Organized by: Association of Agricultural Technology in Southeast Asia (AATSEA)
China Songyang County Government
China Jiangsu CAS Asian Agricultural Bio Engineering Co. Ltd.
Co-operation by: Bureau of Agriculture and Rural Affairs of Songyang County,P.R.C.

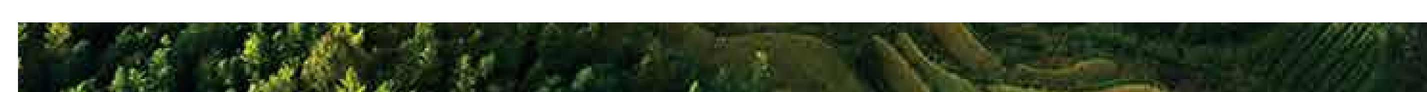
主办单位：东南亚农业技术协会（AATSEA）
松阳县人民政府
江苏中科亚农生物工程有限公司
承办单位：松阳县农业农村局

AATSEA

江苏中科亚农生物工程有限公司
CAS ASIAN AGRICUL TURE

May 11-15, 2019
Songyang, Zhejiang, P.R.China

CHINA SONGYANG MODERN ORGANIC AGRICULTURE FORUM



AATSEA

江苏中科亚农
生物工程有限公司

China Songyang Modern Organic Agriculture Forum

Songyang, Zhejiang, P.R.China
May 11-15, 2019

INVITATION

The Association of Agricultural Technology in Southeast Asia (AATSEA) in co-operation with and full support of Songyang local government and CAS Asian Agriculture and Bio-engineering, Wuxi, Jiangsu will be organizing Songyang Zhejiang International Modern Organic Agriculture Forum on 11-15 May 2019. The aim of forum is to promote organic agriculture production, organic food processing, marketing of healthy foods including advanced research in organic agriculture, biological products as agricultural inputs.

I am looking forward to see you in China.

Yours sincerely.

Kasem Soytong
President of AATSEA

王书记
前言版面

王书记
前言版面

CHINA SONGYANG MODERN ORGANIC AGRICULTURE FORUM

FORWORD

It is the first international conference on organic agriculture that Association of Agriculture Technology in Southeast Asia organizes in co-operation with Songyang County People's Government and CAS Asian Agriculture and Bio-engineering, Wuxi. The Organizing Committee welcome all participants to China Songyang Modern Organic Agriculture Forum held in Songyang, Zhejiang Province, P.R.C. China during May11-15, 2019. We will provide the opportunity to discuss the recent advances and progress development in organic agriculture with the theme "Organic Agriculture, Safety Life and Protecting the Environment". The theme of the conference is aptly chosen to address the current needs for academic research and farm demands for further development of organic agriculture.

Clean food and environment are needed to build up the sustainable development of human being. Organic agriculture can be the smartest and the most effective way to get healthy food and achieve ecological balance in ecosystem. As being a resource of knowledge, AATSEA realizes that it is responsibility to serve the community by providing education, research and development in organic agriculture. Accordingly, this conference is targeted to initiate an international network among academic members, researchers, scientists and interested people in organic agriculture and organic life. It is aimed to a venue for knowledge exchange and discussion among those seeking for new vision and insight in all topics related to organic agriculture.

There will be 35 speakers and 35 presentations and attendants all together is about 200 participants who come from 20 countries. Academicians, researchers, policy makers as well as extension experts contributed their expertise, experience and research results to this conference. May the book of this conference provide useful information and serve as references for those who are interested in organic agriculture and organic life.

Editors

FORWORD

The Association of Agricultural Technology in Southeast Asia (AATSEA) in co-operation with and full support of Songyang local government and CAS Asian Agriculture Bio Engineering, Wuxi, Jiangsu, China is organized China Songyang International Modern Organic Agriculture Forum on 11-15 May 2019. The aim of forum is to promote organic agriculture production, organic food processing, marketing of healthy foods including advanced research in organic agriculture, biological products as agricultural inputs.

The harzardous agrochemicals are encountering much seriously to kill the living organisms in our earth, facing environmental changed. How to stop the use of agrochemicals are still doubtful by many people. How to produce enough food to serve the increased world population without agrochemicals ? Agriculture is done without synthetic agrochemicals namely ORGANIC AGRICULTURE need some know how to complete the production with quantity and quality.

This international forum also aims to brainstorm the current the knowledge and innovations on organic agriculture or non-agrochemicals in agriculture, establish the knowledge gaps, information, practical technologies and to share experienced knowledge of organic agriculture from production to marketing as well as organic certification.

We have invited the famous scientists and organic experts come to share experience in this conference from 20 countries eg. China, Botswana, Bangladesh, Cambodia, Egypt, Finland, India, Indonesia, Iran, Japan, Laos, Myanmar, Nigeria, Philippines, Russia, Sri Lanka, Syria, Thailand, Turkey, Vietnam.

I would be acknowledged and thanks to all committees, members, organizers and all participants to make our conference completely and special congratulates to all invited lecturers to receive Award of Excellence in this conference who deserve individual to contribute their experience with sacrifice work to the world society.

I deserve to thanks the International and local organizing committee, help to make this conference perfectly success.

Wishing all of you will have a wonderful time in China.
Thank you very much for your coming with sincerely heart and attention.

Kasem Soytong
President of AATSEA

CHINA SONGYANG
MODERN ORGANIC AGRICULTURE FORUM

SONGYANG, ZHEJIANG, P.R.CHINA
MAY 11-15, 2019

ORGANIZED BY
ASSOCIATION OF AGRICULTURAL TECHNOLOGY IN SOUTHEAST ASIA (AATSEA); SONGYANG LOCAL GOVERNMENT, ZHEJIANG, CHINA; CAS ASIAN AGRICULTURE BIO ENGINEERING, CHINA.

INTRODUCTION

Crop production is done to produce food for human beings. It was done continuously without using agrochemicals from generation to genearation for thousands of years. In the early part of the 19th century, however, cheap and rapid response agrochemical inputs – highly soluble synthetic fertilizer, and chemical pesticides for pest eradication were introduced. Dubbed as "Modern agriculture", agrichemicals are used both for crop and animal production to increase yield in short period of time. Thereafter, the side effects such as unbalanced agroecosystems and environmental pollution; cultivated soils becoming compact, acidic, low soil organic matter content, and almost extinct beneficial living organisms (P-solubilizing/N-fixing bacteria, actinomycetes, earthworms), and toxic residues passing through the food chain and finally affecting human health.

Organic agriculture had been defined! But many definitions and explanations are unclear. Others anchor their definition on agroecosytems management to enhance and stimulate the agroecosystem including biological diversity. This may be accomplished by using agronomic, biological, and mechanical methods. In the current context, AATSEA defines organic agriculture as an agricultural imperative that is NOT using synthetic chemical agricultural inputs, relying on practical management to maintain soil fertility, prevent diseases and insect pests without synthetic agrochemicals application.

In brief, AATSEA definition is based on our experiences in organic agriculture as strictly non-agrochemical application for crop and animal production in the farms. The agricultural inputs are biological products for organic agriculture that are results of well tested-research works and applied in organic farms eg. biofertilizers, and biopesticides. Other cultural practices are combined for organic production which include crop rotation, compost production, medicinal plants or herbs for diseases and insect pest protection. The natural inorganic substance without synthetic chemical process to be finished are allowed but genitically modified organism (GMO) are to be excluded. AATSEA is mostly concerned on environmental preservation, regeneration, achieving ecological balance in agro-ecosystem and sustainable development in both rural and urban interfaces.

Agrochemicals have been used for agricultural production in over 100 years. Farmers were using agrochemicals for crop cultivation year by year. The toxic chemicals residue in agricultural products had caused human diseases e.g. heart, high blood pressure and cancer etc. Beginning in early 20th century, organic farmimg had been realized to be practical crop and animal production but without toxic agrochemnical applications. The International Federation of Organic Agriculture (IFOAM) was established in 1972 and organic agriculture is now internationally recognized and regulated by many countries. It is important to re- educate farmers, scientists, civil society organization (CSO), the academe, R&D (public/private) institutions to learn non-chemical agriculture e.g. green manure, composted manure, bone meal, crop rotation , mixed cropping systems, biological pest control, use of insect pedators, and natural substances. And organic agriculture production methods do not use synthesized chemical fertilizers, chemical pesticides, and genetically modified organisms. It aims to unburden agricultural farming families especially women who take charge on cooking and making food available on the table, empowers the farmers by allowing them own the agriculture value chain while protecting the environment ,conserving/protecting biodiversity and making food safe and nutritious, thus, envigorating human health.

OBJECTIVES OF THE FORUM

Hence, this international forum aims to brainstorm the current knowledge and innovations on organic agriculture or non-agrochemicals in agriculture; establish the knowledge gaps, information, systems/practices, practical technologies; and to share experiences, knowledge of organic agriculture from production to marketing as well as organic certification.

INVITED PARTICIPANTS

Scientists, Agricultural Technicians, Organic farmers, people involved in the business of organic agriculture.
Interested participants can attend by free registration including food and coffee break but they must pay for air tickets and hotel room.
Please contact to: CAS Email: zhaoyijoy@163.com casyano@163.com

SCHEDULE OF ACTIVITIES

February 2019	Project approval and nomination of organizing committee
March 2019	Scientific program, invitation, book of abstracts
April 2019	Hotel accommodation, conference venue, food and tea break, transportation
11 May 2019	Arrivals in Songyang
12-13 May 2019	Conference days
14 May 2019	Brainstorm for organic agriculture model, Study tour
15 May 2019	Departure

INTERNATIONAL COMMITTEE

Chairman:
Dr. Kasem Soytong (President of AATSEA)

Vice Chairman:
Prof. Timo Korpela (Finland)
Prof. Dr. Fucheng Lin, Zhejiang University (China)

Committee:
Prof. Dr. Devarajan Thangaduri (India)
Prof. Dr. Teodoro C. Mendoza (Philippines)
Mr. Boun-Oum Douangphrachan (Laos)
Prof. Dr. Danesh, Y.R. (Iran)
Prof. Dr. Hiroyuki Konuma (Japan)
Prof. Dr. John C. Moreki (Botswana)
Dr. Samantha C. Karunarathna (Sri Lanka)
Prof. Dr. Thanuku Samuel Sampath Kumar Patro (India)
Prof. Dr. Younes Rezaee Danesh (Iran)
Prof. Dr. Okigbo Raphael (Nigeria)
Dr. Laitha Ravikumar (India)
Prof Dr Wafaa Haggag (Egypt)
Dr Hoang ND Pham (Vietnam)
Prof Dr MD Asaduzzaman Sarker (Bangladesh)
Prof Jin-Cheol Kim (South Korea)
Prof Dr Nanik Setyowati (Indonesia)

INTERNATIONAL COMMITTEE

General Secretariat: Joy Zhao (CAS)
Vice-general Secretariat: Dr. Jiaojiao Song (CAS)

Advisory Committee:
Chair: Dr. Kasem Soytong (President of AATSEA)
Vice-Chair: Master of ceremonies: Cheng Kaijun (Songyang local Goverment); Dr. Jiaojiao Song (CAS)

Songyang local government responsibility
Registration and list of participants: Xu Chunyan
Financial management: Wu Weimin
Ticket reservation and transportation: Xu Chunyan
Conference venue and decoration: Cheng Kaijun
Food & Coffee break, reception: Xu Chunyan
Documentation - Photograph & Video record: Li linchao
Audiovisual aid: Cheng Kaijun
Entertainment & IT: Cheng Kaijun
Reception, Hotel reservation and transportation: Xu Chunyan
Sourvenirs: Cheng Kaijun

CAS reponsibility
Communications: Dr. Kasem Soytong , Joy Zhao (CAS)
Professors ' title of presentation: Dr. Kasem Soytong
Scientific program: CAS , Dr. Kasem Soytong
Invitation letters: Joy Zhao (CAS)
Plaques Awards: Joy Zhao (CAS) and others
Book of Abstracts: CAS (Dr. Jiaojiao Song, Dr. Kasem Soytong)
Certificate: Joy Zhao (CAS) and Dr. Jiaojiao Song (CAS)
Conference management: CAS
Art work:

CHINA SONGYANG
MODERN ORGANIC AGRICULTURE FORUM

SONGYANG, ZHEJIANG, P.R.CHINA
MAY 11-15, 2019

PROGRAM

11 MAY, 2019 12:00 REGISTRATION AND VISIT TO THE MING-QING DYNASTY STREET

CONFERENCE DAY 1: MAY 12, 2019

08:45-09:30 OPENING REMARKS
Opening and Welcome Remarks
Wang Jun, Secretary of CPC Songyang County Committee
Dr. Kasem Soytong, President of AATSEA
?, Representative from CAS
Other leaders
09:30-09:45 GROUP PHOTO
09:45-10:00 TEA BREAK

Keynote Session Chairs: Prof. Dr. Fucheng Lin, Prof Dr. Teodoro Mendoza

10:00-10:20 Prof. Dr. Teodoro C. Mendoza (Philippines): Achieving More Productive Multifunctional Agriculture : Organic Agriculture as the 4th Wave Agriculture in the 21st Century
10:20-10:40 Prof. Dr. Fucheng Lin, Zhejiang University (China): Biological Control of Rice Blast Disease
10:40-11:00 Prof. Timo Korpela (Finland): Acidity in Biology: Special Reference to Alkaliphilic Microorganisms
11:00-11:20 Prof. Dr. John C. Moreki (Botswana) :Organic Livestock Production in Botswana: Challenges, Opportunities and Prospects
11:20-11:40 Dr. Hoang ND Pham (Vietnam):Ectomycorrhizal (ECM) Fungal Community of Mixed Forest of Endemic Pines and Broad Leaves in BiDoup – NuiBa National Park, Vietnam
11:40-12:00 Dr. Elvira Khalikova (Russia) :Cyclic Lipopeptides from Paenibacillus Ehimemsis, Strain IB-X-b with Wide-Spectrum Antifungal Effects
12:00-12:20 Prof. Dr. Devarajan Thangaduri (India): Microbial Biocontrol Agents for Sustainable Farming System : from Genetic Diversity to Genome Shuffling for Strain Improvement

12:30-13:30 LUNCH BREAK
14:45-17:30 STUDY TOUR: Visit Organic Tea Garden and Organic Products Market
17:30-18:30 DINNER

CONFERENCE DAY 2: MAY 13, 2019

Keynote Session Chairs: Prof. Dr. Hiroyuki Konuma(Japan), Prof. Dr. Devarajan Thangaduri (India)

08:20-08:40 Prof Moammar Dayoub (Syria): Overview of the Best Organic Practices for Farms in the EU
08:40-09:00 Prof. Dr. Danesh, Y.R. (Iran): Plant Growth Promoting Microbes (PGPMs) and Their Roles in Sustainable Agriculture
09:00-09:20 Prof Dr Nanik Setyowati (Indonesia):From Research to Practice: Developing CAPS for Sustainable Highland Vegetable Production
09:20-09:40 Prof. Dr. Laitha Ravikumar (India):Plant Growth Promoting Microbial Consortium – A Synergistic Approach Towards Sustainable Agricultural Development and Rhizoremediation of Heavy Metals
09:40-10:00 Prof Dr MD Asaduzzaman Sarker (Bangladesh):Role of Botanical Pesticide in Sustainable Crop Protection
10:00-10:20 Prof. Dr. Jeyabalan Sangeetha (India):Microbial Pesticides: Production, Application and Development for Sustainable Agriculture
10:20-10:40 Dr. Samantha C. Karunarathna (Sri Lanka):Organic Mushroom Growing: Improving Human Health and Livelihoods
10:40-11:00 Prof. Dr. Hiroyuki Konuma (Japan):Food Security, Food Safety and Sustainable Development
11:00-11:20 Thanart Ngaolee (Thailand):Lomrak Organic Farm : Organic Shrimp and Fish Cultivation in Thailand
11:20-11:40 Prof. Dr. Thanuku Samuel Sampath Kumar Patro (India):Scope and Prospects of Organic Cultivation by Exploiting and Expanding Potential Biocontrol Agents for Doubling of Farmers Income with Special Reference in Southeast Asia
11:40-12:00 Dr. Honkai Wang (China): Studies on Relationship of Laccase Acitivity and Biocontrol of Citrus Black Spot Disease by Trichoderma Atroviride

12:00-13:00 LUNCH

13:40-14:00 Prof Jin-Cheol Kim (Republic of Korea):Discovery and Application of Fungi-derived Metabolites for the Control of Root Knot Nematode
14:00-14:20 Prof. Dr. Okigbo Raphael (Nigeria):Disease Management in Organic Crop Production
14:20-14:40 Prof. Dr. Zainal Muktamar (Indonesia):Dynamic of Soil Quality Under Long-term Organic Farming Practice in Tropical Highland of Indonesia
14:40-15:00 Prof Dr Wafaa Haggag (Egypt):How Bio-organic Farming Benefits the Environment
15:00-15:20 Sakari Matti Lehtinen (Finland):Organic Farming Near the Polar Circle
15:20-15:40 Thet Lwin Htay (Pho Cho) (Myanmar):Organic Agriculture Movement in Myanmar
15:40-16:00 Mr. Boun-Oum Douangphrachan (Laos):Organic Agriculture in Lao PDR
16:00-16:20 Dr. Huyly TANN (Cambodia):Organic Rice in Cambodia
16:20-16:40 Prof. Kampon, S. (Thailand):Organic Food
16:20-17:00 Mr. Zejiang Zhou (China):Global Organic Agriculture Development and the Inspiration
17:00-17:20 Prof. Wenliang WU(China):The Innovation Driven Development Strategy and Rural Revitalization Route of Songyang Modern Organic Agriculture: the Theory, Method and Examples
17:20-17:40 Mr. Shangwen Fu (China):The Present Situation and Future of Organic Tea in China
17:40-18:00 Mr. Liandeng Jin(China):The Features, Achievement and Futures of Organic Rice Industry Developmemt in China
18:00-18:20 Dr. Kasem Soytong (Thailand) :Organic Agriculture Model -from Research Contribution, Organic Certification and Marketing

18:20-19:30 DINNER

DAY 3: MAY14, 2019

08:40-11:00 Brainstrom to establidsh Songyang Organic Model :Dr. Kasem Soytong, Prof. Timo Korpela, Prof. Dr. Teodoro C. Mendoza
11:00-12:00 CLOSING CEREMONY
Awarding Ceromony: Reserved Scientists by Dr. Kasem Soytong, Songyang Governors
Conclusion Remarks: Dr. Kasem Soytong, President of AATSEA
Wang Jun, Secretary of CPC Songyang County Committee

12:00-13:00 LUNCH
13:00-18:00 STUDY TOUR:

18:00 DINNER

DAY4: MAY15, 2019 DEPARTURE

CONFERENCE DAY 1: MAY 12, 2019 KEYNOTE SESSION

ACHIEVING MORE PRODUCTIVE MULTIFUNCTIONAL AGRICULTURE : ORGANIC AGRICULTURE AS THE 4TH WAVE AGRICULTURE IN THE 21ST CENTURY

TEODORO C. MENDOZA (PHILIPPINES)

PhD, Professor of Crop Science, ICROPS, College of Agriculture, UPLos Banos , Laguna, Philippines.
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By and large, chemical agriculture altered the multifunctional features of agriculture .Going organic restores the multi functions of agriculture i.e. ecosystems services(carbon sequestration, biodiversity conservation, hydrologic cycle/water conservation, soil regeneration);production of nutritious , healthy and safe foods ; and less fossil fuel (low energy footprint) and low cash capital requiring. Organic agriculture is biodiverse agriculture which leads to more productive systems as synergetic relations of components where output/by-products in one component becomes input in the other component (integrated rice + duck systems, combine indigenous/ traditional varieties + upgraded varieties), makes soil more productive on the aggregate as there are no idle space and there is sustained photosynthetic productivity; leads to more efficient use of water, land, nutrient/ labor + inputs , more productive/ more profitable and less risky agriculture (not all eggs are placed in one basket!), more food &health per acre-hectare farm (energy, protein food); balanced nutrient/ diet.

Organic Agriculture (OA) is climate change compliant agriculture systems- uses less energy(energy foot print) and carbon emitting energy-based inputs(no agrochemical inputs -fertilizer, pesticides, growth regulators) releasing CO_2 in the various manufacturing stages, sequester back CO_2 emitted via the soil organic matter and below /above ground biomass of perennial trees interspersed with annual crops and farm perimeter, road sides and irrigation dikes.

Organic agriculture is conserving/ preserving and enhancing biodiversity of flora and fauna. Without toxic pesticides, butterflies, pollinators, birds and wildlife flourish, fishes/frogs, edible snails in rice agroecosystems, N-fixing, P-solubilizing bacteria and other microbes (nano-eliciting) that confers resistance/ immunity to pathogens and other pests(makes crop healthy)

OA is localized agriculture (less processed, packaged, stored and transported food) , consuming more direct plant based food rather food that are high in the food chain , makes rural households more food self-sufficient and more resilient to the extreme weather (flood, drought, mega typhoons) , the key to food sufficiency in the 21st century.

Organic agriculture is the 4th wave agriculture facilitating green rural economy and paving agriculture value chain that makes farmers benefits across the various stages of production to post production (farm-to-plate) and bring agriculture back to the realm of the real farmers and not the corporate/ industrialists who plays around capital flows. OA is fair trade, justified, caring (people, mother earth) agriculture - brings back the seeds, the control, management, trade and farm derived benefits to the farmers for the health and happiness of the consumers!

KEYWORDS: Organic agriculture, Climate, Biodiversity, Localized

BIOLOGICAL CONTROL OF RICE BLAST DISEASE

FUCHENG LIN (CHINA)

State Key Laboratory for Rice Biology, Biotechnology Institute, Zhejiang University, Hangzhou, China.
Corresponding Author: fuchenglin@zju.edu.cn

China is the world's largest producer of rice as a staple food, with 208 million tons produced in 2015. Rice blast is the most economically devastating disease of cultivated rice, causing by the rice blast fungus, Magnaporthe oryzae. The pathogenic fungus differentiates a special infection structure, an appressorium, to rupture the strong cuticular layer of its host. The appressorium generates colossal intracellular turgor pressure (as much as 8.0 Mpa), allowing it to penetrate the leaf cuticle with a huge mechanical force rapidly. The mechanical forces that generate a mature appressorium and deliver its penetration peg have been confirmed by researchers worldwide. Currently, it has been verified that autophagy is involved in the turgor accumulation of the appressorium, which could be a novel drug target for control of the disease specifically.

The successful prevention and control of rice blast results from a comprehensive series of recommendations that employ several different management strategies, including culture strategies, genetic resistance, and the use of biological agents, such as endophytic fungi.

KEYWORDS: Rice blast, Pathogenic fungus, Appressorium

ACIDITY IN BIOLOGY: SPECIAL REFERENCE TO ALKALIPHILIC MICROORGANISMS

TIMO KORPELA (FINLAND)

Senior Advisor, Department of Future Technologies, University of Turku, Finland.
Email: timokor@utu.fi (www.utu.fi)

Water has simple chemical formula, H2O, but it is far from simple substance. Water has physical and chemical features which make life on the earth possible. Acidity, i.e. concentration of protons is an important property typical to water solutions. Almost every chemical reaction depends on protons, either directly or indirectly. The concept of acidity, expressed by term pH, and some properties of water will be briefly discussed. pH in higher animals and plants inside their cells is extremely strictly regulated. pH in human blood is 7.4. Deviation of over +/- 0.05 can be pathological. Human stomach can have pH 1-2 but after stomach pH it is increased in small intestine to about 8. The purpose of these sharp changes is to kill microbes in food. Most microbes die in pH 1-2 whereas those which do not die, probably die at pH 8. This is important because enzymes produce rich nutrient medium into the intestine and microbes could propagate uncontrollably.

The biggest biodiversity centres around neutral pH indicating that it is favourable. When pH of the surrounding deviates from neutral, the number of life forms decrease rather sharply.

Our laboratory has studied since 1980´s a soil bacterium Bacillus alcalophilus. It grows optimally at pH around 10. A principal question is how such "alkaliphiles" have "adapted" to high pH, i.e. to proton concentration about 1/1000 of that of neutral. Microbial adaptation could be separated two things: microbes may secrete extracellular enzymes and other metabolites to their growth medium which must be biologically active at pH 10 or more.
Second, the microbes must absorb nutrients from surrounding, like amino acids, sugars, vitamins etc. into cells.

Prof. Horikoshi´s (Japan) research group has been pioneering the "alkaliphilic microbiology" during >50 years. They and other groups have shown that pH inside alkaliphiles´ cells is lower than outside. Microbes have proton pumps from out to in creating higher proton concentration inside the cell. It follows that the cell wall must be specific to keep the extremely volatile protons not leaking out of the cells. Proton pumps are certainly universal mechanism to stay alive at high pH conditions in all organisms. Many evidences indicate that pH inside alkaliphiles are not much over pH 9.5. But, this means proton concentration is still several hundred times less than in neutral.

Second question is how metabolism is working in low proton concentration. May be metabolism inside cells is slower with the alkaliphiles? May be enzymes of alkaliphiles afford to have lower specific activity of enzymes because the external competition is less (less microbial species compete). Intracellular enzymes are good objects for studying and comparing the metabolism. We purified to homogeneity and characterized two pyridoxal-phosphate dependent aminotransferase enzymes from one obligate and one facultative alkaliphiles and from Escherichia coli (neutralophile). Alkaliphilic enzymes had pH optima of 9.5 but the optima were narrow compared to E,coli. Surprisingly the specific activities of all the three enzymes were practically the same when measured at their pH optima. We consider that the substrate amino acid brings on the average one proton to the active site with all of the three studied enzymes. In alkaline, the active site promotes intake of protons but in neutral extra protons are rejected. The protein folds of the intracellular alkaline enzymes were not specially stabilized against high pH.

Alkaliphiles can be frequently found also in neutral soils. It is considered that "microenvironment" in soil can create favourable conditions to them. Alkaliphiles produce various unique metabolites into their surroundings. Alkaliphiles certainly have a role in soil ecology. Related discussion could be made also on the acidophilic microbes.

Plants have optimal growth at pH range of 4-8. Life of higher organisms and microbes are tightly interconnected with plants as recent studies show about humans and animals. Understanding these subtle relations is very important for the sustainable agriculture. The most modern science is therefore the basis for sustainable agriculture. It is not traditional agriculture but the new generation of the knowledge-based responsible agriculture which only has become possible after the recent breakthroughs in many branches of the sciences.

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KEYWORDS: Alkaliphilic, Microorganisms

ORGANIC LIVESTOCK PRODUCTION IN BOTSWANA: CHALLENGES, OPPORTUNITIES AND PROSPECTS

JOHN C. MOREKI (BOTSWANA)

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Email: jcmoreki@gmail.com

This paper discusses livestock farming in Botswana in relation to organic farming. Organic agriculture is defined simply as farming without the addition of artificial chemicals; hence it is perceived to have less adverse effects on the environment than conventional agriculture. The quality-conscious consumers are increasingly demanding environmentally safe, chemical-residue-free healthy foods together with product traceability and a high standard of animal welfare, which are said to be ensured by organic production methods. Organic agriculture is not new to Africa as the majority of livestock across the continent are reared under natural pastures and are able to perform their natural behaviours. In Botswana, livestock production systems can be broadly categorised into traditional and commercial sectors. The traditional sector entails rearing cattle in unenclosed communal grazing while in the commercial sector cattle are reared in fenced ranches. Over 80% of cattle slaughtered at the three Botswana Meat Commission (BMC) export abattoirs come from the traditional sector which depends almost entirely on natural pastures with limited use of complete feeds and vaccines. As cattle from the traditional sector and feedlots are slaughtered together at BMC, beef is not sold as organic or grass-fed. Botswana beef is exported to the EU market, Norway and other markets. Although not a common practice in Botswana, some operations put grass-fed cattle through feedlotting to desired slaughter body weight. The main challenges in organic livestock farming are lack of knowledge of organic production practices, animal welfare issues and requirements of importing countries; lack of accredited certification body; lack of training and certification facilities; undeveloped quality-conscious market; drought; diseases; traceability and poor record keeping. Opportunities exist for organic beef, mutton and chevon exports to the European Union, the Middle East and the Far East. Beef produced by smallholder farmers largely qualifies to be sold as organic beef or "natural" as conventional feeds and vaccines are minimally used. Organic livestock farming is in its infancy in Botswana and hence needs to be promoted if its benefits are to be realized.

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KEYWORDS: Animal welfare, conventional agriculture, organic livestock production, organic beef, production systems, smallholder farmers, traceability.

ECTOMYCORRHIZAL (ECM) FUNGAL COMMUNITY OF MIXED FOREST OF ENDEMIC PINES AND BROAD LEAVES IN BIDOUP-NUIBA NATIONAL PARK, VIETNAM

HOANG ND PHAM (VIETNAM)

NDH Pham1*, K Nara2, LAT Dang3, TD Vu1, TAD Vo3, HQ Dang1, T Koizumi2, XD Nguyen1
1Biotech. Cen. of Hochiminh City, Vietnam, 2Grad. Sch. of Frontier Sciences, The Univ. of Tokyo, Japan, 3Fac. of Biology, Univ. of Sciences, HCMC, Vietnam, *Presenting Author's Email: pndhoang@gmail.com

Two 4 hectares - plots were set up in mixed forest between endemic pines Pinus dalatensis, Pinus krempfii and broad leaves in Bi Doup Nui Ba National Park, Vietnam. The first plot was set up in the dominant of pines P. dalatensis forest and the second plot was in Fagaceae dominant forest. Two underground ECM fungal constituent along a 500 meter transect in each plot were identified by ITS regions. Each transect included 50 soil samples in 25 collected sites. In pine dominant plot, transect was through P. dalatensis vegetation. Totally, 4966 ECM root-tips belonged to 76 fungal species were recorded. In Fagaceae dominant plot, 4354 ECM root-tips belonged to 83 fungal species were recorded. In both plot, the community structure of underground ECM fungi is evenly high diversity described by diversity index (Simpson 1/D=19.62 and Shannon-Wiener H'=3.5), species evenness (Pielou J about 0.8 in each plot). Russula spp. is a dominant fungal group.
In each plot, a 1.5 km length x 1 meter width transect will be set up as the perimeter of 3 smaller concentric squares of 4 has, 1 ha and 0.25ha. All observability fungal reproductive structures along transect will be recorded and collect in each 2 weeks of year 2015 (27 times). Totally, 1320 sporocarps were collected and identified belonged to more than 150 fungal species by ITS regions. The ECM fungal species were propose from reference. The comparison between the underground ECM underground fungal community and terrestrial showed that the similarity of total species and content of species. This is the first study investigates the ECM fungal community of endemic P. dalatensis, the most southern population of 5 needles pine in the world and the very narrow distribution pine P. krempfii in both underground and terrestrial. The additional transect through P. krempfii vegetation is setting up.

KEYWORDS: Ectomycorrhizal fungi, Endemic, Pines and Broad Leaves

ISOLATION AND IDENTIFICATION OF CYCLIC LIPOPEPTIDES FROM PAENIBACILLUS EHIMENSIS

ELVIRA KHALIKOVA (RUSSIA)

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Lipopeptides are low molecular weight compounds formed by cyclic or linear peptides linked to a lipid tail or other lipophilic molecules. They constitute a structurally diverse group of secondary metabolites produced by a wide variety of bacteria, fungi and yeasts. Biosynthesis of lipopeptides is carried out by multi-modular mega- enzymes classified as non-ribosomal peptide synthetases. Lipopeptides consist not only of the 20 canonical L-amino acids, but also non-proteinogenic amino acids. Microbial lipopeptides exhibit a broad array of bioactivities from antimicrobial to antitumor properties.

Phytopathogens such as fungi, bacteria, yeasts, and viruses are responsible for major crop losses during agricultural production, and they also affect the quality and safety of fresh and processed food. Until recently, control of pathogens has relied heavily on chemical fungicides and antibiotics. However, public concerns about the potential side effects on human health and environment have stimulated development of new biological agents that meet current health and safety standards. Aerobic endospore-forming bacteria belonging to genera Bacillus and Paenibacillus have been recognized for their antagonistic properties, which may be exploited in biocontrol of plant and animal diseases, as well as, in the prevention of decay of woody construction materials. Paenibacillus species are common in natural habitats and can produce antimicrobial compounds (peptide and other antibiotics, cyclic lipopeptides, bacteriocins and volatiles) and cell wall degrading enzymes. Many of the lipopeptides produced by these bacteria are known for decades and represent a potential "gold mine" of antibiotics. This list includes polymyxins, octapeptins, polypeptins, iturins, surfactins, fengycins, fusaricidins, and tridecaptins, as well as, some novel examples, including the kurstakins. In addition to biocontrol activity, various species of Paenibacillus promote plant growth by atmospheric nitrogen fixation, mineral solubilization and production of phytohormones.

We isolated from soil antifungal P. ehimensis IB-X-b strain and studied mechanism of its antifungal action. It secreted not only several cell-wall degrading chitinolytic enzymes but also low-molecular weight antifungal metabolites. The fraction was purified with water–methanol extraction followed by a chromatography on a C18-support. The analysis with LC–MS showed presence of two main series of homologous compounds, family of depsipeptides containing a hydroxy fatty acid, three 2,4-diaminobutyric acid (Dab) residues, five hydrophobic amino acids and one Ser/Thr residue, and cyclic lipopeptides of bacillomycin L and fengycin/plipastatin/agrastatin families. The prevailing compounds in this group are bacillomycin L-C15, fengycin/plipastatin A-C16together with their homologues responsible for the majority of fungal growth inhibition by P. ehimensis IB-X-b. It was found that the substances secreted by the bacterium make holes into cells of fungi effecting them to swell and finally die.

KEYWORDS: Lipopeptides, Paenibacillus ehimensis, Human health, Environment

MICROBIAL BIOCONTROL AGENTS FOR SUSTAINABLE FARMING SYSTEM: FROM GENETIC DIVERSITY TO GENOME SHUFFLING FOR STRAIN IMPROVEMENT

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Sustainable agriculture aims at enhancing crop yield without having any deleterious effect on the environment. Microbial derived biopesticides have revolutionised modern farming practices with its properties such as reduced toxicity and nonspecificity. Several bacterial species including Bacillus, Trichoderma, Pseudomonas and Beauveria have already been commercialized as microbial biopesticides. However inconsistency in performance and high costs involved are few of the reasons behind lack of widespread acceptance of these biopesticides. Recombinant DNA techniques has aided in the significant improvement of pesticidal activity of microbes. These advancements have become possible through combining genetic information of microorganisms with technical approaches towards increase in gene expression and genome shuffling. Genome shuffling is an appropriate method for microbial strain improvement. Several genes responsible for production of toxic metabolites, through multiple rounds of genome shuffling, can be recombined resulting in desirable phenotypes. This method has been successfully exploited for improving the strains of Streptomyces, Lactobacillus and Sphingobium species. Improved knowledge of the genetic mechanism behind the virulence shown by microorganism and molecular biology techniques will help in development of improved strains that can produce more efficient biopesticides to achieve agricultural development under changing climate and environment.

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KEYWORDS: Genetic diversity, Genome shuffling, Microbial biopesticides, Strain improvement, Sustainable agriculture

OVERVIEW OF THE BEST ORGANIC PRACTICES FOR FARMS IN THE EU

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Modern organic agriculture in many aspects follows the local traditional practices. However, it is the next generation approach both to the traditional as well as to conventional agriculture since organic agriculture exploits the newest outcomes of sciences, including biology, ecology, soil sciences, biochemistry, and even taking into account the recent climatic changes. Thus, modern organic agriculture is highly knowledge-based. This is reflected by the fact that it is mostly adopted by young farmers. European Union supports strongly the growth of organic agriculture by different subsidies and (EU) targets to significant increase in organic farming. Organic food categories and amounts have grown significantly during about 10 years, the organic farming area is increasing by about 500,000 ha per year representing now about 6.2% of the total agricultural area.

The best agricultural practices are deployed in organic farming helping farmers to adapt to climate change by strengthening agro-ecosystems, improving soil structure, water management, and water quality, diversifying crop and livestock production, while concomitantly building farmers' knowledge base. These practices include maintaining or improving the quality of soil and water resources while avoiding the use of artificial fertilizers. At the same time use of tolerant or resistant crop varieties and use of certified seeds to control of diseases, as well as the control pests (natural enemies), are required to strengthen functional biodiversity, physical/biological methods like nets, traps, and repellents. Reduced tillage, adding supportive microorganisms and fungi in soil, can reduce weed and improve soil fertility.

The organic farmers' attempt for best organic practice and ecological, social and technological innovation driven by the co-operation between scientists and farmers is important. These practices lead to a decreasing yield gap between organic and conventional agriculture and achieve sustainability.

KEYWORDS: Best practices, organic agriculture in EU, conventional agriculture.

PYRIFORMOSPORA INDICA: A NOVEL MYCORRHIZA LIKE FUNGUS IN SUSTAINABLE AGRICULTURE

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Crop productivity is being challenged by various adverse environmental factors (biotic and abiotic stress factors) worldwide. To meet this challenge we must increase the yield potential of our food crops. Pyriformospora indica is an interesting endophytic fungus of the order Sebacinales, the fungus is capable of colonizing roots and forming symbiotic relationship with every possible plant on earth. P. indica has also been shown to increase both crop yield and plant defense of a variety of crops against various biotic and abiotic stress factors. Given the capability of P. indica to colonize a broad range of hosts, it must be anticipated that the fungus has evolved efficient strategies to overcome plant immunity and to establish a proper environment for nutrient acquisition and reproduction. This fungus holds a promise for tremendous practical applications because it is easy to propagate in vitro and is accessible to basic physiological, genetic and molecular research. This characteristic has led to its promotion as a bio-fertilizer and a bio-control agent. The high potential of multifaceted fungus, P.indica has tremendous applications in future as bio-fertilizer, protector and immune regulator which will be helpful in improving quality of not only plants but also ultimately of food, nutrition, medicine and overall quality of human life. Also the fungus has been reported to possess good quantity of antioxidants. Mechanism by which

P. indica promotes the growth of plants is unclear but some studies have implicated various factors induced by it in plants that were responsible for its positive effects.

KEYWORDS: Pyriformospora indica, Plant growth promotion, Plant stress tolerance

CLOSED AGRICULTURE PRODUCTION SYSTEM FOR SWEET CORN PRODUCTION IN HIGHLAND ENVIRONMENT

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Consumer's demands on organic vegetables, including sweet corn, are steadily increasing in many developing countries. However, most of sweet corn production in many developing countries takes place in highland altitude and is characterized with intensive application of synthetic chemicals such as pesticides and fertilizers which eventually reduces the acreages of arable lands and environmental supports. A closed agriculture production system is considered as an organic agricultural practice with integral approaches to maintain the sustainability of biodiversity, biological cycles and soil biological activities. Since 2010, a model for integration of organic farming and dairy cattle farm to produce organic vegetables with the restriction of external synthetic agrochemical inputs has been continuously developed. Series of experiments have been continually conducted in Rejang Lebong, Bengkulu Province, Indonesia, at elevation of approximately 1.015 m above sea level (3°, 27', 30.38" South Latitude and 102°. 36', 51.33'' East Longitude). Experiments activities covered social engineering and farmer involvements, developing solid organic fertilizer (vermicompost), developing liquid organic fertilizer, breeding program for sweet corn, improving cropping systems for sweet corn, developing organic bio-pesticides.

improving sweet corn production practices, evaluation of soil nutrient dynamics under organic production systems and evaluation of sweet corn and soil nutrient relationships. Results indicated that community involvement determined the successfulness of sweet corn production in a closed production systems, used of cattle wastes in combination with local materials as solid and liquid fertilizers, developing organic sweet corn lines, used of organic bio-pesticides and crop rotation and arrangement were considered reliable to maintain high sweet corn yields and maintaining soil productivity. Further research should be addressed on improving the stability of sweet corn lines, organic fertilizers and bio-pesticides as well as on scaling up the model for organic sweet corn production in highland areas.

KEYWORDS: Closed agriculture production system; organic sweet corn; organic fertilizers; organic bio-pesticides

PLANT GROWTH PROMOTING MICROBIAL CONSORTIUM – A SYNERGISTIC APPROACH TOWARDS SUSTAINABLE AGRICULTURAL DEVELOPMENT AND RHIZOREMEDIATION OF HEAVY METALS

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Soil contamination by the heavy metals is the critical environmental problem and poses significant impacts to the ecosystem. Heavy metals presence in the soil subsequently enters in to the human food through plants and cause risk and they tend to transferred from one food chain to another. Through anthropogenic activities the industries discharge a variety of heavy metals like cadmium, nickel, chromium, lead, arsenic, mercury, of heavy metals in trace amount cause toxic to flora and fauna. The remediation of soils contaminated with heavy metals can be performed using chemical, physical, and biological techniques. Chemical and physical methods have the advantage of a short remediation time, but are expensive and cause secondary pollutants. Among bioremediation, rhizoremediation, the process of utilizing plants to absorb, accumulate, and detoxify heavy metals in soil, is considered an alternative strategy for the remediation of soils contaminated with heavy metals. This method is ecologically sound, safe, and cost effective, but its remediation efficiency is mostly affected by limiting factors, such as meteorological factors and the toxicity of pollutants. Plants used for extraction of metals from contaminated soil must be tolerant to heavy metals, adapted to the local soil and climate characteristics, and able to take up a large amount of metals. This study emphasis that heavy metal polluted soils can be remediated by use of environmental friendly and less costly methods of PGPR application. The use of PGPR for plants is presently receiving substantial worldwide attention and the latest successive PGPR researches exhibit luminous prospects for bioremediation of polluted soil environments. In future, PGPR application would be the most favoured technology keeping in view the advantages of PGPR usage over physical and chemical remediation approaches. Biomineralization and synergistic coevolution have great potential for improving soil quality and improves soil health. Synergistic effect of soil microbes with plants is vital respond to extreme abiotic environments.

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KEYWORDS: Phytoremediation, microbes, PGPR, contamination, heavy metals

ROLE OF BOTANICAL PESTICIDE IN SUSTAINABLE CROP PROTECTION

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Due to global climate change intensity of insect and disease pests in crops, developing resistance of the pests towards chemical pesticides and price hiking of agro-chemicals made the faming challenging for the smallholders of Bangladesh. Thus maintaining sustainability of agriculture is getting harder for the farmers day by day through conventional farming practices. However, many countries in the world are trying to minimizing these challenges through introduction of farmers' innovations those are ecologically beneficial and may reduce farmers' dependency on highly expensive purchased agro-chemicals. Thus, the present study was taken into consideration to identify and using botanical pesticide as a farmers' innovation in sustainable crop production in Bogra district of Bangladesh. The study explored that botanical pesticide as the promising farmers' innovation and finally recommend as effective measures of sustainable crop protection from insect and disease pests for the smallholder farmers. The study organized the local farmers and through participatory research they developed a botanical pesticide from locally available plants to protect their crops from insect pests. The leaves and seeds of the locally available plants (like, Azadirachta indica, Polygonum tomentosum, Adhatoda vasica etc.) having insecticidal values were collected and chopped with sharp knife. After that 20 liters of water were poured of in a big cooking pot and 5 kg of leaves and seeds were mixed with this water and boiled for half an hour. The boiled mixture then keeps for several hours to make it cool. After cooling it properly the pot air-tightens and kept the mixture in a cold place. After fermentation of the mixture for 3 weeks the juice of the plants were collected and use by farmers as botanical pesticide for pest control in their crop fields. Farmers usually use 50 ml of botanical pesticide with 10L of water and spray in their crop fields to protect their crops from attack of insect pests. It was reported that they have used this botanical pesticide both in paddy rice as well as vegetable crops. It is evident from the three years journey at Kamarpara village of Bogra district that botanical pesticides are really worthy to contribute in sustainable crop production while smallholder farmers are really struggling due to over pressures of chemical based conventional farming system. The study explored that use of botanical pesticide along with perching can contribute significantly in managing their insect pest problems in crop production which is really inexpensive as well as environmentally-friendly. Thus, if it is possible to scaling out botanical pesticide as a potential innovation in other parts of Bangladesh as well as other Asian regions (having similar socio-economic context), it would be possible to reduce major challenges of insect and disease management of major crops in a sustainable manner and can reduce smallholder farmers' enormous dependency on agro-chemicals. That might save our soil, ecology, bio-diversity and planet. However, to let it happen more partnership is needed at national, regional and global level.

KEYWORDS: Botanical Pesticide, Resistance, Innovation

MICROBIAL PESTICIDES: PRODUCTION, APPLICATION AND DEVELOPMENT FOR SUSTAINABLE AGRICULTURE

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Pesticides are used extensively for pest and weed control so that there is consistent yield and economic growth. However, the environmental impact of indiscriminate and unplanned use of these chemicals is evident not just on the treated fields but it also emigrates to nearby waterbodies, land resources and even air. Therefore there is a very high requirement for environmentally sustainable pest management strategies. In the present scenario, control of pests using microbes is gradually gaining importance. These biopesticides are based on living bacteria, fungi, viruses and protozoa and the bioactive compounds derived from them. Target specificity and reduced toxicity are the major merits of biopesticides over the synthetic ones. Bacillus thuringiensis, an entomopathogenic bacterium have been successfully used as a biopesticide. Apart from this, continuous research has led to the discovery of novel microbial strains that can produce toxins with insecticidal activity. Some of the entomopathogenic bacterial species that can be exploited for the formulation of biopesticides include Serratia, Streptomyces, Pseudomonas, Bacillaceae and Chromobacterium sp. Similarly, the ability of baculoviruses to establish pathogenic relationship with insects can contribute to their biological control. Baculoviruses show high host specificity. At present, biopesticide active against Lepidopteran caterpillars is the only commercial product derived from baculoviruses. Fungal biocontrol agents (FBCAs) offer considerable potential (generally unexploited) for insect, disease and weed control. Up to 3,00,000 potentially unique mycotoxins were reported. Nevertheless, little information is available on FBCAs that have been developed or are being developed.

During the formulation of biopesticides, microbes are mass produced using liquid, semisolid or solid state fermentation in a medium that can induce secondary metabolite production. The formulation should be favourable enough to maintain the viability of the organism. Hence the microbial component is mixed with different carriers and adjuvants for protection from environmental stresses , better bioactivity and longer shelf life. There are dry formulations such as dusts, granules and wettable powders whereas liquid formulations can be oil based, water based or polymer based. The protocol used varies with the physical state required. Microbial pesticides form an important part of integrated pest management. And have been used to control several arthropods that commonly affect crops. Despite of several advantages over chemical pesticides, microbial biopesticides constitute less than one percent of the global pesticide market. Inconsistent performance, high costs, low shelf life and issues associated with quality control are some of the challenges. that hinder the growth of biopesticide industry.

KEYWORDS: Microbial Pesticides, Sustainable agriculture, Biopesticides

ORGANIC MUSHROOM GROWING: IMPROVING HUMAN HEALTH AND LIVELIHOODS

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Mushroom cultivation provides a continuous supply of edible mushrooms to people since wild edible mushrooms are only available in rainy season of any given region. The main steps of the mushroom cultivation are; Pure culture preparation, Spawn production, Main growing substrate preparation, Inoculation of spawn to growing substrate, and Mushroom production. Mushroom mycelia easily absorb any chemical constituent in the growing substrate so the main growing substrate should come from organically grown trees, i.e. if the main substrate is rice straw then the rice straw should come from organically grown rice. If the main mushroom growing substrate contains heavy metals like mercury (Hg), cadmium (Cd), arsenic (As), chromium (Cr), thallium (Tl), and lead (Pb) then there is a very high chance to absorb those heavy metals by the mushrooms. The grains use in spawn substrate should come from organically grown grains. It is very important to maintain a clean environment in mushroom growing area since insecticides, pesticides or fungicides can't be used to control insects or other microfungal contaminants. Thus the organic mushroom cultivation is becoming popular as it produces healthy mushrooms.

Mushrooms have been consumed since earliest history; ancient Greeks believed that mushrooms provided strength for warriors in battle, and the Romans perceived them as the "Food of the Gods." For centuries, the Chinese culture has treasured mushrooms as a health food, an "elixir of life". They have been part of the human culture for thousands of years and have considerable interest in the most important civilizations in history because of their sensory characteristics; they have been recognized for their attractive culinary attributes. Nowadays, organic mushrooms are popular valuable foods because they are low in calories, carbohydrates, fat, and sodium: also, they are cholesterol-free. Besides, organic mushrooms provide important nutrients, including selenium, potassium, riboflavin, niacin, vitamin D, proteins, and fiber. All together with a long history as food source, organic mushrooms are important for their healing capacities and properties in traditional medicine. It has reported beneficial effects for health and treatment of some diseases. Many nutraceutical properties are described in mushrooms, such as prevention or treatment of Parkinson, Alzheimer, hypertension, and high risk of stroke. They are also utilized to reduce the likelihood of cancer invasion and metastasis due to antitumoral attributes. Organic mushrooms act as antibacterial, immune system enhancer and cholesterol lowering agents; additionally, they are important sources of bioactive compounds. As a result of these properties, some organic mushroom extracts are used to promote human health and are found as dietary supplements.

Restricted quality crops and markets limit the capacity of rural communities to generate income in the mountain regions Southeast Asia and South Western China. This often results in the exploitation of forest systems, leading to a decline in forest health, and the subsequent need for alternative means of income generation and forest restoration programs. Cultivation of edible and medicinal mushrooms organically is an alternative source of income and also contributes to household protein supply of rural and impoverished communities. There are a number of ongoing programs in Southeast Asia currently implementing trainings and demonstration practices for the cultivation of mushrooms at a village level. In this context three organic mushroom cultivation strategies were implemented in selected rural areas in China, India and Myanmar. The cultivation strategies are: 1. Introduce high priced mushroom species to the farmers who have been cultivating low priced species such as Auricularia and Pleurotus 2. Improve technical knowledge about organic mushroom cultivation to increase the yield and minimize challenges 3. Introduce organic mushroom cultivation and readily available cheap raw materials as mushroom growing substrate to the rural communities who are new to mushroom cultivation. We introduced high priced Stropharia rugosoannulata and Oudemansiella raphanipes to Honghe County, Yunnan, China; provided technical knowledge to improve yield and continuous supply of high quality spawn to Pleurotus cultivators in Megahalaya, India; and introduced P. ostreatus and P. eryngii cultivation to the new mushroom growers in Chin state, Myanmar. These cultivation strategies will help further improve and develop organic mushroom industry in rural areas and contribute to rural development. This research is associated with a parallel program to increase the knowledge of rural communities on the use of wild edible mushrooms and the importance of forest health for a stable supply of mushrooms. In addition, we focus on cultivation systems that incorporate the use of organic crop residues, organic woody substrate derived from agroforestry systems, and organic livestock waste in order to ensure a sustainable, integrated approach to organic mushroom cultivation.

KEYWORDS: Edible mushrooms, food, fungi, medicinal mushrooms, nutraceuticals

FOOD SECURITY, FOOD SAFETY AND SUSTAINABLE DEVELOPMENT

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The world has adopted the Sustainable Development Goals (SDGs) at the UN Summit in September 2015 as a common shared global priority targets for achievement by 2030 which constitute 17 goals including the eradication of poverty and hunger, and deduction of inequalities. They are integrated and inter-linked, and balance the three dimensions of sustainable development: the economics, social and environmental. The success of the achievement would deeply be depended on concerted efforts and collaboration at all levels. Despite of the historic initiative and the global commitments, however, the inequalities are increasing especially in Southeast Asia, and the number of chronic hunger increased to 815 million in 2016, up from 777 million in 2015, after a prolonged declining trend for decades, and immediately after the inception of the SDGs in 2016. The world is expected to add nearly 2 billion population by the year 2050 from present level of 7.6 billion. The average per capita calorie consumption would reach a range of 3,000 – 3,200 kcal per day per capita by 2050 from that of 2,780 kcal in 2005/07. The combination of these factors would necessitate the increase of global food production by 49 percent (by 112 percent if developing countries only) by the year 2050 from the level in 2012 to satisfy rapidly increasing food demands (FAO, 2017). In addition, consumers are increasingly concerned on food quality and safety, rather than the volume. Despite of these challenges, world is facing various limitations and uncertainties such as the limitation of arable lands, increasing scarcity of water resources, high food losses and waste, increasing the competition between food crops and bio-energy crops on the use of land and water, increasing demand for quality and safety food, and negative impacts of natural disasters and climate change. If food shortage occurs in the future, poor people would most suffer and the world peace and stability would seriously be threatened. Hence, the role of research and technology is increasingly important for the survival of our future generations.

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KEYWORDS: Food security, Food safety, Sustainable developement

LOMRAK ORGANIC FARM: ORGANIC SHRIMP AND FISH CULTIVATION IN THAILAND

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Shrimp or prawn (Penaeus sp.) has been organically cultivated in 25 commercial shrimp ponds, and some part is co-opearated with Japan to produce for safety food and export to Japan. The system of water flow is controlled in the farm into the released water pond where culture several kinds of fishes, the water has never drain out from the farm by reuse water after passing cleaning system to protect the surrounding envirnment. Steps to be done as follows:

1. Preparation of cultivated ponds:- the bottom pond remains soil and making slope, set up the sucker system for sediment in the bottom pond, adjusted soil pH to be above 5.5 using MgO. Then flowing the water passed 200 micron screening into the pond, and filled in the released water upto the level of 60-80 cm, then applied the tea waste 10 kg in in order to get rid of fishes, and using the rake to spread out to whole pond, and adjusted soil surface, and added the appropriate nutrients.

2. Build up the natural nutrients is done for early stage of young shrimp by using rice bran 100 kg /1000 squares meters, mixed with sodium bicarbonate 20 g and microorganism (Bacillus sp. No.1) 500 ml, then composted for 24-48 h before used. Applying the fermented rice brand by broadcast into the pond while water flow in the pond, thereafter 2-3 days it will occur the natural feed or red worm raising shrimp (blood worm).

3. Culviated the young shrimps:- releasing the young shrimps at 80,000 - 100,000 shrimps/1600 square meter into the pond, the young shrimps will eat the blood worm for 15 days, then give same amount of shrimp feed to check the young shrimps which start to feeding or not, if the shrimps start feeding food, it means the natural feed is limited. Then strating to give shrimp the feed No. 2 at 5 kg/100,000 shrimps/day. It is necessary to check the feed in pond every hour to know the amount of consuming rate, and gradually adding 500 g by using AutoFeed until appropriate point. It is noted that all feed will be mixed to fermented soybean and lemom juice with microorganism (Bacillus sp No. 2) for 6 h before used in order to stimulate the feeding rate, help for digestibility, and protect water cquality.

4. Cultivation until harvest:- the water in the pond must gradually checked, if water color is changed, then drain out water 50 % from the pond and drain clean water into the pond every 7 days at the level of 10 cm, until 20 cm level to stimulate shrimp molting. This time must drain out the sediment in the bottom pond.

5. General techniques to be done:- measure water level every morning and evening, check water pH, apply fermented rice bran with microorganism (Bacillus sp.No.3) in order to increase natural feed.

6. Disease protection :- white feces syndrom which caused by Vibrio cholerae or Vibrio spp. is protected by applying curcumin and lemon jouice mixed to shrimp feed by make as the bio-ball, 20 bio-ball per 1600 squre meter was used.

Organic shrimp cultivation has now more demanded and this natural method to cultivate that will not pollute the environment. It is produced as sustainable agricuture. The by-product in the releasing and cleaning pond for reuse can be cultivated many kind of fishes as well. The detail information will be discussed.

KEYWORDS: Organic farm, Shrimp and fish cultivation

SCOPE AND PROSPECTS OF ORGANIC CULTIVATION BY EXPLOITING AND EXPANDING POTENTIAL BICONTROL AGENTS FOR DOUBLING OF FARMERS INCOME WITH REFERENCE IN SOUTH EAST ASIA

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Organic Farming is global phenomenon since last decades and it is presume globally that there is huge market for potential Organic Agriculture products in USA, Middle east and Europe. Europe countries like Netherlands, Germany, Italy produces a large variety of food crops including cereals, pulses and oilseeds and large number of seasonal fruits. In the name of increased productivity, indiscriminate application of enormous quantity of chemical fertilizers is being followed keeping the health factor at bay. Hence an alternative method of farming is of urgent need which could satisfy the needs of increased food production as well as providing a security against any potential health problem. Organic farming has been proved as a solution to both of these problems. Also since the need for the prerequisites for organic farming is less as compared to chemical farming, therefore, in a country like India where the agriculture is highly influenced by the vagaries of various biotic and abiotic factors, organic farming is capable enough to provide economic security to the mediocre farmers as well. The total organic agricultural area in Asia was 3.2 million hectares in 2017. This constitutes nine percent of the world's organic agricultural land. Last year, the international organic export and domestic market grew by 30 and 40 per cent respectively. As the industry continues to grow, it faces unique challenges. However, with the policies implemented by the EU and ASSEAN to encourage organic farming regarding the commencement, implementation and the marketing of organic food products as well as the increasing demand of the organic products in the domestic as well as international market, there is ample scope for organic food industries to expand and generate revenue for strengthening the Indian economy.. A number of bio-control agents like Trichoderma spp., Gliocladium spp., Bacillus subtilis, Aspergillus niger, Azotobacter chroococcum, Azospirillum lipoforum, Psuedomonas fluorescens etc. have been exploited in the management of major plant diseases. Modification in cultural practices, mechanical destruction of source of inoculum, clean cultivation use of organic amendment and bio-fumigation, developing pesticides of organic origin, encouraging natural biological agents, use of cover and trap crops can be conveniently used to manage disease incidence below economic injury level. Being an international Researcher, we presume that if we promote Organic Agriculture in South Asia and South East Asia could be a global leader in Organic Agri business and farmers could sustain their livelihood.

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KEYWORDS: Organic Farming, ASSEAN, Trichoderma spp., Gliocladium spp., Bacillus subtilis, Aspergillus niger, Azotobacter chroococcum, Azospirillum lipoforum, Psuedomonas fluorescens

STUDIES ON RELATIONSHIP OF LACCASE ACITIVITY AND BIOCONTROL OF CITRUS BLACK SPOT DISEASE BY TRICHODERMA ATROVIRIDE

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Laccase is an important lignin degrading enzyme, which is closely related to the parasitism and other antibacterial activities of Trichoderma spp. In this article, based on the important role of laccase in the biocontrol mechanism of Trichoderma spp., a Trichoderma atroviride LAC9 was screened out. It can use the litter branches of citrus orchards as substrates to promote laccase. The effects of citrus branch content, carbon source content, and environmental pH on the laccase production of the strain were studied to further investigation by One - Way ANOVA. During the parasitism of Trichoderma atroviride, and the effect of the laccase activity contributes to citrus black spot disease biocontrol was evaluated using plate confrontation cultivation. Our results provide theoretical basis for the biological control of diseased remains in citrus orchards.

KEYWORDS: Laccase, Trichoderma atroviride, citrus black spot disease, biological control, parasitism

DISCOVERY AND APPLICATION OF FUNGI-DERIVED METABOLITES FOR THE CONTROL OF ROOT-KNOT NEMATODES

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Root-knot nematodes (RKN; Meloidogyne spp.) are one of the most economically damaging group of plant-parasitic nematodes worldwide. RKN is responsible for a large part of global damage to reach $77 billion caused annually by nematodes. Over the past few decades, several synthetic chemicals have been used effectively to control RKN disease. However, their negative effects on human health and the environment led to the elimination of many of these chemical pesticides and stimulated the search for new, safe, effective, and eco-friendly alternatives for Meloidogyne spp. management. The fungus showing strong nematicidal activity and its metabolites can be used directly as a microbial nematicide or its metabolites can play an important role as lead molecules for the development of new synthetic nematicides. During the screening of strong nematicidal activity against M. incognita, we found that an endolichenic fungus EL000614 has strong nematicidal activity. Bioassay-guided fractionation and instrumental analyses led to grammicin being identified as the nematicidal metabolite. Because patulin is a mycotoxic isomer of grammicin and is known to have strong antibacterial and cytotoxic activities, several biological activities of the two compounds were compared. Grammicin showed strong second-stage juvenile killing and egg-hatching inhibitory effects, with a 50% effective concentration at 72 h (EC50/72 h) of 15.9 g/mL and a 50% effective concentration at 14 days (EC50/14 days) of 5.87 g/mL, respectively, whereas patulin was virtually inactive in both respects. Patulin was strongly active toward various phytopathogenic bacteria in vitro, whereas grammicin was weakly so. Patulin at the concentration range of 0.1–10 g/mL also showed dose-dependent cytotoxicity toward the human first-trimester trophoblast cell line SW.71, whereas grammicin was not toxic toward this cell line. In pot and field experiments, a wettable powder-type formulation and fermentation broth filtrate of X. grammica KCTC 13121BP effectively suppressed the development of RKN disease on tomato and melon plants. Additionally, the optimization of the fermentation condition for grammicin production by X. grammica EL000614 was carried out. The fungal strain produced more grammicin at 25℃ than 20℃. In addition, stationary incubation was better than shaking incubation (150 rpm) for the production of grammcin. The maximum amount of grammicin in a menimal medium-based optimum medium in a flask was 5.75 g/L after 3 weeks fermentation, which is approximately 4 times higher level than potato dextrose broth (PDB) medium culture. The optimum culture (OC) filtrate also showed 4 times stronger nematicidal activity against 2nd juveniles of M. incognita and M. arenaria than PDB culture filtrate. The results suggest that X. grammica and grammicin may have potential applications for control of RKN disease of various crops.

KEYWORDS: Fungi-derived Metabolites, Root-knot Nematodes

DISEASE MANAGEMENT IN ORGANIC CROP PRODUCTION

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Organic crop production is one among the broad spectrum of production methods that are supportive of the environment. Organic crop production is managing the components of the farm system to favour crop plant over disease organisms. Organic agriculture is based on four strongly interrelated approaches like; aim for balance, integrated disease management, Organic cycle optimization and Disease management techniques, management. Pest and diseases that plague conventional farming operations, causing yield loss or the application of costly inputs are often the same species that challenge organic growers producing the same crops. Bio-control of plant disease is the involvement of the use of beneficial microorganisms, such as, specialized fungi and bacteria to attack and control plant pathogens and the diseases they cause. There are four different mechanisms by which beneficial or bio-control agents interact with other microorganisms, which include; direct competition, antibiosis, predation and parasitism, and resistance of host plant. The disease management system must be devised to utilize control technology that works harmoniously within the cropping system while maintaining the pathogen population below an economically damaging level. The increasing demand for biopesticides should propel research scientists, research institutes, biotechnologists and major stakeholders to engage in tissue culture as an alternative method to provide large amounts of pesticidal plants and other biopesticides compounds. Policies should also be directed at developing biotechnology capabilities through funding of projects, training of researchers and creation of specialized research institute.

KEYWORDS: Biocontrol, environment, plant pathogens, organic Agriculture, management

DYNAMICS OF SOIL QUALITY UNDER LONG-TERM ORGANIC FARMING PRACTICE IN TROPICAL HIGHLAND OF BENGKULU, INDONESIA

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Long-term organic farming practice stimulates the change in soil quality over the years. The presentation aims to determine the fluctuation of soil quality as managed under long-term organic agriculture system. The study was carried out in 0.5 ha of land and maintained as an organic farming practice since 2009. Organic amendment at a rate of 15 Mg ha-1 was applied in each growing season for cultivating diverse kinds of crops. Soil samples were collected during 2013 to 2018 and analyzed for soil organic matter (SOM), total soil nitrogen (TSN), available phosphorus (P-Bray), exchangeable K, exchangeable Al, soil pH, and bulk density. The results indicated that SOM, TSN, and exchangeable K fluctuated over the years, but tended to increase in the long run. Consistent increase in P-Bray was also observed during the period of the observation. Soil pH was relatively steady from 2015 through 2018 after an increase for the first two years of the observation. On the contrary, a substantial decline in the exchangeable Al was detected over the period. Eight years of organic farming practice has significant benefit for soil quality improvement prominent to the enhancement of crop productivity.

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KEYWORDS: Soil quality, organic farming, organic amendment

HOW BIO-ORGANIC FARMING BENEFITS THE ENVIRONMENT

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Since the 1930, chemical farming based on chemical pesticides mineral fertilizers started in many parts of the world to combat food deficiency. Since, the rates of agrochemical application increased gradually to reach a hazardous level at the time being. Chemical farming, however, led to serious environmental deterioration and unsafe harvests. Recent biotechnologies achievements offered new bio-organic safe farming tools. Bio-organic farming excludes the use of agrochemicals in agriculture and replace them with safe biological inputs. Bio -organic farming depends mainly on bio- pesticides , biofungicides and or biotechnology products.
According to leading R&D analyses, Biotechnology products has been reported as an additional technology which could help in meeting the global demands for sustainable agriculture and prevention of crop losses by decreasing pollution from agrochemicals, while improving climate resilience (Sustainable Development Goal (SDG) Zero Hunger, improved varieties and increased productivity. Utilization of certain beneficial microorganisms (BMO) to control plant disease and increase crop production is an integral component in sustainable clean farming. Indeed, untold research dollars have been internationally spent searching for ways to conserve microbial biodiversity.

In most developing countries, blossoming agricultural production is more thoughtless than sustainability, natural resources management or even environmental quality. Development and sustainability, however, should not be incompatible, as they represent the way through which agricultural growth is privileged . Shortage of agricultural development would lead to environmental vanishing problems, largely in low potential areas, where accretion and increased production are crucial to help restore the fragile delicate natural resources base.

In Egypt, varied pollutants, both chemical and biological, are constantly found in soil and aquatic ecosystems. These pollutants, in most cases, are biomagnified in food chain lowering the safety of crops growing in such ecosystems. Moreover, they also adversely affect soil health and lower environmental quality. The extent of the existence of these pollutants in the soil and aquatic ecosystems and vegetable harvests, however, rest on pollutant load and exposure time. No doubt, there is a strong claim for the application of new clean biotechnologies in Egyptian farms both in old and newly reclaimed areas (Haggag Wafaa et al., 2016 & 2017).

Although chemical farming led to accomplish vast steps towards recapping agricultural production, it raised antagonism and disordered symmetry between nutrient elements, shifted the pH, disfigured the biomass, prompted frailer structure and raised pollutants in soil ecosystems. These obstacles directed a severe unfriendly environmental outcome, as well as to unsustainable farming. Such adverse impacts might be contained through bio fortified farming.
The concept of smearing new cleaner biotechnological protocols in farming have been now highlighted as far as it involves combined bio-fortification technologies with a set of varied microbial remediative amendments applied (Haggag Wafaa and Saber, 200 & 2001).

In recent years it has become evident, as a result of public opinion and environmental legislations, those new and safe alternatives to traditional synthetic pesticides are both desirable and mandated. Most sustainable and environmentally acceptable pest control means might be achieved using biocontrol agents (Haggag, Wafaa, 2002).

Biological control offers an environmentally friendly alternative to the use of pesticides for controlling plant diseases (Haggag, Wafaa et al., 2012 a,b ,c and 2013 a,b). Antagonistic microorganisms are being studied in depth and considered as an attractive option for the development of microbial-based biofungicides and mixed formulations containing biocontrol agent(s) and low doses of chemical fungicides. To develop these isolates as commercial biofungicides, an extensive identification is essential. Therefore, biological, biochemical and molecular technique were conducted with the aim of identification of promising isolates for future development as biological control agents.

In our previous studies, we found that application of biotechnology products of beneficial microorganisms to the crops could contribute efficiently in reducing such problems (Haggag Wafaa and Timmusk, 2007, Haggag, Wafaa et al. 2015 b,2016, 2017). Similarly, Blue-green Algae (cyanobacteria) are a diverse group of organisms that frequently occur in marine environment and play a role in soil fertility, reclamation, protect plants from pathogens, change of microbiological system and can stimulate plant growth that show a great potential for generation of novel agricultural technologies derived benefit and as a source of compounds act as biofertilizers, biopesticides and biofungicides products (Hoballah et al. 2012 and Haggag, Wafaa et al. 2014 and 2015a). Biochemically and physiologically, algae are similar in many aspects to other plants. Algae possess the same basic biochemical pathways; all possess chlorophyll-a and have carbohydrate, protein, vitamins, amino acids, polypeptides, antibacterial or antifungal substances and products comparable to those of higher plants and polymers, especially exopolysaccharides, that improve soil structure and exoenzyme activity (Hoballah et al. 2012 and Haggag, Wafaa et al. 2014) (Figs. 1-4).

The results of our previous study provide evidence that, during its growth, the BCAS secretes enzymes that are thought to be involved in the degradation of fungal cell walls: CMCase, endo, exo-b-1,3-glucanase, chitinase and protease. Penicillium oxalicum, R. glutinis and B. polymyxa isolates produced extracellular cellulolytic enzymes (exo-glucanase and endo-glucanase, that possibly related to the biocontrol process . Tilletiopsis pallescens was found to produce protease enzyme. Meanwhile, Streptomyces , Rhodatorula glutinis and Verticillium lecanii isolates were found to produce extracellular chitinase enzymes. The number of chitinase isoenzymes as well as a high proteolytic activity has been described as relevant for biocontrol activity in biocontrol isolates (Haggag Wafaa et al., 2012, a,b,c,d,e ; Haggag Wafaa and Singer (2012); Haggag, Wafaa; Abo El Soud (2013);Haggag Wafaa and Elham Abdallh (2012); and Haggag Wafaa et al 2013 a,b,c ; Patents 1,2,3, and 4 (Fig. 4). The media composition should therefore be further investigated and optimized as the recipe used may have cost implications in higher production regimes. For fermentation process development, recipe development and optimization will form an integral part to ensure an economically viable production recipe. The broad spectrum nature of the isolate, even though targeted could also have potential negative outcomes. The impact of product application on the microbial product has to be properly investigated prior to product registration. For example, P. putida and S. aureofaciens were more effective against anthracnose , die back and grey mould (patent 4). Their mode of action is extremely varied: they may directly start a lethal biological process or only suppress the bio-aggressor by competition. Sometimes they induce resistance factors in the plant. In general, S. aureofaciens had the ability to exhibit high antifungal activity against Colletotricum gloeosporioides and Botrytis cinerea. The ability to produce multiple classes of antibiotics, that differentially inhibit different pathogens, is likely to enhance biological control. Many species of actinomycetes, especially those belonging to the genus Streptomyces, are well known as biocontrol agents that inhibit or lyse several soil borne and airborne plant pathogenic fungi. It is well known that Streptomyces sp. can produce industrially useful compounds, notably wide spectrum of antibiotics, as secondary metabolites, and continues to be screened for new bioactive compounds (Haggag Wafaa et al., 2012c). Members of the genus Rhodotorula glutinis have long been known for their potential to reduce the plant disease caused by fungal pathogens and they have gained considerable importance as potential antagonistic microorganisms. Recently, an antagonistic yeast strain of Rhodotorula glutinis have been reported as an effective biocontrol agent (in vivo) against postharvest decay of fruits and vegetables (Haggag Wafaa and Abdall 2012). Foliar application of culture filtrate on mango trees provided greater efficacy for controlling malformation disease suggested that the fungus produce some antifungal enzymes. Research on biological control of foliar plant diseases has resulted in the selection of large numbers of micro-organisms wit high potential as biological control agents against plant diseases and it could lead to alternatives strategy of plant disease control. Several products formulated for disease control are prepackaged mixtures containing two or more active ingredients(Figs. 1-4).

Management of the precious renewable organic agro-residues that enrich nutrient elements in soil ecosystem, improves its biological, chemical and physical properties and are an imperative source of energy. Bio fortified farming uses organic manures in the form of composts prepared from agricultural residues . It should be applied, however, at a rate that satisfies plant needs. Despite being in the decade of biological reliability, many constraints are adjacent to the notoriety of bio fortified farming systems. The most substantial one is conceptual, others, however, might be technical and/or economic. Bio fortified farming is based on bioremediation of the polluted agricultural ecosystem followed by inoculation of certain remediative microbial amendments and ends with growing proper hyper-accumulator plants .

Multi-bio-fertilizers are composed of different strains isolated from the soil rhizosphere and have a definite positive impacts on soil fertility. They will be isolated, purified and their potency estimated. The most active strains are selected, on the basis of their efficiency and acclimatization in rhizosphere, and preserved for use in preparing various combinations of multi-strain bio-fertilizers. The most important features of bio-fertilizers in relation to plant growth are symbiotic and asymbiotic nitrogen fixation, mobilizing plant nutrient elements and/or secreting plant growth promoting principles bio-controlling soil-borne diseases (saber, 2006). Bio-fertilizers are practiced as seed coats or seedling dressers just anterior to sowing. They are also used in bio fortifying compost heaps. Before adding bio-fertilizers, a sticky ingredient like gum Arabic is bestowed to make the seeds or seedlings surface-adhesive. Bio-fertilized seeds or seedlings ought to be sown within few hours after bio-fertilization in a moist soil. They are applied in a convenient successiveness for a proper duration, they reduce venture to pesticides handlers, contamination of food crops, overthrow of non-targeted organisms and pollution of the environment .

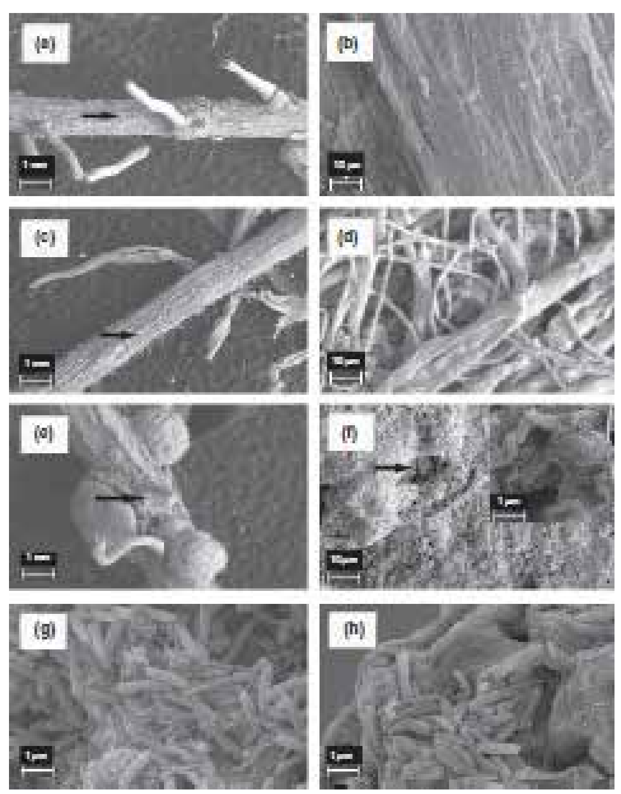

FIG. 1 . PAENIBACILLUS POLYMYXA COLONIZED ROOT SYSTEM

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FIG. 2. BIO PRODUCTION OF CUCUMBER.

FIG. 3 ORGANIC WHEAT PRODUCTION

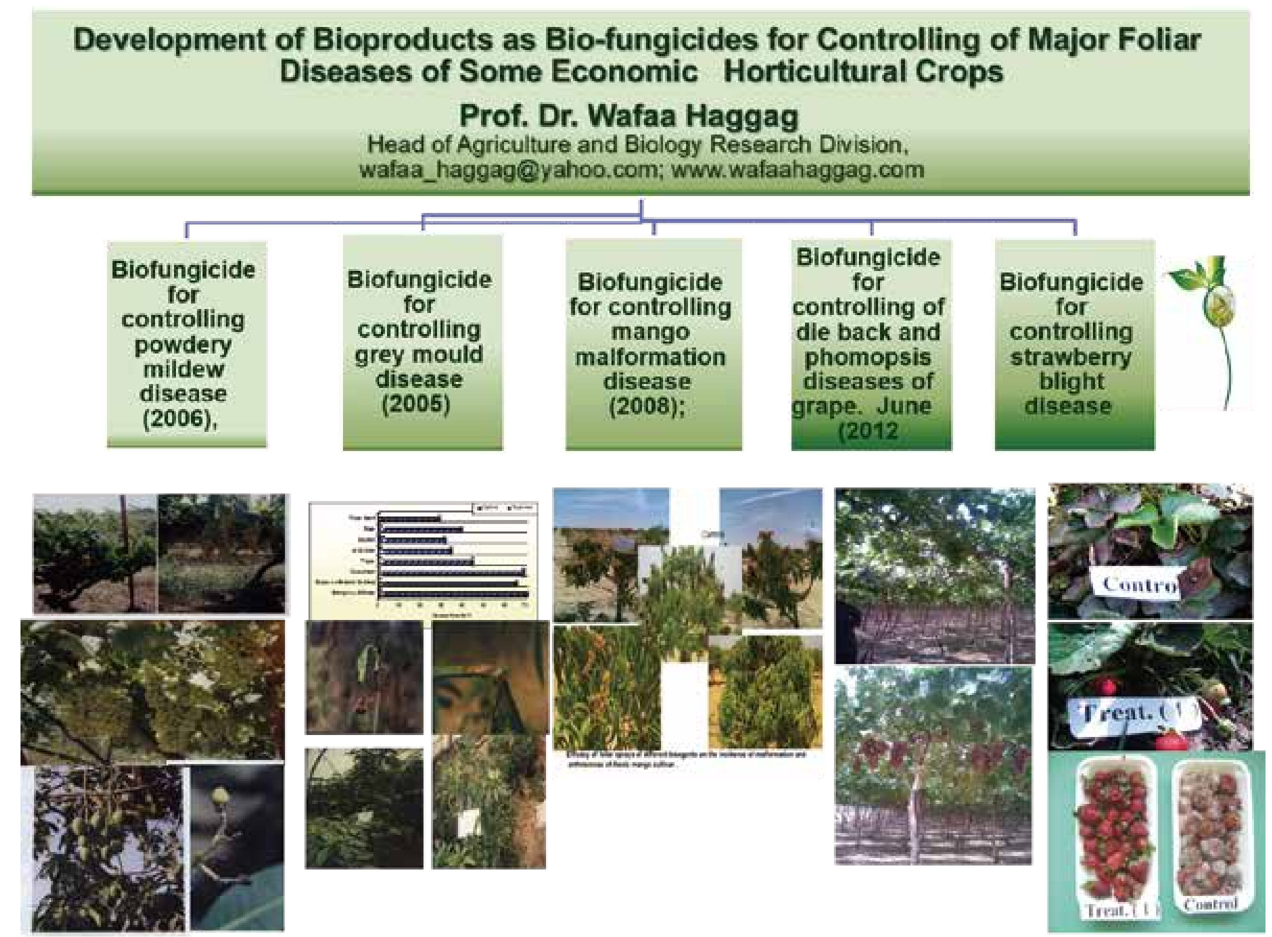

FIG. 4. BIOPRODUCTS FROM BENEFICIAL MICROORGANISMS

KEYWORDS: Best practices, organic agriculture in EU, conventional agriculture.

ORGANIC FARMING NEAR THE POLAR CIRCLE

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I will describe some of practises of organic farming at the most northern farming area in the world reaching up to the polar circle, Finland. Typical crop rotation of organic farms in Finland can be red clover-based grass, rye, oats, beans, and barley. Depending on the need for forage, clover is maintained from 1 to 4 years at a time. Although having an arable farm, regulations demand including plants capable of nitrogen fixation in the crop rotation as the green manure. Beans alone are not considered enough to maintain the soil productivity. Additional years for clover per rotation period causes better soil condition, extra nitrogen, and improved weed control.

In the northern climate, nitrogen fixation and mineralization are unpredictable and highly variable. Specially, the main crop, spring barley needs sufficient amount of free nitrogen for strong growth. Low soil temperature decreases the microbial activity in the critical first half of the growing season.

Biogas processes for treatment of organic waste materials releases nitrogen into soluble form. Many new organic digesters have been recently started and availability of such digested slurry is valuable for organic farmers. Concentrated organic fertilizers have been brought to the market as nitrogen and potassium organic fertilizers. Biogas itself is very valuable for the farms.

Organic farming in Finland currently covers almost every product lines: milk, cereals, meat, eggs, potato, vegetables, as well vegetables and herbs from greenhouses. Sugar is the only significant product without organic option. Oats are only product which is successfully exported. Rye is found reliable to grow in our climate and has favourable effects on soil. Ruminants have reached the best yield rates compared to the techno-chemical production. Pork and poultry sectors have met some problems to get popular. Strict legislation as to the origin of animals and their housing together with high costs of feed with lower production level make a burden to be considered.
Spraying with allowed balanced micronutrient solutions on leaves of plants is getting popular in organic fields. Other trend is pests treated with pesticides of natural origin. A question may be raised if we are losing the traditional idea of organic farming. What happened to the idea of the soil ecology healing itself? The lost crops may belong to as a part of natural variation? How could we solve obvious problems?
Conventional farming has also made sustainable progress along with approaching “no-till”, or with “minimum-till” as the main method, supported by chemical herbicides. Organic farming has remained the ploughing method added by repeated stubble cultivations for the weed control. Peat soils and carbon emissions have been risen to be a topic of climate politics. The nutrient leaks from cultivated fields are under a strict control. Some organic farmers have taken the soil coverage at outside of growing season as a new standard.

An autonomous, solar powered weeder robot is promising method helping hands to ease the weed problem without tillage and bare ground. First applications are ready to come to market, but have not seen yet in practise in Finland.

A simple separation process for legume biomass would be important in the future for:

1. marketless crops of arable farms, allowing to increase legume grass-years into the crop rotations,

2. improve lack of critical amino acids on organic pig and poultry diets,

3. biodegrable input for biodigester with a reduced nitrogen level, sustainable as a by-product.

System has been tested in Danish university and found reasonable. http://icrofs.dk/forskning/dansk-forskning/organic-rdd-3/supergrasspork/

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KEYWORDS: Polar circle, Organic farms, North climate

ORGANIC AGRICULTURE MOVEMENT IN MYANMAR

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Main objective of this presentation is to create awareness of organic agriculture movement in Myanmar. Agriculture is the main industry in Myanmar, accounting for 60 percent of country's GDP and employing more than 65 percent of total 54 million people. Rice is the major export crop for Myanmar, once Asia's largest exporter of rice. Due to fluctuating weather pattern and wrong use of chemical products, it results in drop of production in recent years. But still most of the farm lands in Myanmar are agrochemical-free since most of them are too poor to afford chemical products. Instead they use animal's dung as the natural fertilizer which is organic. But at the worrying rate, smallholder farmers are changing to use chemical products as the result of aggressive marketing of the chemical fertilizer companies. The government accept to authorize the Organic certify to the farmers who has no use of agrochemical. We have done now on the aromatic organic coconut, organic rice and organic vegetables and try to serve the society to avoid for consuming the causal toxic pesticides residue in agricultural products and maintain our environment as well. This is where we come up with the idea of setting up organic fertilizer factory and supporting to build up the Organic University in Myanmar with the help of Dr. Kasem Soytong and other professors to help and educate smallholder farmers.

KEYWORDS: Organic agriculture, Rice, Organic coconut

ORGANIC AGRICULTURE IN LAO PDR

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Lao PDR prioritized clean agriculture production as an important strategy policy. Organic Agriculture (OA) plays a crucial role in supporting this policy to enhance the production of the food for consumers, sustainable production, and conservation of natural resources and to provide the opportunities to generate income for farmers. Organic Agriculture production is deemed to have significant potential in the Lao PDR.
Agriculture production in Laos has been widely practiced in a traditional way of subsistence farming systems which are resource which based productions. The production systems are mainly based on indigenous knowledge and local conditions. However, this practice typically has a lack of diversity, consideration for the variable factors and the adaptive solutions to the unique conditions in each environmental condition.
Laos has potentials to support Organic Agriculture production due to its enriched and abundant biodiversity and its favorable climate. On the other hand, the use of chemicals in agricultural production remains low level, which is considered as an advantage for clean agriculture production.

Organic Agriculture production systems face several limitations and challenges that shall be overcome in order to enable Organic Agriculture development successful. In order to be recognized as Organic Agriculture for both domestic sale and export, the prioritized focus is the management of inorganic chemical usage, standardization of production systems and enhancing the certification for quality and safe produce.
Several Organic Agriculture and clean agriculture projects have been implemented since early 2003 onward. Significant achievement for the development of Organic Agriculture in Laos was attained be the implementation of Promotion of Organic Farming and Marketing in the Lao PDR (PROFIL) and PRORice projects supported by Helvetas and implemented by Department of Agriculture from 2004 and 2011 respectively PRORice was merged into PROFIL from 2008 onward. The PROFIL project supported the development of Lao Organic Agriculture standard, which adopted a norm of International Federation of Organic Agriculture Movement (IFOAM), developed guidelines for inspectors and certification, and supported the establishment of Organic Agriculture farm groups in Vientiane Capital.

In addition, the PROFIL also supported the development of human resources and institutional capacity building development, in particular, the development of Laos Certification Body (LCB) and Internal Control System (ICS) Unit. The project also supported the establishment and organized weekly market at That Luang, which is now independently operated by farmer groups since 2009.Since August 2013, apart from That Luang market, another weekly organic market has been operated at Chao Fangum in Vientiane Capital. Some (6sh0ls) mini markets and retail outlets have been setting Organic Agriculture products in Vientiane Capital.

Organic Agriculture extension promotion throughout the country includes Vientiane Capital and 7 others provinces/17 provinces covering 26 districts, 2 agriculture centers, and 14 companies. This includes 22 large Organic Agriculture producer groups, which are made up of 84 small groups covering 1,562 households with total area of 3,231 Ha and the average production 2,657,88 tons per year.

The Organic Agriculture activities are implemented throughout the country, in particular, Vientiane Capital, with 8 districts : including Sangthong, Saythany, Sikhodtabong, Sisatanark, Hadsaifong, Saysettha, Pak Ngum, Nasaithon. Vientiane province with 1 district: Thoulakhom. Xiengkhuang province with 3 districts: Phoukoud, Paek, Khoun. Xaysomboun province with 2 districts: Thathom, Hom. Luang Prabang province with 3 : Luang Prabang, Xieng Ngeun, Phonxay. Oudomxay province with 1 district: Xay district. Savannakhet province with 1 district: Kaysone district. Champasack province with 5 districts: including Paksong district that Dr. Kasem SOYTONG has some activities with Korean Company on Organic Coffee Production with 150 hectares of coffee plantation, Bachieng district, sanasomboun district, Khong distric and Mounlapamok district. Xayabouly province with 1 district: Kaenthao district.

For human resource development, so far 35 staff were trained on Organic Agriculture inspection and certification, 15 staff were trained on ISO/IEC 17011, ISO/IEC 19011 and ISO/IEC 17065, 20 technical staff were trained on ICS and 120 staff were trained to be farm advisors.
The existing Organic Agriculture markets with participation from public sector and producers groups open throughout the week. This event is the platform for facilitating the trading of organic products and exchange of lessons on techniques and production principles among producers and consumers. The management mechanism of the Organic Agriculture market was initially supported by Project. Later on, the management gradually shifted to development of organizational structures, rules of controlling markets and providing some funding supports for establishment of markets. Along with development of the domestic markets, some Organic Agriculture potential products were supported and facilitated to export to international markets; for instance, rice, coffee and silk clothes and products from mulberry silk. Organic agriculture markets have significantly grown, and they have developed small to large groups gradually responding to the increasing demand and consumers' awareness.

The development of Organic Agriculture in Lao PDR faces several challenges. For example, group of farmers and producers are required of further strengthening despite of the supports receiving from the public sector and international organizations for implementation of organic Agriculture. Extension into grassroots levels for production is limited. In addition, participation of entrepreneurs or private sector operators remains low.

To increase Organic Agriculture production in terms of quantity and quality, it is necessary to undertake the following tasks: develop legal instruments or legislation on the production of Organic Agriculture emphasizing the creation of standards of Organic Agriculture : develop inspection systems in particular the approval and certification process; determine target production areas; build necessary infrastructure; create sales points/shops for Organic Agriculture products; strengthen plant protection and plant quarantine; strengthen regulations and policies to facilitate convenience for producers and entrepreneurs in order to conduct business aspects of Organic Agriculture production most effectively.

REVIEW OF ORGANIC AGRICULTURE DEVELOPMENT IN THE PAST UP TO PRESENT IN LAO PDR.

1. Policy and direction for development of clean agriculture
The IX Party Congress of the Political Bureau of Party Central Committee (17th March 2011) determined the Organic Agriculture production must follow clean agriculture direction due to potentials of natural resources, in particular, soil, climate, air and clean water resources which are suitable for Organic Agriculture. For example, Kao Kai Noi rice production is unique in northern part, coffee and tea production in northern and southern parts, vegetable growing on plateaus and riverbank. In the past, the government has issued supportive policies for Organic Agriculture production, especially Ministry of Agriculture and Forestry has issued the agreement on Organic Agriculture standard in 2005, ref. No. 1666/MAF, Vientiane Capital, dated 30/12/2005

2. Past Achievement in the Actual Implementation of Organic Agricultural Production
The Organic Agriculture production was initiated as sustainable agriculture or biological agriculture by 2014. The development of Organic Agriculture production followed the standard of inspection and certification based on international standard ISO/IEC 17065.

Organic Agriculture markets have been established in Vientiane Capital, Xiengkhuang, Savannakhet and Luang Prabang. In addition, the Organic shops have opened in some big cities across the country. Meanwhile, the export Organic Agriculture products have been initiated.

2.1. Cooperation and investment in Organic Agriculture
The government has been had a policy for development of clean agriculture especially the development of Organic Agriculture in cooperation with international agencies such as PROFIL, Sustainable Commercial Production Promotion Project in 5 southern provinces, Small Holder Development Project and Lao Organic Agriculture Promotion Project. In addition, there have been participations from domestic and international operators.

2.2. Human Resource Development for Organic Agriculture
The government recognizes the importance of developing Organic Agriculture production systems. The Department of Agriculture established Standard Division and Clean Agriculture Development Center as well as assigned staff for establishing and developing Lao certification of Board of Directors, Certification Committee, Inspectors, farm advisors and trainers for internal control system (ICS) based on international standard ISO/IEC17065. 15 inspectors were trained on ISO/IEC17011, ISO/IEC19011, and 22 staff from Lao Certification Body (LCB) and committee members were trained on ISO/IEC17065 in Thailand 2 times; 20 staff was trained on internal control system (ICS), 120 staff was trained to be farm advisors.

2.3. Development of Standards, Certification and Accreditation of Organic Agriculture Systems in the Regional and the World
Apart from EU and US that developed regulations for controlling Organic Agriculture, many countries in the region have developed controlling regulations on Organic Agriculture, including Japan, Taiwan, the Republic of Korea, China, Indonesia and Philippines.
From the end of 2015 onwards, the ASEAN Economic Community (AEC) has been implemented. One of the targets of AEC is to establish a common market for Good Agriculture Practices (GAP), Good Animal Husbandry Practices (GAHP), Good Hygiene Practice (GHP), Good Manufacturing Practice (GMP) anf Hazard Analysis Critical Control Point (HACCP). These are basic systems for agricultural food products with significant trade potentials. It is expected that in the near future, GAP certification will be necessary for trade of agriculture produce within ASEAN. National GAP schemes have been developed by ASEAN member states including Lao PDR. Certain modules of ASEAN GAP standards have been developed and system for conformity assessment and recognition arrangement to follow.

In order to prepare Lao PDR for economic integration regionally and globally, the agriculture sector will have to transform itself from public services to public control through laws and regulations for supporting and facilitating private sector and farmers groups engaging in organic farming and enhance the linking with regional and international levels.

Lao PDR has joined many international treaties such as ASEAN and World Trade Organization (WTO), which provide opportunities for its agricultural products access to regional and global markets increasingly. On the other hand, agricultural products from other countries compete in the domestic market. Therefore, it is essential for Lao PDR to develop Organic Agriculture products with high quality in accordance with regional and international standards to gain the recognition from international markets.

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KEYWORDS: Organic agriculture, Lao PDR

ORGANIC RICE IN CAMBODIA

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In field experiment for rice var. Sen Pidoa showed that the organic method significantly decreased leaf spot infection caused by Curvularia lunata, followed by chemical method and GAP method. The chemical method gave the best results in all plant parameters, followed by the GAP and organic methods. The chemical method gave the highest panicle/plant, panicle length, panicle weight, grain weight/plant which significantly differed from the GAP and organic methods. The chemical method also gave the best results in filled grain/panicle, unfilled grain/panicle, grain weight/plot, dry hay weight/plot, biomass weight/plot and harvest index, and was significantly better than the GAP and organic methods. This is the first report using C. cupreum CC3003 to control leaf spot of rice var. Sen Pidoa caused by C. lunata in Cambodia. Field application of Chaetomium sp to control leaf spot of rice var. IR66 showed that chemical method gave the better result in plant height, number of tillers and all parameters including yield than GAP and organic methods which significantly differed when compared to non-treated control. Further field experiment for rice var. Sen Pidoa showed that the organic method significantly decreased leaf spot infection caused by C. lunata, followed by chemical method and GAP method. The chemical method gave the best results in all plant parameters, followed by the GAP and organic methods. The chemical method gave the highest panicle/plant, panicle length, panicle weight, grain weight/plant which significantly differed from the GAP and organic methods. The chemical method also gave the best results in filled grain/panicle, unfilled grain/panicle, grain weight/plot, dry hay weight/plot, biomass weight/plot and harvest index, and was significantly better than the GAP and organic methods. This is the first report using C. cupreum CC3003 to control leaf spot of rice var. Sen Pidoa caused by C. lunata in Cambodia. Organic agriculture in Cambodia is one of the policy that the government doing Organic certify to the farmers.

KEYWORDS: Biological control; Chaetomium cupreum; Curvularia lunata; rice

ORGANIC AGRICULTURE MOVEMENT IN MYANMAR

KAMPON SRIWATANAKUL (THAILAND)

Innovative Project for Development of Smart Farming Technologies in Rayong Province, Thailand. Innopro Co., Ltd, Bangkok, Thailand

A growing global population and negative impact of climate changes make the demand for food to feed the people much greater than the present year. It has been estimated that the world will need 70 percent more of food production. Smart farming technologies are required to provide sustainable development goals for climate adaptation, poverty and getting rid of hunger. Smart agriculture involves the integration of management information system, precision agriculture and agricultural system. In order to initiate the project, it requires the farm owners having more than 500 acres of land and with the passion to become the excellent center. With the aim of setting up Rayong as a world class for value added fruits and herbal products, Suphattra fruit garden is collaborating with partners to create a research lab at its site in the province. The center will collect fruits and herbs that share Thailand the equatorial latitude. Genetic tests will be used to identify and authenticate plant species. It will also provide R (&) Services and set up a health and anti-aging center, as well as social enterprise and a company CSR center. Digital data management and marketing known as blockchain technology will be used to support End-to-end supply chain. In this presentation, the innovative healthcare products already successfully developed will be described. These include weight loss products derived from processed durian and mangos teen in both tapioca and alginate pearls, anti- wrinkle serum derived from silk worms, xanthones extracted from mangos teen having strong antioxidant activities and various health benefits. and natural enzyme products having deodorant and antiseptic properties.

搭建有机农业产业技术平台的重要性和迫切性
IMPORTANCE AND URGENCY OF BUILDING TECHNICAL PLATFORMS FOR ORGANIC AGRICULTURE SECTOR

周泽江 ZHOU ZEJIANG (CHINA)

传统农业在世界进入工业化时代后受到了明显的影响，并由此带来了一系列现实的和潜在的生态、环境和健康问题，20世纪初，一些卓有远见的先锋们看到和预见到了这些问题可能会给地球带来的长远影响，进而提出了有机农业的理念。我们把1920年代初到1970年代初这段时间称之为有机农业的1.0时代。

从1972年国际有机农业运动联盟（IFOAM）成立到2015年在韩国举办的世界有机大会上发出有机3.0时代宣言的43年时间，我们称之为有机农业的2.0时代。这40多年时间是世界各地制定有机标准、制定相关法规、开发有机生产技术、开拓有机产品市场的阶段，到2017年，全世界有80多个国家有了有机标准和法规，有机农业仅第三方认证的农地面积已经达到7000万公顷，全球有机食品市场销售额超过了1000亿美元。

人们总结有机2.0时代的经验时发现有机产业的发展存在着技术和市场两大瓶颈。没有合适的技术就没有真正的有机产品，这是根本，而如果好的真的有机产品找不到合适的市场，则同样是前功尽弃。围绕着这两个瓶颈，国际有机界认为有机产业已经具备了进入3.0时代的条件，并提出了创新发展、最佳实践、透明诚信、全链强化、包容合作和真值实价的有机3.0时代六大特色。

目前已经有了不少搭建有机产品贸易平台的努力，虽然离成熟的市场还有相当的距离，但相对而言，有机产业的技术平台则基本还没有人来搭建，但这正是有机产业发展的源头保障所急需的。笔者就搭建有机产业技术平台所需要的几个基本条件，以及存在一些必须克服的关键性障碍，并根据笔者所了解的全球有机界发展情况，特别是有机产业技术基础方面的现状，结合有机3.0时代的六大特色提出了看法和建议，期盼能与业内同行就此议题进行深入的交流，为促进有机产业技术平台的搭建，为有机产业的持续健康发展尽一份力。

After the industrialization of the world, traditional agriculture has been significantly influenced and a series of existing and potential ecological, environmental and health problems. In early 1920's some far-sighted pioneers realized and predicted the adverse long term effects of those problems to the planet and further initiated the concept of organic agriculture. The period between the early 1920's and early 1970's is known as Era of Organic 1.0

The period from 1972 (the Year of the establishing of IFOAM, International Federation of Organic Agriculture Movements) to 2015 (the year that the Goesan Organic 3.0 Declaration was issued during the Goesan Organic Expo in Korea) is known as the Era of Organic 2.0. Within the 43 years a series of private and public organic standards released; regulations and acts on managing and supervising organic sector worked out and implemented; technology for organic production worked out and market for organic products explored. To the year of 2017 more than 80 countries had implemented their own organic standards and regulations and the area certified to organic standards exceeded 70 million ha, and the world sales value of organic food was almost 100 billion USD.

In the end of the era of Organic 2.0 people realized that technology and market are two key bottlenecks that are negatively influential to the development of the world organic sector. Without appropriate technology there will be no real organic products and without good market for organic products there will also be no incentive and no future for the organic industry. So that, the world organic sector needs to be turned into a new era, which is the Era of Organic 3.0. The Era of Organic 3.0 is characterized by six features: Culture of innovation, best practice, transparent integrity, holistic empowerment, inclusiveness, true value and real pricing. So far, quite a lot of efforts have been made on building organic market platform, though, far less than matured. But there is almost no one real organic technical platform built yet. Actually, organic technical platform is an important measure in guaranteeing the supply of real organic products from the source and is in urgent need.

The basic conditions needed for the building of organic technical platform are described and the obstacles existed in the processes of building organic technical platform have been analyzed. For promoting the building of organic technical platforms and for the sustainable development of organic movements, comments and ideas on the building of organic technical platforms have been proposed on the bases of the status quo and development trend of the world organic sector, especially the situation of basic needs on organic technical support, combined with the six features of Organic 3.0.

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松阳有机农业国内外竞争制胜之道与落地途径性
THE WAY OF WINNING THE DOMESTIC AND OVERSEAS COMPETITION OF SONGYANG'S ORGANIC FARMING AND LANDING APPROACH

吴文良 WU WENLIANG (CHINA)

内容缺失

中国有机茶发展现状与展望
STATUS QUO AND OUTLOOK OF ORGANIC TEA DEVELOPMENT IN CHINA

傅尚文 FU SHANGWEN (CHINA)

1.中国有机茶发展历程与现状	1.Development and status quo of of organic tea in China
2.中国有机茶标准、认证与监管	2.Standard, certification and supervision of organic tea in China
3.中国有机茶发展环境	3.The environment for development of organic tea in China
4.中国有机茶发展的科技支撑	4.Technical supports to the development of organic tea in China
5.有机茶对中国茶产业贡献	5.Contribution of organic tea to Chinese tea industry
6.中国有机茶发展展望	6.Outlook to the development of Chinese organic tea

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中国有机稻米产业发展特征、成果与创新展望
DEVELOPMENT CHARACTERISTICS, ACHIEVEMENTS AND INNOVATION PROSPECTS OF ORGANIC RICE INDUSTRY IN CHINA

金连登 JIN LIANDENG (CHINA)

1.中国有机稻米产业发展特征。	1. Development characteristics of organic rice industry in China.
2.中国有机稻米产业发展成果。	2. Development achievements of organic rice industry in China.
3.中国有机稻米产业可持续创新展望。	3. Prospects for sustainable innovation of organic rice industry in China.
4.对松阳县对接有机农业高质量发展的思考。	4. Consideration on the high-quality development of docking organic agriculture in Songyang County.

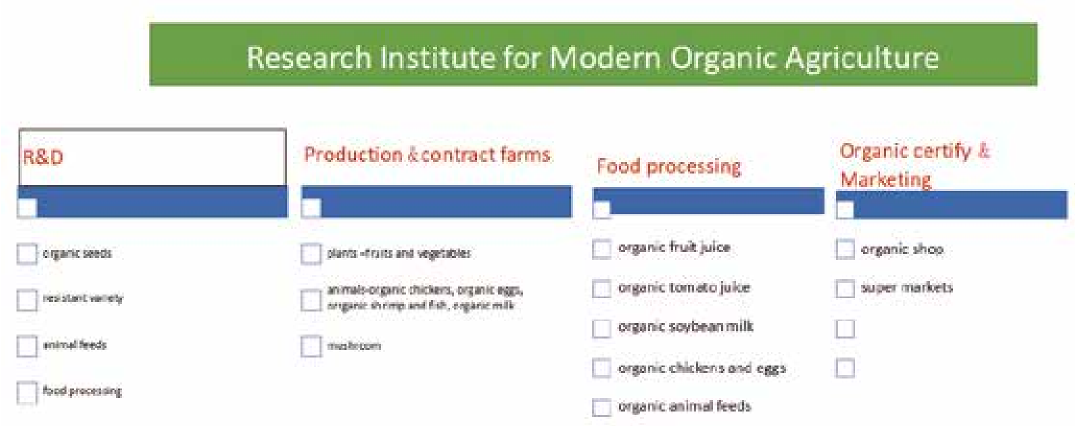
ORGANIC AGRICULTURE MODEL -FROM RESEARCH CONTRIBUTION, ORGANIC CERTIFICATION AND MARKETING

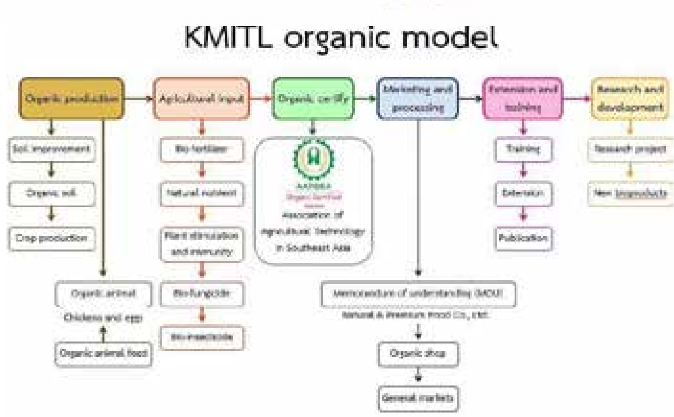
KASEM SOYTONG (THAILAND)

Department of Plant Production Technology, King Mongkut's Insitute of Technology Ladkrabag (KMITL), Bangkok 10520, Thailand, Association of Agricultural Technology in Southeast asia (AATSEA)

Organic agriculture model has been demonstrated in Thailand e.g KMITL Organic Model, AATSEA organic model etc., to contribute the research findings of biological products as agricultural inputs to be used for organic agriculture in practice. It is to promote the farmers to gain the based knowledge of organic agriculture. The organic model is divided into six parts as follows: production, agricultural inputs, organic certification, marketing, extension and training as well as research and development. The model is a process from production to marketing including research findings which necessary to serve the model. The based knowledge from scientific research in organic agriculture from many scientists must combine for practical usage to econimize the production cost in commercial scale. The research on organic agriculture will become modern whenever it is sucessfully applied in organic agriculture model. The commercial organic products would be released into the markets for consumers safety and healthy eg. organic vegetables, fruits, medicinal herbs as well as organic animals eg organic beef, chickens, duck , shrimp, fishes, eggs, milk etc. The organic food processing would be come out as organic tomato jouice and others. The research finding would be attended to organic seeds, organic animal feeds and so on. It is needed to do more research in organic agriculture eg agricultural inputs for organic agriculture eg. biofertilizers, biopesticides, bio-nutrients, bio-stimulates , bio-medicine etc. The organic agriculture model is combined all processes and steps forward to the commercial scales.

AATSEA is performed in 9 march 2011 and officially approved on 17 April 2012. It is a group of scientists especially in Southeast Asia. ATTSEA is active in a variety of training programs for agricultural technology, especially organic agriculture. It has also done organic certification in Thailand, Vietnam, Cambodia, Myanmar and Laos since 6 august 2018. Marketing is very important factor for cultivation thereafter production. The organic model has committed to produce organic vegetables and animal delivery to the markets. It is known before which kinds of vegetable would be cultivated and speculation of each plants including the quality, quantity and price. Organic production planning would depend on production order. Moreover, organic shop and home delivery would also be started for marketing promotion. The training program for organic agriculture has organized in organic farm. A pilot project of transfer technology for organic agriculture model to expand learning network in the areas to be trained the farmers and interesting peoples to gain knowledge based commercial scale of organic agriculture.





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有机农业的乡村智慧——基于乡村价值的有机农业
RURAL WISDOM OF ORGANIC AGRICULTURE: ORGANIC AGRICULTURE BASED ON RURAL VALUE

朱启臻 ZHU QIZHEN (CHINA)

乡村在其长期生长过程中，逐渐发展出来适合农业生产的各种功能，蕴含着丰富的可持续农业智慧。村落选址充分考虑节约耕地和方便农业生产的需要，民居建造则充分体现着尊重自然和利用自然的智慧；村落不仅是实现种植业与养殖业之间有机循环的重要空间，同时也是农民生产与生活之间实现循环的重要节点。由于乡村的存在，乡村资源得以综合利用，可持续发展得以实现。乡村也是特色农业与融合农业发展的重要条件。不仅发现、传承特色农业，也培养了特色农业文化，为乡村产业的融合发展奠定了社会文化基础。

In its long-term growth process, the countryside has gradually developed various functions suitable for agricultural production, which contains abundant sustainable agricultural wisdom. The location of villages fully considers the need of saving arable land and facilitating agricultural production, while the construction of dwellings fully reflects the wisdom of respecting and utilizing nature. Villages are not only an important space for realizing the organic cycle between planting and aquaculture, but also an important node for realizing the cycle between farmers'production and life. Because of the existence of rural areas, rural resources can be comprehensively utilized and sustainable development can be realized. The countryside is also an important condition for the development of characteristic agriculture and integrated agriculture. It not only discovers and inherits characteristic agriculture, but also cultivates characteristic agricultural culture, which lays a social and cultural foundation for the integration and development of rural industry.

松阳自然农法的缘起和发展现状
THE ORIGIN AND DEVELOPMENT OF SONGYANG NATURAL AGRICULTURE LAW

何 兴 HE XIN (CHINA)

松阳自然农法，从农民中来到农民中去，旨在让农业就地增值，让农民就地增收，让农村可持续发展。松阳自然农法跟是一种心法，是一种健康生活理念及方式严格要求下的健康生产方式，它通过渠道切入，贴近市场，组织客户真实需求，再反向匹配生产规模。通俗地说，它销售的是尊重客户意愿并高度认可的生产标准及其山乡村好水好人更好的生产能力，是真正意义的体验加预付费定制农业。

松阳自然农法的定位消费者认可标准，缘于健康生活追求者的真实需求，简单地说，就是不使用农药，不使用化肥，不使用转基因种子，不使用除草剂等，尽可能摆脱对外界任何可能有害物质的依赖而致力生态内循环农业。

Songyang Natural Agriculture Law, from the peasants to the peasants, aims to increase the value of agriculture in situ, increase farmers'income in situ, and make the rural sustainable development. Songyang Natural Agricultural Law is a mental method, a healthy production mode under the strict requirements of the concept and mode of healthy life. It cuts in through channels, closes to the market, organizes the real needs of customers, and then matches the production scale in reverse. Popularly speaking, it sells production standards that respect customers'wishes and are highly recognized, as well as better production capacity of good people in mountain and countryside. It is a real experience plus prepaid customized agriculture.

The orientation of Songyang Natural Agriculture Law is based on the real needs of healthy life seekers. Simply speaking, it is to devote itself to eco-internal recycling agriculture without pesticides, fertilizers, genetically modified seeds and herbicides.

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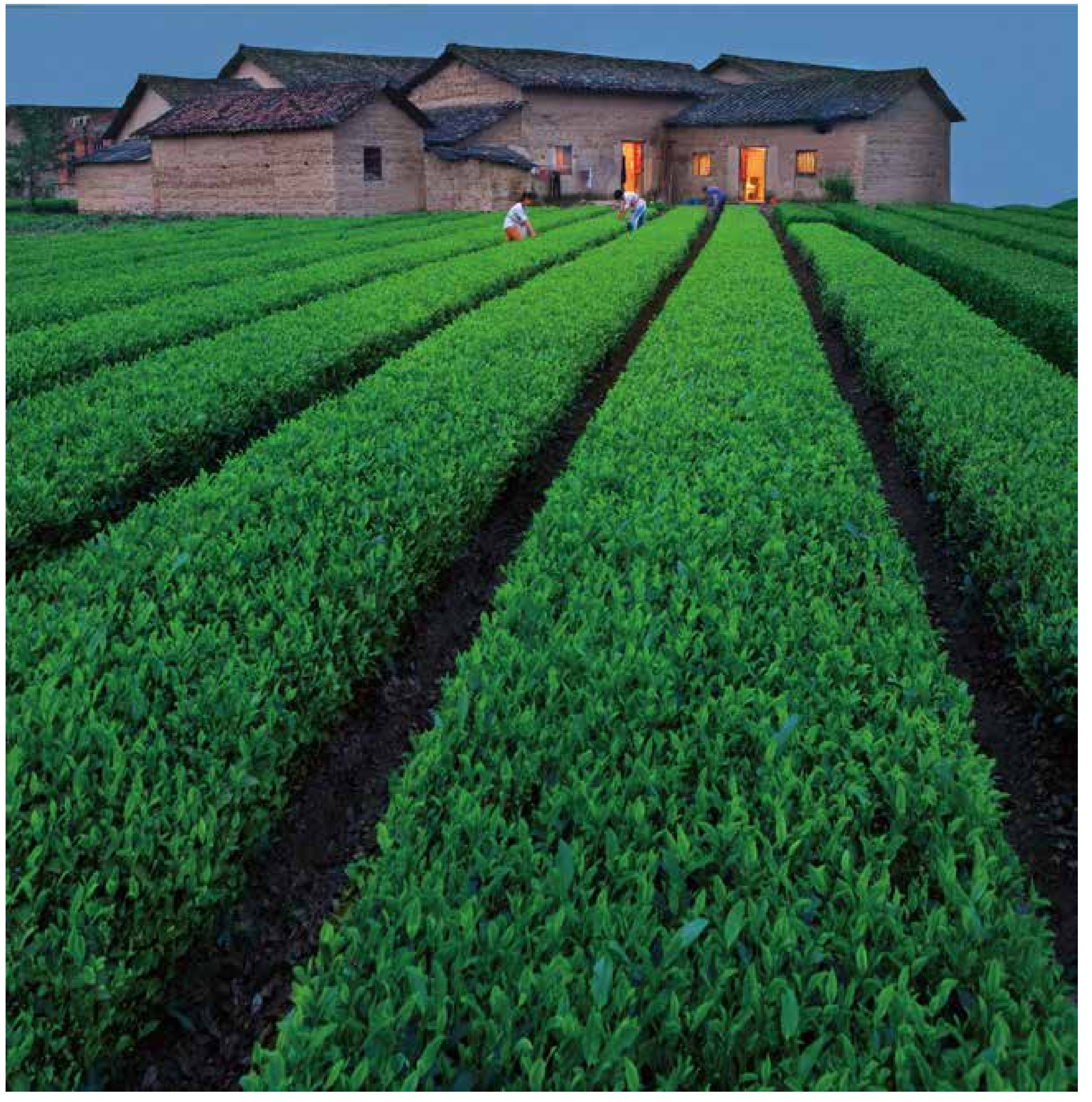
有机生活让生命与环境共生
ORGANIC LIVING, MAKING LIFE AND ENVIRONMENT MUTUALLY DEPENDENT

胡 珊 HU SHAN (CHINA)

选择有机生活是推动可持续农业发展的最好方式，有机生活让我们健康，让我们的生存环境健康，让地球上的所有生命健康。

Choosing organic living is the best way to promote sustainable farming development, making our environment healthier ,making all the beings on Earth healthier.



JiangSu CAS Asian Agricultural Bio Engineering Co.Ltd is established in 2017 and Located in WuxiZhongguancun Science Park,Jiangsu,China nearby beautiful Tai Lake .The company has developed microbial biotechnological research for agriculture by expert scientist.We are now focused on developing and producing the unique bio-products eg . Bio nutrients for plant immunity to diseases and insert , Bio-nutrient for plant growth stimulate and increase yield , and the new technology Nano-product to stimulate plant growth etc Our key scientist, Dr.KasemSoytong is the leader to develop the advanced microbial bio-technological research products who served as Research & Development (R&D) Director.Company' s mission is to maintain and protect our environment with green technology in China and elsewhere. We are promoted the farmers to produce green products for safety and healthy food.

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江苏中科亚农生物工程有限公司成立于2017年，位于江苏无锡中关村软件园，美丽的太湖湖畔。公司专家致力于开发研究农业方面的微生物技术。目前，我公司致力生产专门的农用生物制品，如：生物肥和植物免疫剂，提高病虫害免疫力，增加产量；最新的纳米技术生物产品，能够促进植物生长。Kasem 教授是国际开发先进微生物技术产品的领导者。Kasem教授是中科亚农生物工程有限公司的合伙人，同时担任公司研究与开发部首席科学家。我们的使命是用我们绿色环保的生物技术维护、保护中国乃至其他任何地方环境。我们致力于让农民生产安全健康的绿色食品。

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Product Introduction

CAS Bio-Product No.1 Ketomium (Bio-fertilizer and plant immunity agent–powder)

Ketomium is a world unique bio-fertilizer and plant immunity agent of a mixture of effective strains of *Chaeomium cochioides* and *Chaetomium* sp.

CAS Bio- Product No.2 Bio-nutrient（Liquid Biofertilizer)

Bio-nutrient is the naturally necessary plant nutrients to promote plant growth and increase yield.

CAS Bio- Product No.3 Bio-insect（plant immunity agent for insect protection – liquid)

Naturally substances for plant immunity to insect pest. Active ingredient: the naturally chitosan and sulfur solution and plant immunity agent for insect protection.

CAS Bio- Product No. 4 Nano- Kytex

Nano- Kytex is a natural biocontrol and elicitor，It is used as a plant growth stimulant.

CAS Bio-product No. 5 MICROBIAL ELICITOR: for plant immunity

It consists of natural products of metabolites from *Chaetomium* sp eg chaetoglobocin C,rotirorinal, chaetomanon etc., plus the potent bacteria *Rhodopseudomonas* , Bacillus to promote plant growth.

CAS Bio-product No. 6 NUTRI-FOOD

It is a powder formulation of the naturally necessary natural plant nutrients to promote plant growth and increase yield.

CAS Bio-product No. 7 BIO-PEST: for insect and disease

Bio-pest consists of natural sulfur plus the potent microorganism (Bacillus and Metarhizium) Properties – it can be used for insect control as the mechnism of repellant and / or kill insect by contact.

CAS Bio-product No. 8 BIO-DECOMPOSER

It contains high potential microorganism producing enzymes of cellulose, hemicellulase, ligninase and protease etc. as follows:- *Achaetomium* sp., *Eurotium* sp, *Emericella* sp, *Humicola* sp., *Rhodopseudomonas* sp. and actinomycetes.

CAS Bio-product No. 9 Bio-nematode (Liquid)

Mechanism of Product:Nematodes destroy plants and reduce the plant humidity and nutrient, so that plants' growth is weak.

CAS Bio-product No. 10 Bio-nematode (Powder)

Bio-nematode contains Paecilomyces which is a bio-control agent for nematodes.

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产品介绍

中科亚农菌剂一号 生物肥料和植物免疫剂 - 粉末

该产品是生物肥和植物免疫剂，含有枯草芽孢杆菌有效菌株可以自然促进螺卷毛壳菌的生长，引导植物刺激提高病害免疫力。

中科亚农菌剂二号 生物营养肥料 -液体

该产品是液态生物肥料，营养成分丰富，配方合理，可以有效刺激根系生长；

中科亚农菌剂三号 生物昆虫植物免疫剂-液体

天然植物对害虫的免疫力的物质，活性成分：天然壳聚糖和硫磺用于昆虫保护的溶液和植物免疫剂。

中科亚农菌剂四号 纳米-Kytex

Nano-Kytex是一种天然的生物控制和诱导剂，用作植物生长兴奋剂。

中科亚农菌剂五号 微生物诱导剂

是促进植物生长的天然产品，由来自毛壳菌活性菌株的代谢物如球毛壳菌素-C，rotirorinal，chaetomanon等，混合红假单胞菌及芽孢杆菌等强效细菌而成。诱导植物免疫力，刺激植物产生植保素，促进新根系的生长

中科亚农菌剂六号 NUTRI-FOOD

促进花果生长；提高土壤养分的吸收及运输功效；刺激或诱导果树花蕾的生长；增加产量，提高质量。

中科亚农菌剂七号 BIO-PEST-用于昆虫和疾病

它是由天然硫磺和有益微生物（芽孢杆菌和绿僵菌）组成。它是通过驱避或直接接触杀死机理进行虫害控治，同时本产品还可以很好的消除营养专性病菌的寄生。

中科亚农菌剂八号 生物降解剂

它包含了多种高潜力产生纤维素酶，半纤维素酶，木质素酶和蛋白酶的微生物菌株如下：*Achaetomium* sp., *Eurotium* sp, *Emericella* sp, *Humicola* sp., *Rhodopseudomonas* sp. and actinomycetes。

中科亚农菌剂九号 线虫生防剂-液态

产品机理是线虫破坏植物，降低植物湿度和养分，使植物增长乏力。

中科亚农菌剂十号 生物线虫-粉剂

生物线虫含有拟青霉（Paecilomyces），它是线虫的生物控制剂。