International Forum on Research of Natural Resources Rehabilitation, Environment and Energy

31 August 2020

The Sirindhorn International Environmental Park

Cha-am, Phetchaburi, Thailand

Organizers of International Forum on Research of Natural Resources Rehabilitation, Environment and Energy

International Forum on Research of Natural Resources Rehabilitation, Environment and Energy

31 August 2020

The Sirindhorn International Environmental Park

Cha-am, Phetchaburi, Thailand




International Forum on

Research of Natural Resources Rehabilitation, Environment and Energy

31 August 2020

The Sirindhorn International Environmental Park

Cha-am, Phetchaburi, Thailand

Organizing Committee and Academic Committee

Organizing Committee

Pol. Lt. Gen. Prapun Chantaim	Chairperson
Mr. Thanawit Chaiyapa	Member
Mr. Rath Rungchotvit	Member
Dr. Panida Duangkaew	Member
Assoc. Prof. Mana Kanjanamaneesathian	Member
Asst. Prof. Dr. VM. Narin Preyavichyapugdee	Member
Asst. Prof. Dr. Kangsadan Sagulpongmalee	Member
Mr. Yossakon Saisory	Member
Ms. Areeporn Sittiyanpaiboon	Member and Secretary
Ms. Chutikarn Tonamrut	Member and Assistant Secretary

Academic Committee

Assoc. Prof. Mana Kanjanamaneesathian	Chairperson
Mr. Rath Rungchotvit	Member
Asst. Prof. Dr. Phisit Suvarnaphaet	Member
Dr. Rachsawan Mongkol	Member
Asst. Prof. Dr. Kangsadan Sagulpongmalee	Member
Ms. Areeporn Sittiyanpaiboon	Member and Secretary

Preface

It is a great pleasure to have organized the “International Forum on Research of Natural Resources Rehabilitation, Environment and Energy" which was held on 31 August 2020 at Sirindhorn International Environmental Park, Cha-am, Phetchaburi. The international forum was organized by Sirindhorn International Environmental Park (SIEP) Foundation under the royal patronage of HRH Princess Maha Chakri Sirindhorn in collaboration with Silpakorn University (SU) Phetchaburi IT Campus, Phetchaburi Rajabhat University (PRU) and Department of Environmental Quality Promotion (DEQP), Ministry of Natural Resources and Environment. We are pleased to wrap up the forum with the expectation to continue this activity in the years to come.

The objective of this international forum is to provide the platform for an interaction among all stakeholders and disseminate the knowledge obtained from research in the areas of natural resources rehabilitation, environment and energy to the public.

The participants are diverse, with 52 participants from various institutes, both domestic (SIEP, SU, PRU and DEQP) and international (such as IUCN and UNDP). These participants are from nine countries including Cambodia, Haiti, Myanmar, Tanzania, Thailand, Timor-Leste, Uganda, USA and Vietnam.

The international forum is the platform to share both knowledge and experiences through lively presentations and robust discussion amongst all participants. These activities have positive impacted to the continuation of further relevant research and the dissemination of the best practices to the public. In addition, the international forum has initiated networking for further collaboration among the participants in term of researching and sharing information on natural resources rehabilitation, environment and energy.

Academic Committee

The International Forum’s Organizer

Table of Contents

Table of Contents

Programme

International Forum on Research of Natural Resources Rehabilitation, Environment and Energy

On 31 August 2020 Time : 9.00-16.00 hrs.

At Lecture Room 2, Energy for Environment Centre

Sirindhorn International Environmental Park, Cha-am, Phetchaburi, Thailand

Time	Agenda	Individual/Organization
8.30 - 9.00 hrs.	Registration	
Opening & keynote presentation		
9.00 - 9.15 hrs.	- Opening remarks - Group photo	Prof. Sanit Aksornkoae Committee, Sirindhorn International Environmental Park Foundation
9.15 - 9.45 hrs.	Keynote presentation : "New challenges on natural resources and environmental management"	Dr. Wijarn Simachaya President, Thailand Environment Institute (TEI)
9.45 - 10.00 hrs.	*Coffee break*	
Presentation : Morning session		**Moderator :** Assoc. Prof. Mana Kanjanamaneesathian **Rapporteurs :** Alex Ahebwa Kyaw Soe Win Silpakorn University Phetchaburi IT Campus
10.00 - 10.20 hrs.	State Audit Office of the Kingdom of Thailand and the contribution in environment and ecosystem	Nunnapat Ruengsri Chomprang Wongrusmeeduan Phattraravee Parvaputsakul Wannisa Nokmud Pimpisut Pansook State Audit Office of the Kingdom of Thailand (SAO)
10.20 - 10.40 hrs.	The study of suitable plant species growing in Sirindhorn International Environmental Park by using dripping irrigation	Areeporn Sittiyanpaiboon Sirindhorn International Environmental Park
10.40 - 11.00 hrs.	Atmospheric nitrogen exchange in tropical forest, Sakaerat Biosphere Reserves	Dr. Phuvasa Chanonmuang Thailand Institute of Scientific and Technological Research (TISTR)

Programme

International Forum on Research of Natural Resources Rehabilitation, Environment and Energy

On 31 August 2020 Time : 9.00-16.00 hrs.

At Lecture Room 2, Energy for Environment Centre

Sirindhorn International Environmental Park, Cha-am, Phetchaburi, Thailand

Time	Agenda	Individual/Organization
11.00 - 11.20 hrs.	Homemade solar food dryer	Asst. Prof. Dr. Phisit Suvarnaphaet Silpakorn University Phetchaburi IT Campus
11.20 - 11.40 hrs.	Integration of solar energy with food production	Asst. Prof. Dr. Kangsadan Sagulpongmalee Phetchaburi Rajabhat University
11.40 - 12.00 hrs	Solutions for tackling marine plastic pollution	Siriporn Sriaram IUCN Asia Regional Office
12.00 - 13.20 hrs.	*Lunch & exhibition visit*	
Presentation : Afternoon session		**Moderator :** Assoc. Prof. Mana Kanjanamaneesathian **Rapporteurs :** Alex Ahebwa Kyaw Soe Win Silpakorn University Phetchaburi IT Campus
13.20 - 13.40 hrs.	Long term effect of forest ecosystem on soil properties: A case study in the Royally-Initiated Khao Cha-Ngum deteriorated area development project, Thailand	Dr. Nattaporn Prakongkep Land Development Department
13.40 - 14.00 hrs.	Fumigation and synergistic potential of volatile compounds from lemongrass and makrut lime for grain storage	Alex Ahebwa Silpakorn University Phetchaburi IT Campus
14.00 - 14.20 hrs.	Efficacy of some plant extracts suppress two fungi which cause grain discoloration of rice	Thi Thi Win Silpakorn University Phetchaburi IT Campus
14.20 - 14.40 hrs.	Dried galangal (*Alpinia galanga*) suppresses grain discoloration1 of rice (*Oryza sativa)*	Kyaw Soe Win Silpakorn University Phetchaburi IT Campus
14.40 - 15.00 hrs.	Krailart Niwate Mangrove Ecosystem Preservation : A Public-Private Partnership	Brian Anderson Chiva-Som International Health Resorts Co., Ltd.
15.00 - 15.30 hrs.	*Coffee break*	

Programme

International Forum on Research of Natural Resources Rehabilitation, Environment and Energy

On 31 August 2020 Time : 9.00-16.00 hrs.

At Lecture Room 2, Energy for Environment Centre

Sirindhorn International Environmental Park, Cha-am, Phetchaburi, Thailand

Time	Agenda	Individual/Organization
Conclusion & reflection of forum and closing remarks		
15.30 – 16.00 hrs.	- Conclusion & reflection of forum - Closing remarks	Assoc. Prof. Mana Kanjanamaneesathian Pol. Lt. Gen. Prapun Chantaim Managing Director, Sirindhorn International Environmental Park

Remarks : 1) Exhibition displayed during 8.30-16.00 hrs.

2) Side event comprising 2 practicing activities;

2.1) Natural dyeing during 12.30-13.15 hrs.

2.2) Making cap from softener and detergent bags during 8.30-16.00 hrs.

QR Code for presentation

Opening remarks

By Prof. Dr. Sanit Aksornkoae

Board Committee, Sirindhorn International Environmental Park Foundation under Royal Patronage of HRH Princess Maha Chakri Sirindhorn

Chairman

International Forum on Research of Natural Resources Rehabilitation, Environment and Energy

The Sirindhorn International Environmental Park

31 August 2020

Dr. Wijarn Simachaya, Former permanent secretary of Ministry of Natural Resources and Environment

Police Lieutenant General Prapun Chantaim, Managing Director of Sirindhorn International Environmental Park

Associate Prof. Mana Kanjanamaneesathian from Silpakorn University

Distinguished participants

Ladies and Gentlemen

On behalf of the Sirindhorn International Environmental Park Foundation under Royal Patronage of Her Royal Highness Princess Maha Chakri Sirindhorn, I have the honor and pleasure to welcome all of you for joining the International Forum on Research of Natural Resources Rehabilitation, Environment and Energy this morning. This is an auspicious and vision of the Park, which is an international learning center on rehabilitation of natural resources, environment and energy.

I would like to mention here that the Sirindhorn International Environmental Park is, by the mandates, positioned to promote education, public awareness, capacity building and research innovation. The Park also builds international linkages and global partnership in engaging strategic alliances through networking at the local, national and international levels.

I would like to tell you more about the Park. The Park was initiated by the Royal Highness Princess Maha Chakri Sirindhorn due to previously environmentally degraded area. Presently, the area has been rehabilitated and restored into its original natural condition. I suggest all of you to find sometime to visit the mangrove forest in the park during your stay here. The role of the Park is aimed at natural resource, environment and energy conversation in order to cope with the national strategies on climate change. In addition, the Sirindhorn International Environmental Park also serves the core of the Regional Center of Expertise on Education for Sustainable Development.

Ladies and Gentlemen

I am so delighted that the Sirindhorn International Environmental Park with collaboration of Silpakorn University can organize the International Forum on Research of Natural Resources Rehabilitation, Environment and Energy. We have several participants from various government agencies, academic institutions, IUCN, graduate students from Silpakorn University and from Chiva-som hotel. I gratefully acknowledge to you all for coming to participate in this important Forum.

Finally, I believe that this forum should be an occasion for all of us to get to know each other better particularly for individual group and also to exchange the ideas and experiences and share good practices on research and innovation of natural resources rehabilitation, environment and energy. I am thankful to those who are making presentations. I wish the International Forum today to be a great success. Please come to visit us here at the Park again sometimes in the future. We always welcome you all and now it is good time to declare officially open the International Forum on Research of Natural Resources Rehabilitation, Environment and Energy.

Thank you so much for your attention

Keynote presentation

“New Challenges on Natural Resources and Environmental Management”

By Dr.Wijarn Simachaya

President, Thailand Environment Institute (TEI)

Keynote speaker

International Forum on Research of Natural Resources

Rehabilitation, Environment and Energy

The Sirindhorn International Environmental Park

31 August 2020

“New Challenges on Natural Resources and Environmental Management”

Dr.Wijarn Simachaya, keynote speaker, in his keynote presentation, pointed out the new challenges (such as GHG emission, waste dumping, deforestation, air pollution and Covid-19) to the natural resources and environment worldwide. He emphasized the roles of TEI in its responsibility and accountability in the management of natural resource in Thailand. Furthermore, he presented the Thailand’s 20-years national strategic plan with the objective to attain three main goals, namely stability, sustainability and prosperity, under the umbrella of Sufficiency Economy Philosophy (SEP). The world will move toward sustainability with the advent of advanced knowledge and innovative communication platform. The key is to harmonize development and conservation.

Natural Resources Rehabilitation

International Forum on "Research of Natural Resources Rehabilitation, Environment and Energy"
31 August 2020
Sirindhorn International Environmental Park,
Cha-am, Phetchaburi, Thailand

The study of suitable plant species growing in Sirindhorn International Environmental Park by using dripping irrigation

Title of project :
The study of suitable plant species growing in Sirindhorn International Environmental Park by using dripping irrigation

Type of project :
Natural resources rehabilitation

Location of project :
Sirindhorn International Environmental Park (SIEP), Cha-am, Phetchaburi Thailand

Research team :
Research & Development Group, Sirindhorn International Environmental Park

Owner of project :
Sirindhorn International Environmental Park

Source of fund :
Chevron Thailand Exploration & Production & Sirindhorn International Environmental Park

Objectives of project

1) To study suitable growing plant species that can achiere high growth rate and / or high survival rate through dripping irrigation under constrained environmental factors e.g. soil salinity, drought at Sirindhorn International Environmental Park.

2) To disseminate the knowledge obtained at SIEP forest plantation demonstration site.

3) To provide a guideline for the visitors/ learners to apply in their plantation areas where effected by soil salinity and drought etc.

Brief of research study process

1) The research was carried out in forest plantation area in Sirindhorn International Environmental Park, Cha-am District, Phetchaburi, Thailand.

2) Through observing, plantation area was classified into 3 types ; high, moderate and poor in growth and survival rate. They were named Plot A, B and C respectively.

3) Three plots with the size of 10 m x 10 m each were selected in Plot A, B and C. Therefore, 9 plots in total were selected. They are named A1, A2, A3, B1, B2, B3, C1, C2, C3.

4) Soil samples were collected in each plot to examine the soil property (structure, OM, pH, salinity (EC), P, K).

5) Measures of growth (height, circumference and radius) and survival rate were carried out in Plot A, B and C for 3 years (2017-2019). As well, the environmental data i.e. temperature, relative humidity and rainfall were collected.

6) Soil improving materials comprised, vermicompost, compost, manure, chemical fertilizer were randomly applied in Plot A, B and C in order to compare the growth rate.

7) Appropriate water amount penetrated into soil through dripping irrigation was checked and noted as well as time of watering.

The study in plantation areas (2017-2019)

Research result & Conclusion

- **Result of soil examination**

Soil series = Nong Kae & Hub Kapong
Texture = Sand, OM = Low
Drainage = Plot A > Plot B > Plot C
Salinity = Plot A < Plot B < Plot C (see table)

Plot	Average EC (%)	Soil Salinity Class	Effect on Crop Plants
A	0.21	Slightly-moderately saline	Yields of sensitive crops may be restricted/ yields of many crops are restricted.
B	0.38	Moderately saline	Yields of many crops are restricted.
C	1.31	Very strongly saline	Only a few very tolerant crops yield satisfactorily

- **Result of appropriate growing plant species in Plot A, B and C**

Plot	Suitable plant spp.	
	High survival rate*	High growth rate**
A	- Thai Copper Pod (*Senna siamea*) - Queen of Flowers (*Lagerstroemia macrocarpa*) - Siamese Neem Tree (*Azadirachta indica*) - Alexandrian Laurel (*Calophyllum inophyllum*) - Red Sandalwood Tree (*Pterocarpus santalinus*) - Earleaf acacia (*Acacia auriculiformis*) - Yellow Flame (*Peltophorum pterocarpum*) - Peacock Flower Tree (*Caesalpinia pulcherrima*) - Cork tree (*Millingtonia hortensis*) - Broad-leave Mahogany (*Swietenia macrophylla*) - Teak (*Tectona grandis*) - Tamarind (*Tamarindus indica*)	- Rain Tree (*Samanea saman*) - Bastard Poon Tree (*Sterculia foetida*) - Bastwitiows (*Cerbretum quadrangulare*)
B	- Broad-leave Mahogany (*Swietenia macrophylla*) - Alexandrian Laurel (*Calophyllum inophyllum*) - Rain Tree (*Samanea saman*) - Red Sandalwood Tree (*Pterocarpus santalinus*) - Thai Copper Pod (*Senna siamea*) - Siamese Rosewood (*Dalbergia cochinchinensis*) - Queen's Flower (*Lagerstroemia speciosa*)	- Burmese Rosewood (*Pterocarpus indicus*) - Siamese Ga Mot (*Gluta siamensis*) - Yellow Flame (*Peltophorum pterocarpum*) - Tamarind (*Tamarindus indica*) - Siamese Neem Tree (*Azadirachta indica*) - Black Rosewood Pod Mahogany (*Afzelia xylocarpa*) - Cork Tree (*Millingtonia hortensis*)

Plot	Suitable plant spp.	
	High survival rate*	High growth rate**
C	- Bastard Poon Tree (*Sterculia foetida*) - Ebony (*Diospyros rhodocalyx*) - Tamarind (*Tamarindus indica*)	- Teak (*Tectona grandis*) - Siris Tree (*Albizia lebbeck*) - Thai Copper Pod (*Senna siamea*) - Rain Tree (*Samanea saman*) - Siamese Neem Tree (*Azadirachta indica*) - Thai Banger (*Lagerstroemia loudonii*) - Queen's Flower (*Lagerstroemia speciosa*)

Remark :
*High survival rate = > 70 %
**High growth rate, but survival rate is under 70%

1) **Controlled factors**
dripping irrigation, amount of water, temperature, relative humidity, rainfall, time of watering

2) Mean temperature (2017-2019)
- Mean annual temp. = 28.4 °C
- Mean max. temp. = 34.1 °C
- Mean min. temp. = 23.5 °C

3) Mean annual precipitation (2017-2019)
= 1,132.73 mm/year


Thai Copper Pod
(*Senna siamea*)


Queen of Flowers
(*Lagerstroemia macrocarpa*)


Alexandrian Laurel
(*Calophyllum inophyllum*)


Siamese Neem Tree
(*Azadirachta indica*)


Rain Tree
(*Samanea saman*)


Teak
(*Tectona grandis*)


Broad-leave Mahogany
(*Swietenia macrophylla*)


Red Sandalwood Tree
(*Adenanthera pavonina*)


Bastard Poon Tree
(*Sterculia foetida*)

- Result of appropriate amount of water and watering time

Appropriate water amount penetrated into soil through dripping irrigation was checked and noted as well as time of watering.

Time of watering	mins.	Average amount of water (per plant per day)
05.00 am-10.00 am	15	4-6 litres
08.00 am-05.00 pm	20	8.5 litres

- Result of appropriate soil improving materials

Overall, vermicompost provides best result in regard to growth rate, while the others provide not so much different results. Chemical fertilizer is not the best choice and will have a long term effect on the environment and soil quality. Vermicompost is expensive. Manure and compost should be used according to their performance and reasonable price

The research result reveals that forest plantation in environmentally constrained area such as area with drought and soil salinity can be successful if study of soil type and properties is done along with the selection of suitable plant species and the providing of appropriate amount of water through dripping irrigation. The appropriate soil improvement material that provides best result in term of growth must be considered, however economic and environmental factors should also be reviewed.

Pros : The forest plantation can be more successful. It can also be demonstration site.

Cons : The cost of investment for dripping irrigation should be considered. For example, in SIEP, we planted 365 plants/rai, and we invested around 5,000 Baht/rai for dripping irrigation, not included water pump which is around 8,000-9,000 Baht each.

Extension of project

- Dissemination of knowledge at SIEP forest plantation demonstration site
- Information for replanting at SIEP forest plantation area




Contact details

Name : Research and Development Group
Address : Sirindhorn International Environmental Park
1281 Rama VI Camp, Cha-am, Phetchaburi Thailand 76120
Tel. (+66) 32 508 352 Fax. (+66) 32 508 396
E-mail : siep@sirindhornpark.or.th
Website : www.sirindhornpark.or.th

QR Code
for more project details

Long term effect of forest ecosystem on soil properties: A case study in the Royally-Initiated Khao Cha-Ngum Deteriorated Area Development Project, Thailand

Title of project :
Long term effect of forest ecosystem on soil properties: A case study in the Royally-Initiated Khao Cha-Ngum Deteriorated Area Development Project, Thailand

Type of project :
Natural resources rehabilitation

Location of project :
Khao Cha-Ngum Sub-district, Photharam District, Ratchaburi Province

Research team :
Nattaporn PRAKONGKEP, Robert J. GILKES, Sumitra WATANA, Satira UDOMSRI, Supaluck PAKANKUL, Worachart WISAWAPIPAT, Rattanachart CHUAYBUDDA, Warunee SITTI, Wassana PRAMNOY, Kridsophon DUANGKAMOL and Suwicha POLFUKFANG

Owner of project :
Land Development Department, Ministry of Agriculture and Cooperatives, Thailand

Source of fund :
Land Development Department

Objectives of project

This study aims to evaluate the effect of forest ecosystem on soil properties in a natural reforestation area of Thai Royally-Initiated Khao Cha-Ngum deteriorated area at Khao Cha-Ngum Sub-district,

Brief of research study process

The study area was located at the pavilion in the project area of the Royally-Initiated Khao Cha-Ngum Deteriorated Area Development Project, Thailand. The studied area ranges in altitude at 85 above mean sea level, in mean annual temperature from 28°C and in annual precipitation from 1200 mm (average precipitation 100 days). The forest was degraded without topsoil and it was restored for over 20 years.

Research result & Conclusion

Natural regeneration was studied in abandoned farmland after intensive agricultural land use in the Royally-Initiated Khao Cha-Ngum deteriorated area. Evaluation of soil properties under natural reforestation revealed impact on soil health especially soil organic carbon because land cover and input change.The driving factor in biological activity in these soils is the amount of organic matter present. Litter is the main source of soil organic carbon and plant nutrient cycling. Litterfall and root decomposition add organic matter to soil. Natural-reforestation is recommended as a great low input strategy of regenerating degraded lands.

Extension of project

The article was submitted to International Journal of Forest, Soil and Erosion.The electronic version of a final report will be distributed to Office of Science for Land Development Department website whereas the hard copy version will be distributed to Khao Cha-Ngum Degraded Land Rehabilitation Study Center and Royal Forest Department. The major results revealed that natural-reforestation significantly affected soil properties which could be used as a soil information database for land reforestation.

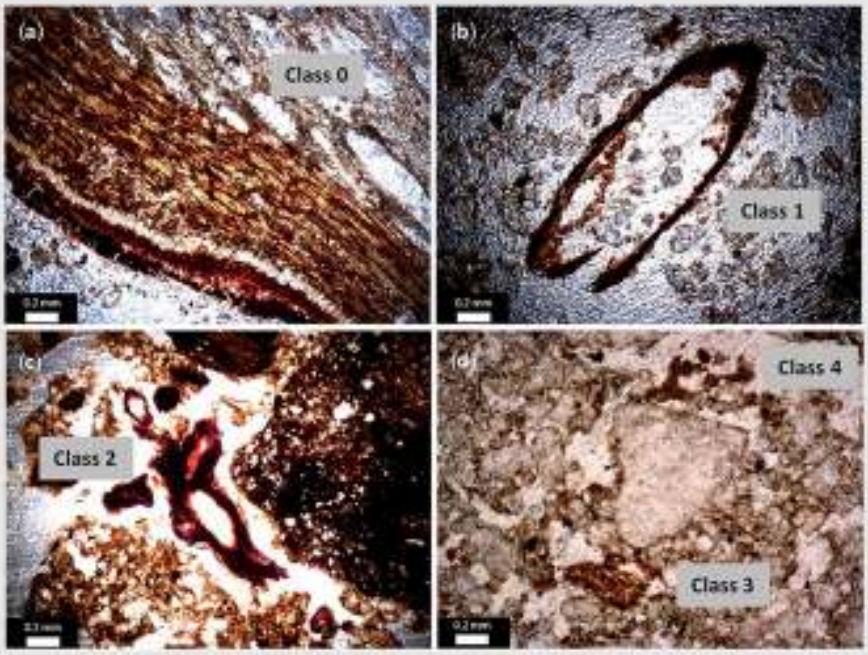


Figure 1 Soil micromorphology showing longitudinal and cross sections of plant roots at different degradation levels.

a) Class 0 root, inner portion and sheath are complete (East, A horizon).
b) Class 1 root, inner portion and sheath are incomplete (West, BC horizon).
c) Class 2 root, Carbon is dispersing into surrounding soil, tissue fragments are still present (North, A horizon).
d) Class 3 root, visible tissues are absent, root shape is discernible. Class 4 root, visible tissues are absent, original root shape is indefinite (East, A horizon). The bar in the lower corner = 0.2 mm.

Contact details

Name : Dr.Nattaporn PRAKONGKEP
Address : Department of Land Development
2003/61 Phahonyothin Road, Ladyao, Chatuchak,
Bangkok, 10900 Thailand
Tel. (+66) 86 348 1636
E-mail : asoil@hotmail.com; nattaporn@ldd.go.th

QR Code
for more project details

Krailart Niwate Mangrove Ecosystem Preservation Project: A Public-Private Partnership

Title of project :
Krailart Niwate Mangrove Ecosystem Preservation Project: A Public-Private Partnership

Type of project :
Natural resources rehabilitation

Location of project :
Krailart Niwate Mangrove Ecosystem Preservation Project, Wat Khao Krailart, Khao Takiab, Hua Hin, Prachuap Khiri Khan, Thailand

Research team :
Brian Anderson

Owner of project :
Public-Private Partnership of Wat Khao Krailart (owner of mangrove property) and Chiva-Som International Health Resorts Co., Ltd. (Manager of Krailart Niwate)

Source of fund :
Chiva-Som International Health Resorts Co., Ltd.

Objectives of project

To rehabilitate the mangrove forest at Wat Khao Krailart as a reconstructed wetland project through reforestation and forest management and to promote eco-spiritual tourism in the region.

Brief of research study process

The reconstructed wetland project began in 2007 and we have reforested the 12 rai area with the planting of 5,000 mangrove trees to Year 2020 to rebuild the forest which used to be in poor condition. A 1,000-meter elevated boardwalk was constructed throughout the mangrove forest in 2015. The project expanded in 2020 to include an adjacent 6 rai plot of barren land for afforestation.

Research result & Conclusion

The 12 rai plot of land is now a luxuriant forest with new afforestation currently in process of the 6 rai plot of land.

Extension of project

This is a demonstration of mangrove ecosystem rehabilitation and preservation of biodiversity.

Contact details

Name : Brian Anderson
Address : 73/4 Petchkasem Road, Hua Hin,
Prachuap Khiri Khan, 77110 Thailand
Tel. (+66) 87 146 3258 , (+66) 32 536 536
E-mail : brian.anderson@chivasom.com

QR Code
for more project details

Environment

State Audit Office of the Kingdom of Thailand and the contribution in environment and ecosystem

Title of project :
State Audit Office of the Kingdom of Thailand and the contribution in environment and ecosystem

Type of project :
Environment

Location of project :
Thailand

Research team :
Dr. Sutthi Suntharanurak, Acting Capt. Pitikhul Nilthanom, Nunnapat Rueangsri, Phattraravee Parvaputsakul, Chomprang Wongrusmeeduan, Wannisa Nokmud, Pimpisut Pansook

Owner of project :
State Audit Office (SAO) of the Kingdom of Thailand

Source of fund :
State Audit Office (SAO) of the Kingdom of Thailand

Objectives of project

1) To contribute the role of SAO to the protection and preservation of environment and ecosystem.
2) To provide guideline for a good governance for environmental management.

Brief of research study process

The study was conducted through the analysis of secondary data from literature review and previous auditing researches.

Research result & Conclusion

The Environmental Performance Auditing (EPA) in Thailand involved 3 areas (a) natural resources and ecological system such as forest, water resources, and wetland (b) environmental impacts from pollution and infrastructures such as noise, air, wastewater and invasive plants (c) environmental and disaster management such as flood prevention.

The audit results in EPA reports contributed in the protection and preservation of environment and ecosystem, the prevention of environmental impacts and the promotion of environmental management are shown in Table 1.

Contribution	Example of audit report	Audit results
1.To preserve the natural resources and ecological system	Performance audit of wetland conservation	Recommended to establish detailed regulations and clear directions on environmental impacts
2. To prevent environmental impacts	Bangkok Super Skywalk Projects: Preventive environmental audit	Recommended to review the cost-effectiveness of the project and environmental impacts
3. To promote environmental management	Performance audit on wastewater treatment	Recommended the government to provide financial, legal, and institutional arrangements to support environment

Table I: Contribution and examples of EPA in Thailand

In conclusion, SAO realized the importance of environmental impacts resulted from the public projects and spending. The criteria of auditing thus expand from only 3E to environmental issues and also SDG audit. We tried to strengthen and broaden our impacts by implementing environmental audit in the policies and planning to initiate the related activities that support learning of auditors on environmental issues for future sustainable development.

Extension of project

- Best practice from SAO, based on EPA experience, will contribute the monitoring and reporting on the environmental impacts to public sector auditing.
- This is to strengthen the environmental audit leading to good monitoring for SDGs in the future.
- This paper on the role of SAIs in EPA is a good start of SAO Thailand to monitor the environmental impacts leading to the progress of government in achieving the SDGs in 2030.

Contact details

Name : Pimpisut Pansook
Address : State Audit Office (SAO), Soi Areesampan, Rama 6 Road, Samsen Nai, Phaya Thai, Bangkok, 10400 Thailand
Tel. (+66) 90 963 8345
E-mail : pimpisut.m8@gmail.com
Website : www.audit.go.th

QR Code
for more project details

Atmospheric nitrogen exchange in tropical forest, Sakaerat Biosphere Reserves

Title of project :
Atmospheric nitrogen exchange in tropical forest, Sakaerat Biosphere Reserves

Type of project :
Environment

Location of project :
The experimental tower located in Sakaerat Biosphere Reserves, Nakhon Ratchasima Province. Thailand Institute of Scientific and Technological Research (TISTR).

Owner of project :
This project is the research collaboration between Tokyo University of Agriculture and Technology (TUAT), Japan and Thailand Institute of Scientific and Technological Research (TISTR), Thailand.

Owner of project :
This project is the research collaboration between Tokyo University of Agriculture and Technology (TUAT), Japan and Thailand Institute of Scientific and Technological Research (TISTR), Thailand.

Source of fund :
a. TUAT support by in kind, provide instruments and consumables materials, and support chemical analysis
b. TISTR support researcher team (young researchers) for sampling at Sakaerat Environmental Research Station yearly (continuing the seasonal difference)

Objectives of project

The joint research aims to better understand the exchange of reactive nitrogen between atmosphere and tropical forest to contribute the evaluation of harmful effects on terrestrial ecosystems due to acidification and eutrophication from the atmospheric nitrogen deposition.

Brief of research study process

The air sampling was conducted on the experimental tower at two levels, 5 and 30 m above the ground in dry deciduous forest. The ambient air was collected 5 times/month (24hr of each), using filter assembly, at 20 L min^{-1} airflow. The reactive nitrogen consist of nitrate aerosol (NO_3^-) and ammonium aerosol (NH_4^+). The concentration of NO_3^- and NH_4^+ were analyzed using ion chromatography (IC) for both of fine and coarse aerosols. The yearly field measurements were conducted from January 2019 to December 2019, and to evaluate exchange of nitrogen compounds in the forest.

Extension of project

The reactive nitrogen (NO_3^- and NH_4^+) was found in all seasons in this area as shown in figure 1. The NH_4^+ was higher than NO_3^- aerosols in all measurements (12 months). The average concentration of NH_4^+ was higher than NO_3^- 5-6 times for both fine and coarse particles as shown in figure 2. The concentration of NH_4^+ was highest during February to May 2019 and rose up again during September to November 2019, the reason will be discussed. The difference of concentration of reactive nitrogen between higher and lower sampling was found in each sampling period. It showed the exchange of reactive nitrogen between atmosphere and tropical forest. The result will be evaluated with other environmental parameters to preserve ecological system in tropical forest. Emission source also need to be identified and controlled.

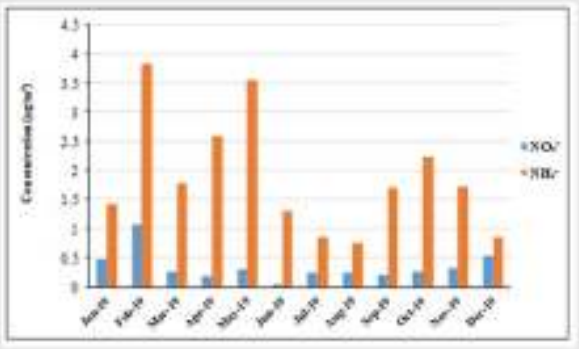
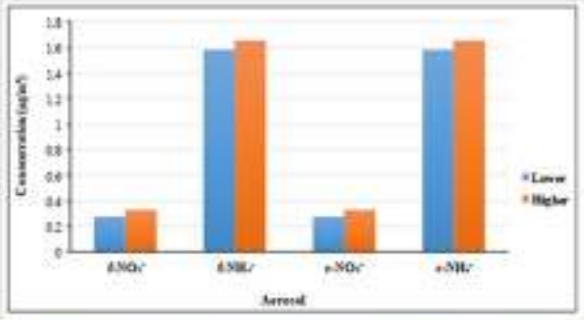


Figure 1 The average concentration of NH_4^+ and NO_3^- in each month



Remark: $f\text{-}NO_3^-$ and $f\text{-}NH_4^+$ mean fine aerosol
$c\text{-}NO_3^-$ and $f\text{-}NH_4^+$ mean coarse aerosol

Figure 2 The average concentration of NH_4^+ and NO_3^-

Experimental tower in dry deciduous forest

Characteristic of canopy in different season (wet and dry season)

Sampling system installation

Aerosol sampling for chemical analysis

Training Center for young researchers and students

Research result & Conclusion

- To be training center for young researchers and students (master and doctorate student)

- To provide the other projects related to environmental parameters monitoring

Contact details

Name : Dr. Phuvasa Chanonmuang
Address : Expert Centre of Innovative Clean Energy and Environment
Thailand Institute of Scientific and Technological Research (TISTR)
35 Mu 3, Khlong Ha, Khlong Luang, Pathum Thani, 12120 Thailand
Tel. (+66) 25 779 450, (+66) 81 988 1140
E-mail : phuvasa@tistr.or.th

QR Code
for more project details

Fumigation and synergistic potential of volatile compounds from lemongrass and makrut lime for grain storage

Title of project :
Fumigation and synergistic potential of volatile compounds from lemongrass and makrut lime for grain storage

Type of project :
Environment

Location of project :
Silpakorn University, Phetchaburi IT Campus, Cha-am, Phetchaburi, Thailand

Research team :
Alex Ahebwa, Dr. Rachsawan Mongkol, Assoc. Prof. Mana Kanjanamaneesathian

Source of fund :
Thailand International Cooperation Agency (TICA) and Silapkorn University, Graduate School

Objectives of project

To assess the potential of volatile compounds from lemongrass and makrut lime in controlling storage fungi of rice and corn.

Brief of research study process

Preliminary study : The raw plant materials of fresh lemongrass (stems) and makrut lime (leaves and fruit peels) were collected from areas of Phetchaburi and Prachuap Khiri Khan provinces. Essential oils were extracted by distillation of the plant materials in water. Both the raw materials and essential oils were assessed for their efficacy in inhibiting mycelial growth of *Aspergillus flavus, A. niger, Curvularia lunata* and *Fusarium proliferatum* which are major storage fungi of economic importance in Phetchaburi province.

Research result & Conclusion

In the first screening test, individual EO vapour, both lemongrass (LG) and makrut lime leaf (ML) showed a complete mycelial growth inhibition at 10 µL for all tested fungi. The MICs of 0.09 µL/mL against *C. lunata* and 0.19 µL/mL against *A. flavus, A. niger* and *F. proliferatum* were observed for both LG and ML as the most inhibitory. Eucalyptus oil produced the least effective vapour (MIC 0.37 - 0.74 µL/mL) against all tested pathogens. *C. lunata* was most sensitive pathogen to all the EOs. The combination of LG and ML EOs showed synergism against all the tested fungi with a fractional inhibitory concentration index (FICI) of 0.5. The individual EOs of Eucalyptus, lemongrass and makrut lime leaf were demonstrated as potentially inhibitory to aflatoxin production by *A. flavus*.

The EOs from lemongrass and makrut lime leaf have potential to suppress the growth of *A. flavus, A. niger, F. proliferatum*, and *C. lunata* and aflatoxin production by *A. flavus*. The combination of lemongrass oil and makrut lime leaf oil have the potential to be used as storage fumigants and should be suitable candidates as alternatives to chemical fungicides.

Extension of project

Future studies are necessary to apply these in a real setting in a store for grains affected by the above mentioned fungi.

Aflatoxigenic *Aspergillus flavus* isolated from corn and *Curvularia lunata* isolated from rice

Plant raw materials of Makrut lime fruit peels and lemongrass stems

Contact details

Name : Alex Ahebwa
Address : Faculty of Animal Science and Agricultural Technology, Silpakorn University, Phetchaburi IT Campus, Cha-am, Phetchaburi, 76120 Thailand
Tel. (+66) 94 643 2054
E-mail : alex.ahebwa14@gmail.com

QR Code
for more project details

Efficacy of some plant extracts suppress two fungi which cause grain discoloration of rice

Title of project :
Efficacy of some plant extracts suppress two fungi which cause grain discoloration of rice

Type of project :
Environment

Location of project :
Faculty of Animal Science and Agricultural Technology, Silpakorn University, Phetchaburi IT Campus, Thailand

Research team :
Thi Thi Win, Dr. Rachsawan Mongkol and Assoc. Prof. Mana Kanjanamaneesathian

Owner of project :
Thi Thi Win

Source of fund :
Thailand International Cooperation Agency (TICA) and Silapkorn University, Graduate School

Objectives of project

To evaluate the *in vitro* efficacy of some plants extracts against the mycelial growth of *Fusarium sacchari* and *Curvularia lunata* causing rice grain discoloration disease.

Brief of research study process

Fifteen plants materials (fresh and dried) were collected (Figure 1) from around Silpakorn University, Phetchaburi and Hua Hin, Prachuap Khiri Khan province and then were extracted by maceration technique with 60% ethanol (Figure 2). The 15 ethanolic extracts with four concentrations were investigated to control fungal pathogens; *F. sacchari* and *C. lunata* by using poisoning food techniques (Figure 3). The diameter of the fungal colony was measured after 5 days of incubation, after which the percentage of fungal inhibition was calculated.

Research result & Conclusion

Dried *A. galanga* extract at the concentration of 10% completely inhibited the mycelial growth of *F. sacchari* and followed by the extracts from dried peel of *C. hystrix* and dried leave of *M. calabura* at the concentration of 20% with 50.00%, 40.42% inhibition, respectively. Moreover, dried *A. galanga* extract at 20% concentration showed the highest inhibition (78.33%) against *C. lunata*, followed by the extracts from dried and fresh leave of M. calabura with 49.17%, 43.33% inhibition respectively. For sustainable rice grain production, galanga extracts have potential to replace the chemical fungicide to suppress grain discoloration disease of rice.

Extension of project

The efficacy of dried *A. galangal* extracts has been tested in the rice field by Thai farmers.

Figure 1 Collection of 15 plants materials

Figure 2 Preparation of extraction method

Figure 3 Antifungal activity of plant extracts

Contact details

Name : Thi Thi Win
Address : Faculty of Animal Science and Agricultural Technology,
Silpakorn University, Phetchaburi IT Campus, Cha-am,
Phetchaburi, 76120 Thailand
Tel. (+66) 96 814 3860
E-mail : mathithiwinyau2000@gmail.com

QR Code
for more project details

Dried galangal *(Alpinia galanga)* suppresses grain discoloration of rice *(Oryza sativa)*

Title of project :
Dried galangal *(Alpinia galanga)* suppresses grain discoloration of rice *(Oryza sativa)*

Type of project :
Environment

Location of project :
Tambon Pho Rai Wan, Phetchaburi, Thailand

Research team :
Kyaw Soe Win, Assoc. Prof. Mana Kanjanamaneesathian, Dr. Rachsawan Mongkol

Owner of project :
Kyaw Soe Win

Source of fund :
Thailand International Cooperation Agency (TICA) and Silapkorn University, Graduate School

Objectives of project

To access the galangal plant extract to control grain discoloration (GD) disease in the rice field.

Brief of research study process

Galangal *(Alpinia galanga)*, one of the medicinal plants which have been used for food and medicine were collected from the field at Hua Hin District, Prachuap Khiri Khan, Thailand. The crude extract of galangal, using ethanol (60%) as solvent was prepared by maceration techniques. Dried galangal plant extract (at 20% in water) is effective to suppress plant pathogenic fungi, such as *Curvularia lunata* which caused grain discoloration disease in rice (var. Suphan Buri 2) in Phetchaburi, Thailand.

Research result & Conclusion

The symptom of grain discoloration of rice (var. Suphan Buri 2) was composed of different type of symptoms via, from small spots to large lesions. The simple preparation of dried galangal in ethanol was effective to suppress the fungus, *Curvularia* sp., which caused both large lesion and small spot symptoms in rice (var. Suphan Buri 2). The dried galangal in ethanol was as effective as the commercial chemical fungicide Armure® (mixture of propiconazole and difenoconazole).

Extension of project

The extract of dried galangal in 20% solution is being demonstrated to farmers in Phetchaburi for use.

Figure 1 : Preparation of the dried galangal extract

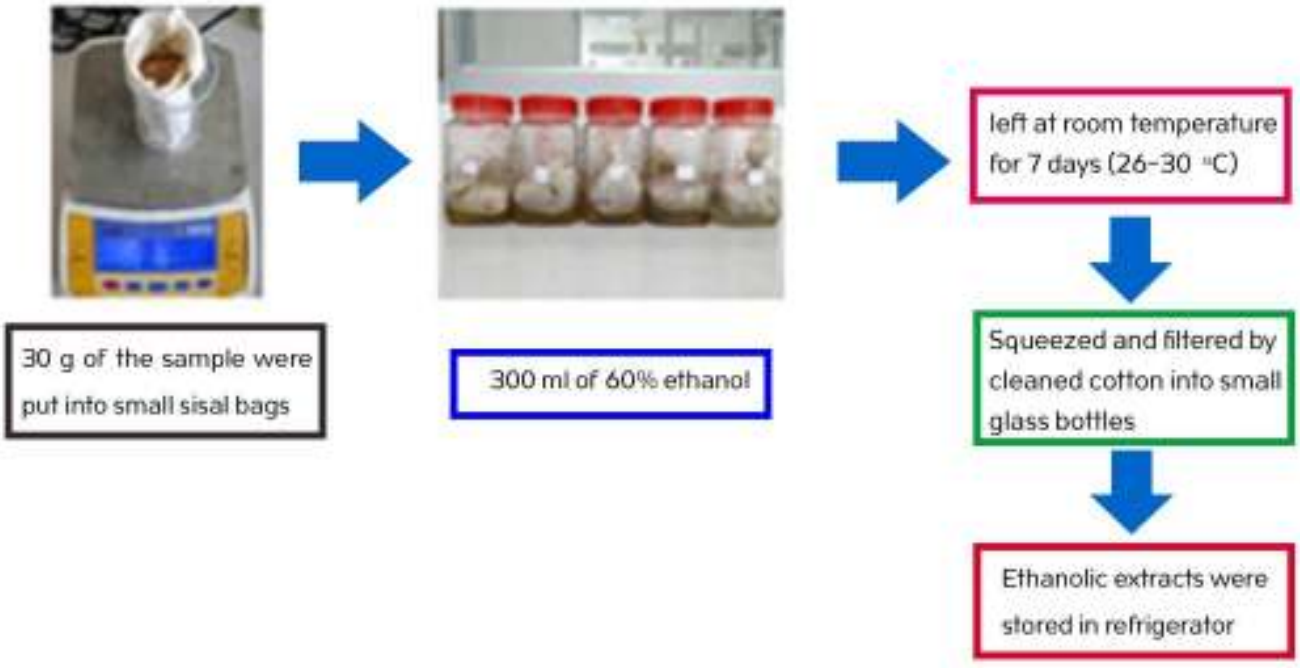


Figure 2 : Preparation of the dried galangal solution in 60% ethanol

Contact details

Name : Kyaw Soe Win
Address : Faculty of Animal Science and Agricultural Technology, Silpakorn University, Phetchaburi IT Campus, Cha-am, Phetchaburi, 76120 Thailand
Tel. (+66) 64 759 5177
E-mail : kyawsoewinagri@gmail.com

QR Code
for more project details

Energy

Homemade Solar Food Dryer

Title of project :
Homemade Solar Food Dryer

Type of project :
Energy

Location of project :
Faculty of Animal Science and Agricultural Technology, Silpakorn University Phetchaburi Information Technology Campus.

Research team :
Phisit Suvarnaphaet and Kataya Mahachanawong Suvarnaphaet

Owner of project :
Phisit Suvarnaphaet and Kataya Mahachanawong Suvarnaphaet

Source of fund :
private fund

Objectives of project

The purpose of the dryer is to supply the product with more heat under ambient conditions, thereby increasing the vapor pressure of the crop moisture to a sufficient degree. As a result, the migration of moisture from crops is improved. The dryer also significantly reduces the relative humidity of the drying air and, by doing so, increases its moisture-carrying capacity, ensuring a sufficiently low level of humidity.

Brief of research study process

A Homemade Solar Food Dryer is one in which the food is exposed directly to the sun's rays. Direct passive dryers are ideally suited for drying small quantities of fruit and vegetables such as bananas and pineapples (Suvarnaphaet, 2014). This type of dryer consists of a drying chamber which is covered by a transparent plastic cover. The theoretical basis for the concept being considered is the greenhouse effect and thermosiphon principles. There is an air vent (or inlet) to the solar collector where the air enters and is heated by the greenhouse effect, the hot air rises through the drying chamber passing through the trays and around the food, removing the moisture content and exiting through the air vent (or outlet) near the top of the shaded side. Hot air acts as a drying medium, extracts. and transfers moisture from the product (or food) to the atmosphere under free (natural) convection, so the system is a passive solar system and no mechanical device is required to control the intake of air into the dryer. Figure 1 shows a schematic of a simple direct dryer

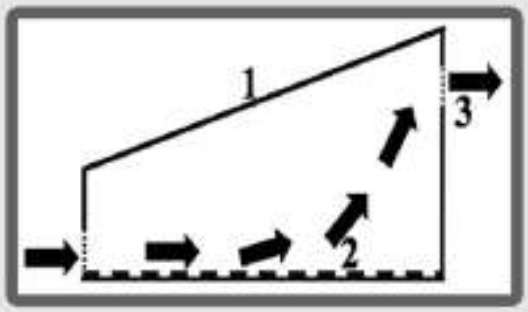


Fig. 1 Structure of a passive cabinet food solar dryer (Suvarnaphaet, 2014)

The following materials have been used for the construction of the homemade solar food dryer:

1. Transparent plastic - As the cover of the solar collector and the cover for the drying chamber. It allows solar radiation to the system, but resists the flow of heat energy from the systems.
2. Black plastic sheet of 1 mm thickness (dimension 57 cm x 45 cm) for absorption of solar radiation.
3. Insect net at inlet and outlet air to prevent insects entering the dryer.
4. Hot glue gun and glue stick as fasteners and adhesives.
5. Cutter for Plastic.

It is a small plastic box, 57 cm in length, and 45 cm in width. The temperature in this dryer cabinet is 60 ° C. Cabinet dryer has certain disadvantages, like, i] the required drying time is high due to natural air flow convection hence low heat and coefficient of transfer of moisture. ii] as a result, efficiency is low.

Research result & Conclusion

Solar radiation can be used effectively and efficiently for the drying of agricultural products in our environment if the proper design is carried out. This was demonstrated and the design and construction of the solar dryer showed a sufficient ability to dry agricultural products, especially food products, at a noticeably reduced level of humidity.

Locally available cheap materials have been used to make it available and affordable to all and agriculturists particularly. It would go a long way in reducing food waste and food shortages at the same time, as it can be used extensively for most crops. Also, it requires solar energy for its operation, which is readily available in the tropics, and it is also a clean form of energy As it dries food products faster, it preserves the atmosphere and saves costs and time spent on open sun drying of agricultural produce. Even the food products are well covered in the solar dryer than in the open air, thereby reducing the pest and insect attack case as well as contamination.

However, the efficiency of existing solar food dryers can still be improved, especially in terms of reducing drying time and possibly storing heat energy within the system. Meteorological data should also be readily accessible to consumers of solar products to guarantee optimum device performance and effectiveness. Such knowledge would possibly direct a local farmer when to dry and when not to dry his agricultural produce.

Extension of project

The training course is designed to practice: Hand-on practice in building a small quantity solar food dryer for household, so that the participants are able to build, operate, and maintain an appropriate dryer for the drying of fruit and vegetables.

"Hand-on practice in building a small quantity solar food dryer for household" KOICA – TICA Joint Training Program on Sustainable Agriculture and Environmental Management based on Sufficiency Economy Philosophy, 1- 21 November 2017,
Faculty of Animal Science and Agricultural Technology, Silpakorn University
Instructor : Asst. Prof. Dr. Phisit Suvarnaphaet

Course outline

- Introduction of solar drying, and benefits
- Solar dryer types
- Components of the solar drying system
- Practical exercises

References

Suvarnaphaet, P. (2014). Performance of A Low-Cost Direct Passive Solar Dryer for Pineapple Drying: Case Study of of Cha-am District, Petchaburi Province, Thailand, In the Proceedings of the 5th Rajamangala University of Technology International Conference Agricultural and Food Industry, 605-609.

Contact details

Name : Asst. Prof. Dr. Phisit Suvarnaphaet
Address : Faculty of Animal Science and Agricultural Technology, Silpakorn University, Phetchaburi. Information Technology Campus, Cha-am District, Phetchaburi Province, 76120 Thailand
Tel. (+66) 32 594 037 Fax.(+66) 32 594 038
E-mail : suvarnaphaet_p@silpakorn.edu

QR Code
for more project details

Integration of solar energy with food production

Title of project :
Integration of solar energy with food production

Type of project :
Energy

Location of project :
Phetchaburi Rajabhat University

Research team :
Kangsadan Sagulpongmalee, Division of Energy Engineering, Faculty of Industrial Technology, Phetchaburi Rajabhat University.
Siriwan Dangcham, Division of Agriculture, Faculty of Agricultural Technology, Phetchaburi Rajabhat University.

Owner of project :
Phetchaburi Rajabhat University

Source of fund :
Phetchaburi Rajabhat University

Objectives of project

This research involved concept of the integration of clean energy generation and food production or agrivoltaic system which is a solution to help reduce high competition on land requirement between food production and clean energy generation.

Brief of research study process

To compare the growth of 2 corn plots, consisting of the corn grown in the normal plot and the corn grown under the 20 solar photovoltaic panels, each had 40 W single crystalline silicon solar cell installed. Therefore, the solar photovoltaic panels provided total capacity of 800 W.

Research result & Conclusion

For the solar PV testing, the maximum power output of the solar PV system was generated equal to 648.56 W or 81.07% of the total capacity in area of 14.56 m^2. For the results of the growth of 3 hybrid sweet corns, in the area of 260 cm x 560 cm each found that corn grown under the solar PV panels had higher in the average height and leaves number than those in the normal field equal to 12.95 % and 3.39% respectively. For the ear size of corn, corn grown under PV panels were lower than those in the normal field equal to 10.56% of ear weight, 1.39% of ear width and 6.07% of ear length. This research result showed that despite the installation of solar panels above the plantation area had a significant effect on the yield of corn, the installation of PV system above corn plantation area was suitable.This approach could increase farmers' income from energy generation, thus reduce the risk of relying solely on income from agricultural production.

Extension of project

To extend to a practical level in the future with further study in larger scale and with other crops.

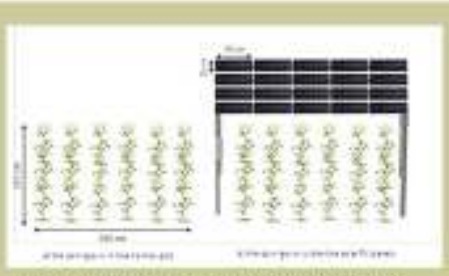


Figure 1 Layout of the experimental plots

Figure 2 Experimental plots of corn planting in Phetchaburi Rajabhat University

Figure 3 Solar PV system installation above the corn plot

Figure 4 Measuring the size of the corn

a b

Figure 5 The comparison of ear corn between (a) normal plot and (b) plot under the solar PV panels

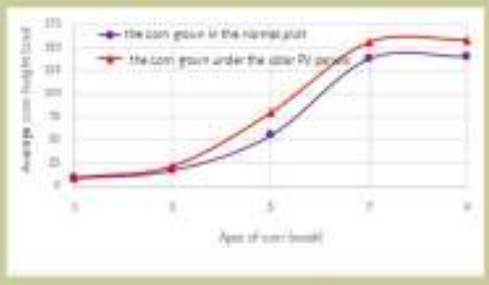


Figure 6 The comparison of the average height of corn plants and planting period

Figure 7 The comparison of the average leaves number of corn and planting period

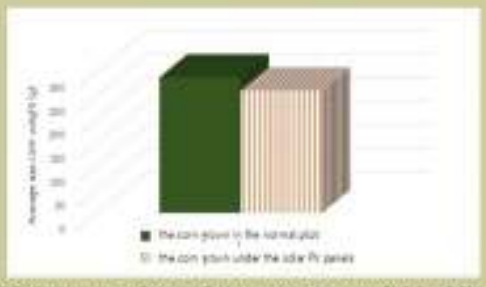


Figure 8 The comparison of the average weight of the ear corn and planting period

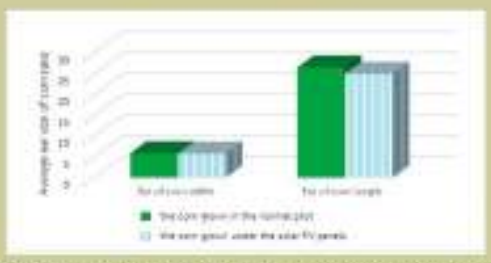


Figure 9 The comparison of the average size of the ear corn and planting period

Contact details

Name : Asst.Prof.Dr.Kangsadan Sagulpongmalee
Address : Division of Energy Engineering, Faculty of Industrial Technology, Phetchaburi Rajabhat University, 38 Moo 8, Na Wung, Mueang, Phetchaburi, 76000 Thailand
Tel. (+66) 86 636 1698
E-mail : kangsadan.sag@mail.pbru.ac.th

QR Code
for more project details

Rapporteurs' Note

&

Conclusion and reflection of forum

Rapporteurs' Note

International Forum on Research of Natural Resources Rehabilitation, Environment and Energy

On 31 August 2020, Time: 9:00 am – 16:00 pm

At Lecture Room 2, Energy for Environment Centre

Sirindhorn International Environmental Park, Cha-am, Phetchaburi, Thailand

---

Prof. Dr. Sanit Aksornkoae, Committee of Sirindhorn International Environmental Park Foundation kindly started the opening remark by explaining roles of the Sirindhorn International Environmental Park (SIEP). SIEP has showcased various activities related to the issues of environment. The location where SIEP is situated is the prime learning center with a boardwalk to study mangrove ecology and bird watching. He highlighted the ways to conserve the mangrove forest to achieve long-term sustainable development. He stated that the objective of this international forum is to share and exchange the innovative technologies and practices presented by the participants. As a result, environmental sustainability can be achieved.

Dr. Wijarn Simachaya, the President of Thailand Environment Institute (TEI) pointed out the new challenges (such as GHG emission, waste dumping, deforestation, air pollution and Covid-19) to the natural resources and environment worldwide. He emphasized the roles of TEI in its responsibility and accountability in the management of natural resource in Thailand. Furthermore, he presented the Thailand's 20-years national strategic plan with the objective to attain three main goals, namely stability, sustainability and prosperity, under the umbrella of sufficiency economy philosophy (SEP). The world will move toward sustainability with the advent of advanced knowledge and innovative communication platform. The key is to harmonize development and conservation.

Staffs from State Audit Office (SAO) of the Kingdom of Thailand discussed how environmental performance audit (EPA) has the impact to the environment and natural ecosystem. EPA included protecting the environment and promoting transparent environmental management by monitoring the process of project implementation to ensure that budget has been spent for the benefit of the people.

Ms. Areeporn Sittiyanpaiboon, head of the research and development group, Sirindorn International Environmental Park (SIEP) revealed the research result of how to select suitable plant species to grow in SIEP's forest plantation area. The soil properties in each plantation area were different with respect to soil texture, salinity and

drainage ability. The climatic conditions in the project, where the experiment was carried out, were characterized as having low precipitation with long term draught. These harsh conditions were rectified using dripping irrigation. Suitable time of watering and average amount of water per plant per day was determined for the whole area under this investigation. Growth and survival rate of plants under dripping irrigation with different soil conditions, revealed the result how to select suitable plant species for growing in each area. Various materials such as vermicompost, manure, compost and chemical fertilizer were evaluated for their capacity to improve soil conditions. She concluded that not only utilization of chemical fertilizer is not the best option, but its continued use will also have a long-term negative effect on the environment and soil quality. Although vermicompost is effective, it is more expensive than other materials. Organic manure and compost, however, should be recommended for application because of their efficacy and low cost. In addition she advised that the forest plantation could be successfully established through dripping irrigation. However, the cost of installing the dripping irrigation in this reforestation project should be taken into consideration because this watering system required high financial investment.

Dr. Phuvasa Chanonmuang from Thailand Institute of Scientific and Technological Research (TISTR) outlined the factors affecting atmospheric N exchange in the tropical forest, and how the atmospheric N concentration is important to the environment and human's health.

Assistant Prof. Dr. Phisit Suvarnaphaet from Silpakorn University (SU) Phetchaburi IT Campus explained how to design a low-cost solar energy cabinet dryer, while **Assistant Prof. Dr. Kangsadan Sagulpongmalee from Phetchaburi Rajabhat University (PRU)** showed how crop could be produced under the solar cells used to capture radiation from the sun. Solar energy, which is still underutilized and considered to be a source of clean energy, should be promoted to reduce our reliance on fossil as source of energy.

Ms. Siriporn Sriaram from International Union for Conservation of Nature (IUCN) highlighted the hazard of solid wastes (plastic, rubber and tire, PET bottle, etc.) to the marine ecology and why appropriate management system plays a crucial role in managing these wastes and protect marine life.

Dr. Nattaporn Prakongkep from Land Development Department (LDD) talked about how to manage forest ecosystem to improve soil properties in a natural reforestation area at Khao Chang-um area. Natural reforestation, which is a low input strategy to regenerate degraded land, should be used to restore the degraded forests in other parts of the country.

Mr. Alex Ahebwa, Mr. Kyaw Soe Win and Ms. Thi Thi Win, from Silpakorn University (SU) Phetchaburi IT Campus talked about the inappropriate and indiscriminate use of chemical pesticides which caused the undesirable effect to human's health and environment. Using alternative method based on plant extracts not only reduced the reliance on the synthetic chemical pesticides but also promoted agricultural sustainability. Plant extracts such as lemongrass, makrut lime leaf oils and dried galangal had the potential in controlling *Aspergillus* sp., *Fusarium* sp. and *Curvularia* sp. which caused the grain storage and grain discoloration diseases in maize and rice.

Last but not least, **Mr. Brian Anderson from Chiva-Som International Health Resorts Co., Ltd.** showcased his project at Krailart Niwate Mangrove Ecosystem Preservation which highlighted the significant of the partnership between the private and public sectors resulting to mitigating the degradation of the mangrove ecosystem.

Assoc. Prof. Mana Kanjanamaneesathian from Faculty of Animal Science and Agricultural Technology, Silpakorn University (SU) Phetchaburi IT Campus concluded the forum by encouraging the participants to continue working on the projects which have contributed to preserve the environment. There are always ways and means to preserve this world for the next generations.

In his closing remarks**, Pol. Lt. Gen. Prapun Chantaim, the Managing Director of SIEP,** thanked and urges all of the participants and speakers to make a contribution in conserving the environment in their respective professions.

Prepared by: Mr. Kyaw Soe Win & Mr. Alex Ahebwa

Rapporteurs

Conclusion and reflection of forum

By Assoc. Prof. Mana Kanjanamaneesathian

Faculty of Animal Sciences and Agricultural Technology Silpakorn University Phetchaburi IT Campus

Moderator

International Forum on Research of Natural Resources Rehabilitation, Environment and Energy

The Sirindhorn International Environmental Park

31 August 2020

I ask myself the question. How many species on Earth?

The answer is 8.7 million species on Earth with 6.5 million species on land and 2.2 million in oceans.

Which species cause damage more to the environment the others?

I did not get an answer but there are several results from the Google research which tell something like:

- Human impact on the environment
- How do human affect the environment
- Human causes environment change
- Human impact on ecosystem
- Human are causing life on Earth to vanish

So my conclusion is that we have done damage to the environment more than the others.

There are elven ways humans impact the environment:

- Overpopulation
- Pollution

- Global warming
- Climate change
- Genetic modification
- Ocean acidification
- Water pollution
- Over fishing
- Deforestation
- Acid rain
- Ozone depletion

There are about 5.3 trillion pieces of plastic debris in the ocean. This forum has the speaker, from International Union for Conservation of Nature (IUCN), who talks about how to mitigate this problem with the project “Close the plastic tap”.

An estimate 18 million acres of forest have been cut each year. We need more trees planted to compensate this loss. The works done by the staffs of Sirindhorn International Environmental Park (SIEP), Thailand Institute of Scientific and Technological Research (TISTR), Land Development Department (LDD) and Chiva-Som International health resort are the good projects that address this problem.

There are two speakers who talk about solar energy. As Thailand has been ranked third in the world, after USA and Australia, in term of the potential to capitalize solar energy for use, turning to utilize this solar energy should reduce the need to use fossil for generating energy.

In the 10 months period (between October 2018 to July 2019), there were 3,067 cases of injuries and 407 fatalities of farmers as a result of the misuse of chemical pesticides in Thailand. Three speakers, from Silpakorn University (SU), talk about an alternative measures to control disease in rice. The simple preparation of galangal extract has been proven to be effective to control grain discoloration disease of rice.

SAO functions to ensure the effective use of the state budget for the benefit of the Thai people. The transparency and accountability in using the state budget to execute the projects in environment is as important as the technical know-how used to solve the problem applied to attain the objectives of the projects itself. The SAO’s work is to enforce good governance among the stakeholders for the benefit of the environment and the people.

WHAT NEXT?

It depends on us to continue working to protect and preserve the environment for the following generations.

DREAMING ESCAPE

I run, I escape, I hide and I sleep in fear!

I run away from the blazing sun's heat,

But all shed trees have been reduced to stumps.

I run away from the burning fires,

But the largest investments go to industrial pollution.

I run away from flooding waters, hurricanes and devastating storms,

But Arctic ice is vastly melting and sea banks' buffers have been erased.

I run away from chemical sprays in farmlands,

But farmers have been convinced that there are no alternatives.

Yet when I have finally escaped, I have to run back home (wreckage) to pick my mask!

Because PM2.5, PM10, Cholera and COVID-19 have all invaded my environment.

My heart is pumping, I wake up exhausted, in fear and sickly every day.

Then I realize our environment is sick, we all better do something.

By : Mr. Alex Ahebwa

Photo gallery












International Forum on
Research of Natural Resources Rehabilitation,
Environment and Energy"









of Natural Resources Rehabilitation
Environment and Energy"
31 August 2020

Environment and Energy"
31 August 2020

Environment and Energy"
31 August 2020





























The Sirindhorn International Environmental Park Foundation
under Royal Patronage of HRH Princess Maha Chakri Sirindhorn
1281 Rama VI Camp, Cha-am, Phetchaburi 76120 Thailand
Tel. +66 3250 8352, +66 3250 8405-9 Fax. +66 3250 8396
Website : www.sirindhornpark.or.th Email : siep@sirindhornpark.or.th