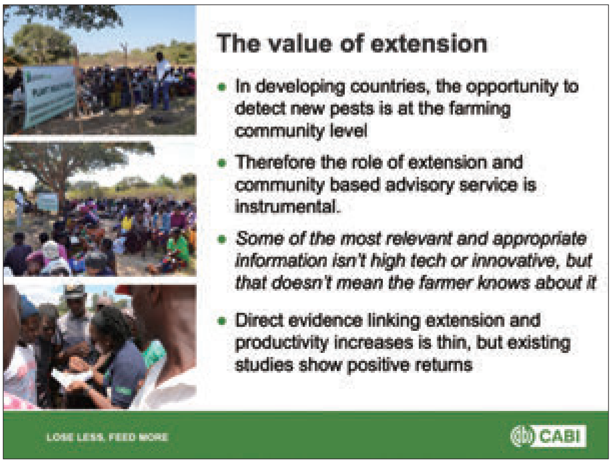


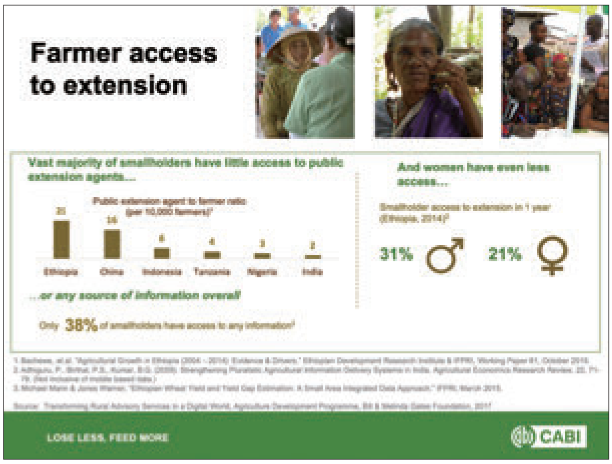
	BIOCAT 2010
No of introductions	6,158
No of establishments	2,007 (33%)
No of pest targets	588
No of agent species	2,171
No of countries	148
No of satisfactory controls	620 (10%)
No of different pest species controlled	172

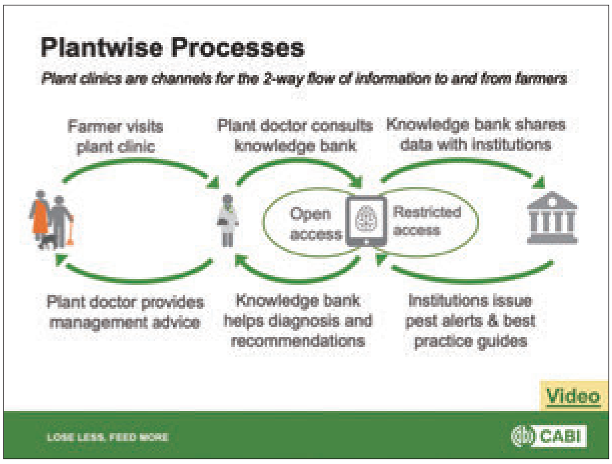


Low-income country	At least two partial or better success programmes	Start year
Madagascar	Eucalyptus weevil, *Gonipterus scutellatus* Spotted borer, *Chilo sacchariphagus* African pink stem borer, *Sesamia calamistis* Potato tuber moth, *Phthorimaea operculella* Coconut hispine, *Gestronella lugubris*	1948 1960 1968 1968 1976
Tanzania	Orthezia scale, *Orthezia insignis* Sugarcane scale, *Aulacaspis tegalensis* Cassava mealybug, *Phenacoccus manihoti* Diamond back moth, *Plutella xylostella*	1953 1971 1988 2001
Benin	Mango mealbug, *Rastrococcus invadens* Larger grain borer, *Prostephanus truncatus* Diamond back moth, *Plutella xylostella*	1988 1992 1996
Togo	Mango mealbug, *Rastrococcus invadens* Larger grain borer, *Prostephanus truncatus*	1987 1991
DR Congo	Cassava mealybug, *Phenacoccus manihoti* Mango mealbug, *Rastrococcus invadens*	1982 1989
Uganda	Orthezia scale, *Orthezia insignis* Woolly whitefly, *Aleurothrixus floccosus*	? 1996
Zimbabwe	Apple woolly aphid, *Eriosoma lanigerum* Potato tuber moth, *Phthorimaea operculella*	1961 1965








Plantwise Processes
Plant clinics are channels for the 2-way flow of information to and from farmers
Farmer visits plant clinic
Plant doctor consults knowledge bank
Knowledge bank shares data with institutions
Open access
Restricted access
Plant doctor provides management advice
Knowledge bank helps diagnosis and recommendations
Institutions issue pest alerts & best practice guides
Video
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Countries Plantwise operates in 33 countries
The Americas
Barbados
Bolivia
Brazil
Costa Rica
Grenada
Honduras
Jamaica
Nicaragua
Peru
Trinidad & Tobago
Africa
Burkina Faso
DR Congo
Ethiopia
Ghana
Kenya
Malawi
Mozambique
Rwanda
Sierra Leone
Tanzania
Uganda
Zambia
Asia
Afghanistan
Bangladesh
Cambodia
China
India
Myanmar
Nepal
Pakistan
Sri Lanka
Thailand
Vietnam
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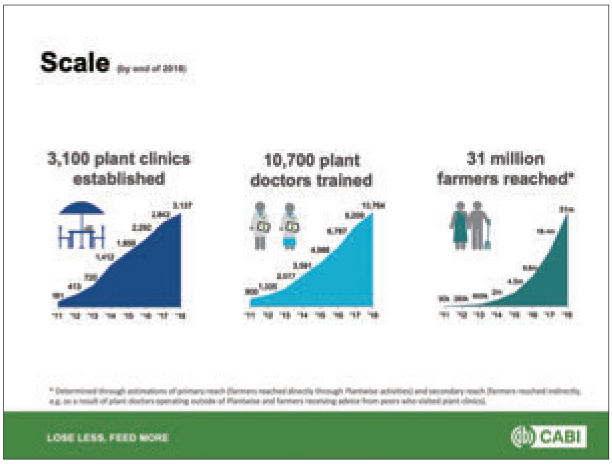
Scale
3,100 plant clinics established
10,700 plant doctors trained
31 million farmers reached*
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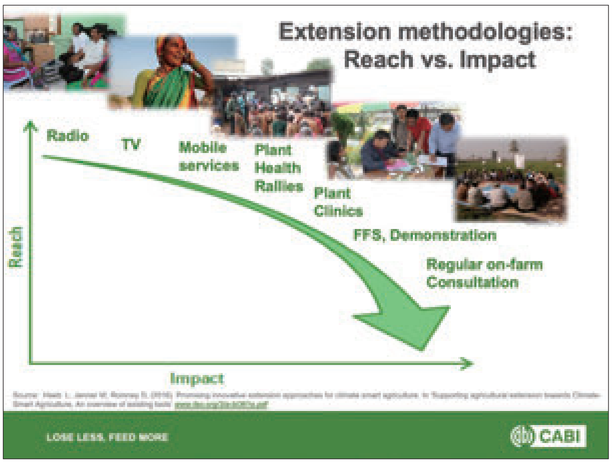
Extension methodologies: Reach vs. Impact
Radio
TV
Mobile services
Plant Health Rallies
Plant Clinics
FFS, Demonstration
Regular on-farm Consultation
Reach
Impact
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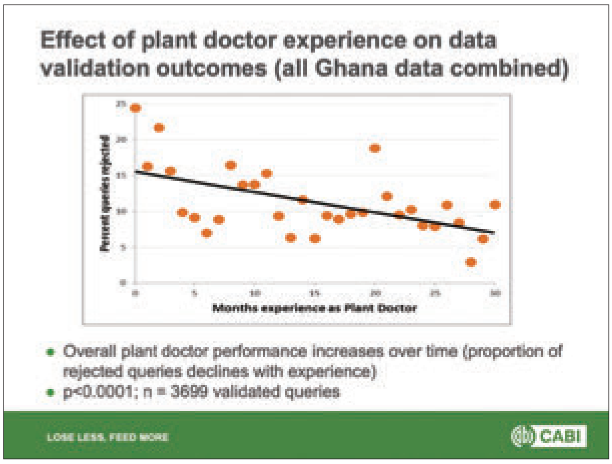
Effect of plant doctor experience on data validation outcomes (all Ghana data combined)
Percent queries rejected
Months experience as Plant Doctor
Overall plant doctor performance increases over time (proportion of rejected queries declines with experience)
p<0.0001; n = 3699 validated queries
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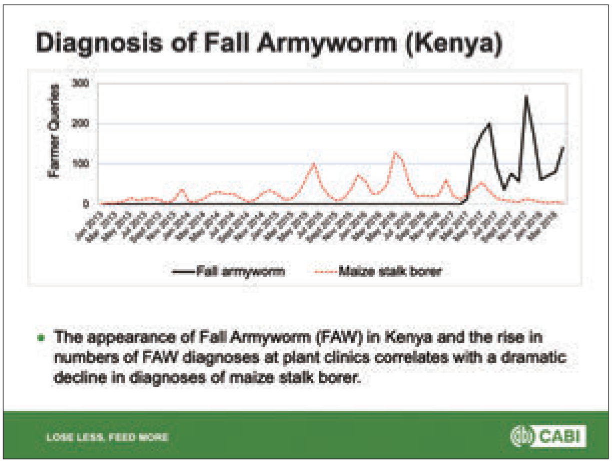
Diagnosis of Fall Armyworm (Kenya)
Farmer Queries
300
200
100
0
Fall armyworm
Maize stalk borer
The appearance of Fall Armyworm (FAW) in Kenya and the rise in numbers of FAW diagnoses at plant clinics correlates with a dramatic decline in diagnoses of maize stalk borer.
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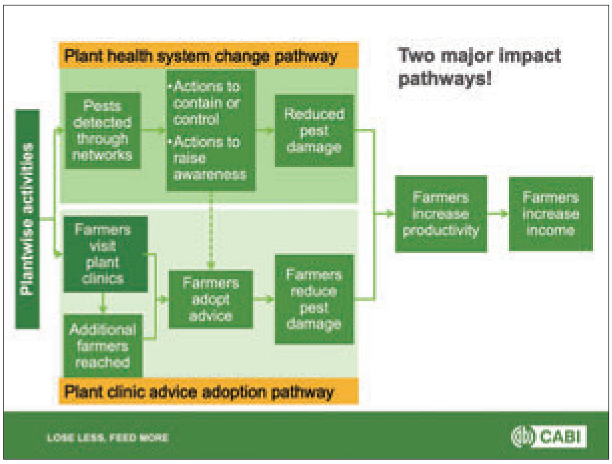
Plant health system change pathway
Pests detected through networks
•Actions to contain or control
•Actions to raise awareness
Reduced pest damage
Plantwise activities
Farmers visit plant clinics
Farmers adopt advice
Farmers reduce pest damage
Additional farmers reached
Plant clinic advice adoption pathway
Two major impact pathways!
Farmers increase productivity
Farmers increase income
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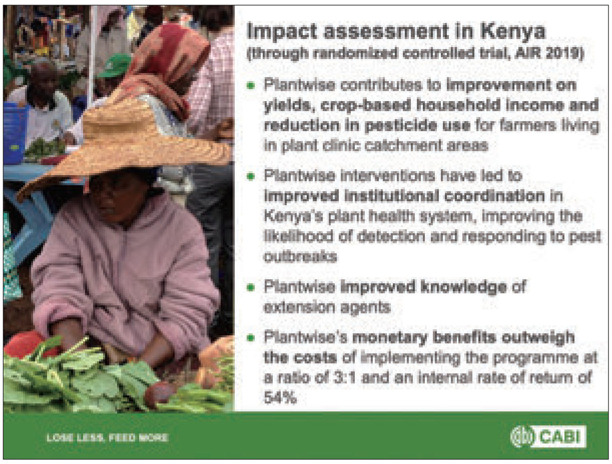
Impact assessment in Kenya
(through randomized controlled trial, AIR 2019)
Plantwise contributes to improvement on yields, crop-based household income and reduction in pesticide use for farmers living in plant clinic catchment areas
Plantwise interventions have led to improved institutional coordination in Kenya's plant health system, improving the likelihood of detection and responding to pest outbreaks
Plantwise improved knowledge of extension agents
Plantwise's monetary benefits outweigh the costs of implementing the programme at a ratio of 3:1 and an internal rate of return of 54%
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شكرا جزيلا
merci
zikomo
xie-xie
obrigado
efharistó
ありがとう
kiitos
thank you
tak
gracias
zikomo
ke itumetse
asante
urakoze
danke
terima kasih
dhanyawaad
CABI is an international intergovernmental organisation, and we gratefully acknowledge the core financial support from our member countries (and lead agencies) including:
UKaid
Ministry of Agriculture, People's Republic of China
Agriculture and Agri-Food Canada
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Session 1

Important Transboundary Insect Pests

Chair:

Youichi Kobori, JIRCAS

MIGRATION ANALYSIS AND FORECASTING OF MIGRATORY INSECT PESTS

Akira Otuka

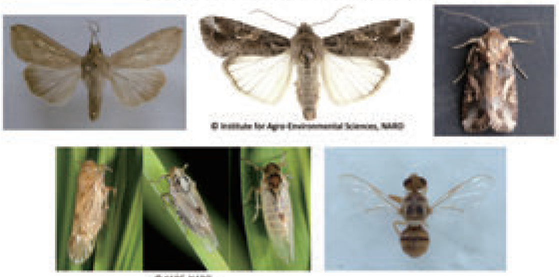
Unit Leader, Institute of Agricultural Machinery, National Agriculture and Food Research Organization (NARO), Japan

Akira Otuka is the Unit Leader of the Agro Informatics Unit, Institute of Agricultural Machinery, National Agriculture and Food Research Organization (NARO). He started his career with the Hokkaido National Agricultural Experimental Station in 1995 and worked at the National Agricultural Research Center from 1996 to 2009. He moved to the National Agricultural Research Center for Kyushu Okinawa Region in 2009. He specializes in migration risk analysis of transboundary pests.

ABSTRACT

Japan is located at mid-latitudes on the globe where westerly winds constantly prevail. The Asian Continent where many insect pests occur is also situated west of Japan. Some of these insect pests can fly a long distance, sometimes for over 1,000 km crossing the East China Sea. A variety of migratory insect pests, therefore, arrive in Japan. These environmental conditions basically explain why we have many migratory insects. So far, we have studied the migration of seven species including rice planthoppers, a fruit fly and nocturnal moths. The fall armyworm, Spodoptera frugiperda, originally native to the Americas, is a very recent one having arrived in Japan in summer 2019. The moth was rapidly expanding this spring in China, thus we evaluated the risk of possible immigration with forward trajectory analysis using meteorological data from the past five years. We also quickly developed a preliminary migration prediction system and monitored favorable winds from southern China on a daily basis. This prediction was shared with colleagues in Taiwan. The result showed that Japan would be invaded from Fujian and Zhejiang Provinces in 1 June–15 July, and Kyushu, Shikoku and southwestern Honshu could face the highest risk of S. frugiperda invasion. The migration prediction system predicted a possible migration from Guangdong Province emigrating on 20 and 23 May, and late instar larvae were found in Taiwan on 8 June. These timings quite matched the developmental time from oviposition to 6th instar of 14 to 17.7 days, based on reference estimates. In Japan, the first two larvae were found in Minami-Kyushu City, Kagoshima Prefecture, southwestern Japan, on 27 June 2019. A total of 78 larvae were found in six prefectures of Kyushu-Okinawa region by 16 July. A predicted possible migration from southern China on 6 June suggested the first immigration timing for Japan. Topological analysis of larvae collection sites suggested for the first time that S. furgiperda's flight height during overseas migration reaches an altitude of up to over 800 m. We are also studying the migration and dispersal of the oriental armyworm, Mythimna separata, and the common cutworm, Spodoptera litura. The cutworm is a highly dispersible insect pest and attacks soybean leaves in summer in western Japan. Its dispersal was monitored with searchlight traps and an entomological radar. The armyworm usually arrives in northern Japan and its migration source is being estimated with trajectory analysis and stable isotope analysis of wing samples. Technologies related to insect migration studies are also introduced in this presentation.

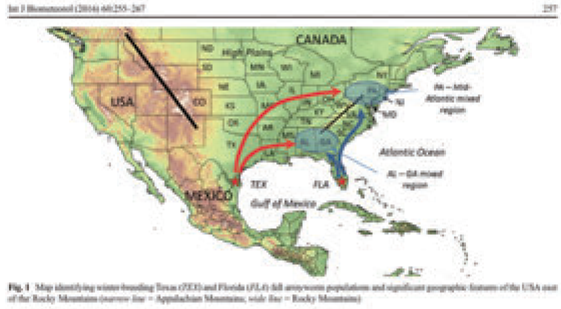
Migration analysis and forecasting of migratory insect pests



Akira Otuka
National Agriculture and Food Research Organization

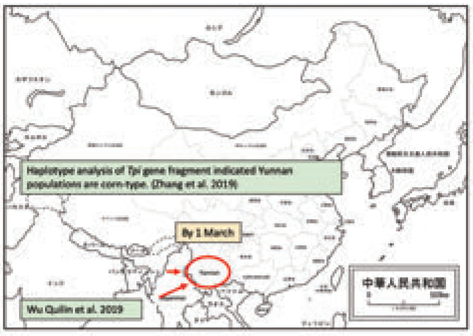
Fall armyworm, *Spodoptera frugiperda*

- Migratory insect (Westbrook, 2016)



Arrival of the fall armyworm and expansion of its distribution in East Asia

Arrival in southwestern China in Jan 2019



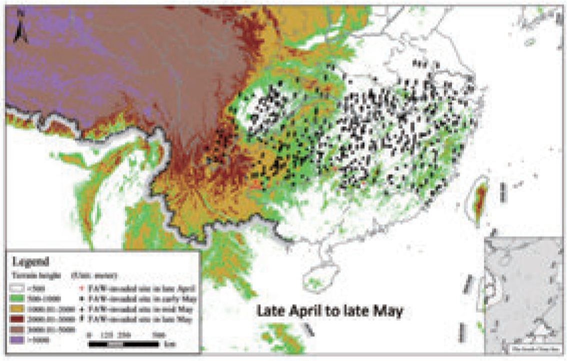
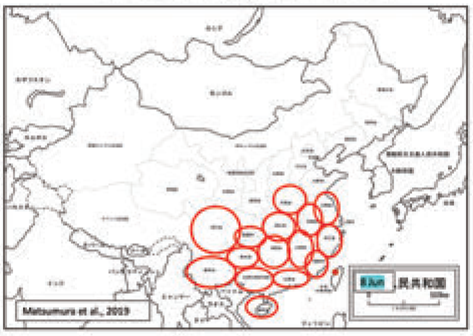


Figure 2. Topographic terrain and field survey locations of the Yangtze River Valley of China.

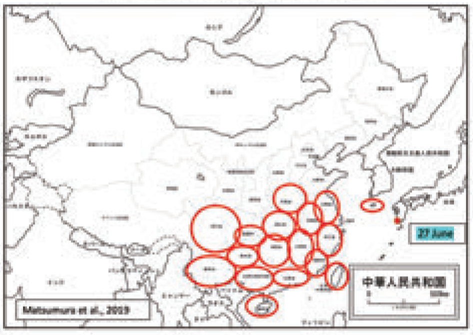
(Wu et al. 2019 Insects)

Overseas migration: Taiwan



Overseas migration: Korea

Overseas migration: Japan



Summary: FAW overseas migrations

Case	Arrival Date	Meteorol. condition	Estimated source	Flight duration
Taiwan	17-20 May	Rainy front	Fujian, Guangdong	17-21 h
Korea	6 June	Low pressure system	Fujian, Guangdong	24 h
Japan	7 June	Low pressure system	Zhejiang, Fujian, Guangdong	14, 9 38 h

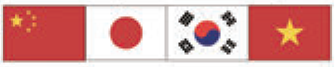
Case	Flight distance	Take-off night	Assumed flight height	Host
Taiwan	325-800 km	16-19 May	1000-1500 m	Maize (young)
Korea	1100-1600 km	5 June	1000-1500 m	Maize (young)
Japan	1000, 270 km 1600 km	6 June 5 June	1000-1500 m Up to 800 m	Maize (young)

First estimation of parameters of FAW's overseas migrations

What would happen in 2020?

- Autumn populations in China and Japan exist
  - They migrate to the south and overwinter there.
  - Guangdong, Henan, Guangxi, Yunnan provinces as well as probably Vietnam would be overwintering areas (>10 deg.C in winter).
  - Spring population could become larger than that in 2019.
  - Spring-summer migration could get intense.

International cooperation on migration studies



- JIRCAS
- P.R. China
  - Henan Academy of Agricultural Sciences
  - Nanjing Agricultural University
  - Jiangsu Academy of Agricultural Sciences
  - Guangdong Academy of Agricultural Sciences
- Korea
  - National Institute of Agricultural Science, RDA
- Vietnam
  - Plant Protection Research Institute
  - Southern Region Plant Protection Center
- Taiwan Agricultural Research Institute

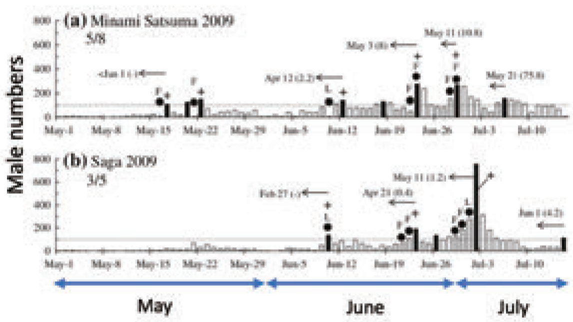
Comparison with *Spodoptera litura*

ORIGINAL RESEARCH PAPER

Overseas migration of the common cutworm, *Spodoptera litura* (Lepidoptera: Noctuidae), from May to mid-July in East Asia

Sumio Tojo · Masanobu Ryuda · Takeshi Fukuda · Tadashi Matsunaga · Dong-Bo Choi · Akira Otuka

Insects caught in pheromone traps in 2009



- Suggestion: possible overseas migration in East Asia could occur from spring, early summer to the *Baiu* rainy season.
- This is the same as Ma et al. 2019 J Appl Entomol
- Monitoring of the overwintering population in southern China is key.

DEVELOPMENT OF INSECTICIDE APPLICATION TECHNOLOGY TO RICE PLANTHOPPERS THAT ARE IMPORTANT TRANSBOUNDARY PLANT PESTS IN ASIA

Sachiyo Sanada-Morimura [1] and Mizuki Matsukawa [2]

[1] Group Leader, Kyushu Okinawa Agricultural Research Center, National Agriculture and Food Research Organization (NARO), Japan

[2] Researcher, Japan International Agricultural research Center for Agricultural Sciences (JIRCAS), Japan

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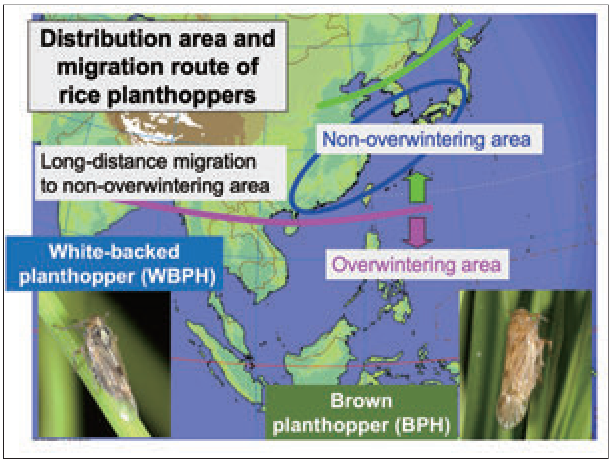
Sachiyo Sanada-Morimura has been the Group Leader of Pest Management Group, Kyushu Okinawa Agricultural Research Center, NARO, since 2018. She received her Ph.D. from Tokyo University of Agriculture and Technology in 1999. She joined the National Agricultural Research Center, NARO, under the Research Fellowship for Young Scientists program of the Japan Society for the Promotion of Science, and worked there until she moved to her present research institute in 2008. Her main work focuses on insecticide resistance in rice planthoppers.

Mizuki Matsukawa earned her Ph.D. from Nagoya University in 2016. She has been working on methods to control rice planthoppers in Vietnam and Cambodia as a researcher at Japan International Research Center for Agricultural Sciences (JIRCAS) since 2016.

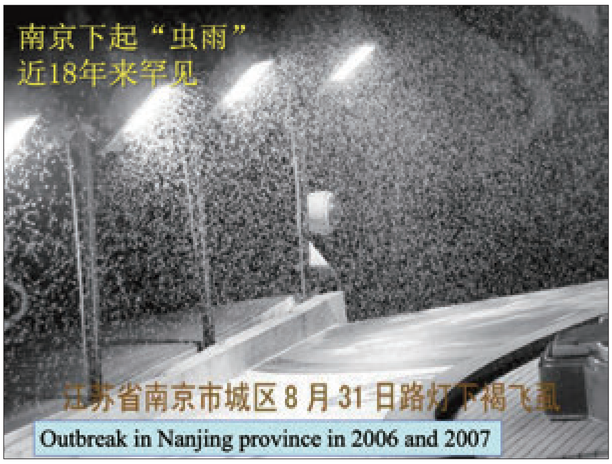
ABSTRACT

Rice planthoppers migrate from the northern part of Vietnam to the southern part of China and western part of Japan every year. They increase drastically in their immigrated areas and cause serious damage to rice. They are known to develop resistance to various insecticides which is one of the most important factors causing serious damage around Asia in recent years. In this presentation, we introduce the collaborative research project of the National Agriculture and Food Research Organization (NARO) and Japan International Research Center for Agricultural Sciences (JIRCAS) to develop insect pest management strategies for rice planthoppers in Asia. NARO has monitored the susceptibilities of insects to various insecticides (i.e. organic phosphate, carbamate, pyrethroid, phenylpyrazole, and neonicotinoid) in Japanese populations of rice planthoppers every year for a long-term period, while noting the development of resistance to some insecticides. For imidacloprid susceptibility in Nilaparvata lugens, which shows a very strong development of resistance, we compared the progress of insecticide-resistance development in many populations in Southeast Asia and East Asia. As the result, it has been revealed that the modes of insecticide resistance development have synchronized among insect pests in northern Vietnam, southern China, and western Japan. It shows the importance of monitoring insecticide susceptibility throughout Asia, not only in immigrated areas but also in areas of emigration, and share the information for solving the insecticide-resistance problem. NARO has developed a new method for monitoring insecticide susceptibility and created the general manual for monitoring. In addition to briefly explaining the contents of this manual, we introduce our efforts to expand its use in Asia.JIRCAS has conducted a research activity titled “Population dynamics of rice planthoppers and relationship with agricultural activities in Vietnam” under the JIRCAS research project “Development of technologies for the control of migratory plant pests and transboundary diseases” since 2016. It aims to clarify 1) the population dynamics of planthoppers and natural enemies, 2) the insecticide resistance of planthoppers against the insecticides used by farmers, and 3) the tolerance to planthoppers of the variety used by farmers in the central and northern part of Vietnam. These are important components to consider for establishing an integrated pest management (IPM) system to control rice planthoppers in Vietnam. JIRCAS collaborates with the Plant Protection Research Institute and five sub-departments of Plant Protection under the Ministry of Agriculture and Rural Development in Vietnam, and NARO in Japan. Our current results are briefly introduced in this presentation.

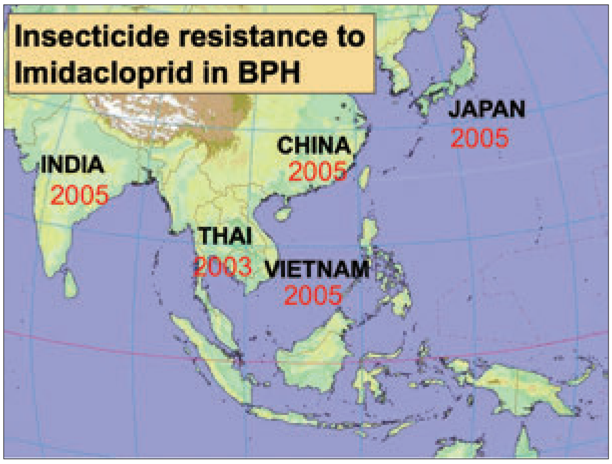

Development of insecticide application technology to rice planthoppers that are important transboundary plant pests in Asia
NARO
JIRCAS
国際農研
Sachiyo Sanada-Morimura[1] and Mizuki Matsukawa[2]
[1] Kyushu Okinawa Agricultural Research Center, NARO
[2] Japan International Research Center for Agricultural Sciences

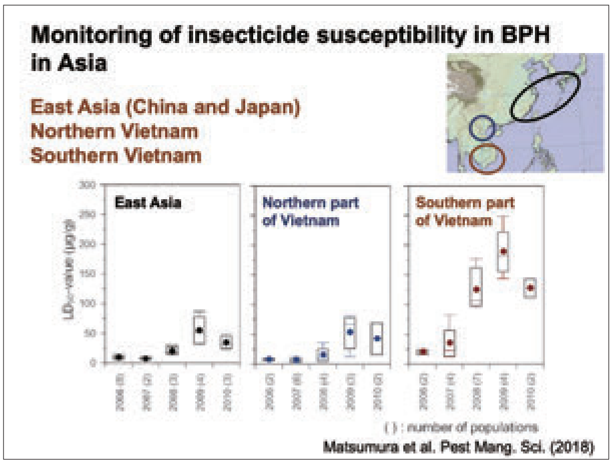

Distribution area and migration route of rice planthoppers
Non-overwintering area
Long-distance migration to non-overwintering area
White-backed planthopper (WBPH)
Overwintering area
Brown planthopper (BPH)

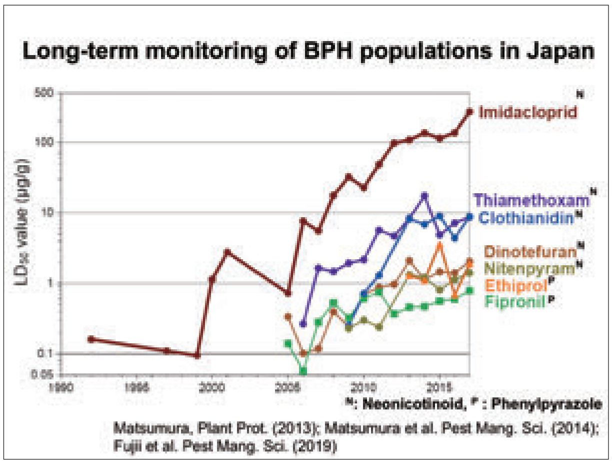

Hopperburn in a paddy field for whole crop silage
(Kumamoto pref. Japan, 2014)


南京下起“虫雨”
近18年来罕见
江苏省南京市城区 8 月 31 日路灯下褐飞虱
Outbreak in Nanjing province in 2006 and 2007


NARO
Challenge from NARO for insecticide resistance management

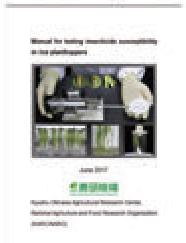

Insecticide resistance to Imidacloprid in BPH
JAPAN
2005
CHINA
2005
INDIA
2005
THAI
2003
VIETNAM
2005


Monitoring of insecticide susceptibility in BPH in Asia
East Asia (China and Japan)
Northern Vietnam
Southern Vietnam
East Asia
Northern part of Vietnam
Southern part of Vietnam
( ) : number of populations
Matsumura et al. Pest Mang. Sci. (2018)


Long-term monitoring of BPH populations in Japan
LD50 value (μg/g)
500
100
10
1
0.1
0.05
1990
1995
2000
2005
2010
2015
Imidacloprid
Thiamethoxam
Clothianidin
Dinotefuran
Nitenpyram
Ethiprol
Fipronil
N: Neonicotinoid, P: Phenylpyrazole
Matsumura, Plant Prot. (2013); Matsumura et al. Pest Mang. Sci. (2014); Fujii et al. Pest Mang. Sci. (2019)

Manual for testing insecticide susceptibility

1. Training of monitoring method for testing insecticide susceptibility
2. Sharing information about BPH management among NARO, JIRCAS and PPRI (Plant Protection Research Institute).



Challenge from JIRCAS for insecticide resistance management

Structure of the Project (2016-2021)

Population dynamics | Proper insecticide use | Variety tolerance | Utilization of natural enemies

Out put: Component technique of IPM system

Field evaluation

Output: Manual for controlling planthoppers in Vietnam

Outcome: Avoiding the development of insecticide resistance and variety tolerance of planthoppers in Vietnam

Reduce the damage by rice planthoppers

Collaborated institutes

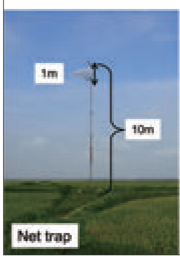
JIRCAS

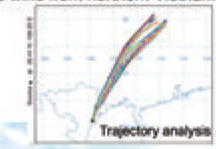
Vietnam
- Plant Protection Research Institute (PPRI)
- Sub-department of Plant Protection under MARD
  Vinh Phuc, Nam Dinh, Ha Tinh, Hue, Phu Yen

Japan
- Kyushu Okinawa Agricultural Research Center
- Institute of Agricultural Machinery
- Institute of Agrobiological Sciences

Population dynamics of rice planthoppers

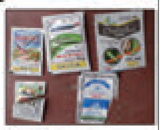
- Clarify the migration of rice planthoppers in the central and northern Vietnam
- Peaks were observed in Apr-May, and trajectory analysis showed the wind from northern Vietnam to South China

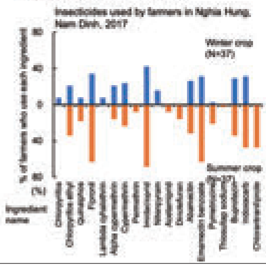




Effect of insecticide application to density of rice planthoppers in farmers' fields

- Clarify the insecticide use by farmers and its effect on the density of planthoppers in the farmers' fields
- Low effect on planthopper's density by number of insecticide application





Result of GLM analysis on variables affecting the density of rice planthoppers

Factor	df	Estimated value	χ2	P value
Location	1	0.6301119	4296.0328	<0.001*
Season	1	-0.309063	662.63372	<0.001*
Number of insecticide applied	1	0.0150648	22.469658	<0.001*
Spider	1	0.0190922	4534.7519	<0.001*
Miridbug	1	0.0588881	6285.5591	<0.001*

Monitoring of the insecticide susceptibility on rice planthoppers

- Monitor the yearly fluctuation of insecticide susceptibility on rice planthoppers in Vietnam using topical application (2018~)

Insect populations
Nam Dinh, Vinh Phuc, Hue, Phu Yen, Dong Thap

Chemical ingredients
Dinotefran, Nitenpyram, Thiametoxam, Clothianidine Imidacloprid, Pyraxsalt

- LD_{50} values in 2018 showed the similar tendency with BPH populations in Japan

Future Plans of Collaboration

NARO

There is a fear that rice planthoppers would develop strong resistance against the popular insecticides and its outbreak would be occurred again in near future

Collaboration research on insecticide resistance, population dynamics and migration will be conducted to establish the management of insecticide resistance in Southeast and East Asia


Thank you for your attention!

FALL ARMYWORM DAMAGE IN AFRICAN SMALLHOLDER MAIZE FIELDS AND ITS IMPACT ON YIELD

Frédéric Baudron

Principal Scientist, Sustainable Intensification Program, International Maize and Wheat Improvement Center (CIMMYT), Harare, Zimbabwe

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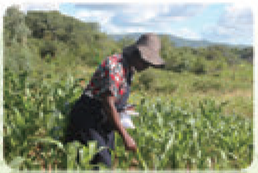
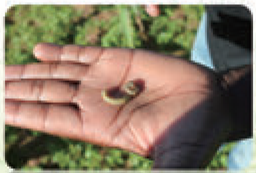
Frédéric Baudron works as a principal scientist at the southern Africa regional office of the International Maize & Wheat Improvement Centre (CIMMYT) in Harare, Zimbabwe. He started his career working for various development programs targeting the interface between people (mainly farmers) and wildlife. Later, he obtained his Ph.D. in Plant Production Systems. He has close to 20 years' experience developing solutions for small-scale farming systems in sub-Saharan Africa. His research interests include appropriate mechanization, sustainable intensification, farming system research, impact of agriculture on biodiversity, and participatory innovation development. He is involved in a number of research projects in Ethiopia, Malawi, Rwanda, Tanzania, Zambia and Zimbabwe.

ABSTRACT

Fall armyworm (FAW, Spodoptera frugiperda J.E. Smith) is an invasive lepidopteran pest established in most of sub-Saharan Africa since 2016. Although the immediate reaction of governments has been to invest in chemical pesticides, control methods based on agronomic management would be more affordable to resource-constrained smallholders and minimize risks for health and the environment. However, little is known about the most effective agronomic practices that could control FAW under typical African smallholder conditions. In addition, the impact of FAW damage on yield in Africa has been reported as very large, but these estimates are mainly based on farmers' perceptions, and not on rigorous field scouting methods. Thus, our objectives were to understand the factors influencing FAW damage in African smallholder maize fields and quantify its impact on yield, using two districts of Eastern Zimbabwe as cases. A total of 791 smallholder maize fields were scouted for FAW damage during the 2017/18 season and the heads of the corresponding farming households were interviewed. Grain yield was later determined in 167 (about 20%) of these fields. The same FAW damage survey was repeated in 2018/19 with the same farmers. 638 maize fields were thus surveyed (153 farmers didn't plant maize that season). Grain yield was then determined in 386 (about 60%) of these fields.FAW damage was found to be significantly reduced by rotation with a legume or a fallow, legume intercropping, minimum- or zero-tillage, balanced fertilization, the application of manure and/or compost, frequent weeding and early planting, in at least one of the seasons under study. Conversely, the presence of a hedgerow and pumpkin intercropping was found to significantly increase FAW damage (during both seasons). FAW damage appeared significantly higher in plots receiving pesticides (during both seasons), suggesting poor efficacy of the pesticides or application method used. We also found evidence of varietal effects on FAW damage during both seasons.Our best estimate of the impact of FAW damage on yield was 11.57% in 2017/18, which is much lower than what previous studies reported. Although our study presents limitations, losses due to FAW damage in Africa could have been over-estimated. In 2018/19, however, our estimate of FAW damage was double the 2017/18 estimate (22.37%), possibly because of an interaction between FAW and drought. This study demonstrates the viability of using agronomic management to control FAW in African smallholder conditions. It is guiding on-going work from CIMMYT and its partners to develop the most cost-effective practices. These include zero-tillage, push-pull and pheromone trapping in irrigated maize. Preliminary results from this empirical work are presented.

Understanding factors influencing fall armyworm (*Spodoptera frugiperda* J.E. Smith) infestation in African smallholder maize fields & quantifying its impact on yield

Frédéric Baudron (CIMMYT), Mainassara Abdou Zaman-Allah (CIMMYT), Isaac Chaipa (GOAL), Peter Chinwada (UZ, IITA), Shingirayi Nyamutukwa (PPRI), Christian Thierfelder (CIMMYT), & Newton Chari (GOAL)

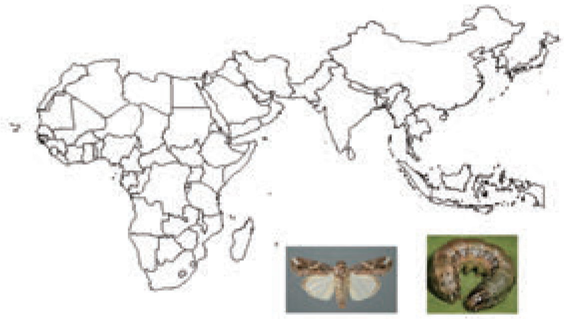
26 November 2019, JIRCAS International Symposium 2019, Tsukuba, Japan

CIMMYT

Invasion of Africa & Asia in < 4 years…

Presence of fall armyworm in 2015/10

Source: EPPO Global Database & IPPC



Introduction

- Investing in chemical pesticides has been the immediate reaction of African governments *(Harrison et al., 2019)*
- The use of chemical insecticides remains the main strategy of farmers to control FAW, but with mixed results *(Kumela et al., 2018)*
- Control methods based on agronomic management are likely more affordable for resource-constrained smallholders and represent a lower risk for health and the environment *(Thierfelder et al., 2018)*.
- But lack of data. Data from the Americas and 'anecdotal' observations made in the region (Harrison et al., 2019).
- Yield impact of FAW reported as very large *(ranging from 22 to 67% in Ghana and Zambia, Day et al., 2017)*.
- But these estimates are based on farmers' perceptions, not on rigorous field scouting methods *(such as the one proposed by McGrath et al., 2018)*.

CIMMYT

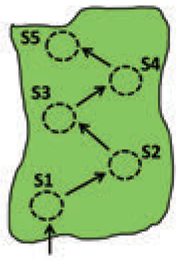
Objectives

1. To estimate fall armyworm damage in smallholder maize fields in two study Districts following a rigorous scouting protocol
2. To understand the factors influencing fall armyworm damage
3. To quantify yield losses due to fall armyworm damage.

CIMMYT

Assessment of **395** fields in Chipinge and **396** in Makoni in 2017-18

Assessment of **278** fields in Chipinge and **360** in Makoni in 2018-19



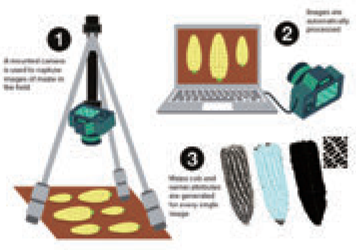
'W' sampling, 5 sampling points of 10 plants

	No. plants with leaf damage	No. plants with frass in the whorl	Damage score for the 10 plants
S1			
S2			
S3			
S4			
S5			

(from McGrath et al. 2018)


CIMMYT

Yield data from 167 plots in 2017/18 and 386 plots in 2018/19

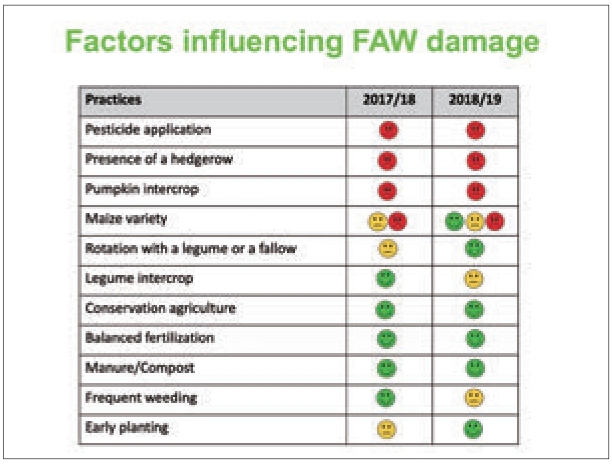



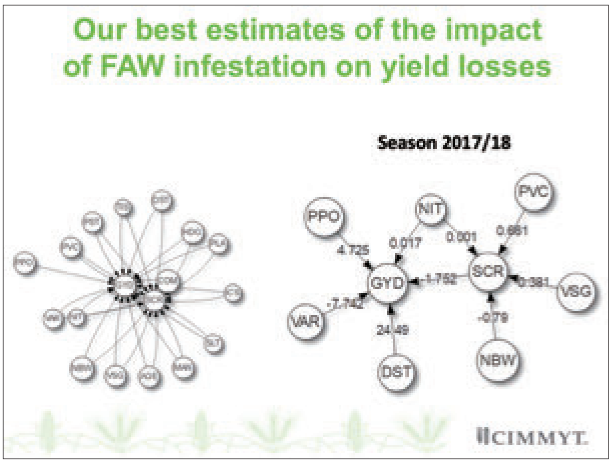
CIMMYT

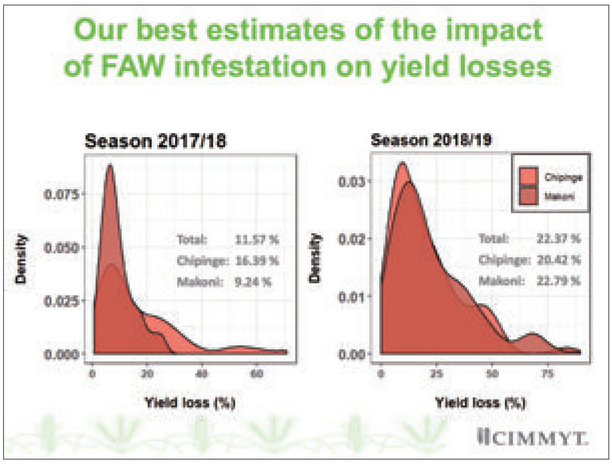
FAW damage incidence and severity

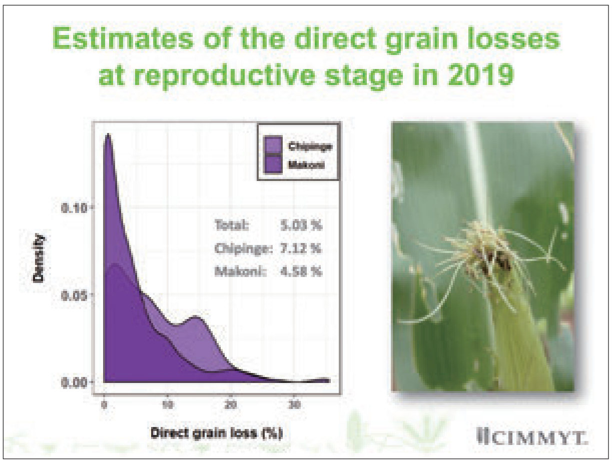
Indicators	2017/18		2018/19	
	Chipinge	Makoni	Chipinge	Makoni
Leaf damage (%)	41.5 ± 28.7	54.9 ± 26.3	75.4 ± 21.8	49.4 ± 28.2
Damage score	3.74 ± 2.21	3.83 ± 1.96	5.32 ± 1.41	3.57 ± 1.85


CIMMYT

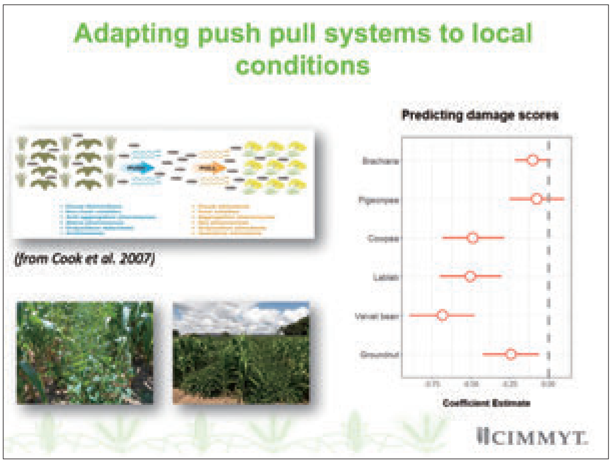

Factors influencing FAW damage
Practices
2017/18
2018/19
Pesticide application
Presence of a hedgerow
Pumpkin intercrop
Maize variety
Rotation with a legume or a fallow
Legume intercrop
Conservation agriculture
Balanced fertilization
Manure/Compost
Frequent weeding
Early planting

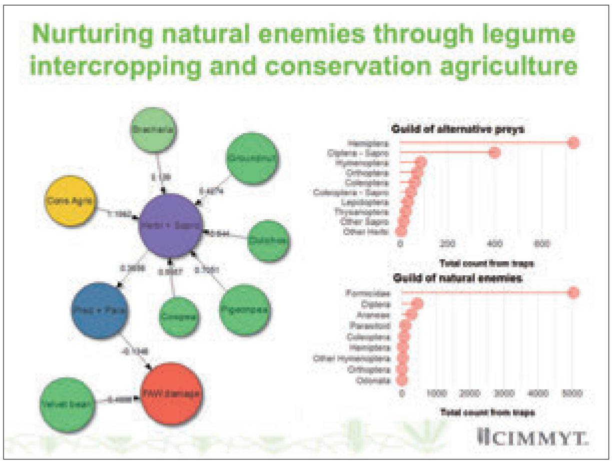

Our best estimates of the impact of FAW infestation on yield losses
Season 2017/18
PPO
NIT
PVC
4.725
0.017
0.001
0.681
GYD
-1.752
SCR
0.381
VSG
VAR
-7.742
24.49
-0.79
DST
NBW
CIMMYT

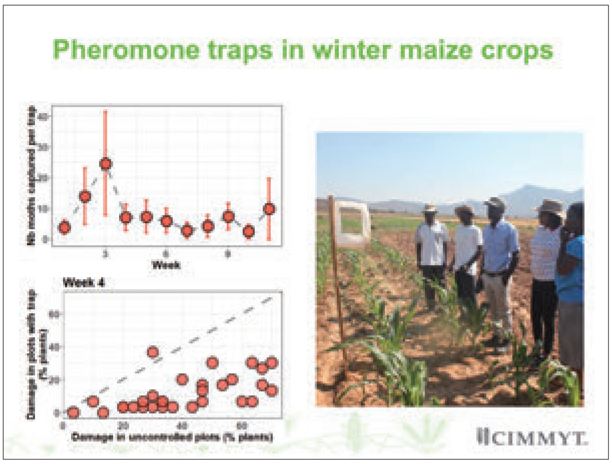

Our best estimates of the impact of FAW infestation on yield losses
Season 2017/18
Density
Total: 11.57 %
Chipinge: 16.39 %
Makoni: 9.24 %
Yield loss (%)
Season 2018/19
Chipinge
Makoni
Total: 22.37 %
Chipinge: 20.42 %
Makoni: 22.79 %
Yield loss (%)
CIMMYT

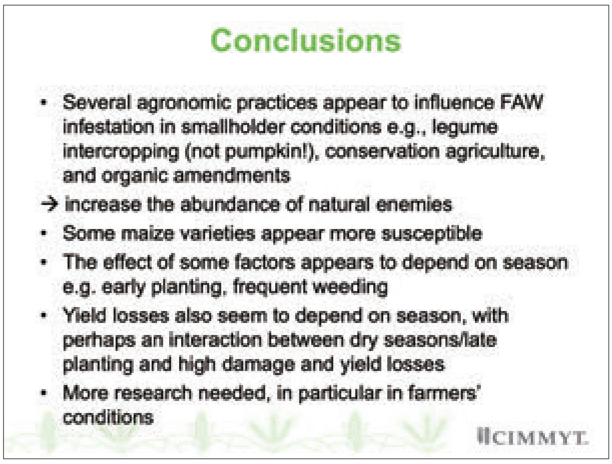

Estimates of the direct grain losses at reproductive stage in 2019
Chipinge
Makoni
Density
Total: 5.03 %
Chipinge: 7.12 %
Makoni: 4.58 %
Direct grain loss (%)
CIMMYT


Crop Protection
Fall armyworm could destroy $3pm worth of grain — study
AgriNews


Adapting push pull systems to local conditions
(from Cook et al. 2007)
Predicting damage scores
Brachiaria
Pigeonpea
Cowpea
Lablab
Velvet bean
Groundnut
Coefficient Estimate
CIMMYT


Nurturing natural enemies through legume intercropping and conservation agriculture
Brachiaria
Groundnut
Cons Agric
Herb + Sapro
Dolichos
Pred + Para
Cowpea
Pigeonpea
FAW damage
Velvet bean
Guild of alternative preys
Total count from traps
Guild of natural enemies
Total count from traps
CIMMYT


Pheromone traps in winter maize crops
Nb moths captured per trap
Week
Week 4
Damage in plots with trap (% plants)
Damage in uncontrolled plots (% plants)
CIMMYT


Conclusions
• Several agronomic practices appear to influence FAW infestation in smallholder conditions e.g., legume intercropping (not pumpkin!), conservation agriculture, and organic amendments
→ increase the abundance of natural enemies
• Some maize varieties appear more susceptible
• The effect of some factors appears to depend on season e.g. early planting, frequent weeding
• Yield losses also seem to depend on season, with perhaps an interaction between dry seasons/late planting and high damage and yield losses
• More research needed, in particular in farmers' conditions
CIMMYT


CIMMYT
GOAL
MAIZE
Irish Aid
bakker brothers
Thank you for your interest!
f.baudron@cgiar.org
@FBaudron

Session 2

Important Migratory Diseases and Quarantine

Chair:

Yoshimichi Fukuta, JIRCAS

INTERNATIONAL COLLABORATIVE RESEARCH NETWORKS FOR RICE BLAST

Yoshimichi Fukuta

Senior Researcher, Tropical Agricultural Research Front, Japan International research Center for Agricultural Sciences (JIRCAS), Japan

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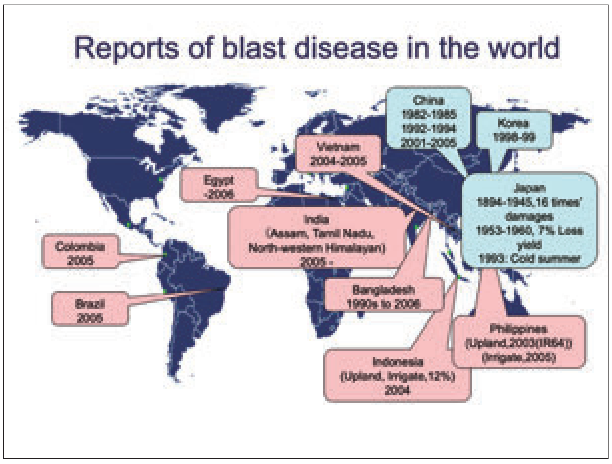
Yoshimichi Fukuta is a senior researcher at JIRCAS and an invited professor at the Graduate School of Agricultural Sciences, Tottori University. He started his career in rice breeding at Hokuriku National Agricultural Experiment Station in 1986 and received his doctoral degree in 1993. From 1999 to 2004, he was dispatched to the International Rice Research Institute (IRRI) from the Ministry of Agriculture, Forestry and Fisheries (MAFF) as a seconded scientist. After returning to JIRCAS, he worked as project leader of the "Blast Research Network for Stable Rice production" and "Rice Innovation for Environmentally Sustainable Production Systems"

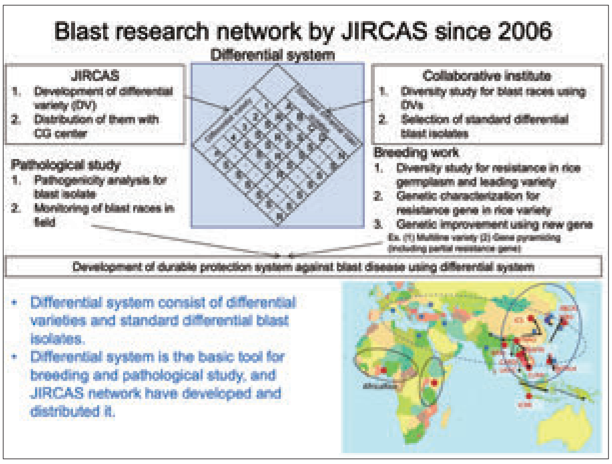
ABSTRACT

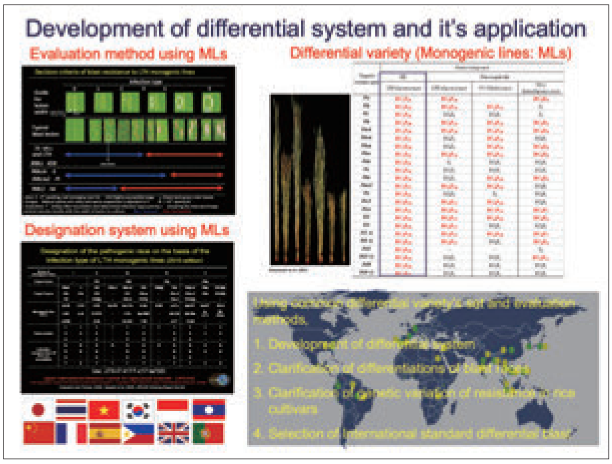
Blast is one of the most serious diseases of rice plants in temperate regions, and it has been found to occur frequently in the rainfed lowlands and uplands in the tropics. Japan International Research Center for Agricultural Sciences (JIRCAS) has been conducting the research project, titled "Blast Research Network for Stable Rice Production," to solve this problem since 2006. Under the research network, an international differential variety set (DVs: monogenic lines) for 23 blast resistance genes; *Pish*, *Pib*, *Pit*, *Pia*, *Pii*, *Pi3*, *Pi5*(t), *Pik-s*, *Pik-m*, *Pi1*, *Pik-h*, *Pik*, *Pik-p*, *Pi7*(t), *Pi9*(t), *Piz*, *Piz-5*, *Piz-t*, *Pita-2*, *Pita*, *Pi12*(t), *Pi19*(t), and *Pi20*(t), and the methods of evaluation for reaction patterns of DVs against blast isolates and designation of blast races, are commonly used among participating nations (Korea, China, Vietnam, Philippines, Indonesia, Lao PDR, Cambodia, Bangladesh, Kenya, and Japan), international agricultural institutes (IRRI and AfricaRice), and university (Yunnan Agricultural U., China). The genetic variations of blast races and of resistance in rice cultivars have been clarified in each country and at the global level. These genetic variations of blast races and of resistance in rice cultivars differ dramatically among the countries, with Japan showing the lowest diversities and south Asia showing the highest. Additionally, highly virulent blast races were found to be distributed at high frequencies in West Africa and northeast China. Additionally, the differential system consisting of DVs and standard differential blast isolates was also developed in each institute, becoming one of many achievements from pathological studies. The differential system is a basic tool for the characterization of resistance genes in rice cultivars and the pathogenicity of blast isolates. Using the differential system developed in each institute, genetic improvement of leading rice cultivars is being conducted through introduction of partial resistance genes, such as *pi21*, *PB1*, *Pi34*, *Pi35*, and *Pi38*. Multiline varieties with genetic backgrounds of Indica Group rice cultivars, IR 64 and IR 49830-7-1-2-2, are also being developed.These differential systems, leading rice cultivars introduced with partial resistance genes, and multiline varieties, will be the key materials toward development of a durable protection system, which will be implemented in harmony with environmental conditions and contributing to sustainability in rice cultivation.

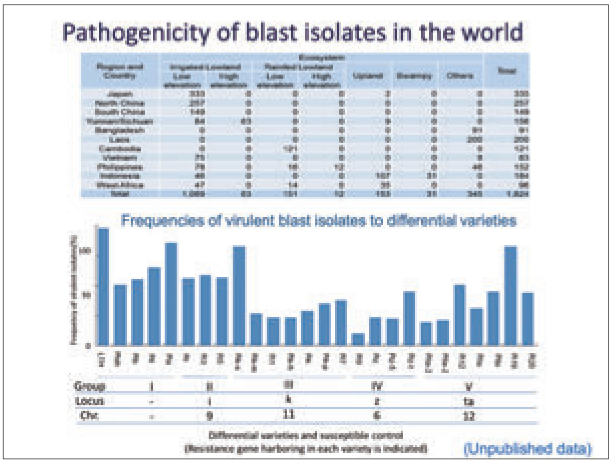

JIRCAS
Intenationla Collaboration Research networks for Stable Rice Production
Yoshimichi Fukuta
Tropical Agriculture Research Front (TARF), Japan International Research Center for Agricultural Sciences (JIRCAS)
E-mail:zen@affrc.go.jp

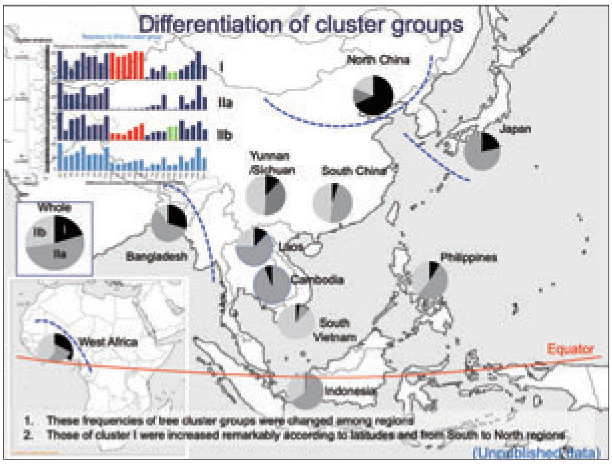

Reports of blast disease in the world
China 1982-1985 1992-1994 2001-2005
Korea 1998-99
Vietnam 2004-2005
Egypt -2006
Japan 1894-1945,16 times' damages 1953-1960, 7% Loss yield 1993: Cold summer
India (Assam, Tamil Nadu, North-western Himalayan) 2005 -
Colombia 2005
Brazil 2005
Bangladesh 1990s to 2006
Philippines (Upland,2003(IR64)) (Irrigate,2005)
Indonesia (Upland, Irrigate,12%) 2004

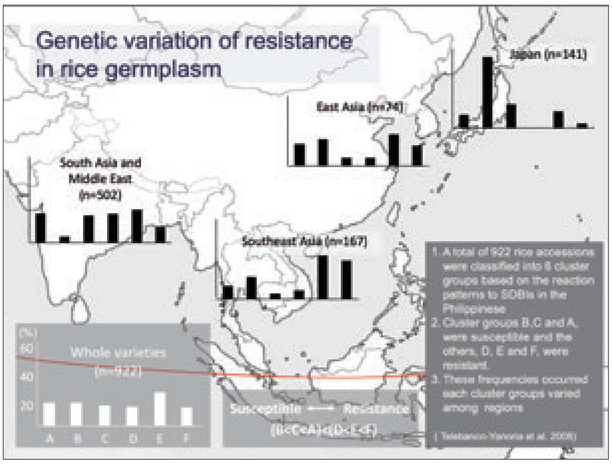

JIRCAS project
Blast Research Network for Stable Rice Production
"Differential System for Blast Resistance for a Stable Rice Production Environment" (29 August 2006)
and Work Plan Meeting for JIRCAS research project -
"Blast Research Network for Stable Rice Production" (30 August 2006)
1st. Phase: 2006-2010, 2nd. Phase: 2011-2015, 3rd: 2016-2020

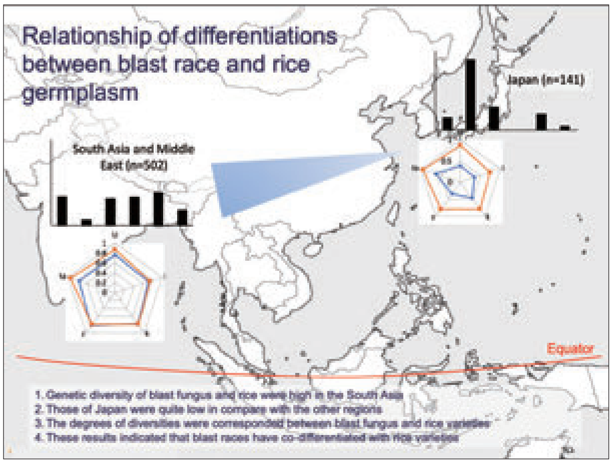

Blast research network by JIRCAS since 2006
Differential system
JIRCAS
1. Development of differential variety (DV)
2. Distribution of them with CG center
Collaborative institute
1. Diversity study for blast races using DVs
2. Selection of standard differential blast isolates
Pathological study
1. Pathogenicity analysis for blast isolate
2. Monitoring of blast races in field
Breeding work
1. Diversity study for resistance in rice germplasm and leading variety
2. Genetic characterization for resistance gene in rice variety
3. Genetic improvement using new gene
Development of durable protection system against blast disease using differential system
Differential system consist of differential varieties and standard differential blast isolates.
Differential system is the basic tool for breeding and pathological study, and JIRCAS network have developed and distributed it.

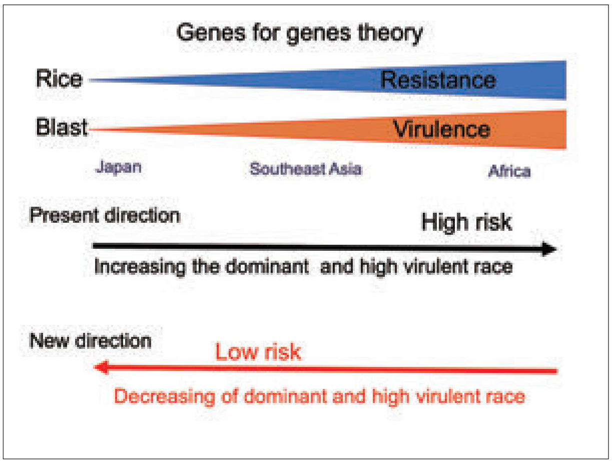

Development of differential system and it's application
Evaluation method using MLs
Differential variety (Monogenic lines: MLs)
Designation system using MLs
1. Development of differential system
2. Clarification of differentiations of blast races
3. Clarification of genetic variation of resistance in rice cultivars
4. Selection of international standard differential blast

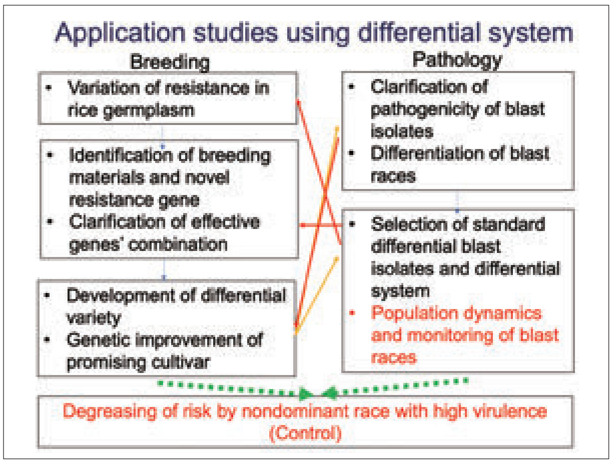

Pathogenicity of blast isolates in the world
Frequencies of virulent blast isolates to differential varieties
Group
Locus
Chr.
Differential varieties and susceptible control
(Resistance gene harboring in each variety is indicated)
(Unpublished data)

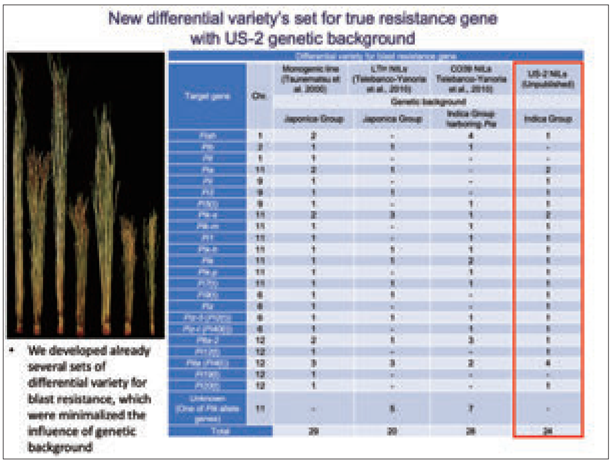

Differentiation of cluster groups
I
IIa
IIb
North China
Japan
Yunnan /Sichuan
South China
Whole
Bangladesh
Laos
Cambodia
Philippines
South Vietnam
West Africa
Equator
Indonesia
1. These frequencies of tree cluster groups were changed among regions
2. Those of cluster I were increased remarkably according to latitudes and from South to North regions
(Unpublished data)


Genetic variation of resistance in rice germplasm
Japan (n=141)
East Asia (n=74)
South Asia and Middle East (n=502)
Southeast Asia (n=167)
Whole varieties (n=922)
Susceptible ⟶ Resistance
(B<C<A)<(D<E<F)
1. A total of 922 rice accessions were classified into 6 cluster groups based on the reaction patterns to SDBIs in the Philippines
2. Cluster groups B,C and A, were susceptible and the others, D, E and F, were resistant.
3. These frequencies occurred each cluster groups varied among regions





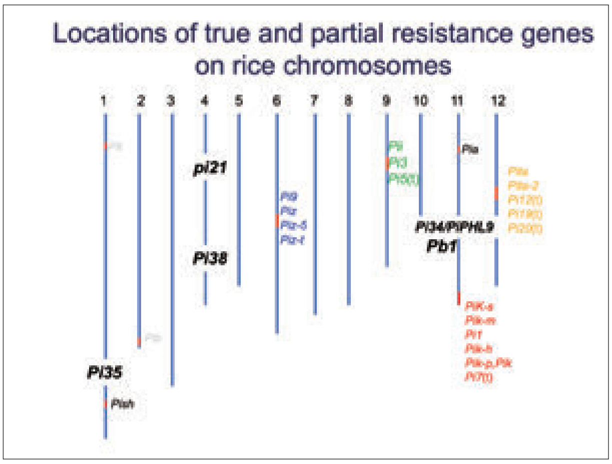


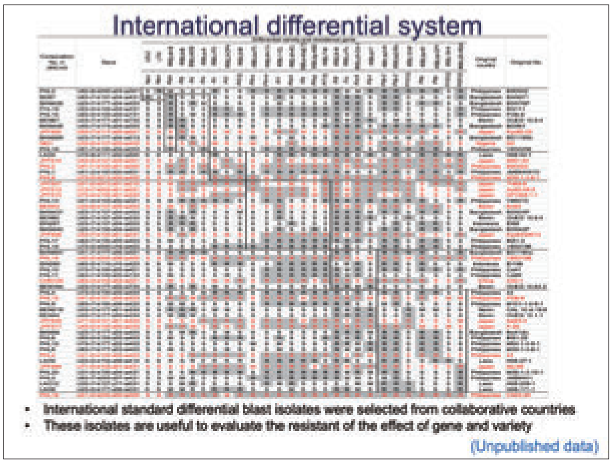


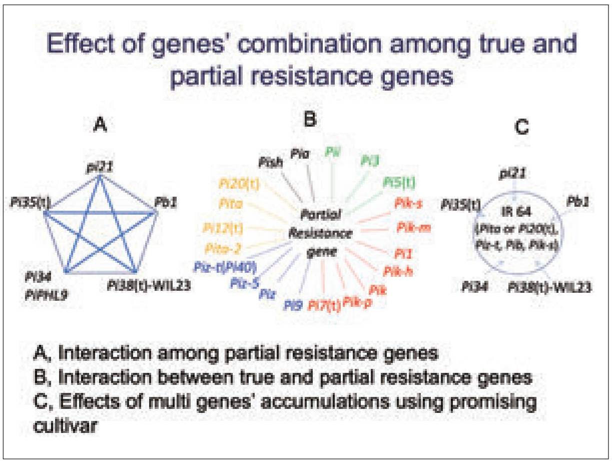
US-2 NILs for partial resistance genes

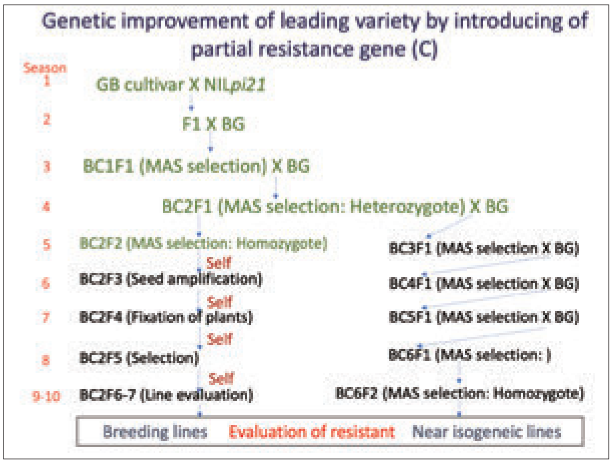
Target resistance gene	Chr.	Donor	Generation in 2018
PiPHL9(t)	11	Hokkai PL9	BC6F8
pi21	4	Owarihatamochi	BC6F8
Pi35	1	Hokkai188	BC6F9
Pi34	11	Chube 32	BC6F8
		Chugoku 40	BC6F10
Pi38(t)	4	WIL23	BC6F8
Pb1	11	Asano-hikari	BC6F9

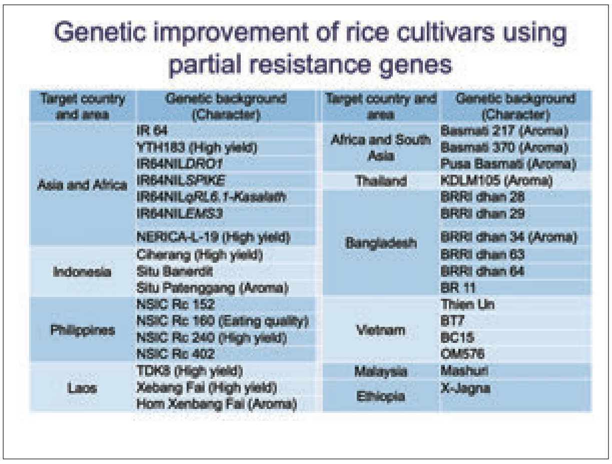
Partial gene(s) have been expected that these were resistant against all blast races with intermediate effects.
Near isogenic lines(NILs) for partial resistance genes were developed to confirm the effects.



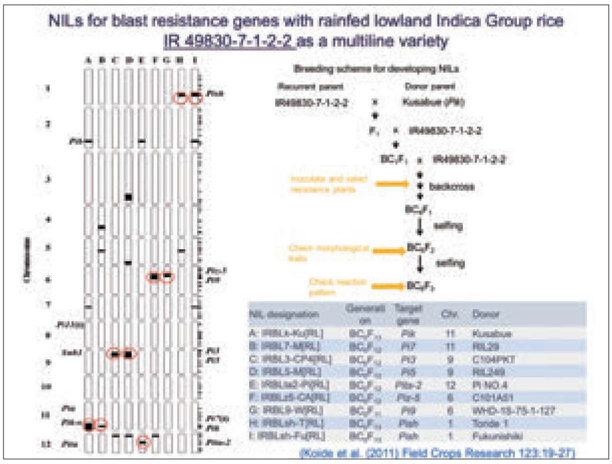


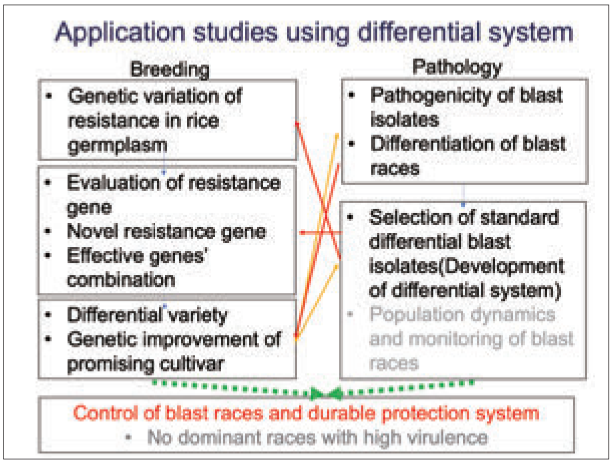





Genetic improvement of rice cultivars using partial resistance genes

Target country and area	Genetic background (Character)	Target country and area	Genetic background (Character)
Asia and Africa	IR 64	Africa and South Asia	Basmati 217 (Aroma)
	YTH183 (High yield)		Basmati 370 (Aroma)
	IR64NIL*DRO1*		Pusa Basmati (Aroma)
	IR64NIL*SPIKE*	Thailand	KDLM105 (Aroma)
	IR64NIL*qRL6.1-Kasalath*	Bangladesh	BRRI dhan 28
	IR64NIL*EMS3*		BRRI dhan 29
	NERICA-L-19 (High yield)		BRRI dhan 34 (Aroma)
Indonesia	Ciherang (High yield)		BRRI dhan 63
	Situ Banerdit		BRRI dhan 64
	Situ Patenggang (Aroma)		BR 11
Philippines	NSIC Rc 152	Vietnam	Thien Un
	NSIC Rc 160 (Eating quality)		BT7
	NSIC Rc 240 (High yield)		BC15
	NSIC Rc 402		OM576
Laos	TDK8 (High yield)	Malaysia	Mashuri
	Xebang Fai (High yield)	Ethiopia	X-Jagna
	Hom Xenbang Fai (Aroma)		





INVASION OF SOYBEAN RUST AND ITS MANAGEMENT, FROM BRAZILIAN EXPERIENCES

Claudia Vieira Godoy

Researcher, Empresa Brasileira de Pesquisa Agropecuária,

Centro Nacional de Pesquisa de Soja (Embrapa Soybean), Brazil

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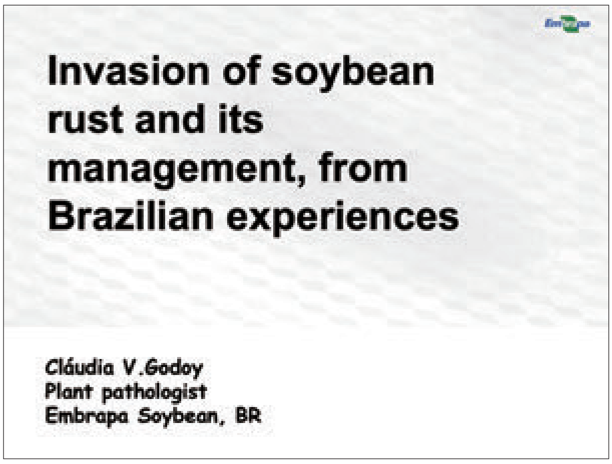
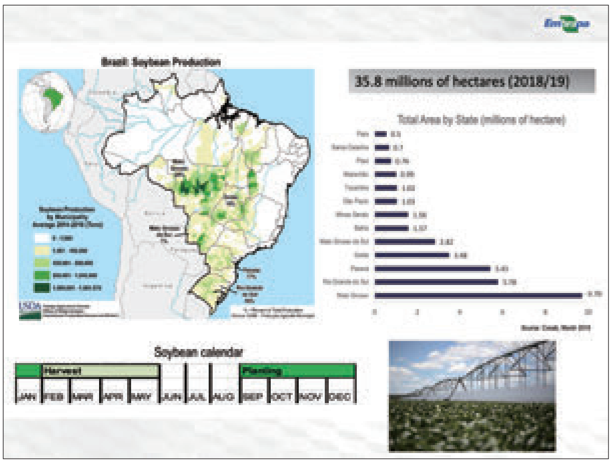
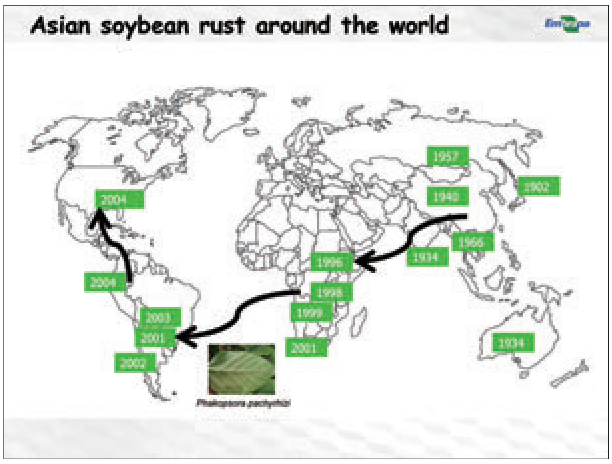
Claudia Vieira Godoy is a researcher at the Soybean Research Center of the Brazilian Agricultural Research Corporation (Embrapa). She earned her Ph.D. from the University of São Paulo. During her Ph.D. course, she worked as a visiting researcher at Gottfried Wilhelm Leibniz Universität in Hannover, Germany, and at Université Paris-Sud in France. She then worked as a researcher at Zeneca/ Syngenta Crop Protection from 1999 to 2002. In 2002, she began her career at Embrapa as a plant pathology researcher, focusing on epidemiology and control of soybean diseases. Since 2004, she has been acting as coordinator of the Anti-rust Consortium, a task force created to control soybean rust. In 2012-2013, she worked as a visiting researcher at USDA/ University of Illinois.

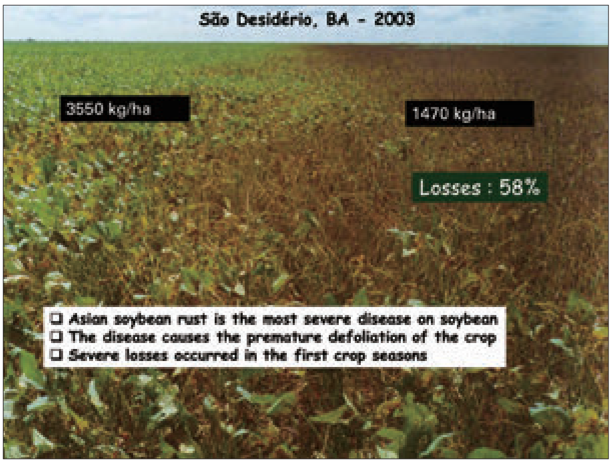
ABSTRACT

The cultivated soybean area in 2018/19 in Brazil reached 35.8 million hectares (Conab, 2019). One disease that threatens the sustainability of the crop and represents a breakthrough in the history of soybean in Brazil is Asian soybean rust, caused by the fungus Phakopsora pachyrhizi. The disease was first reported in Paraguay in 2001 and in the west of the state of Paraná, Brazil, spreading, within three years, throughout South America (Yorinori et al. 2005). Epidemics of the disease were common in the country, where the fungus can survive year-round. Management and regulatory measures were adopted to reduce the inoculum between crop seasons (soybean-free period) and to curb late sowing of soybeans. Varieties with resistant genes have been available in the Brazilian market since 2009. Fungicide applications are recommended for these varieties due to the variability of the fungus' ability to overcome the resistance genes. The most important soybean rust control strategy in Brazil has been the early sowing of short-cycle varieties after the soybean-free period, escaping the higher inoculum pressure period. The use of fungicides is one of the strategies adopted in the management of the disease. Fungicide application costs in soybean were estimated at US$ 2.9 billion in 2018/19, with an average of 2.75 fungicide applications per soybean crop season. Since 2003/04, uniform field trials have been carried out in different producing regions in order to compare the efficacy of registered fungicides and those in the registration phase. Besides the fungicides'efficacy, the results allowed accompanying changes in the sensitivity of the fungus to the different modes of action over the years, along with bioassays and molecular analyses. Reduced fungicide efficacy in the uniform field trials was reported for the demethylation inhibitors (DMIs) in 2007, the quinone outside inhibitors (QoIs) in 2013, and for the succinate dehydrogenase inhibitors (SDHIs) in 2016. At least six CYP51 mutations (Y131F/H; F120L; K142R; I145F; I475T) and overexpression are involved in the sensitivity reduction towards DMIs (Schmitz et al., 2014). For QoI, the F129L mutation was reported at high frequency (~ 90%) in 2013/14 isolates (Klosowski et al., 2016) and remained stable in the subsequent crop seasons. SDHI fungicides were used on soybean in Brazil for the first time in 2013/14 and strains of P. pachyrhizi with a lower sensitivity were found in monitoring studies in 2015/16, with a mutation in the C-I86F gene (Simões et al., 2018). With the P. pachyrhizi resistance to single-site fungicides, the efficacy of multi-site fungicides (mancozeb, chlorothalonil, and copper) has also been evaluated in the uniform field trials and their use in Brazil to control Asian rust has increased. Even though all major single-site mode of action fungicides used for soybean rust control (DMI, QoI, and SDHI) have experienced adaptation by P. pachyrhizi in Brazil, they still contribute to disease control when associated with other management strategies.

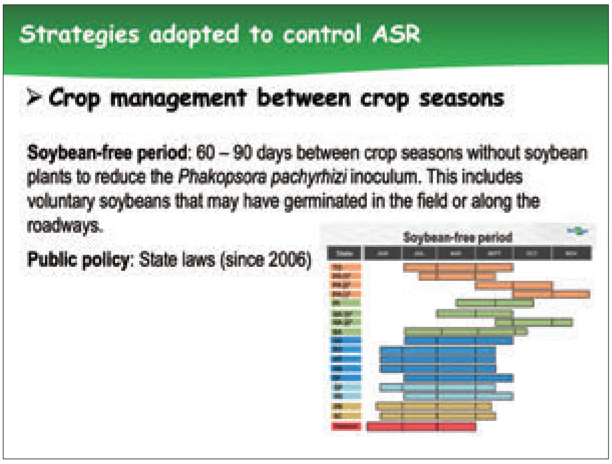

Invasion of soybean rust and its management, from Brazilian experiences
Cláudia V.Godoy
Plant pathologist
Embrapa Soybean, BR


Brazil: Soybean Production
35.8 millions of hectares (2018/19)
Total Area by State (millions of hectare)
Soybean calendar
Harvest
Planting
JAN
FEB
MAR
APR
MAY
JUN
JUL
AUG
SEP
OCT
NOV
DEC

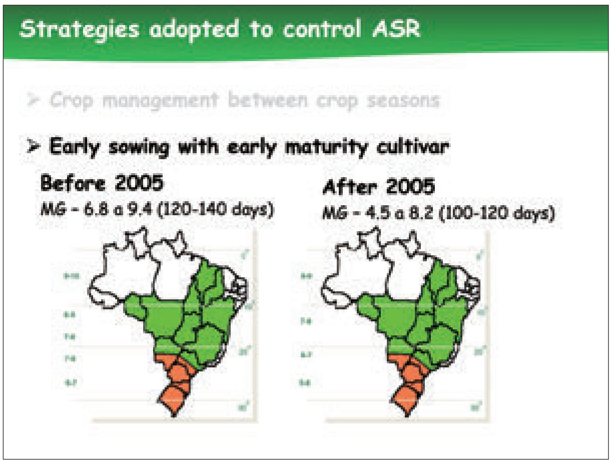

Asian soybean rust around the world
1957
1940
1902
2004
1966
1934
1996
2004
1998
2003
1999
2001
2001
2002
1934
Phakopsora pachyrhizi

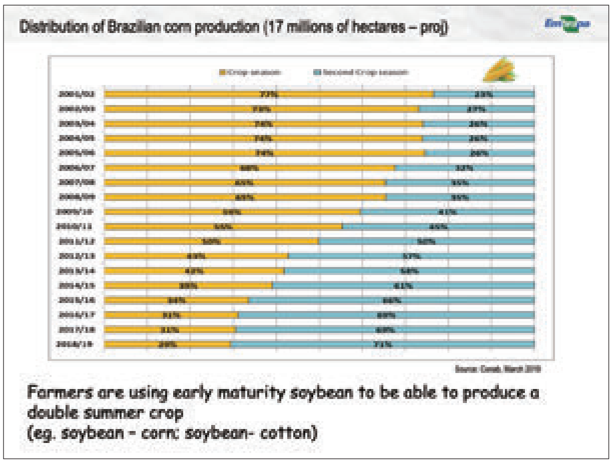

São Desidério, BA - 2003
3550 kg/ha
1470 kg/ha
Losses : 58%
❑ Asian soybean rust is the most severe disease on soybean
❑ The disease causes the premature defoliation of the crop
❑ Severe losses occurred in the first crop seasons

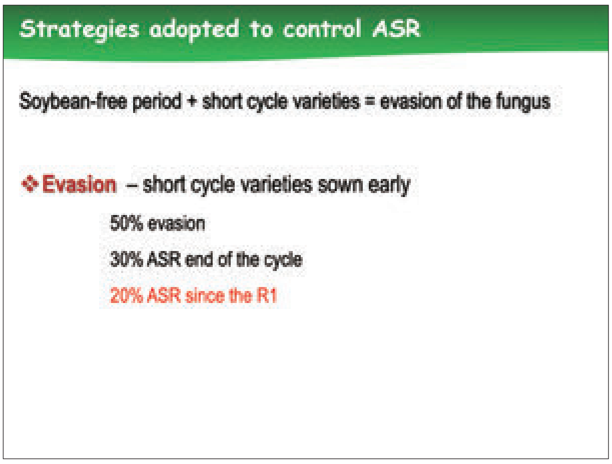

Strategies adopted to control ASR
❑ Restrict the sowing under irrigation between crop seasons to avoid the green bridge
J.T. Yorinori
Primavera do Leste, Mato Grosso - July 2003

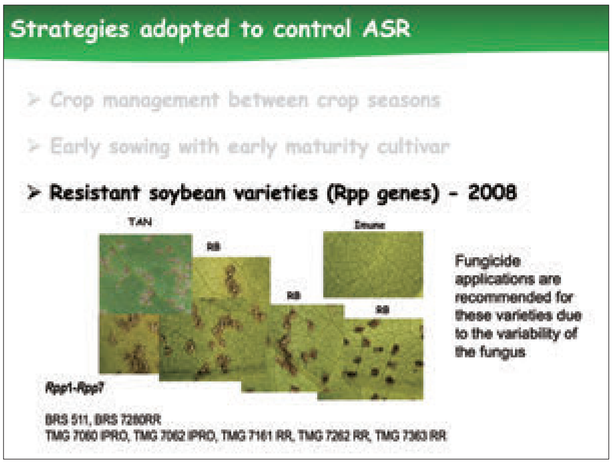

Strategies adopted to control ASR
➢ Crop management between crop seasons
Soybean-free period: 60 – 90 days between crop seasons without soybean plants to reduce the Phakopsora pachyrhizi inoculum. This includes voluntary soybeans that may have germinated in the field or along the roadways.
Public policy: State laws (since 2006)
Soybean-free period

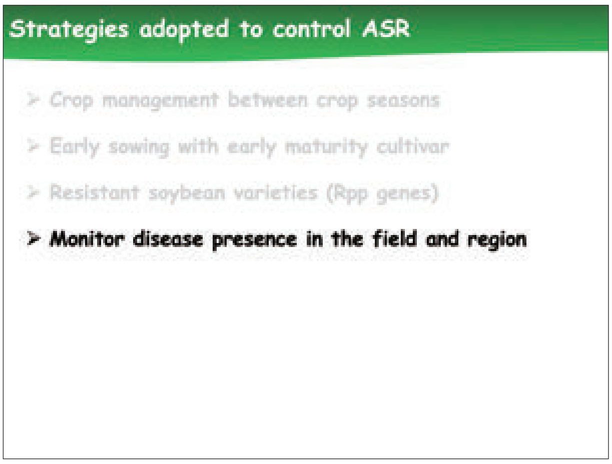

voluntary soybeans

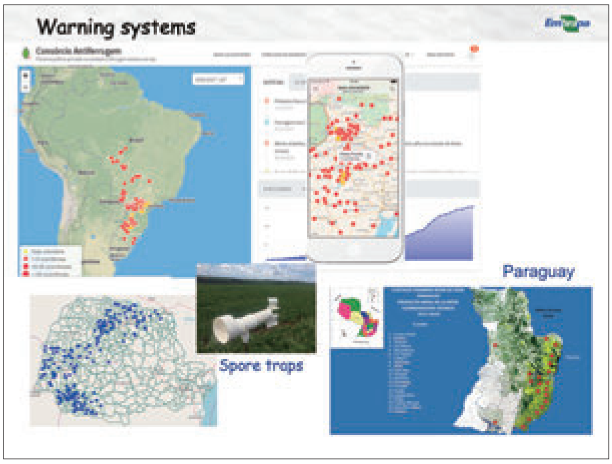

Strategies adopted to control ASR
➢ Crop management between crop seasons
➢ Early sowing with early maturity cultivar
Before 2005
MG - 6.8 a 9.4 (120-140 days)
After 2005
MG - 4.5 a 8.2 (100-120 days)

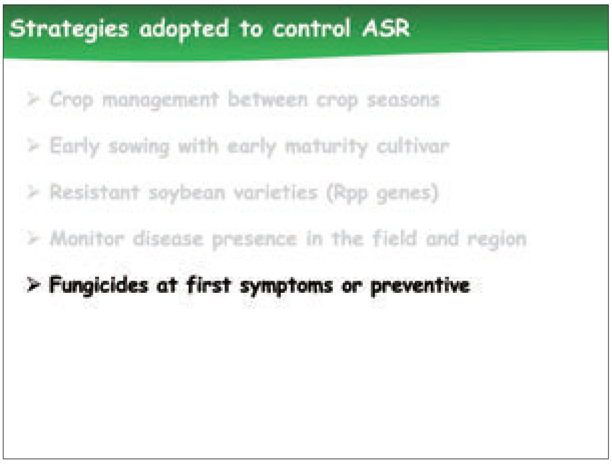

Distribution of Brazilian corn production (17 millions of hectares – proj)
Crop season
Second Crop season
2001/02 77% 23%
2002/03 73% 27%
2003/04 74% 26%
2004/05 74% 26%
2005/06 74% 26%
2006/07 68% 32%
2007/08 65% 35%
2008/09 65% 35%
2009/10 59% 41%
2010/11 55% 45%
2011/12 50% 50%
2012/13 43% 57%
2013/14 42% 58%
2014/15 39% 61%
2015/16 34% 66%
2016/17 31% 69%
2017/18 31% 69%
2018/19 29% 71%
Farmers are using early maturity soybean to be able to produce a double summer crop
(eg. soybean - corn; soybean- cotton)

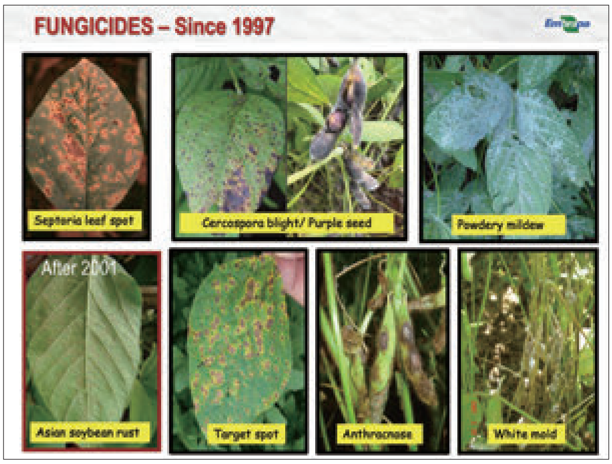

Strategies adopted to control ASR
Soybean-free period + short cycle varieties = evasion of the fungus
Evasion – short cycle varieties sown early
50% evasion
30% ASR end of the cycle
20% ASR since the R1

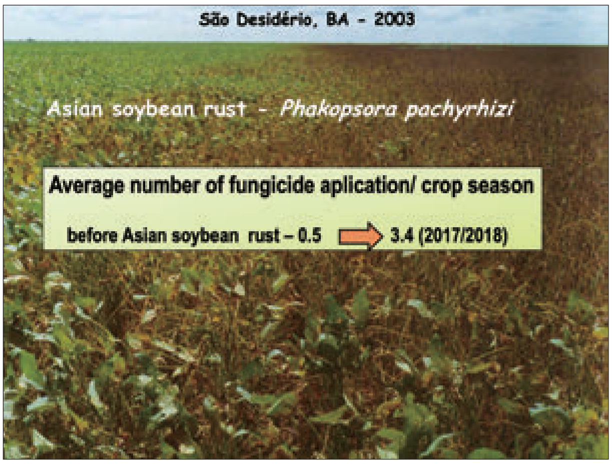

Strategies adopted to control ASR
Crop management between crop seasons
Early sowing with early maturity cultivar
Resistant soybean varieties (Rpp genes) - 2008
TAN
RB
RB
RB
Fungicide applications are recommended for these varieties due to the variability of the fungus
Rpp1-Rpp7
BRS 511, BRS 7280RR
TMG 7060 IPRO, TMG 7062 IPRO, TMG 7161 RR, TMG 7262 RR, TMG 7363 RR


Strategies adopted to control ASR
Crop management between crop seasons
Early sowing with early maturity cultivar
Resistant soybean varieties (Rpp genes)
Monitor disease presence in the field and region


Warning systems
Paraguay
Spore traps


Strategies adopted to control ASR
Crop management between crop seasons
Early sowing with early maturity cultivar
Resistant soybean varieties (Rpp genes)
Monitor disease presence in the field and region
Fungicides at first symptoms or preventive


FUNGICIDES – Since 1997
Septoria leaf spot
Cercospora blight/ Purple seed
Powdery mildew
After 2001
Asian soybean rust
Target spot
Anthracnose
White mold

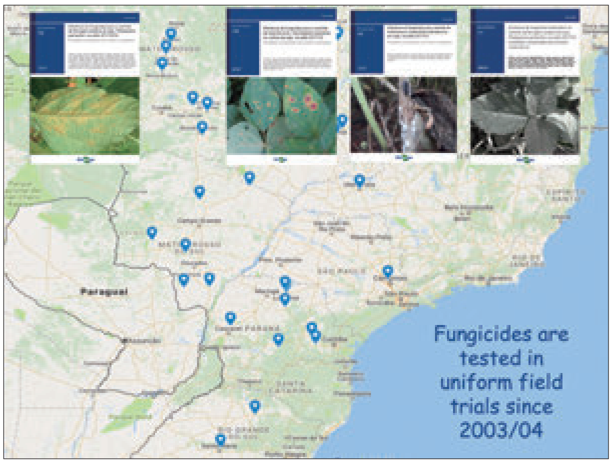

São Desidério, BA - 2003
Asian soybean rust - Phakopsora pachyrhizi
Average number of fungicide aplication/ crop season
before Asian soybean rust – 0.5
3.4 (2017/2018)

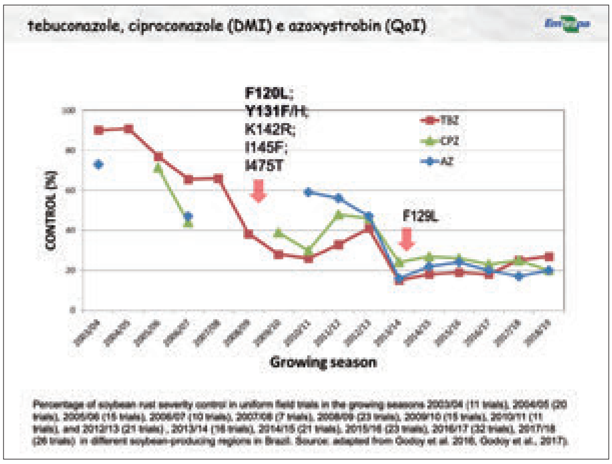
Fungicides registered for ASR

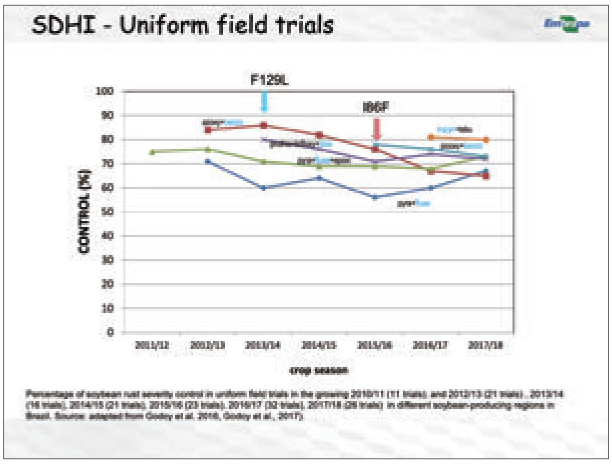
Sterol biosynthesis inhibitors (G)
- DMI (G1): cypro-, epoxi-, tebuco-, tetra-, prothioconazole
- Amines (Morpholines, G2): fenpropimorph

Respiration Inhibitors (C)
- SDHI (C2): benzovindiflupyr, fluxapyroxad, bixafen (2013), impirfluxan, and fluindapyr
- QoI (C3): azoxy-, picoxy-, pyraclo-, metomino-, trifloxystrobin
- uncouplers of oxidative phosphorylation (C5): fluazinam

Multi-sites activity (M) (2014)
- Inorganics (M1): copper
- Dithiocarbamates (EBDC, M3): mancozeb
- Chloronitriles (M5): chlorothalonil



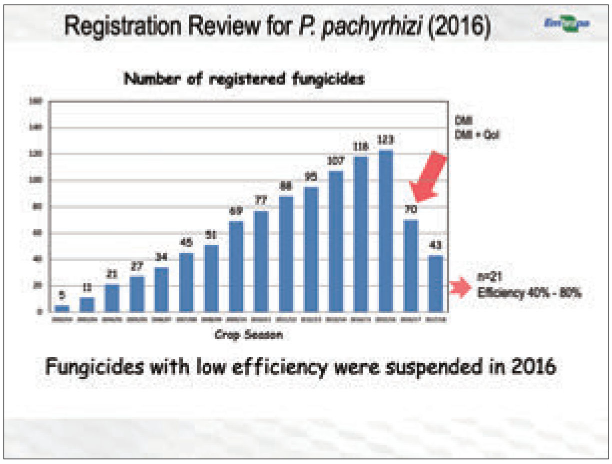


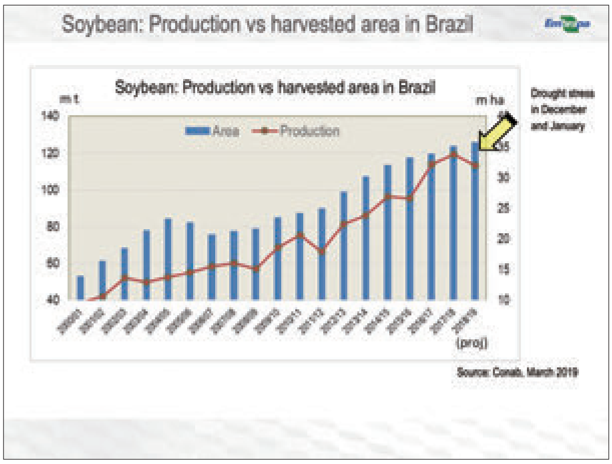


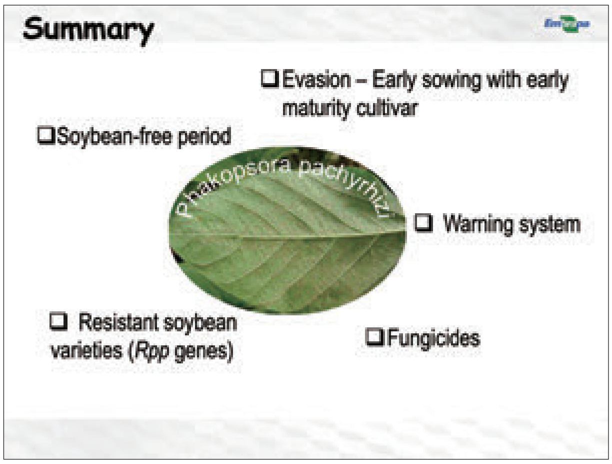
Fungicide resistance reported for *P. pachyrhizi* in Brazil

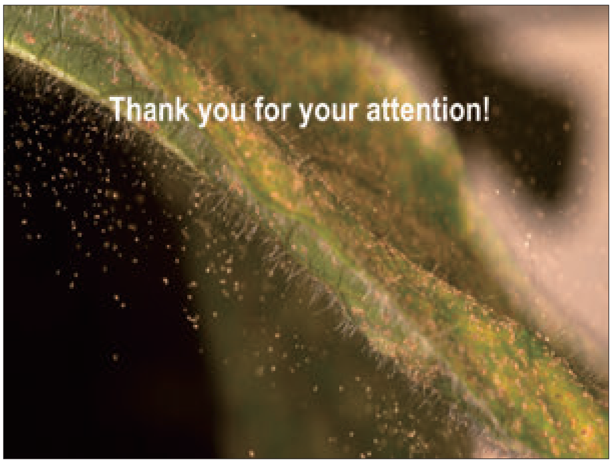
Mode of Action	*P. pachyrhizi*	year
DMI Demethylation Inhibitors	F120L; Y131F/H; K142R; I145F; I475T constitutive up-regulation of the cyp51-gene	2006/07 – flutriafol, cypro, epoxi, tebuco, tetra > prothioconazole *Pest Manag Sci* 2014; **70**: 378–388
QoI Quinone outside Inhibitor	F129L	2013/14 - azoxy, pyra > picoxy, metomino, trifloxy *Pest Manag Sci* (2015)
SDHI Succinate Dehydrogenase Inhibitor	C-I86F; N88S	2015/16 – benzo > fluxapyroxad, bixafen *J Plant Dis Prot* (2017)
Multi-sites		

Parcial resistance (orange)
No reports of resistance (green)








Thank you for your attention!

PLANT QUARANTINE AND RISK MANAGEMENT

Yukio Yokoi

Director for World Trade Organization (WTO), International Affairs Department, MAFF, Japan, former Director of Research Division, Yokohama Plant Protection Station, MAFF, Japan

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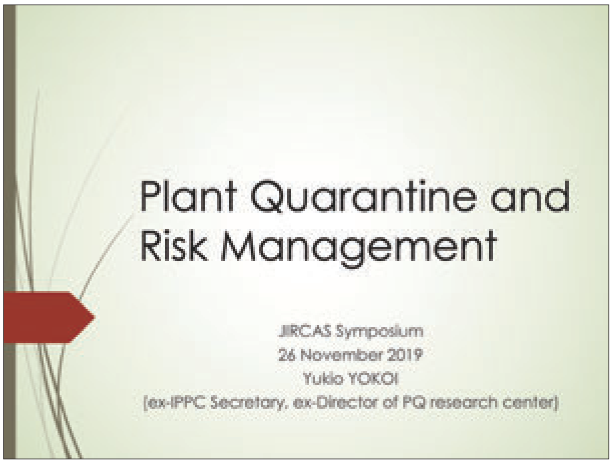
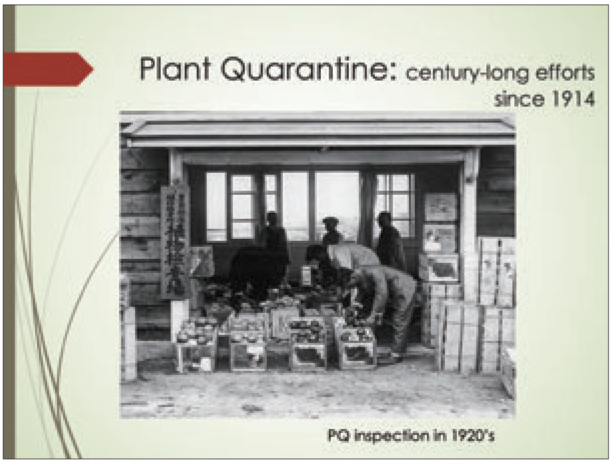
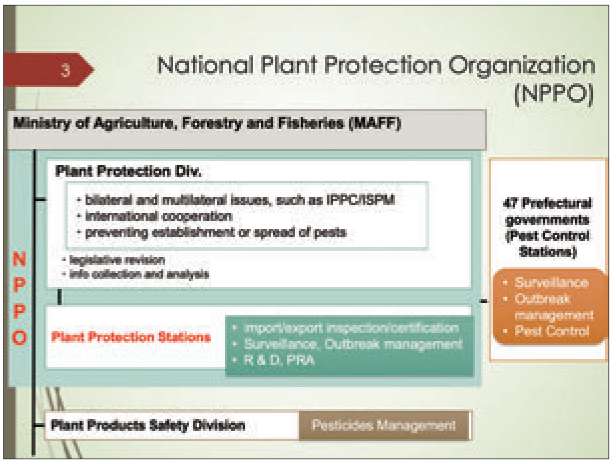
Yukio Yokoi is the Director for World Trade Organization (WTO), International Affairs Department, Ministry of Agriculture, Forestry and Fisheries (MAFF), Japan. Before that, he contributed to international plant protection efforts during his stints with the Yokohama Plant Protection Station (2015-2019) and the IPPC (2010-2014). He was involved in tackling various development issues with Japan International Cooperation Agency (JICA), and marketing issues with Japan External Trade Organization (JETRO) (2005-2009). He also worked at Osaka University, Tokyo University of Foreign Studies and Gakushuin Women's College.

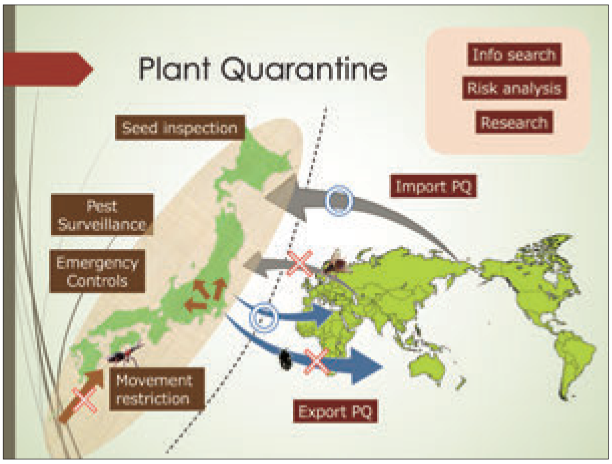
ABSTRACT

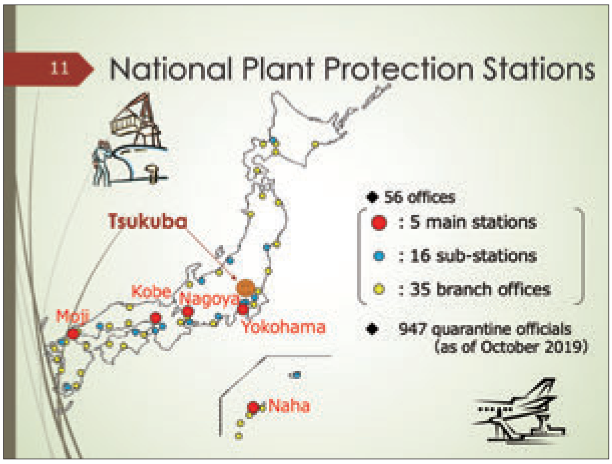
The plant quarantine system, which is an integral part of risk reduction efforts to protect plant resources, will be presented, followed by a discussion of improvement ideas for possible further collaboration with the research community. Fundamental to the whole plant quarantine issue is pest risk analysis, for which international standards provide guidelines, and countries add their own perspectives according to the situation and within the national legal framework. Japan, like other countries, has developed its own pest risk analysis guidelines. Information on pest distribution and detection as well as revisions in trade partners' regulations are regularly collected through various sources, based on which immediate consideration is made and pest risk analysis is conducted when necessary. Based on pest risk analysis, the plant quarantine legislative scheme has been continuously developed, which is the legal basis to support various regulative activities, such as import and export inspections at ports and airports, as well as pest surveillance throughout the country, among others. In order to strengthen the effectiveness, collaborative efforts are made between national authorities such as with Customs, and also with trade partner countries regionally and internationally. Particular importance is placed on identification of how certain pests have been introduced as well as development and establishment of pest control methods in emergencies. Regulative actions are essential to protect plants against harmful pests, for which research has been also playing important roles to support them. Plant quarantine can be further improved against the increasing pest risks, through regional/ international collaboration and with emerging technologies and innovative approach.

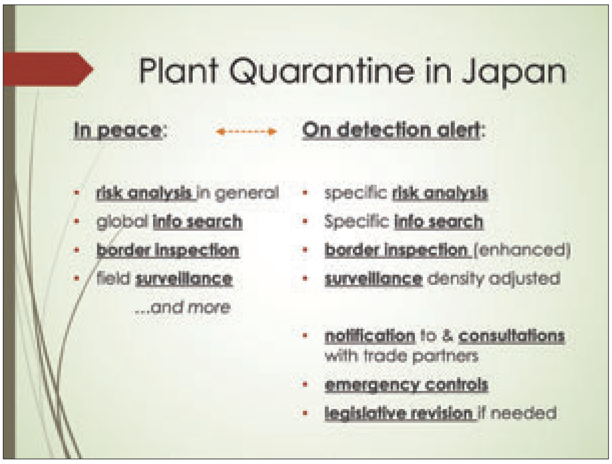

Plant Quarantine and
Risk Management
JIRCAS Symposium
26 November 2019
Yukio YOKOI
(ex-IPPC Secretary, ex-Director of PQ research center)

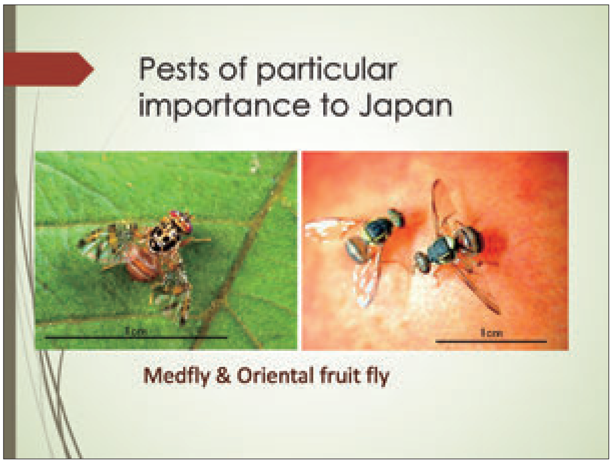

Plant Quarantine: century-long efforts
since 1914
PQ inspection in 1920's

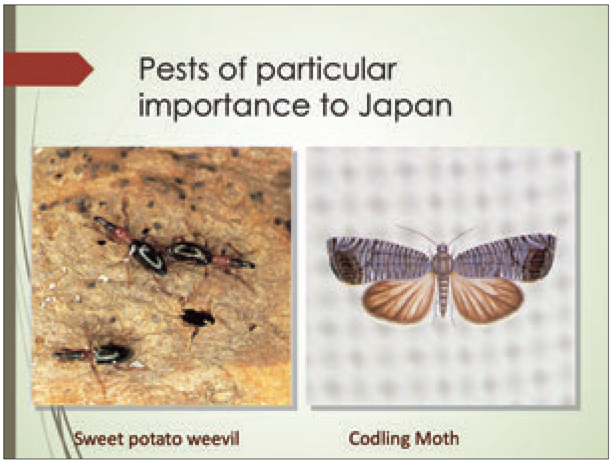

3
National Plant Protection Organization
(NPPO)
Ministry of Agriculture, Forestry and Fisheries (MAFF)
Plant Protection Div.
・bilateral and multilateral issues, such as IPPC/ISPM
・international cooperation
・preventing establishment or spread of pests
・legislative revision
・info collection and analysis
NPPO
Plant Protection Stations
・import/export inspection/certification
・Surveillance, Outbreak management
・R & D, PRA
47 Prefectural governments (Pest Control Stations)
・Surveillance
・Outbreak management
・Pest Control
Plant Products Safety Division
Pesticides Management


Plant Quarantine
Info search
Risk analysis
Research
Seed inspection
Import PQ
Pest Surveillance
Emergency Controls
Movement restriction
Export PQ

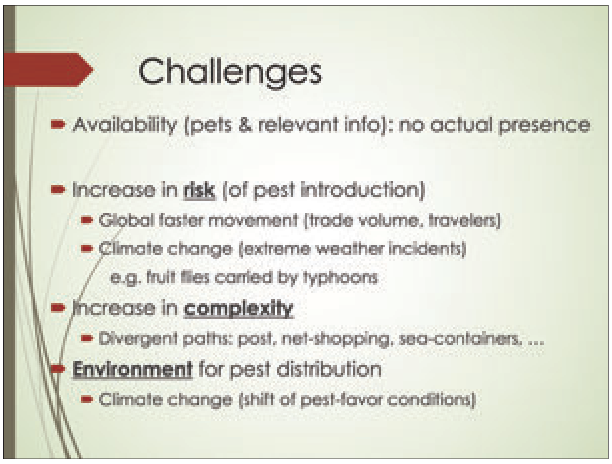

11
National Plant Protection Stations
Tsukuba
Kobe
Nagoya
Moji
Yokohama
Naha
◆ 56 offices
: 5 main stations
: 16 sub-stations
: 35 branch offices
◆ 947 quarantine officials
(as of October 2019)

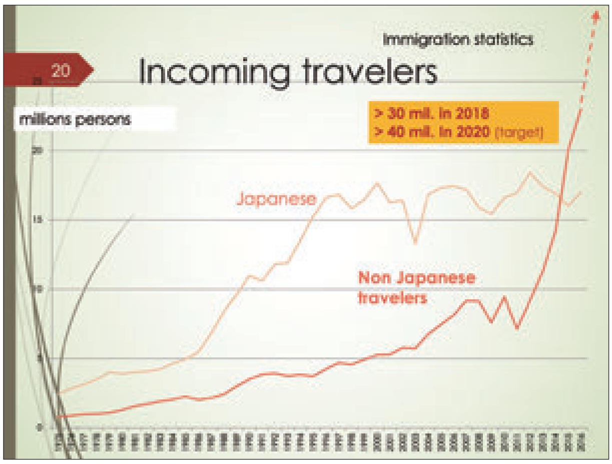

Plant Quarantine in Japan
In peace:
On detection alert:
• risk analysis in general
• global info search
• border inspection
• field surveillance
...and more
• specific risk analysis
• Specific info search
• border inspection (enhanced)
• surveillance density adjusted
• notification to & consultations with trade partners
• emergency controls
• legislative revision if needed

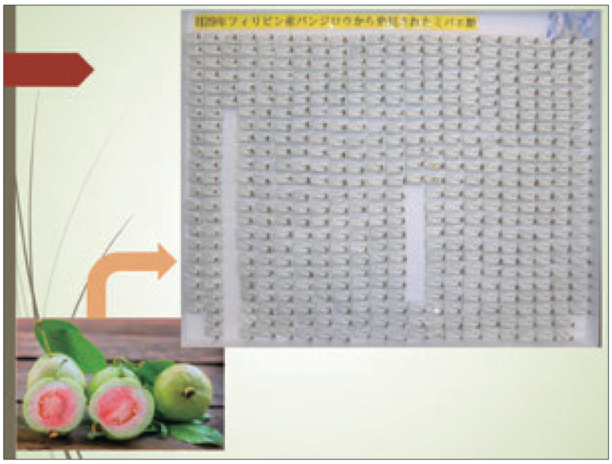

Pests of particular importance to Japan
Medfly & Oriental fruit fly


Pests of particular importance to Japan
Sweet potato weevil
Codling Moth


Pests of particular importance to Japan
Fire Blight
Potato cyst nematode


Challenges
Availability (pets & relevant info): no actual presence
Increase in risk (of pest introduction)
Global faster movement (trade volume, travelers)
Climate change (extreme weather incidents)
e.g. fruit flies carried by typhoons
Increase in complexity
Divergent paths: post, net-shopping, sea-containers, ...
Environment for pest distribution
Climate change (shift of pest-favor conditions)

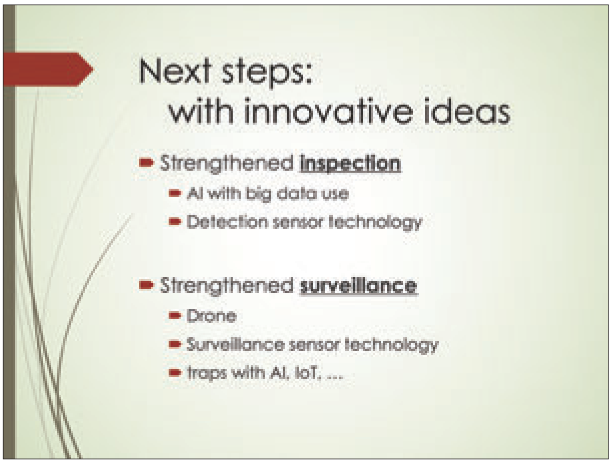

Immigration statistics
Incoming travelers
millions persons
> 30 mil. in 2018
> 40 mil. in 2020 (target)
Japanese
Non Japanese travelers

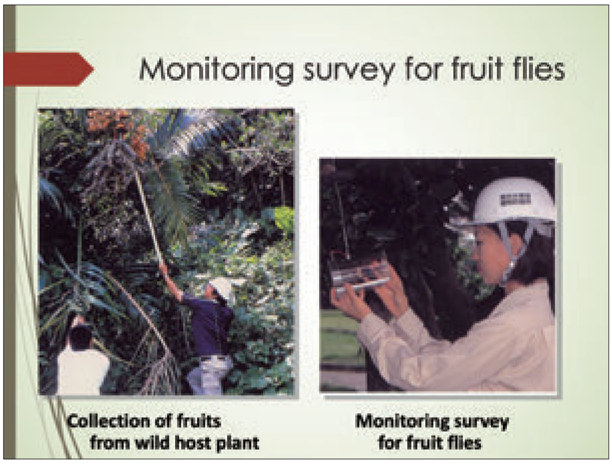


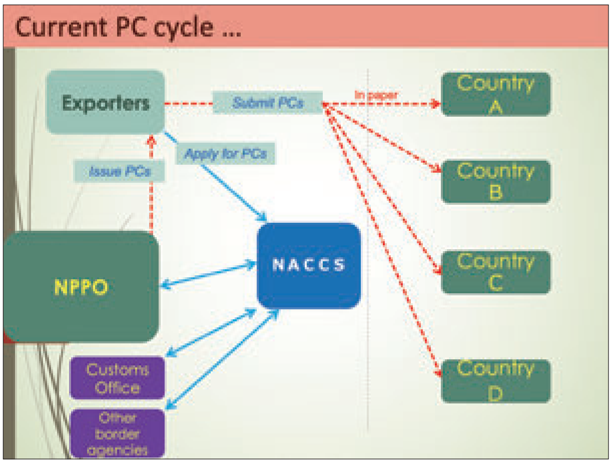

Collaboration efforts in place
Among border control agencies
With trade partners
Regionally and internationally
IPPC: strategy, standards, implementation, ...
IYPH
Technical cooperation
Research community (G20MACS)

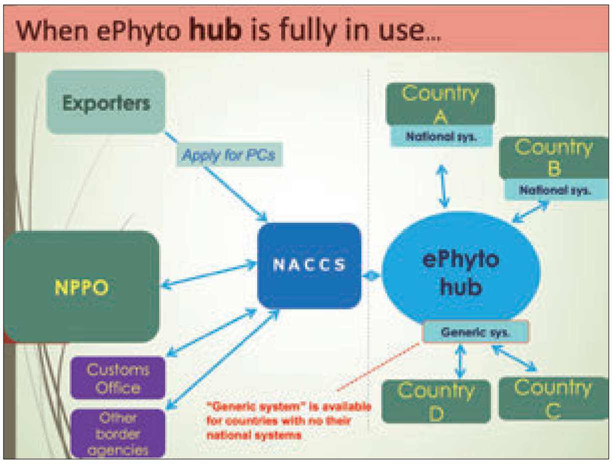

Next steps:
regulative actions - 1
Strategic awareness raising
Timely info provision
Regional and/or international collaboration
More effective and efficient controls
Legislation to allow swift actions

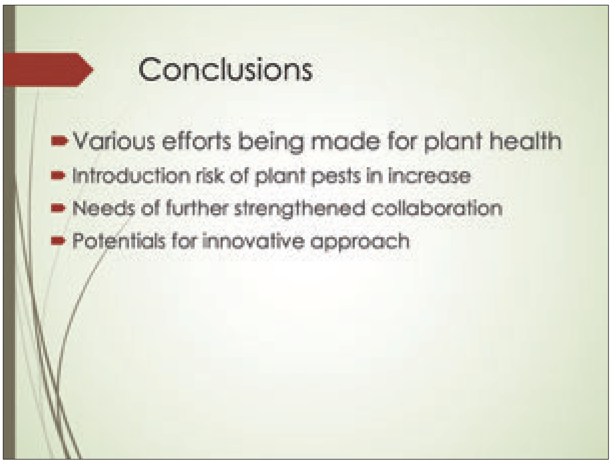

Next steps:
regulative actions - 2
Risk analysis with emerging pests
Simulation, big data use, focus on specific importance …
Strengthened regional & international collaboration
Semi-real-time pest info sharing
Pest identification
Pest control info, tools, technology


Next steps:
with innovative ideas
Strengthened inspection
AI with big data use
Detection sensor technology
Strengthened surveillance
Drone
Surveillance sensor technology
traps with AI, IoT, …


Monitoring survey for fruit flies
Collection of fruits from wild host plant
Monitoring survey for fruit flies


Current PC cycle …
Exporters
Submit PCs
In paper
Apply for PCs
Issue PCs
NPPO
NACCS
Customs Office
Other border agencies
Country A
Country B
Country C
Country D


When ePhyto hub is fully in use...
Exporters
Apply for PCs
NPPO
NACCS
ePhyto hub
Customs Office
Other border agencies
Country A
National sys.
Country B
National sys.
Generic sys.
Country D
Country C
"Generic system" is available for countries with no their national systems


Conclusions
Various efforts being made for plant health
Introduction risk of plant pests in increase
Needs of further strengthened collaboration
Potentials for innovative approach

Panel Discussion

Moderator:
Masayasu Kato, JIRCAS
and ***Masaya Matsumura***, NARO

Speakers:

Jingyuan Xia, Secretary, International Plant Protection Convention Secretariat

Ulrich Kuhlmann, Executive Director, Global Operations, CABI

Akira Otuka, Unit Leader, Institute of Agricultural Machinery, NARO

Frédéric Baudron, Principal Scientist, Sustainable Intensification Program, International Maize and Wheat Improvement Center, Harare, Zimbabwe

Claudia Vieira Godoy, Researcher, Embrapa Soybean, Brazil

Yukio Yokoi, Director for WTO, International Affairs Department, MAFF, Japan, former Director of Research Division, Yokohama Plant Protection Station, MAFF


derator
CAS
su Kato


Embrapa
Claudia
Godoy
MAFF
Yukio Yokoi


CIMMYT
Embrapa

Dr. Masayasu Kato:

Thank you for the introduction. Before the panel discussion, I would like to wrap up the excellent presentations by the keynote and session speakers using diagrams of transboundary plant pests and their contributions to SDGs.

Today's theme for the symposium is collaborative research on transboundary plant pests and its contributions to SDGs. We would like to see how our collaboration contributes to the SDGs. Before the invasion of plant pests, they don't worry about the plant pests. At the borders there is a quarantine system. Some plant pests may be introduced by human activities, but the quarantine stops their invasions. Some plant pests may pass through the quarantine system and are established in new countries. Sometimes the plant pests can migrate by themselves or by wind. The invaded countries need information on the target pests to develop control measures. Just after the invasion, the information is scarce for them, so they need collaboration with the countries of origin. But the information in the origin is not sufficient, because of the differences in the environments. The invaded countries need the risk assessment and the surveillance and control measures. After the invasion, they can obtain some information within the countries. They make collaborations with researchers, extensionists, and farmers. Finally, they can develop applicable control measures under the balance of cost and benefit. These collaborations contribute to most of the SDGs, especially for No Poverty, Zero Hunger, Life on Land, and the Partnership for the Goals. From now we would like the panelists to show how the collaboration contributes to the SDGs. Thanks.

From now, I would like to pass the moderator role to Dr. Matsumura from the National Agriculture and Food Research Organization.

Dr. Masaya Matsumura:

My name is Matsumura. Unfortunately, only 20 minutes is left for the panel discussion.

I would like to ask all the six panelists a direct question. My question is this. There are various ways to promote international collaboration. In some cases, collaboration is not only between researchers, but also with farmers, private companies, and officials. In each of your cases, my question is, what are the challenges and difficulties for promoting international collaboration on transboundary plant pests, and how do you solve them?

Let's start with Dr. Xia. Sorry, a very short comment please.

Dr. Jingyuan Xia:

Okay, thank you very much. This diagram of the relationship to SDGs is very important. I'm going to add something here first. For transboundary pests, there are contributions to the SDG goals. Number one, of course, is for poverty. Second is food security. Third one is biodiversity, and then trade. There is another one that is very important, and that I would recommend adding. I deal with Climate Change, because climate change is very relevant to transboundary pests. This means we have five important goals to contribute to for transboundary pests. Plant health, transboundary pests research, contributes to five SDG goals. We have already mentioned in the FAO, like this. And I am going to promote another one, Climate Change.

I want to make a concrete example now of how to research and then promote these kinds of collaboration. I want to make an example here of fall armyworm. For fall armyworm I am going to make four recommendations. We need that research, education and government work together.

Nowadays, I think there are four very important areas. The first one is about an area-specified strategy for fall armyworm control. The first area is potential to be spread, like the north Pacific. This is a far area but is quite possible, and then also south Europe. This is one area. The second area is the overwintering area. We've already studied that the fall armyworm maybe overwinters in some places. The strategy in the overwintering area is different from others. And the third area should be the migratory area. These three areas should have three different strategies. This is very important. I hope that all the research people will please pay attention to this. This is a very important global strategy, area-specified, original-specified strategy. This is the number one in my speech.

And for the second one, I would like to make a recommendation. Everybody knows that there are two types of fall armyworm. One is the corn type, and the other one is the rice type. What is my concern? Because nowadays people are saying, “Okay, this is corn type,” many in this continent. But remember that 80% of rice is produced in Asian countries, and 80% of the people live on rice there. If one day a fall armyworm adapts to rice, this will be disastrous. So, now, please study it. This is my second recommendation.

And the third recommendation is about natural enemies. We should study this. I have this experience. We already mentioned that there is one person from CIMMYT. Originally, the fall armyworm was in Latin America. I’m sure there are a lot of natural enemies under control. But now it spread to new areas. Why did it spread so fast? Because there are no natural enemies, or no natural controls. So in this case, I think at this time that we scientists study this. You should go to Latin America to study what real important natural enemies are. Even in this case, we should introduce it. Otherwise, we only depend on pesticides. That will be a disaster. That’s my third recommendation.

Another one is pesticide resistance. I know that small-scale farmers only rely on pesticide. Remember, pesticide resistance would be a lot of disasters. So I think this area is very important, and could use collaboration.

Thank you.

Dr. Masaya Matsumura:

Okay, thank you. Next, Dr. Kuhlmann. Please.

Dr. Ulrich Kuhlmann:

Okay. We are talking in particular about collaborative research. I would like to come back to the issue where of course the G20 countries have an incredible advantage in terms of conducting research and have processes and functions in place to deal with the incoming problems. As I was trying to mention already in my presentation, however, there is a huge disconnect between the G20 and developing countries. The developing countries have no processes or mechanisms, no capacity in place, to deal with these incoming problems. It is just an ad hoc mechanism. They find out they have another pest problem. So it is a task, I believe, in terms of collaborative research between the G20 and the developing countries, to share information as much as possible. When we have done certain activities in the G20 and have researched results, we must be able to share these kinds of information more quickly, more efficiently.

Of course, we also need to understand that adaptation to the local needs is urgently required. However, this kind of exchange is very, very important, in my opinion, going forward. And these are not only particular research areas; this is the entire area related to the prevention and containment and control of transboundary plant pests.

Dr. Masaya Matsumura:

Okay, thank you. Next, Dr. Otuka, please.

Dr. Akira Otuka:

Yes. I would like to talk about migration. We want to predict migration into Japan. We need information about the density and character of the insect, and the insect resistance information. These two kinds of information are very important.

But access to that information from foreign countries is a little bit difficult. I don’t like to blame China, I don’t intend to cast blame, but that information is very important for them, and not easy to freely disclose. Now, our approach is information on the Internet. Nowadays, many plant protection stations and provinces in China are disclosing occurrence information on the Internet, so we can access that information from Japan. That is a great help. International cooperation needs information sharing. I’d like to emphasize that -- information sharing.

Dr. Masaya Matsumura:

Okay, thank you. Next, Dr. Baudron, please.

Dr. Frédéric Baudron:

Yes. Thank you very much. I won't talk about what's happening upstream before quarantine, but rather how to manage a pest when it arrives, and especially the experience we have with fall armyworm.

I think we are probably too slow to provide information and research to farmers on how to manage this. I liked very much to hear the last speaker talk about big data. I think definitely sharing data and "FAMEWS" for example, for fall armyworm, led by FAO, is a great example. But I think we can do more, especially with perhaps ICT and science, making sure that farmers also… We take seriously the information uploaded by farmers. With ICT now it is really possible to gather much more information, much more data, and actually use a big data approach to much more quickly provide a solution.

And of course, capacity development is also very important. One of the roles I think of research and extension is to quickly build capacity in terms of identification of those new pests once they arrive, and how to deal with them. Thank you.

Dr. Masaya Matsumura:

Okay, thank you. Next, Dr. Godoy, please.

Dr. Claudia Vieira Godoy:

Just to give an example of collaborative research for Asian soybean rust introduced in Brazil. We had one researcher, Dr. Tadashi Yorinori and one breeder travel through Asia just to study all the PIs, the plant introductions, that had resistance. Embrapa started the breeding problem even before we had the disease in Brazil. In the background of the variety we had some resistance, which helped in the beginning, but the fungus overcame this kind of resistance. So this collaborative research is important to anticipate some new diseases that we are expecting in the country, especially ones as severe as Asian soybean rust.

So, when we can travel to other countries, have this collaboration, and have this kind of germplasm in our material, it is really good to work in advance, before the introduction of the new disease, as it happened in soybean rust.

Dr. Masaya Matsumura:

Okay, thank you. Next, Dr. Yokoi, please.

Dr. Yukio Yokoi:

Thank you. Your question is about the challenges and difficulties in collaboration.

Probably we have to start thinking the collaboration forward. I just listed up the collaboration in awareness-raising, monitoring and surveillance, diagnostics, controlled experiences, and probably innovative approaches. These five issues I have in mind for collaboration.

Awareness is already presented in the picture. But public awareness, plus probably awareness of the researchers, is also important. Traditionally, researchers in this field are looking at this transboundary pest issue as a mostly biological issue. But because of a lot of innovative approaches, such as those mentioned by the previous speakers, AI and IoT types of things, we probably need the awareness of engineering researchers, as well. Those collaborations between researchers over different areas would be really necessary in this situation. I think now Japan has started doing that kind of collaboration, among the different areas to do that.

Also about the monitoring and surveillance plus information-sharing, which was mentioned before, as Dr. Otuka mentioned very specifically, the information on occurrence from other countries is really not easy to get. This is the challenge part. They have a certain resistance to transparency, because of the political control they wish to keep. Maybe we need international collaboration to lessen that kind of hurdles, that part.

Also the innovative approach. I think many of us in this room have experiences with OK Google or Alexa. I'm just dreaming that whenever I say, "OK Google, what is the situation for fall armyworm," suddenly the display shows me red spots for the fall armyworm, that pest. This kind of technology is already available, but we haven't really developed how to use it. That is probably a kind of resistance to new technologies. Thank you.

Dr. Masaya Matsumura:

Thank you very much for your excellent, nice comments. Do you have any comment to the other panelists? No? Dr. Xia?

Dr. Jingyuan Xia:

In terms of research cooperation, I think it is important to exchange genetic materials. Like breeding for the fall armyworm, we need to breed a new variety, to TR4 of banana fusarium wilt and even soybean rust in Indonesia. We need genetic materials. Nowadays, so many modern varieties are very narrow for genetic bases. Later we should permit these genes. We need a very quick and efficient way to exchange germ plasms. By the way, previously we had some problem in exchanging genetic materials or germplasms. Now International Standards for Phytosanitary Measures 38, ISPM38, is allowed for exchange, for this kind of seeds and materials. This is now very important for research people to exchange this material. Thank you.

Dr. Masaya Matsumura:

Okay.

Dr. Akira Otuka:

May I? I talked about China and Japan. Due to the time limitation, your impression is negative on China. But I have many, many Chinese collaborator friends, and we drink with them so much. So personal communication and friendship is a basis for international cooperation. It is very important. I want to emphasize this one. Thank you.

Dr. Masaya Matsumura:

Okay. So, the time is almost... Any other comment or question? From the audience? If you have some comments.

Dr. Yukio Yokoi:

Thank you. I would like to share some information with everybody here. I was in another international meeting in the previous week, an international conference for environmental issues. There was a very strict conflict between developing countries and developed countries, something that I've never seen in the plant health community. I think this is a really promising area for collaboration. I was so surprised to see that conflict between those groups. I just would like to share that situation. Thank you.

Dr. Masayasu Kato:

Okay. Thank you. A question to Dr. Baudron. You showed us very good evidence of the factors that accelerate the fall armyworm, and what has a negative effect on the fall armyworm. But your research was only conducted at two sites. After that, how do you develop your recommendations to the other farmers?

Dr. Frédéric Baudron:

That's a good question. We had the same discussion with my colleague Victor, here.

Yes, indeed. It is really very localized, based on two sites and only two seasons. Hence my plea for big data. I think the FAMEWS, for example, is a huge contribution. All these databases are really important. For us researchers, it is really important to have some data sets that can talk to each other. So it is very important to have the same ontology about what we are measuring, what unit, etc., and to be able to report that.

I think we also need to find ways to collect data from farmers. As I said, some of our recommendations come a bit late, but farmers don't wait, and they try a lot of things. Sometimes it is dismissed by research, but there are farmers in Africa who are using sugar solution or fish soup to control fall armyworm. It was a bit dismissed, but it works very well to attract ants and control with the natural enemies of the fall armyworm.

Yes, we need to have data sets, databases, that can talk to each other and be much more agile in collecting data. With ICT, and now the development of smartphone -- every extension agent has a smartphone --it is really possible to collect a lot of data very quickly and pass it to research. I believe it is our role to be able to analyze this research and very quickly give some feedback about what works.

So I'm starting to collaborate with people, like working with FAMEWS. The idea is to try to use the same methodology with much larger data and to see if we have general patterns. Yes. But essentially, researchers need data to be able to do something at a larger scale and with many more seasons.

Dr. Masayasu Kato:

From now, the smartphone and social networks are very important tools for collecting data from local farmers. Dr. Kuhlmann showed us a program "Plantwise." The farmer can send image data to the platform of CABI. This kind of technology is very useful to get the information for the researchers and others, mainly the researchers.

When I visited Thailand, there were fall armyworm problems there. The Thai government wanted to collect information using Social media. So that was very impressive to me. Do you see possibility for the social media for transboundary pests and surveillance of the pests?

Dr. Ulrich Kuhlmann:

Yeah, indeed. The Plantwise program is also exploring opportunities to use these kinds of technologies more, though I have not talked about this in detail at all. In the process there, plant doctors have also been equipped with tablets. One of the fascinating developments, which we had not planned, was that they also immediately started to share photos among the plant doctors themselves. They started to have WhatsApp groups; they started to have Telegram groups, and supported themselves. That was actually what I found fascinating. It was not even our idea. That was a very good development. Of course, there are other means. However, I think we also need to be realistic from all viewpoints. Not in every country is this kind of technology still working. Right? We shouldn't be over-enthusiastic. We need to be realistic, and we should not assume that what is working in our country will work very well in a particular African country, for example.

Dr. Masaya Matsumura:

Okay, thank you. Sorry. It seems that we have spent all our time for the panel discussion. So I would like to close this session. I would like to thank all of you, the panelists and the speakers.

Thank you very much.

Closing Remarks

Osamu Koyama

Vice-President, JIRCAS

Distinguished guests, participants, colleagues, ladies and gentlemen, on behalf of the organizers, I would like to say a few concluding remarks to end this symposium.

This afternoon time was limited, but I personally believe that we have learned lots of comprehensive views on the role of research in tackling the issue of transboundary protection at the regional or international level.

We also learned that the mitigation of transboundary plant pests requires concerted, connected efforts and joint activities. These activities should involve information-sharing and quick exchange of information, for establishing networks to promote research and conduct research collaborations such as joint efforts and joint projects, and also for working with international bodies like IPCC, FAO, and the CGIAR centers.

We have also learned that we must raise awareness among the people. We are reminded of the importance of increasing awareness among all the relevant stakeholders, including researchers, and awareness on how protection is important in addressing global problems such as hunger, poverty, improvement of livelihood, and even environmental conservation. So I hope we learned various things, and that this symposium was successful.

I would like to take this moment to thank all our speakers, especially the keynote speakers, Dr. Jingyuan Xia, and Dr. Ulrich Kuhlmann, and all of the session speakers, for their excellent presentations, as well as the session chairpersons, and the moderators for summarizing the presentations and facilitating discussions. JIRCAS is also very grateful for the opportunity to have co-organized this symposium with the National Agriculture and Food Research Organization, NARO, Japan. I would like to offer a special word of gratitude to the Ministry of Agriculture, Forestry and Fisheries, MAFF, and to the Phytopathological Society of Japan, the Japanese Society of Applied Entomology and Zoology, the FAO Liaison Office in Japan, and the Japan Forum on International Agricultural Research for Sustainable Development, for their strong support.

Finally, thank you to all our symposium participants and to everyone involved in planning and holding this event. We are truly grateful for your valuable contribution and attendance.

Thank you very much and have a good evening.

Program

12:30-13:00	**Registration**

Opening

13:00-13:20	Opening Remarks: ***Masa Iwanaga*** — President, JIRCAS Welcome Remarks: ***Kazuhiko Shimada*** — Deputy Director General, Agriculture, Forestry and Fisheries Research Council Secretariat, MAFF

Keynote Speeches

Chairperson: ***Kazuo Nakashima*** — Program Director, Stable Agricultural Production, JIRCAS

13:20-13:50	Recent challenges in fighting against transboundary plant pests and the FAO strategies for helping farmers in dealing with those pests ***Jingyuan Xia*** — Secretary, International Plant Protection Convention Secretariat; IPPC
13:50-14:20	CABI's experiences of transboundary plant pest management: Strengthening plant health systems and the importance of advisory services ***Ulrich Kuhlmann*** — Executive Director, Global Operations, CABI

Session 1 "Important Transboundary Insect Pests"

Chairperson: ***Youichi Kobori*** — Senior Researcher, Crop, Livestock and Environment Division, JIRCAS

14:20-14:40	Migration analysis and forecasting of migratory insect pests ***Akira Otuka*** — Unit Leader, Institute of Agricultural Machinery, NARO
14:40-15:00	Development of insecticide application technology to rice planthoppers that are important transboundary plant pests in Asia ***Sachiyo Sanada-Morimura*** — Group Leader, Kyushu Okinawa Agricultural Research Center, NARO and ***Mizuki Matsukawa*** — Researcher, Crop, Livestock and Environment Division, JIRCAS
15:00-15:20	Fall armyworm damage in African smallholder maize fields and its impact on yield ***Frédéric Baudron*** — Principal Scientist, Sustainable Intensification Program, International Maize and Wheat Improvement Center: CIMMYT, Harare, Zimbabwe
15:20-15:45	**Photo Session, Coffee Break**

Session 2 “Important Migratory Diseases and Quarantine”

Chairperson: ***Yoshimichi Fukuta*** Senior Researcher, Tropical Agricultural Research Front, JIRCAS

15:45-16:05	International collaborative research networks for rice blast ***Yoshimichi Fukuta*** Senior Researcher, Tropical Agricultural Research Front, JIRCAS
16:05-16:25	Invasion of soybean rust and its management, from Brazilian experiences ***Claudia Vieira Godoy*** Researcher, Embrapa Soybean, Brazil
16:25-16:45	Plant quarantine and risk management ***Yukio Yokoi*** Director for WTO, International Affairs Department, MAFF, former Director of Research Division, Yokohama Plant Protection Station, MAFF

Panel Discussion

16:45-17:20	Moderator: ***Masayasu Kato*** Project Leader, Biological Resources and Post-harvest Division, JIRCAS and ***Masaya Matsumura*** Chief, Department of Research Promotion, Strategic Planning Headquarters, NARO

Closing

17:20-17:30	Closing Remarks: ***Osamu Koyama*** Vice-President, JIRCAS

<u>Abbreviations found in program</u>

JIRCAS: Japan International Research Center for Agricultural Sciences

MAFF: Ministry of Agriculture, Forestry and Fisheries

NARO: National Agriculture and Food Research Organization

SDGs: Sustainable Development Goals

Co-organized by:

National Agriculture and Food Research Organization (NARO)

In cooperation with:

Ministry of Agriculture, Forestry and Fisheries (MAFF)

The Phytopathological Society of Japan

The Japanese Society of Applied Entomology & Zoology

Liaison Office in Japan, Food and Agriculture Organization (FAO) of the United Nations

Japan Forum on International Agricultural Research for Sustainable Development (J-FARD)