



Food and Agriculture
Organization of the
United Nations

REPORT

WORKSHOP ON TRAINING OF TRAINERS ON PROTECTION AGAINST SOUTH AMERICAN LEAF BLIGHT (SALB) OF RUBBER IN THE ASIA-PACIFIC REGION

3 – 7 December 2018

KOTA KINABALU, SABAH, MALAYSIA



SUMMARY

South American leaf blight (SALB) is a devastating disease of rubber which currently found in the American Tropic with Mexico in the North and Brazil in the South. The disease has a high potential to establish in the Asia Pacific rubber growing countries due to the similar climate, increased in agricultural trade and advancement in intercontinental air transport. This workshop was held pursuant to the agreement in the 29th Session of the APPPC meeting in Bali, Indonesia to update the progress on the prevention of SALB incursion and discussed on the future action plan to strengthen the capacity building especially in mitigating SALB pathways of non-rubber agricultural products by utilizing international standard on pest free area of production.

This workshop was attended by 18 participants from 11 rubber producing countries in the Region namely Cambodia, China P.R., India, Indonesia, Lao PDR, Malaysia, Myanmar, Sri Lanka, Thailand, The Philippines and Viet Nam. In the welcoming remarks, Dr Piao Yongfan, Executive

Secretary of APPPC and Senior Plant Protection Officer, FAO RAP, highlighted sustainable support of the commission and FAO on prevention of introduction of SALB to the region in the past years. He informed that the APPPC has organized several workshops in relation to this disease and has published three (3) important documents to support capacity building of the NPPOs in preventing the incursion of this disease. In the opening session, Dr Piao Yongfan briefed the meeting on the FAO Regional Office for Asia and the Pacific initiatives on One Health (OH) framework to support biosecurity, biosafety, food security and environmental health in the region, and SALB is one of the projects that is in line with the OH initiatives.

Mr Ahmad Kamil Mohd Yunus, Director of Plant Biosecurity Division on behalf of Director General of Agriculture Malaysia, officiated the workshop, acknowledged the importance of rubber as an important economic industrial crop in Thailand, Indonesia, Viet Nam, China, Malaysia, Myanmar, and Cambodia. He also encouraged the participants to develop a collaborative network among the rubber growing countries in protecting the rubber industry from SALB in the Region.

The output of the workshop would enhance the capacity building in the protection of region from South American Leaf Blight (SALB) by establishment of core trainers on prevention of SALB in the rubber growing countries in APPPC Region. The trainers' expertise and knowledge on SALB and prevention of SALB will be enhanced and updated with the latest information of SALB by participation of the workshop. The SALB reference materials have been reviewed and consolidated by participation of the workshop. It is expected that the workshop will create networking among plant protection and rubber research personnel on the protection of SALB within the Region.

There were several recommendations by the workshop members in the future action plan discussion including training for plant quarantine and technical officers on identification and surveillance; encourage NPPO to publish materials in local language for public awareness; revise and update document related to *Microcyclus ulei*; and develop and improve protocol for diagnostic of SALB particularly in identification using molecular technique.

During the workshop, a special session on Fall Armyworm (FAW) enabled participants to be informed with update status and management approaches of FAW as well as FAO recommendations against FAW. Soft copy files of main reference materials have been provided to participants through distribution of flash disks.

1.0 INTRODUCTION

1.1 Background

The prevention of the introduction of the disease of rubber plants, South American Leaf Blight (SALB) for rubber remains as one of major concerns for those rubber growing countries of APPPC. APPPC is committed to support the prevention of introduction utilizing the various approaches. Pest Risk Analysis (PRA) on SALB was adopted at the 25th Session of the Asia and Pacific Plant Protection Commission (APPPC) in Beijing, China in 2007. The PRA on SALB and the regional standard on phytosanitary measures (RSPM) on SALB were developed and adopted at the 26th session of APPPC in September 2009 in New Delhi India. In November 2017, a hands-on training on the detection and diagnosis of SALB for Asia and Pacific NPPO experts was conducted in Bahia, Brazil. This training was held in collaboration with Michelin Plantation of Bahia Brazil, NPPO of Brazil, the Malaysia Rubber Board (MRB) and International Rubber Research and Development Board (IRRDB). This would improve the diagnostic SALB capabilities and enable the participants to train other NPPO officers in their respective countries.

The Workshop on Training of Trainers on Protection against SALB held in Sabah, Malaysia is expected to train other officers in rubber growing countries upon their return.

1.2 Objectives and expected outputs

- i) To train and establish core group and core trainers on SALB and prevention of SALB in the rubber growing countries in APPPC region;
- ii) To enhance the trainers' expertise and knowledge on SALB and prevention of SALB with the latest information;
- iii) To create networking among plant protection and rubber research personnel on the protection of SALB within the region;
- iv) To gather and update feedback on the latest information of SALB from Brazil's training, and
- v) To review, update and familiarize the trainers on the SALB reference materials and the measures to be taken when incursion happen based on the latest information.

The workshop expected the participants:

- i) To be able to conduct training on SALB to other officers in their respective countries;
- ii) To produce updated reference materials on SALB;
- iii) To be able to adapt and use reference materials according to the needs of each country; and
- iv) To be subject matter experts (SME) on SALB of each country;
- v) To convey information to the higher management level to conduct relevant SALB activities.

2.0 SESSION 1: OPENING CEREMONY

2.1 Welcoming remarks

Dr Piao Yongfan, Executive Secretary of Asia Pacific Plant Protection Commission (APPPC) welcomed the Director of Plant Biosecurity Division, Department of Agriculture Malaysia, Director of Sabah Rubber Board, participants and distinguished guests to the opening session of the Workshop. He acknowledged the support given by the Ministry of Agriculture and Agro-Based Industry and the Plant Biosecurity Division, Department of Agriculture Malaysia in hosting this workshop. He informed that this workshop was co-organized by Food and Agriculture Organization (FAO) and Department of Agriculture, Malaysia, through the APPPC, to ensure proper policy, regulation and mitigations are in place for the rubber growing countries in the Region to prevent and safeguard the incursion of SALB disease in the Region. He emphasized that the urgency to be prepared against any possible incursion of SALB, as international trading of agriculture products between the Region and the South and Central American countries is growing tremendously. He encouraged all natural rubber growing countries attended to this workshop to review, update the latest information and to create networking among plant protection and rubber research personnel on the protection of SALB within the Region. He also mentioned several available documents such as the PRA, RSPM and reference materials on SALB need to be referred, and those produced by any country in the Region to be shared among member countries in preventing the incursion of SALB disease.

2.2 Opening address

The Director of Plant Biosecurity Division, Department of Agriculture Malaysia, Mr. Ahmad Kamil bin Mohd Yunus, on behalf of the Director General of Agriculture, Department of Agriculture Malaysia officiated the opening of the *Workshop on Training of Trainers on SALB of Rubber in Asia and Pacific Region*. He extended his warmest welcome to distinguished FAO representative, researchers from Malaysian Rubber Board and participants to the workshop and thanked APPPC for choosing Malaysia to be the host of the Workshop and Department of Agriculture Sabah as the co-organizer. He informed that Malaysia has hosted several workshops regarding SALB since 2003 and showed strong commitment to resolve the issue of SALB in international trade within the Region and globally. He encouraged participation from all 11 countries in the Region namely People's Republic of China, Cambodia, Indonesia, Lao PDR, Malaysia, Myanmar, Philippines, Sri Lanka, Thailand and Viet Nam. He emphasized on the importance of rubber as an industrial crop in the Asia-Pacific Region that contributed up to 93% of the world natural rubber production. Thus, it is very critical and important to put in place the appropriate measures to protect this Region from the incursion of SALB or any devastating diseases. Mr. Ahmad Kamil also expressed his high expectation that, through this workshop, a strong network can be built among participants for exchanging information on SALB.

Mr. Ahmad Kamil informed that the last regional SALB workshop held in Malaysia was in October 2016. The workshop on “Mitigation of potential risk of SALB in the Region” had enabled participants to better understand aspects of rubber plantation production, the spread of SALB, the potential risk of introduction of SALB and possible facilitation of safe trade. In this workshop, the standard operation procedure (SOP) on SALB Pest Free Area was also drafted and discussed.

He encouraged the participants to fully utilize all the information on SALB and get in touch with the available technical experts on SALB related matters. He took the opportunity to congratulate the APPPC, the FAO Regional Office for Asia and the Pacific, and DOA Malaysia for co-organizing this important workshop. Lastly he wished all participants a fruitful workshop and a pleasant stay in Kota Kinabalu, Sabah.

3.0 SESSION 2: INTRODUCTION

Datin Jatih Aliah Timin, presented the purpose and scope of the workshop which consisted of the workshop’s objectives and the expected outputs. The purpose of the workshop was to enhance the capacity building on the protection of South American Leaf Blight (SALB) in the APPPC region. She also gave a short briefing on the SALB workshop programme which comprised of lectures, presentations of group report from the group breakout discussions and knowledge sharing sessions. Lectures on topics of biology, symptoms, management of SALB; other pests of rubber; and on diagnostic and detection of SALB pathogen were given.

Datin Jatih Aliah presented the updated activities of SALB working group which is led by Malaysia and the history of previous works on SALB. Six (6) workshops have been conducted since 2003 until 2016. Related publications were published through the workshops namely “Protection against South American leaf blight of rubber in Asia and the Pacific Region” Volume I and Volume II.

Report on training on South American Leaf Blight of rubber in Brazil 2017

Ms Lailatul Jumaiyah, presented the report of “Training of Trainers in Brazil”, a hands-on training programme which was held in October 2017 in Brazil. This training gave an opportunity to the participants to familiarize with the morphology, symptoms and biology of the SALB fungus, *Microcyclus ulei* and exposed them on the development of SALB detection using molecular techniques.

The objectives of the training were:

- i. To train the officers from Asia and Pacific Region on biology and management of SALB.
- ii. To update the information of latest research that has been done on SALB of rubber disease by experts and researchers in Brazil.
- iii. To come out with the future plan on the activities and programmes focusing on protection of rubber industry from SALB to the Asia and Pacific region.

- iv. To verify the draft diagnostic protocols for SALB detection that has been developed through ASEAN Expert Working Group of Phytosanitary (EWG-PS) of ASEAN with experts in Brazil.

The specific objectives were:

- i. To provide hands-on training on diagnostic of SALB so that the participants would be able to recognize and identify SALB symptoms and its pathogen including identification of pathogen using molecular techniques.
- ii. To ensure the availability of SALB diagnosticians in the rubber growing countries within the Asia and Pacific region.
- iii. To familiarize participants with biology SALB.
- iv. To train the trainers in their countries and the region.

The training was attended by 14 participants from 6 countries of the Asia and Pacific Region (China P.R., India, Malaysia, Philippines, Thailand and Singapore). The training was facilitated and assisted by SALB experts from Brazil's rubber and research agencies such as Plantações MICHELIN da Bahia Ltda., Universidade Federal de Vicosa, Cooperverde, Comissão Executiva do Plano da Lavoura Cacaueira (CEPLAC) and Centre de Coopération Internationale en Recherche Agronomique pour le Développement (French Agricultural Research Centre for International Development – CIRAD).

Suggestions and recommendations for future activities of SALB in the Region during the discussion session held with the SALB experts from Brazil were:

- i. To sustain the networking between the Asia and Pacific Region and the SALB endemic countries. This is to ensure the expertise and up-to-date information could be shared among them.
- ii. To identify the SALB experts and update the list of trained experts in Asia and Pacific Region.
- iii. To give the understanding on the invasiveness and danger of SALB to the Asia and Pacific Region and awareness to the policy makers and stakeholders.
- iv. To consider the real time communication for identification of the disease via remote diagnostic microscope.
- v. To consider on allocation of funding for postgraduate studies or long term training on SALB (either by APPPC or other multilateral/bilateral platform) with the advisory from SALB experts in Brazil.
- vi. To develop the diagnostic protocol via morphological and molecular techniques for quick and reliable identification and interception of SALB pathogen to ensure the prevention of SALB invasion in Asia and Pacific Region.

4.0 SESSION 3: BIOLOGY, SYMPTOMS AND MANAGEMENT OF SALB AND OTHER HEVEA PESTS

4.1 Subject 2: Biology of SALB and update on Nomenclature of SALB Pathogen

Ms. Chonticha Rakkrai presented a lecture on the biology of SALB and updates on nomenclature of SALB pathogen. The presentation covered the topic of taxonomic position, disease transmission, disease cycle and epidemiology.

4.2 Subject 3: Symptoms of South American Leaf Blight (SALB)

Ms. Chonticha Rakkrai presented the symptoms of SALB. The presenter discussed the symptoms of the disease to every plant part such as leaves, stems, inflorescent and fruits with the pictorial guide. SALB produces characteristic symptoms on young and mature rubber leaves. On young leaves, the initial symptoms are obvious about three days after infection. The characteristic symptoms are observed on the under surface of leaves on the trees about four to five days after infection. *M. ulei* also infects other young aerial parts of the rubber plants such as leaf petioles, flowers, inflorescent, fruits and stem. Trees severely infected are stunted, possess few leaves and dead branches and stem. Trees suffering from very severe prolonged infection by SALB are killed.

4.3 Subject 4: Management of SALB of rubber in Brazil

Ms. Amor C. Dimayacyac presented the strategies for SALB control in Brazil such as planting in escape area, using the genetically resistance cultivars, chemical control, cultural control using the crown grafting and biological control. The presenter concluded that Brazil is facing the challenge of producing rubber in a country where SALB exists. Planting of rubber trees in escape areas and the use of resistant clones in the humid areas have enabled competitive results. However, more investment in research is needed, especially in breeding and the formation of a research network which will contribute to better results in dealing with this disease problem.

4.4 Subject 5: Other important *Hevea* diseases, quarantine pests and other rubber diseases exotic to Asia

Dr Adam Malik, presented on important *Hevea* diseases, quarantine pests and other rubber diseases exotic to Asia. SALB was the most devastated *Hevea* leaf diseases caused by pathogen called *Microcyclus ulei*. The host species were *Hevea brasiliensis*, *Hevea benthamiana*, *Hevea camargoana*, *Hevea guianensis*, *Hevea pauciflora* and *Hevea rigidifolia*. The fungus caused leaf fall, dieback, stunted and delay the maturity. *M. ulei* is from the group of Ascomycetes and the fungus produces three types of spores; conidia, pycnidiospores and ascospores. The conidia are the most important propagules because of the large number being produced and their ability to survive prolonged periods. The potential entry of the SALB within ASEAN can be caused by various factors; Increased in trade and movement of tourists, businessmen and scientists between the American Tropics and the Asia Pacific countries can be possibly introduce SALB into the Region. The spores may be carried on by travellers, mail and non-*Hevea* planting materials, including dry specimens. Thus, to avoid the chances of entry, the ASEAN countries and the other members of the Asia and Pacific Region should prohibit the importation of plant materials from the South American Tropics with stringent sanitary and phytosanitary measures.

Disease of *Hevea* can be divided into four categories; root diseases, panel diseases, stem and branch diseases and leaf diseases. Most of the disease problems of rubber in Malaysia are caused by the indigenous fungal parasites. Major leaf diseases in Malaysia were *Oidium*, *Colletotrichum*, *Corynespora*, *Fusicoccum*, *Phytophthora* and *Pestalotiopsis* leaf fall.

5.0 SESSION 4: DIAGNOSTIC AND DETECTION OF *MICROCYCLUS ULEI*

5.1 Subject 6 : Diagnostic and detection of *Microcyclus ulei* (syn: *Pseudocercospora ulei*)

Ms Norhayati Madiha, presented on diagnostic and detection of *Microcyclus ulei*. *M.ulei* is in the group Ascomycetes and the fungus produces three types of spores; the conidia, the pycniospores and the ascospores. The conidia produced during asexual state of the disease while pycniospores and the ascospores are produced during the sexual state of fungus. The disease can be spread through wind, rain splash, insects and other animals.

The symptoms of SALB can be observed visually. The first visible symptom is the distortion in shape of the leaflets. The symptoms of SALB showed 2-3 days after inoculation. A few days later, irregular shaped disease lesions developed on the under surface of the young brown coloured leaflets. The leaflets turned black and dropped off. The petioles remain on the stem for several days before drop-off. The severity of infection can be measured by scale of stroma density as follows:

Scale	Stroma Density	Sporulation Intensity
0	Absence Of Stroma	absence of sporulation
1	1 To 5 Stromas/Leaflet	absence of sporulation (necrotic lesion)
2	6 To 15 Stromas / Leaflet	absence of sporulation (chlorotic lesion)
3	16 To 50 Stromas / Leaflet	partial sporulation limited to area of the lesion
4	More than 50 Stromas / Leaflet	partial sporulation on all the lesion

Identification of *M. ulei* can be done by mycological identification methods which are isolation, inoculation, incubation and microscopic observation of spores.

6.0 SESSION 5 and 6: GROUP BREAK UP SESSION

6.1 Group break up session: Discussion on available reference and training materials of SALB and surveillance training programmes/ awareness

Participants were divided into three (3) groups and facilitated by Dr Adam Malik Ahmad Zambri, Datin Jatil Aliah Timin, Ms Lailatul Jumaiyah Saleh Huddin and Ms Norhayati

Madiha. The first group discussed on updating of reference materials. The second group discussed on surveillance, training and awareness programme of SALB and group three compiled pictorial and images of symptoms and pathogens of SALB.

Group 1 suggested several recommendations for diagnostic protocols for identification of South American Leaf Blight (SALB).

Group 2 discussed on the module of the surveillance programme including the responsibilities of NPPO shall appoint a survey and monitoring officer who will be responsible for planning, conducting, monitoring and reporting result of the surveys. The person should provide detail document on sampling method and procedure based on their experience. This group also discussed on the type of survey including detection surveys and delimiting surveys. For laboratory detection, the group agreed to refer the ASEAN Diagnostic Protocol for Regulated Pests (*M. ulei*) and PCR method.

7.0 SESSION 7: FIELD VISIT

A field visit was made to Sabah Rubber Industry Board's Nursery located at Tuaran, Sabah. At the nursery, participants:

- i. Were briefed on the rubber nursery managements who had 150 acreages, involved clones of PB 350, PB 260, RRIM 2001, RRIM 2002, RRIM 2023, RRIM 2025 and RRIM 3001.
- ii. Visited the rubber plantation for clones RRIM 3001 and PB 350.
- iii. Were briefed on how diseases survey took place on major rubber disease in Malaysia.

8.0 SESSION 8 : KNOWLEDGE SHARING AND DISCUSSIONS

8.1 Knowledge sharing on surveillance programme

Representative from respective countries shared their experiences for surveillance activities related to rubber diseases.

Indonesia

Dr Tri Rapani Febbiyanti, presented the guidelines for plant quarantine surveillance to collect and record data about the presence or absence of pests through surveys, monitoring or other procedures. The objective was to detect pest for food crops, horticulture plants, plantation crops, forestry plants, and natural ecosystems. This guideline includes how to design specific surveys to build specimen-based quarantine pest lists, monitor status, determine scattered regional boundaries and determine the presence or absence of pest in certain areas, general surveillance and reporting.

India (see Special session on Fall Army Worm (FAW))

Malaysia

Dr. Adam Malik shared Malaysian Rubber Board experience on Nation-Wide *Hevea* Diseases Survey in Malaysia. He informed that the survey of leaf diseases was first initiated in 1948. The surveyor had to fill up questionnaire and send leaf samples for assessment. This procedure was carried out annually until 1973. From 1974 onwards, disease surveys have been improved. Trained research personnel visit selected sites and make in situ assessments on the severity of the diseases. The surveillance is carried out biannually which covers all plantation and small scale farm nationwide.

The surveys are carried out at 25% trees/plantation. Diseases surveyed are *Oidium* spp., *Colletotrichum* spp., *Corynespora* spp. and also other minor diseases/pest such as algae, *Fusicoccum* spp., *Phytophthora* spp., pink disease, root disease and mites. Detection of SALB is also included in the survey list. For any abnormality or suspected symptoms, the samples will be brought to the laboratory for further test.

Myanmar

Ms. Thanda Moe presented the rubber survey activities in Myanmar. The survey covered 656,924 ha of planted area in the whole country. The surveys were done by scoring a designated form. A list of rubber diseases detected in the rubber area was documented and the diseases found were:

- a. *Phytophthora* Leaf Fall
- b. Powdery Mildew
- c. *Corynespora* leaf fall disease
- d. *Colletotrichum* leaf fall disease
- e. Bird's eyes disease
- f. Pink disease
- g. White root disease

The data collections were later used as the reference points for control and management programme of rubber diseases in Myanmar.

Sri Lanka

Dr. Sarojini Fernando, presented protocol for surveillance of foliar diseases of rubber by Department of Agriculture Sri Lanka using *In Vivo* Screening Techniques that can be very effectively employed for SALB Screening. Bud wood Nursery Type of Experiment is applied to test clones in all major rubber growing areas. This experiment is to diagnose based on the lesions, reproductive characteristics, isolation and PCR. The screening under field conditions is done for mature field clearings to include all the clones to represent all the rubber growing areas. The diagnostic techniques use symptoms and reproductive morphology molecular testing.

Thailand

Ms. Chonticha presented the SALB surveillance programme which involves several agencies in Thailand. General surveillance activities include:

- a. collection of information from website or any online journal (such as CABI, IPPC and NPPO website).
- b. training on SALB for plant protection officers, plant quarantine officers, rubber research institute officers, universities and ACFS officers.

The survey activity is done at airport, sea port and rubber plantation. The diseases that were found through the survey are:

- a. White root disease
- b. Mouldy root
- c. Pink disease
- d. *Colletotrichum* spp. disease on secondary leaf fall
- e. *Oidium* spp. disease on secondary leaf fall

In conclusion from the survey, Thailand is still free from SALB of rubber. All other diseases found are common diseases found in Thailand and other neighbouring countries.

Viet Nam

Dr Minh Tu, presented surveillance programme in Viet Nam. In Viet Nam, several diseases on *Hevea* have been recorded such as *Colletotrichum*, *Corynespora*, *Phytophthora* and white root disease. The surveillance programme is carried out biannually in Viet Nam and used the ISPM 6 (Guidelines for surveillance) as a guideline. Currently, rubber areas in Viet Nam are more than 1 million hectares producing more 1 millions of latex in 2017. However, smallholders in Viet Nam prefer to plant coffee rather than rubber.

Special session on Fall Army Worm (FAW)

Dr. Piao Yongfan shared information on outbreaks of Fall Armyworm (*Spodoptera frugiperda*, FAW) and the activities related to control measures of the pest in different regions. FAW is a trans-boundary insect pest and native to tropical and subtropical regions of the America. They feed on young plants, kill the growing points resulting in no new leaves or cobs of the plants. They were first officially detected in Nigeria in January 2016. Then, it spread and reign across most of the continent, from one country to more than 40 countries. Now they can be found in 44 other African countries.

Scientists from the College of Agriculture at the University of Agricultural and Horticultural Sciences confirmed the arrival of the pest in maize fields within campus grounds in Shivamogga, in the state of Karnataka, southern India. Both morphological and molecular techniques confirmed the identity as FAW. Immediate actions were taken by Government of India through surveillance programmes all over the country to detect the pest.

Recommendations of FAW Control based on experience in Africa are:

- Develop immediate recommendations on FAW management (sharing main FAO findings and FAO FAW IPM Guide, with emphasis on effective low cost options for smallholders);
- Set up monitoring and early warning mechanisms (including a presentation of FAMEWS, and community based monitoring approaches);
- Intensify communication and training campaign (rural radio, print, extension, farmers' field school etc.);
- Review needs for specific policy and regulatory support (HHPs, fast tracking of bio-control agents);
- Identify short and mid-term research priorities based on findings to date;
- Coordination of FAW management in India (creation of national and state level task force, participation of Indian stakeholders in FAO Technical WGs etc.).

FAO also recommend the way forward-potential actions:

- Monitoring update status-spread of FAW
- Facilitation of information sharing
- Encouraging India/countries to use of FAW early warning system platform
- Provision of technical assistance upon request
- Training
 - TOT for monitoring FAW
 - TOT for IPM and bio-control of FAW
- Partnership
 - Sharing expertise and resources for FAW management and for FFS
 - Multi-lateral collaboration among regions
 - Donor support-funding

In addition, it is possible to find more information on FAW early warning system, an app developed by FAO to collect information on monitoring of FAW by field scouting and/or use of pheromone traps.

Dr. Patni from India presented India experience on outbreaks of a devastating pest – Fall Armyworm (FAW - *Spodoptera frugiperda*) and its detection survey. India is the first of Asia countries that has reported to be attacked by this polyphagous pest which has a wide host range, with over 80 plant species in 27 families. It shows a preference for the Poaceae and its preferred host plants are maize, millet, rice, sorghum, sugar cane, and wheat. This pest also attacks other non-graminaceous crops such as apple, cowpea, cotton etc.

Detection surveys were carried out with the collaboration of:

- Department of Agriculture Co-operation and Farmers Welfare
- Central Integrated Pest Management Centre, Bengaluru (DPPQ&S)
- Karnataka State Department of Agriculture
- National Bureau of Agricultural Insect Resources

- College of Agriculture, Hassan (UAS, Bangalore)
- College of Agriculture, Shivamoga (UAHS, Shivamoga)
- University of Agricultural Sciences Raichur

Massive survey and surveillance programmes were initiated by Government of India with all stakeholders in maize growing areas. FAW was reported in several areas of India such as Karnataka, Telangana, Andhra Pradesh, Odisha, Tamil Nadu, and Gujarat at different levels of infestation. The FAW in India is reported only in maize and not from any other crop. Results of the detection were used as the initial data for IPM programme for control and eradication of the pest.

9.0 RECOMMENDATION, CONCLUSION AND CLOSING

9.1 Workshop recommendations

Datin Jatih Aliah Timin presented the workshop recommendations as follows:

- i) Strengthening of networks in the Asia Pacific region with experts of SALB in related agencies include Michelin, CIRAD, CEPLAC or COOPERVERDE by collaboration on specific projects on SALB.
- ii) Updating the list of trained experts in Asia Pacific region and identifying the experts in who is dedicated in SALB work. All member countries should update list of SALB experts in their respective country and share the latest SALB information among stakeholders in the country and members within the region.
- iii) Each member countries should conduct surveillance programme in rubber plantation area and at entry points to maintain SALB free area. Surveillance programmes include:
 - General surveillance
 - Specific surveillance (detection survey, delimiting survey and monitoring survey)
- iv) Reference materials to conduct the survey should be distributed among member countries (refer to surveillance protocol or procedures for other *Hevea* diseases and ISPM No. 6 for General Surveillance Protocol). Member countries can combine surveillance protocol in Brazil with other surveillance protocol available in Asia Pacific region.
- v) Development of diagnostic protocol via morphological and molecular techniques. These methods are very crucial to ensure the prevention of SALB invasion in Asia Pacific region.
- vi) Awareness programme for policy makers and stakeholders. The understanding of the invasiveness and impact of SALB into Asia Pacific region is crucial.
- vii) Performance test on resistant clones in Brazil and introduce the clones in Asia Pacific region.
- viii) Sharing of SALB reference materials using many types of digital platforms such as social media (WhatsApp, Facebook etc).
- ix) Collaboration between NPPO member countries in order to confirm and identify SALB.
- x) All member countries should report and update any suspicious incidence of diseases and pest through National Reporting Organization (NRO) in respective countries.

9.2 Conclusion

The conclusion of the workshop was delivered by Dr. Piao Yongfan. He appreciated that Malaysia, as a host country, had organized this workshop excellently. It was a great experience for the participants who have been to Brazil to be able to share their experiences and knowledge with other members in this workshop. It is a good start for individual representative countries to be able to share many updated information on SALB. During the group discussions, the participants presented a comprehensive information on the reference materials and the information on training and awareness surveillance for SALB. He mentioned that this workshop was held to update information and to update the awareness programmes of SALB among APPPC's member countries. The workshop also discussed and deliberated on several issues pertaining to SALB such as pest status, surveillance of SALB and requirements of pest free area and pest free production sites. He hoped that all APPPC member countries will continue to improve and update their in-country capacity building on policy, awareness level and diagnostic of SALB.

Lastly, Dr. Piao suggested that all member countries should fully utilize the SALB blog and APPPC website to obtain more information on SALB, and they should continuously update their country information on SALB management in the APPPC website.

9.3 Closing remarks

The workshop was officially closed by Datuk Idrus Shafie, Director, Department of Agriculture Sabah. In his closing speech, he appreciated Dr Piao Yongfan, DOA Malaysia and DOA Sabah and team of Malaysia Rubber Board who have contributed to this excellent event. He congratulated all participants for their active participation in this workshop. He mentioned that this workshop was held to update information and progress of SALB related programmes, as well as to report on the status of rubber pest and disease surveillance in the Asia and Pacific Region of rubber growing countries and to develop future action plans at a regional level. The workshop also discussed and deliberated on several issues pertaining to SALB such as pest status, surveillance of SALB and requirements of pest free area and pest free production sites. He hoped that all APPPC member countries will continue updating their in-country capacity building on policy, awareness level and diagnostic of SALB. He finally officiated the closing of the workshop and wish all participants a safe journey home.

LIST OF PARTICIPANTS

Cambodia

Mr. Ho Chea

Technical Officer
Department Plant Protection
Sanitary and Phytosanitary of General
Directorate of Agriculture (GDA)
Cambodia

Mr. Mak Chanratana

Technical Officer
Department Plant Protection
Sanitary and Phytosanitary of General
Directorate of Agriculture (GDA)
Cambodia

People's Republic of China

Dr. Shi. Tao

Deputy Professor
Environment and Plant Protection Institute
(EPPI),
Chinese Academy of Tropical Agriculture
Sciences (CATAS)
No. 4 Xueyuan Rd, Longhua District
Hai kou City, Hainan Province, China

India

Dr. Chandrashekhhar Patni

Assistant Director (PP)
Directorate of Plant Protection, Quarantine
& Storage, Old CGO Complex, NH-IV, NIT
Faridabad, Haryana
India

Mr. Sabu Palathinal Idicula

Rubber Production Commissioner
Rubber Board Head Office
Keezhukunnu Kottayam
686 002 India

Indonesia

Ms. Masayun Eka Maylandari

Technical Officer
JI. Pemuda, No.64 Kav.
16-17 Rawamangun
Jakarta Timur, 13220
Indonesia

Ms. Dwi Sugipriatini

Supervisor
JI. Pemuda, No.64 Kav.
16-17 Rawamangun
Jakarta Timur, 13220
Indonesia

Lao, PDR

Ms. Pinkham Vongphachanh

Technical Officer
Sisavath Village, Chanthabouly District
Lao PDR

Mr. Thippachanh Thadasavanh

Technical Officer
Vangmao, Champhone
Savannakhet, Lao PDR

Malaysia

Ms. Sabariah Kamis

Deputy Director
Plant Biosecurity Division
Department of Agriculture Malaysia
Kuala Lumpur, Malaysia

Dr. Adam Malik Ahmad Zambri

Senior Research Officer
UPPB, Bahagian Kemajuan dan
Pengeluaran
Stesen Penyelidikan
Lembaga Getah Malaysia
Sg. Buloh, 47000, Selangor, Malaysia

Hons. Datin Jatil Aliah Timin

Deputy Director
Plant Biosecurity Division
Dept. of Agriculture Malaysia
Wisma Tani, Jalan Sultan Salahuddin
50632 Kuala Lumpur

Mr. Salahudin Maili

Research Officer
Agriculture Centre Tuaran
DOA Sabah
P.O. Box 03, 89207, Tuaran, Sabah
Malaysia

Ms. Evanni Poili

Principal Research Officer
Agriculture Centre Tuaran
DOA Sabah
P.O. Box 03, 89207, Tuaran, Sabah
Malaysia

Ms. Asmah Salowi

Agriculture Research Centre Semongoh
Batu 12, Jln Borneo Heights
93250 Kuching Sarawak, Malaysia

Ms. Lai Lee San

Agriculture Research Centre Semongoh
Batu 12, Jln Borneo Heights
93250 Kuching Sarawak, Malaysia

Myanmar

Ms. Mi Khin Htay Than

Staff Officer
Department of Agriculture
Myanmar

Ms. Thanda Moe

Deputy Staff Officer
Department of Agriculture
Myanmar

Philippines

Ms. Amor C. Dimayacyac

Supervising Agriculturist
National Plant Quarantine Services Division
Post Entry Quarantine Station
Los Banos, Laguna, Philippines

Dr. Lilia A. Portales

Senior Agriculturist
Department of Agriculture
Bureau of Plant Industry (BPI)
692 San Andres Street, Malate, Manila
Philippines

Sri Lanka

**Mr.A.W. Gaminie (Gaminie
Abeywickrama Widanagamage)**

Additional Director
Grain Legume and Oil Crops Research and
Development Centre
Angunakolapelessa, Sri Lanka

Dr. (Mrs.) T.H.P.S. Fernando

Principal Research Officer
Rubber Research Institute
Ministry of Plantation Industries
Sri Lanka

Thailand

Mrs. Natthaporn Uthaimongkol

Acting Expert in Plant Quarantine
Agricultural Regulatory Office
Department of Agriculture (DOA)
50 Phaholyothin Rd. Ladyao, Chatuchak
Bangkok 10900, Thailand

Ms. Chonticha Rakkrai

Senior Agriculture Research Specialist
Plant Protection Research and Development
Office (PPRDO)
Department of Agriculture (DOA)
50 Phaholyothin Road, Ladyao, Chatuchak
Bangkok 10900 , Thailand

Viet Nam

Dr. Duong Minh Tu

Director
Plant Quarantine Diagnostic Centre (PQDC)
Plant Protection Department (PPD)
Ministry of Agriculture and Rural
Development (MARD)
149, Ho Duc Di, Dong Da
Ha Noi, Viet Nam

IRRDB

Dr. Tri Febbiyanti

Plant Pathologist
Sembawa Research Centre, RRI Indonesia

FAO

Dr. Piao Yongfan

Senior Plant Protection Officer
Food and Agriculture Organization of the
United Nations
39 Phra Atit Road, Maliwan Mansion
Bangkok 10200, Thailand

OBSERVERS:

Mr. Ahmad Kamil Mohd. Yunus

Director
Plant Biosecurity Division
Dept. of Agriculture Malaysia
Wisma Tani, Jalan Sultan Salahuddin
50632 Kuala Lumpur, Malaysia

Ms. Julia Lamdin

Deputy Director (Research)
Department of Agriculture Sabah
Malaysia

Ms. Norhayati Madiha

Assistant Director
Plant Pathology Unit
Plant Biosecurity Division
Department of Agriculture Malaysia
Jalan Gallagher, 50480 Kuala Lumpur
Malaysia

Ms. Aini Rozaini Abu Bakar

Assistant Director
Plant Biosecurity Division
Dept. of Agriculture Malaysia
Wisma Tani, Jalan Sultan Salahuddin
50632 Kuala Lumpur, Malaysia

Ms. Izzah Syazana Za'bi

Assistant Director
Weeds, Nematode, Vertebrata and Molluscs
Unit
Plant Biosecurity Division
Department of Agriculture Malaysia
Jalan Gallagher, 50480 Kuala Lumpur
Malaysia

Mr. Aizat Shamin bin Noran

Research Officer
Bahagian Kemajuan Pengeluaran
Stesen Penyelidikan LGM
Lembaga Getah Malaysia
Sg. Buloh, 47000, Selangor, Malaysia

Mr. Mohd Adi Faiz Bin Ahmad Fauzi

Research officer
Production Development Division
Malaysian Rubber Board (MRB)
47000 Sungai Buloh, Selangor Malaysia

Dr. Murnita Binti Mohmad Mahyudin

Research officer
Production Development Division
Malaysian Rubber Board (MRB)
47000 Sungai Buloh, Selangor Malaysia

**Mr. Khairuddin Akmal Bin Mohamad
Kamal**

Research officer
Production Development Division
Malaysian Rubber Board (MRB)
47000 Sungai Buloh, Selangor Malaysia

SECRETARIAT:

Ms. Lailatul Jumaiyah Saleh Huddin

Principal Assistant Director
Plant Biosecurity Division

Department of Agriculture Malaysia
Jalan Gallagher, 50480 Kuala Lumpur
Malaysia

Mr. Joseph Fung

Agriculture Officer
Plant Biosecurity and Quarantine
Dept. of Agriculture Malaysia Sabah
Malaysia

Mr. Reinold Zachary Kouju

Agriculture Officer
Plant Biosecurity and Quarantine
Dept. of Agriculture Malaysia Sabah
Malaysia

Mr. Mohd. Nazri Mohd. Joha

Assistant Agriculture Officer
Plant Biosecurity Division
Department of Agriculture Malaysia
Jalan Gallagher, 50480 Kuala Lumpur
Malaysia

Mr. Muhammad Nur Hakiki Bin Miskam

Assistant Agriculture Officer
Plant Biosecurity Division
Department of Agriculture Malaysia
Jalan Gallagher, 50480 Kuala Lumpur
Malaysia

**WORKSHOP ON TRAINING OF TRAINERS ON PROTECTION AGAINST SOUTH
AMERICAN LEAF BLIGHT OF RUBBER IN THE ASIA-PACIFIC REGION
3-7 DECEMBER 2018, KOTA KINABALU SABAH, MALAYSIA**

Day 1		
Monday, 3 Dec 2018	SESSION 1: Opening ceremony	
	Time	
	Event	
	08:30-09:00	Registration
	09:00	Arrival of Director General, Department of Agriculture Malaysia
	09:10-09:20	Welcome Remarks by Executive Secretary Asia and The Pacific Plant Protection Commission (APPPC) - Dr. Piao Yongfan
	09:20-09:30	Opening Address by Director Plant Biosecurity Division, Department of Agriculture, Malaysia Hons. Mr Ahmad Kamil Mohd Yunus
	09:30-10:00	Group photography session
	10:00-10:30	Refreshments
	SESSION 2: Introduction	
	Time	Event
	10:30-10:45	Introduction of participants
	10:45 -11:30	Purpose and scope of workshop (<i>workshop objectives and expected output</i>) - Datin Jatil Aliah Timin
	11:30-12:00	Updates of SALB Working Group activities - Datin Jatil Aliah Timin, Malaysia (Working Group on SALB) - Datin Jatil Aliah Timin
	12:00-13:00	Subject 1: Report on training on South American Leaf Blight of rubber in Brazil 2017 - Ms. Lailatul Jumaiyah Saleh Huddin
13:00-14:00	Lunch	
SESSION 3: Biology, symptoms, management of SALB		
Time	Event	
14:00-14:30	Subject 2: Biology of SALB update on nomenclature of SALB pathogen - Ms. Chonticha Rakkrai	

14:30-15:30	Subject 3: Symptoms South American leaf blight: <ul style="list-style-type: none"> ▪ Different symptoms of SALB on different ages of leaves, and clones of rubber in the nurseries; aconidial and peritheci. ▪ Symptoms of disease in nursery, immature and mature plantings <ul style="list-style-type: none"> - Ms. Chonticha Rakkrai
15:30-16:30	Subject 4: Management of SALB of rubber in Brazil <ul style="list-style-type: none"> ▪ Current research activities and management strategies of SALB in Brazil <ul style="list-style-type: none"> - Ms. Amor C. Dimayacyac
16:30-17:00	Refreshments
19:00	Welcome dinner

Day 2											
Tuesday, 4 Dec 2018	SESSION 4: Other pests										
	<table border="1"> <thead> <tr> <th>Time</th> <th>Event</th> </tr> </thead> <tbody> <tr> <td>09:00-10:00</td> <td> Subject 5: Other important <i>Hevea</i> diseases <ul style="list-style-type: none"> ▪ Quarantine pests and diseases of <i>Hevea</i> and other rubber diseases exotic to Asia <ul style="list-style-type: none"> - Dr. Adam Malik Ahmad Zambri </td> </tr> <tr> <td>10:00-10:30</td> <td>Morning Tea</td> </tr> <tr> <td>10:30-12:30</td> <td> Subject 6: Detection of <i>M. ulei</i> <ul style="list-style-type: none"> • Observation of lesions (under the binocular microscopes) • Methods of culturing <i>M. ulei</i> and observation of laboratory cultures and spores (under the binocular microscopes). • Methods of Detection of <i>M. ulei</i> using molecular technique <ul style="list-style-type: none"> - Ms. Norhayati Madiha </td> </tr> <tr> <td>12:30-14:00</td> <td>Lunch</td> </tr> </tbody> </table>	Time	Event	09:00-10:00	Subject 5: Other important <i>Hevea</i> diseases <ul style="list-style-type: none"> ▪ Quarantine pests and diseases of <i>Hevea</i> and other rubber diseases exotic to Asia <ul style="list-style-type: none"> - Dr. Adam Malik Ahmad Zambri 	10:00-10:30	Morning Tea	10:30-12:30	Subject 6: Detection of <i>M. ulei</i> <ul style="list-style-type: none"> • Observation of lesions (under the binocular microscopes) • Methods of culturing <i>M. ulei</i> and observation of laboratory cultures and spores (under the binocular microscopes). • Methods of Detection of <i>M. ulei</i> using molecular technique <ul style="list-style-type: none"> - Ms. Norhayati Madiha 	12:30-14:00	Lunch
	Time	Event									
	09:00-10:00	Subject 5: Other important <i>Hevea</i> diseases <ul style="list-style-type: none"> ▪ Quarantine pests and diseases of <i>Hevea</i> and other rubber diseases exotic to Asia <ul style="list-style-type: none"> - Dr. Adam Malik Ahmad Zambri 									
	10:00-10:30	Morning Tea									
10:30-12:30	Subject 6: Detection of <i>M. ulei</i> <ul style="list-style-type: none"> • Observation of lesions (under the binocular microscopes) • Methods of culturing <i>M. ulei</i> and observation of laboratory cultures and spores (under the binocular microscopes). • Methods of Detection of <i>M. ulei</i> using molecular technique <ul style="list-style-type: none"> - Ms. Norhayati Madiha 										
12:30-14:00	Lunch										

SESSION 5: Breakup session	
Time	Event
14:00-15:00	<p>Group discussion on reference/training materials :</p> <p>Break up discussion on available reference and training materials of SALB (prepared in 2011 workshop)</p> <p style="padding-left: 40px;">- Datin Jatil Aliah Timin</p>
15:00-17:00	<p>Break up session on review and updating of</p> <p>a)Reference material and</p> <p>b)Training/Awareness programme</p> <p style="padding-left: 40px;">- (Facilitators: Ms Datin Jatil Aliah Timin, Dr. Adam Malik Ahmad Zambri and Ms Lailatul Jumaiyah)</p>
17:00-17:30	Refreshments

Day 3

Wednesday, 5 Dec 2018	SESSION 6: Continued break up session	
	Time	Event
	09:00-10:00	<p>Continue break-up session on review and updating of</p> <p>a)Reference material and</p> <p>b)Training/Awareness programme (country/regional)</p> <p style="padding-left: 40px;">- (Facilitators: Ms Datin Jatil Aliah Timin, Dr. Adam Malik Ahmad Zambri and Ms Lailatul Jumaiyah)</p>
	10:00-10:30	Refreshments
	10:30-13:00	Continued break up session
	13:00-14:00	Lunch
	14:00-17:00	<p>Group Presentation:</p> <p>Presentation on reviewed and updated</p> <p>a)Reference material</p> <p>b)Training/Awareness programme</p> <p style="padding-left: 40px;">- (Facilitators: Ms Datin Jatil Aliah Timin, Dr. Adam Malik Ahmad Zambri and Ms Lailatul Jumaiyah)</p>
17:00-17:30	Refreshments	

Day 4

Thursday,	SESSION 7: Field trip
------------------	------------------------------

6 Dec 2018	Time	Event
	08:00 -17:30	Field trip - DOA Sabah and Rubber Research Institute Malaysia
Day 5		
Friday, 7 Dec 2018	SESSION 8: Discussion and knowledge sharing on surveillance programme/pest outbreaks	
	Time	Event
	09:00-10:30	Discussion - (Facilitators: Dr. Piao Yongfan and Datin Jatil Aliah Timin)
	10:30-11:00	Refreshments
	11:00-12:30	Knowledge sharing on surveillance programme and pest outbreaks
	12:30-14:00	Lunch
	SESSION 9: Discussion/Conclusion and closing	
	14:30-15:30	Recommendations for future SALB programme - (Facilitators: Dr. Piao Yongfan and Datin Jatil Aliah Timin)
	15:30-16:30	Conclusion <i>Dr. Piao Yongfan and Datin Jatil Aliah Timin</i>
	16:30-17:00	Closing and presentation of certificates - Datuk Idrus Shafie, Director, Department of Agriculture Sabah
		Refreshments

@ FAO 2018