



# Regional Conference on Role of Soil and Plant Health Towards Achieving Sustainable Development Goals in Asia-Pacific



November 21-23, 2018 Bangkok, Thailand

## Summary and Recommendations



## Key Highlights of Inaugural Session



“Soils are fundamental to increase the food production and productivity. Soil health management is essential for sustainable agricultural production and women empowerment. Plant health is key to the sustainable intensification of agriculture. Deliberations are expected to bring out recommendations for the welfare of APR farmers”

HE Luck Wajananawat, Deputy Minister of Agriculture and Cooperatives, Thailand



“Adopt eco-friendly approaches to prevent crop losses to cope up with challenges of climate change ensuring food security in the region. Soil organic carbon, soil ecology and regional collaboration are important to achieve sustainable development”

Warawut Chootummatouch, Deputy Director General, DOA, Thailand



“This Regional Conference is very timely and important for the region’s sustainable production and livelihoods stabilising food security. I wish to congratulate APAARI for this initiative and best wishes for the conference”

HE Chen-Yuan Tung, Representative TECO, Thailand



“UN adopted the 17 SDGs and expected to end hunger, achieve food security, improved nutrition and promote sustainable agriculture by 2030. Enhance partnership mode in APR for CESRA; ASIS; SEALNET; and other activities planned under GSP”

Yuxin Tong, Associate Professional Officer, GSP Secretariat, FAO, Italy



“Approximately 33% of global soils are degraded, leaving agriculture vulnerable and food security at risk. Soils influence other resources like water, land, nutrients and biodiversity. Agriculture, consequently, soils are at the heart of the SDGs”

Louise Whiting, Senior Water Management Specialist, FAO, Thailand

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## Key Highlights of Inaugural Session



“For every 1% of crop losses saved, we can feed 25 million hungry people. Strengthening agri-food research and innovations is important for sustainable agricultural development. A regional platform for knowledge sharing is important”

Ravi K Khetarpal, Executive Secretary, APAARI, Thailand



“Emerging plant disease threats and transboundary movement need to be addressed. IPS contributed to plant health in its 72 years service. Services of IPS experts are offered for the benefit of APAARI member countries”

R N Pandey, Former President, Indian Phytopathological Society, India

### Background

#### Objectives

#### In the context of climate change address

- neglected soil and plant health
- diminishing soil biodiversity
- emerging crop pests

#### Harness agricultural productivity potential by

- providing a platform to identify regional priorities
- catalysing the global initiatives particularly of FAO
- Innovative ways of investment and explore new collaborations

Deteriorating soil health, emerging pests and development of nutritional disorders and other factors causing ecological imbalances cannot be dealt with in isolation. Environmental concerns include overuse of chemicals, climate change, poor field water management, inadequate and imbalanced nutrient use leading to physical, chemical and biological degradation. Stagnation or declined crop productivity and low input use efficiency are serious concerns. Agrochemical inputs adversely affect soils. Soil degradation is more severe in the subtropics and tropics. Land degradation issues are further complicated by the chronic poverty, political and social instability, and high rates of weathering. Annual potential costs globally due to spread of pests and pathogens are estimated at USD 540 billion. Emerging pests in the APR are important concerns. Phytosanitary capacity needs of the region are pest surveillance, inspection, pest reporting, diagnostics and use of phytosanitary treatments. Crop yield losses due to pests (~20 insects) and several diseases is between 20 and 40%. Studies on interaction of soil and plant health in the context of climate change are rather limited.

The Regional Conference focused on soil and plant health vis-a-vis climate change, ecological pest management, input supplies for soil and plant health, the role of soil and plant health in the value chain and related policy issues. The aim was to contribute to strengthen the national and regional initiatives. Creating awareness amongst the

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A total of 161 participants from different sectors comprising of Policy makers, Global subject matter experts, NARS, Donors, NGO, CGIAR centers and Private sector



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## Background

### Diversity of Participants in the Regional Conference

APAARI members	
South & West Asia	India, Nepal, Bangladesh, Bhutan, Sri Lanka, Iran
South East Asia	Philippines, Thailand, Malaysia, Lao PDR, Japan, Vietnam, Taiwan
Pacific	Fiji, Samoa, Papua New Guinea
IPS members : India, USA, Czech Republic, Oman	
Global subject matter experts : ICRISAT, IRRI, FAO, CIAT, World Vegetable, CABI	

stakeholders needs to be a part of knowledge management and knowledge sharing program. The Conference discussed on ways of developing a regional platform to catalyse the global initiatives through new collaborations, regional networks and projects. In this context issues are discussed through presentations of keynote addresses, country reports, scientific papers and a panel discussion.

## Technical Sessions

Key deliberations of 9 technical sessions, including inaugural and plenary are highlighted below

### Status of Soil Health in Asia-Pacific (Technical session—I)



Generic soil health issues are depletion of soil fertility, soil erosion, soil acidity, soil salinity, drought, water logging, zinc and boron deficiencies, phosphate fixation, compaction, nutrient leaching, low organic matter, soil and water pollution.

Country specific issues were also discussed; soil resource shrinking by 0.73%/ year (Bangladesh); organic agriculture land terracing and rain water harvesting technologies are priorities (Bhutan), 104.2 m ha degraded, heavy crop production losses annually and low soil organic carbon (SOC) < 0.5 % (India); decline in soil fertility, reduced labor availability and change in the climate are major issues (Nepal); landslides damage and nematode population increase (Sri Lanka); SOC in > 60% of soils is <1%, 6.8 m ha salinity (Iran); Mg insufficient in 67%, Ca excessive in 65% of paddy lands (Japan); iron toxicity and rice yield (Lao PDR); high acidity, Al and Fe toxicity (Malaysia); 457 million metric tons of soil loss per year (Philippines); low Ca, Mg, and S and Fe content in the toxic range (Vietnam); and land degradation due to water erosion -60% (Thailand); soil contamination, and pesticide residues,(Taiwan); and unsustainable cultivation resulting in nutrient mining, poor nutrient conservation and nutrient imbalances are issues (PNG).

## Technical Sessions

### Climate Change, Sustainability and Value Chain (Technical session—II)



Climate change leads to extreme weather events, snow, rains, cloud bursts, floods, wildfires, droughts, tropical storms, new and emerging pests and diseases outbreaks, loss of soil health, reduced agricultural productivity, loss of agricultural products, loss of biodiversity, green house

gases (GHGs) emission, increasing CO<sub>2</sub> levels, etc.. Multiple stress tolerant varieties development, seed policies and regional cooperation were discussed as way forward in combating climate change. Integration of Farm Field Schools with Guidelines on Soil and Nutrient Management and empowerment of farmers as Soil Health champions. Public-private partnership and people participation were discussed. Decision Support systems for Mainstreaming and Scaling up for Land Management and Asian Soil Partnership were reviewed. CABI Plantwise, beneficial microbial inoculants and bio-capsule technologies and value chain developed in target areas with case studies (China, New Zealand, Pakistan, India and Vietnam) were presented.

### Status of Plant Health in Asia-Pacific (Technical session—III)

Thrust areas for plant health are regional collaboration for strengthening GAP and safe food production; resistance breeding against pests; managing pest resistance, IPM research; strengthening of phytosanitary rules and regulations and management of new pests, invasive alien species, motivation and awareness-building. Research strategies are resistant varieties; Integrated disease/pest management; plant health extension, weekly climate-based advisory bulletin, Farmers field schools, chemical residue analysis labs, bio-pesticide factory etc.



Major crop pests Leucinodes, Helicoverpa, Spodoptera, Maruca (Bangladesh), Cnaphalocrosis, Magnaporthe, Aceria, Rhyncophorus, Exobasidium (Sri Lanka), Fusarium wilt and Abaca bunchy top virus (Philippines) root knot nematode and taro leaf blight, Banana bunchy top virus, black leaf streak, Rhinoceros, Brontispa, diamondback moth and large cabbage moth (Samoa) and their management strategies were reviewed. Biosecurity management of Meremia, Balloon vine, African Tulip, yellow-spined bamboo locust, tomato leaf miner, cassava green mite etc were also discussed. Plant health strategies of India, Nepal, Japan and Taiwan were also presented.

## Technical Sessions

### Knowledge Management, Outreach and Commercialization (Technical session—IV)



ICT travel from radio and TV to Facebook (1.47 billion daily active users worldwide), 'You Tube' (1.57 billion unique users watch 5 billion videos every day) and 'Linked In' (467 million registered to interact) indicates the speed and quantum of knowledge transfer potential. Virtual Reality Resolution

Facility, interoperable open access institutional repository and MOOCs for capacity development (58 million users) were also highlighted. 'APAARI- Knowledge Management Platform' to provide data, information and educational services was also discussed. Role of different pathology related societies in human resource development and the need to consolidate as a Federation was emphasised. 'Trichoderma bio-products' potential in Asia and its commercialisation in the development, refinement, spread and adoption of the new technology from a university was highlighted.

Thirty one posters were displayed in Technical Session (IV-B) and discussed on soil and plant health.



### Eco-friendly Approaches and Case Studies (Technical session—V & VII)



Trichoderma as biopesticide and to mitigate drought, Common Microbial Biotechnology Platform at CIAT, Vietnam, public-private partnerships and consumer-driven technology development by WVC as consortium partner of Association of International Research and Development Centers for Agriculture, host

plant resistance, bio-management of banana wilt, and tomato bacterial wilt, plant growth promoting rhizobacteria for crop improvement and phytomeidated recovery of soil health were discussed as potential eco-friendly approaches for sustainable agricultural systems and landscapes.

Potential danger of wheat blast and wheat streak mosaic virus, Cotton leaf curl begomovirus complex, banded leaf and sheath blight of maize, Alternaria on litchi and gerbera, black rot of cabbage, pomegranate bacterial blight, bio-inoculants and endophytic fungi for disease management, rhizobia growth, enriched spent mushroom substrate and use of ICTs were presented and discussed as case studies.



## Technical Sessions

### Quarantine, Diagnosis, Taxonomy and Biodiversity (Technical session—VI)



Citrus Greening Disease mainly diagnosed through symptom expression, biological indexing and different PCR- based molecular diagnostic tools and certified disease-free planting material supply is standardised, novel approaches for detection of banana viruses (Banana bunchy top, Banana streak virus, Banana bract mosaic



and Cucumber mosaic viruses) and virus indexed (ELISA and PCR) disease free tissue culture banana seedling production is standardised and need for establishment of a Asia-Pacific Diagnostic Network for plant viruses emphasised. Other presentations include minimising risk of introduction of exotic pathogens through plant genetic resources, fungi of Meghalaya, India, viruses associated with orchids in Sikkim and Darjeeling Hills, India and diagnostics are highly useful for the production of virus-free orchid planting material, genomic features of an Indian isolate of rice false smut, importance of fungal endophytes, phylogenetic and taxonomic re-evaluation and DNA Barcoding of 'Bipolaris - Curvularia - Cochliobolus' Complex, mycorrhizal diversity and profiling of Magnaporthe oryzae isolates and validation on monogenic lines.

### Plant Health Management – Research Trends (Technical session—VIII)



Management (fertilisers, herbicides, micronutrients and carbendazim) practices of *B. cinerea* on rose were studied and found that some of them reduced the fungal growth. The treatment of *Trichoderma* in *Monarda citriodora* and *Tagetes minuta* was found beneficial to increase fresh herb yield of medicinal and



aromatic plants. The severity of diseases (necrosis virus and *alternaria*) on sunflower can be predicted by modelling one/two weeks prior to their incidence. The seed treatment schedule with imidacloprid and Hexaconazole was superior for the management of wheat rust and insect pests (termites and aphids). Effective endophytes against soil-borne diseases in the groundnut were identified. Application of indigenous AMF along with efficient bio-inoculant increases the overall growth and yield performance of aromatic black rice. Seed treatments with biocontrol agents showed-reduction in major soybean soil borne pathogens. Other research trends include biosynthesis of antifungal silver nanoparticles and plant latex extracts. Facts and figures of 17 SDGs and action plan to achieve the goals were presented.

## Technical Sessions

### Panel Discussion on Policy and Capacity Development on Soil and Plant Health (Technical session—IX)



Issues on soil health and plant health for policy and capacity development needs in plant biosecurity in the Asia Pacific were flagged. FAO initiatives on soil health management that included seven core actions and ten guidelines for soil health promotion were discussed to

addressing global challenges, and meeting international commitments, including the 2030 Agenda for Sustainable Development, where Soil Health could directly or indirectly contribute to achieving several of the agreed goals. Socio-economic consideration such as variable farm management practice and policy or program influencing the producers need to be looked into for soil and plant health management and integration of knowledge and policies is important. Various soil health-related issues in Thailand including stagnation of average yield of major economic crops for the last 10 years were presented and insufficient number of soil scientists was felt. Need for strengthening studies on biodiversity and taxonomy of microbes was emphasised. Importance of biopesticides for plant health in India was assessed. APAARI initiative for developing partnerships in Agroecology in higher education institutes was emphasised.

## Recommendations (Plenary session)

Based on 4 keynote addresses, country reports (14 each on soil and plant health), 62 paper presentations, 12 panelists views and 31 posters etc. following key recommendations emerged

### Priority Research Areas for Soil and Plant Health

- ❖ Soil health restoration management to cope with climate change.
- ❖ Soil health research focus on chemical residue.
- ❖ Safe pesticide management using biological and nano technology.
- ❖ Strengthen research on soil microbial diversity and soil structure.
- ❖ C-sequestration as adaptation and mitigation strategy to climate change.
- ❖ New bio-fertilizers know-how, UAV, Satellite technology Data analytics and AI.

## Recommendations

- ❖ More attention for restoration of soil health for sustainable agriculture in APR.
- ❖ Enhanced research on plant growth-promoting microorganisms with biotechnology & molecular biology.
- ❖ Innovations in bio-fertilizers, bio-pesticides and integrated pest management and bio-prospecting.
- ❖ Combining of biological and chemical pesticides in consortia for enhanced efficiency of pest management Regional collaborations for disease resistance breeding against pests and diseases relevant to the region.
- ❖ Alternatives to traditional phytosanitary treatments and biosecurity aspects of the region.
- ❖ Cost-effective diagnostics for races/pathotypes, ICT for early warning and pest-risk analysis.

## Capacity Development

- ❖ Enhancing the scientific capacities in the field of microbial technology for sustainable soil health.
- ❖ Farmers empowerment through capacity building and customization of technological packages.
- ❖ Integrating Farmer Field Schools with focus on agronomic and ecological factors.
- ❖ Building capacity of small-holder farmers on the practice of sustainable soil management (SSM).
- ❖ Encouraging good practices and integrated communication technologies in soil health management.
- ❖ Establishing good linkages between education and extension for accurate soil data, information.
- ❖ Introducing the importance of soil resource and its care in the text books at schools and extending it to more professional levels.
- ❖ MOOCs and other ICT modules to be developed in regional languages; Create partnerships for knowledge dissemination; Creation of New Knowledge Management APAARI Platform.
- ❖ Village level soil health CoE of soil management research and human resource development.
- ❖ Regional capacity building in the field of biosecurity and biosafety.

## Recommendations

### Technical Infrastructure Development

- ❖ Establish soil health, soil testing laboratories, especially at local level.
- ❖ Centralized infrastructure for soil & water analysis, plant tissue testing with new tools and techniques.
- ❖ Up gradation of selected labs with strong monitoring mechanism with a public-private partnership.
- ❖ Plant health clinic and disease diagnosis laboratories should facilitate issuance of sanitary & phytosanitary certificate for export and trade of agricultural commodities.
- ❖ Technology business incubators which act as innovation centres to be developed.
- ❖ Investment in research needs to be linked with national agriculture plan, which will require soil and plant health plans and clear business models.
- ❖ Demand-driven support for infrastructure development is required. Bionexus may be created wherein institutes allow use of their facilities by any agency for sharing purposes, through collaborations.
- ❖ Mechanisms for investment in research product development and marketing emerged for developing agri- inputs improving soil and plant health, including PPP model need to be developed.

### Public Awareness

- ❖ Increasing public awareness on soil's and plant health socio-economic aspects, and approaching demand -driven water management.
- ❖ Public communication/education with budgetary provisions is essential to create awareness about ill effects of soil pollution on environmental quality and food safety.
- ❖ Farmers should be trained to use Good Agricultural Practice in crop production through demonstrations and farm certifications to overcome harmful effect of chemicals.
- ❖ Farmers should be trained and empowered for mass production and use of biofertilizers, biopesticides, bioagents for sustainable and eco-friendly management of pests.
- ❖ Farming community to be made aware of soil erosion, soil degradation, and benefits of soil health improvement through action learning tools.

## Recommendations

- ❖ Educate the farmers on harmful effects of injudicious use of chemical pesticides which effects negatively to people health as well as export of the agricultural commodities.
- ❖ Facilitate awareness on policies and educate on soil contamination with heavy metals, technology usage for better soil health and plant health.

## Policy Advocacy

- ❖ Strengthen national soil information systems for solid monitoring capacities of soil conditions.
- ❖ Plant Quarantine legislation and amendment on regular basis be documented for strict compliance.
- ❖ Upscaling of biocontrol agents and bio-pesticides and modifying as per local needs including capsule technologies involving youth as entrepreneurs.
- ❖ Review guidelines particularly for bio-agents registration, commercialization of microbial technology.
- ❖ Sharing of innovations and success stories which helps in agricultural productivity enhancement and upscaling of prioritised technologies.
- ❖ Regional cooperation for pre-export inspection of commodities for objectionable pest be strengthened by enacting law.
- ❖ Law for manufacturing and selling of spurious pesticides should be strengthened and enacted strictly as punishable offence.
- ❖ International financial institutions should be encouraged by policy advocacy for improved investments on soil and plant health.

## Possible Partnerships

- ❖ Establishing GLOBAL SOIL PARTNERSHIP as a mechanism to develop a strong interactive partnership, enhanced collaboration and synergy of efforts between all stakeholders, soil institutions..
- ❖ Build partnerships and networking of groups and institutions to work on select key issues, deliverables and budget in soil and plant health for South-South Cooperation.

## Recommendations

- ❖ Models of effective Public- Private Partnership (PPP) may be adopted for small and marginal farmers focusing on advanced technologies at affordable costs.
- ❖ Partnerships should be promoted to use latest tools of biotechnology for enhancing conservation and capacities of bio-resources for sustainable use.
- ❖ Mechanisms to facilitate sharing of experiences and lessons learnt on PPP, commercialization of microbial biotechnology of soil and plant health and innovations including licensing, Intellectual Property Rights issues, royalties.
- ❖ Develop a Regional Knowledge Platform on Soil and Plant Health by FAO in association with APAARI to access and share the new knowledge and technologies within and outside the region.
- ❖ Build partnership and networking for enhancing soil biodiversity and implementation of activities of International Network of Soil Information Institutions to combat food insecurity and malnutrition

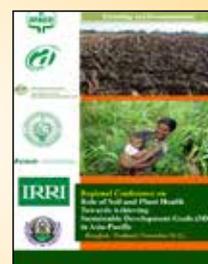
## APAARI Action Points

- ❖ Facilitate creation of Regional Soil and Plant Health Knowledge Platform with FAO/ other international bodies for taking up the following activities:
  - Bring awareness on the issue of crop residue management technologies to avoid burning that causes soil and environmental pollution.
  - Develop focused capacity building modules and policy briefs and facilitate collaborative projects on different aspects of soil and health management directed to all levels of stakeholders including policy makers.
  - Facilitate workshops/meetings to promote partnerships/networks with the private sector and related to international funding opportunities for promoting soil and plant health.
  - Facilitate studies on impact assessment of successful technologies on soil health and document the same to promote the use of those technologies that contribute to achieve SDGs in the APR.
  - Facilitate regional linkages with the Centre of Excellence for Soil Research in Asia (CESRA).

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**Detailed proceedings  
brought out  
separately**



***Publisher & for Further Information***

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