Sorption and exchange of potassium on montmorillonitic soil clay mineral

¹Zuldadan Naspendra, ²Sudarsono, ³Iskandar

¹Department of Soil Science, Universitas Andalas. Jl. Kampus Unand Limau Manis, Padang, 25163, Indonesia (zuldadannaspendra@agr.unand.ac.id)

²Department of Soil Science, Bogor Agricultural University. Jl. Raya Dramaga, Kampus IPB Dramaga Bogor, 16680 West Java, Indonesia (issi_iskandar@yahoo.com)

²Department of Soil Science, Bogor Agricultural University. Jl. Raya Dramaga, Kampus IPB Dramaga Bogor, 16680 West Java, Indonesia (sudarsonotnh@yahoo.com)

Abstract

One of the main problems of montmorillonitic soils is that of high nutrient retention, especially of potassium. Understanding sorption and exchange processes is essential to predicting the retention of potassium on montmorillonitic soils because it can affects on deficiency for plants. Our research was designed to observe: (i) the dynamics of sorption and exchange of potassium on various fraction size of montmorillonitic soil clay minerals, and (ii) the effect of fraction size, abundance of montmorillonite, and ionic strength on the sorption and exchange of potassium. Soil samples were collected from four sites in western Java, Indonesia, namely Lebak (MS1), Karawang (MS2), Cianjur (MS3), and Cirebon (MS4). The samples were fractionated to obtain coarse clay (2-0.2 µm), medium clay (0.2-0.08 µm), and fine clay (< 0.08 μ m). Sorption and exchange experiments of K⁺ followed batch equilibrium method. Statistical analysis used pseudo 1st and 2nd order for kinetic sorption and used Freundlich and Langmuir equation for sorption isotherm. Kinetic sorption of K⁺ was accurately described by the pseudo-second order model, indicating the sorption of K^+ was controlled by valency forces through sharing electron between adsorbent and K⁺. In term of sorption isotherm, the process were best adjusted to the Freudlich models which demonstrated that at a given maximum concentration of K⁺ (440 mg.L⁻¹), soil fraction, total clay, and all clay fractions had more capacity to adsorb K⁺. Based on the particle size, the sorption of K⁺ increased on the finer clay fraction which was linear to the abundance of montmorillonite in the finer clay fraction and CEC value. Sorption of K⁺ was higher at ionic strength concentration 0.1 mol.L⁻¹ NaCl than 0.01 mol.L⁻¹. However, amount of exchangable K⁺ after adsorption expriments was only 42.38-37.75%, indicating that most K⁺ was strongly adsorbed in montmorillonite. These results showed that a high affinity of K⁺ to montmorillonitic soils impact on low availability of potassium for plants.

Key words: batch equilibrium, montmorillonite, potassium, sorption, Freundlich



Fig 1: Kinetic adsorption of K⁺ on clay < 2 μm with K⁺ concentration by 0.17 g.L⁻¹ and ionic strength of NaCl by 0.1 mol.L⁻¹, a) MS1, b) MS2, c) MS3, d) MS4.



Fig 2. Sorption isotherm of K⁺ on soil fraction and various clay fractions with ionic strength 0.1 mol. L⁻¹ NaCl: a) MS1, b) MS2, c) MS3, d) MS4. (□) soil < 2 mm, (◊) total clay < 2 μm, (Δ) coarse clay 2-0.2 μm, (x) medium clay (0.2-0.08 μm), (○) fine clay (<0.08 μm).</p>



Fig 3. Relationship between sorption and exchange of K⁺ on two different ionic strength. a) 0.1 mol. L⁻¹ NaCl, b) 0.01 mol. L⁻¹ NaCl.

14th International Conference of the East and Southeast Asia Federation of Soil Science Societies

National Taiwan University, Taipei, Taiwan. November 3-8, 2019





PROGRAM BOO

Organized by













Contents

PREFACE	1
The 14 th ESAFS General Information	2
General Information in Taiwan	6
Organizing Committees	10
Conference Program at a Glance	
Conference Floor Plan	14
Keynote Speakers	15
Oral sessions	
Conference Program	
Posters	
Odd poster numbers	32
Even poster numbers	

14th ESAFS 2019 TAIWAN

PREFACE

Soil is not only important for sustainable agriculture, but also crucial to environmental quality. The negative impacts of civilization development on our environment are rapidly growing due to the increase of global population, yet humans are getting dependent on the high quality of soil resources for surviving on the earth. The East and Southeast Asia Federation of Soil Science Societies (ESAFS) is dedicated to the exchange of recent advances in soil science in the East and Southeast Asian regions, providing the better understanding of the attributes of soil quality and the way of improving soil and associated environmental quality for sustainable food security and healthy life of East and Southeast Asia as well as world population.

This international conference, ESAFS 2019, is an integrated platform for interaction among scientists, consultants, and policy makers, who are responsible for the research and technology transfer of soil science, fertilizer management, and plant nutrition in order to cope with the rapid industrial development globally. ESAFS 2019 is hosted by National Taiwan University (NTU) and Chinese Society of Soil and Fertilizer Sciences (Taiwan) and is held at GIS Convention Center of NTU in Taipei, Taiwan. It aims to emphasize the multidisciplinary collaboration for the development of smart soil management for sustainable agriculture. The presentations of ESAFS 2019 are focus on soil education and public awareness, emerging contaminant elements in soil-plant systems, pedogenesis and soil information, soil fertility and plant nutrition, soil ecology, paddy soil remediation and forest soils. There is also an education trip of post conference for the visit of landscape, ecology, and culture of soils in central Taiwan.

The organization committee of ESAFS 2019 would like to appreciate a number of people helped us to achieve our aims and we would like to thank all of them: all the committees of ESAFS 2019 and staffs and students in my lab (Soil Survey and Remediation Laboratory, Department of Agricultural chemistry, NTU). In addition, we would like to thank the Ministry of Science and Technology, Taiwan and Apollo Technology Co., LTD. for financially supporting the conference.

Zing - Jin Hsen

Zeng-Yei Hseu Chairman, ESAFS 2019 President, Chinese Society of Soil and Fertilizer Sciences (Taiwan) Professor, Department of Agricultural Chemistry, National Taiwan University 3 November 2019



14th ESAFS 2019 TAIWAN

The 14th ESAFS General Information

Conference

The 14th International Conference of the East and Southeast Asia Federation of Soil Science Societies.

Venue

GIS NTU Convention Center, Taipei, Taiwan (B1, No. 85, Sec. 4, Roosevelt Rd., Da'an Dist., Taipei City, Taiwan)

Conference Organizers

The East and Southeast Asia Federation of Soil Science Societies (ESAFS) National Taiwan University (NTU) The Chinese Society of Soil and Fertilizer Sciences (CSSFS) (Taiwan)

Dates (November 3-8, 2019)

Registration for foreign participants: 15:00-19:00, Sunday, Nov. 3; (GIS NTU Convention Center, Plato Hall) Registration: 08:00-09:00, Monday, Nov. 4; (GIS NTU Convention Center, Lobby) Opening Ceremony: 09:00-09:20, Monday, Nov. 4; (The Forum Hall) Closing Ceremony: 16:10-16:30, Tuesday, Nov. 5; (Socrates Hall) Educational Trip: Wednesday-Thursday, Nov. 6 -7 Departure of foreign participants: Friday, Nov. 8

Welcome Reception (For foreign participants)

Time: 17:30-19:00, Nov. 3 Location: GIS NTU Convention Center, Plato Hall

Council Meeting

Time: 12:00-14:00, Nov. 4 Location: 11th Floor, Just Sleep Hotel 捷絲旅臺大尊賢館 11F, No. 83, Sec. 4, Roosevelt Rd., Taipei, Taiwan 台北市大安區羅斯福路四段 83 號 11 樓 Welcome banquet with Puppetry Show (Foreign participants & invited guests)

Time: 18:00-21:00, Nov. 4

Location: Marée Restaurant 水源會館

No. 16, Siyuan St, Zhongzheng District, Taipei City, Taiwan (See map in P.7) 台北市中正區思源街 16 號

Lunch

Lunch Boxes will be provided during Nov. 4 and 5 in exchange for lunch coupons of each day.

Location: GIS NTU Convention Center, Lobby

Coffee/Tea/Refreshments

Coffee and tea will be served in morning/afternoon tea and coffee time at the GIS NTU Convention Center, Lobby

Poster Sessions

Time: 13:00-14:00, Nov. 4 & Nov. 5

(Nov. 4 ODD poster number only; Nov. 5 EVEN poster number only). Location: Plato Hall, GIS NTU Convention Center

Internet Connection

Free Wi-Fi is available in the GIS NTU Convention Center, but different passwords for each Hall. Internet connection information will be announced in each hall.

Certificate of Attendance

Certificates of attendance will be available for application at the registration desk (GIS NTU Convention Center, Lobby) on Nov. 4 - 5. After conference, we'll give it to you by email.

Abstracts

All abstracts can be accessed online (<u>http://esafs2019.cssfs.org.tw/</u>) or through the USB flash drive provided.

Badges

All participants including exhibitors are kindly requested to wear their badges when attending activities of the conference. Our staffs are easily recognizable by their DEEP BLUE T-shirts with the ESAFS Logo and YELLOW BADGES.

Presentation Guidelines

Oral Presentations:

For keynote speakers, each paper is allocated 40 minutes, with 30 minutes for presentation and 10 minutes for questions and answers.

There are three to four parallel oral sessions during each period after keynote session. Each paper is allocated 10 minutes for volunteer speakers respectively and last 2 minutes for questions and answers should be included.

Oral volunteers should hand in their presentation material on USB drives and copy necessary files to PDF/PPT Collection Desk during registration period or in the session room at least 30 minutes before the "session" starts.

Please go to the session room at least 5 minutes before the session starts, and check presentation material with the computer and audio-visual equipment.

The computer in each session room can display MS PowerPoint and Adobe PDF files. If you use other digital storage devices not supported by the computer in the session room, please ask a staff to transfer the files.

Poster presentations:

Poster Panel Size

Please refer to this visualization of the poster panels to be used during the conference. The display area for posters is **85 cm** (width) × 115 cm (height). Please ensure that your poster does not exceed this size. A sub-area (17 cm wide × 7 cm high) on upperleft corner should be reserved for poster number label manufactured and provided by the conference organizers.



Poster Allocation

Posters are displayed in the room "Plato Hall", GIS Convention Center. Posters will be displayed on November 4 (Monday) for ODD poster number only and November 5 (Tuesday) for EVEN poster number only. Each poster has been assigned a poster number. Please see the session of Posters (P.32) of this program book for your poster number. These numbers are also posted in the upper left-hand corner of each poster board.

Poster Set-Up and Take Down

Posters of ODD poster number must be set up by **10:30** on November **4** (morning tea time) and can be remained on display until 17:10 on November 4. Please remove by **17:30** on the same day.

Posters of EVEN poster number must be set up by **10:30** on November **5** (morning tea time) and can be remained on display until 15:20 on November 5. Please remove by **15:40** on the same day.

Dedicated poster sessions have been scheduled during 13:00-14:00 on November 4-5. Authors will be expected to stand by the posters during these poster session time to answer questions.

Any poster remaining in place after 16:00 on November 5 will be removed by the organizers who accept no responsibility for loss or damage.

Poster Fixing

Thumbtacks will be available in the poster area. Poster panels are also suitable for Velcro fixing, but please ensure that you bring a sufficient amount of materials with you. Adhesive tape or twin adhesive is not allowed.

Poster Content

The poster should include title, author name(s), and affiliation(s). It is highly recommended to use illustrations, charts, tables, and other visually appearing objects to convey your research work. Make sure all materials are clearly readable from a distance. You may bring other relevant materials, e.g., full paper, addendum, etc. to the poster sessions.

General Information in Taiwan

Transportation Information

Between Taiwan Taoyuan International Airport (formerly known as CKS International Airport) and Taipei City:

Routes	Fare (NT\$)	Service Hours	Journey Time
Metro Taoyuan	Adult NT\$150 Child NT\$70 (one way)	6:00-22:55	40 mins (Express) 55 mins (Commuter)
Ву Тахі	1,500 NTD /one way		Approx. 40 min.
By Bus	(CKS International Air	port ↔ Taipei Rai	lway Station)
Kuo-Kuang Motor Transport (Kuokuang Line) 1819	Adult NT\$140 Child NT\$70 (one way)	24 Hours/day Intervals: 15-20 minutes	55 minutes
CityAir Bus 1960 East	Taipei Adult NT\$145 Child NT\$70 (one way)	Taoyuan Airport 05:50-01:05 Taipei City Hall Bus Station 04:40-23:00	60~70 minutes

- You can take metro systems from Taoyuan International Airport to Taipei Main Station (<u>https://www.tymetro.com.tw/tymetro-new/kr/index.php</u>) and transfer into Metro Taipei (<u>https://m.metro.taipei/kr/</u>) to Just Sleep Hotel at G07 Stop (Gongguan) along Exit No. 2 and turn left going 50 meters to find the circle-shaped building behind street (Just Sleep Hotel). The GIS NTU Convention Center is located nearby the Just Sleep Hotel.
- 2. Bus ticket counters are located in the Arrival Passenger Reception Areas of both Terminals of airport.
- 3. Taxi from Taipei Railway Station to National Taiwan University is about 135 NTD.
- 4. If you take the MRT from Taipei Railway Station to Gongguan Station, it will cost 20 NTD.
- 5. Howard International House Taipei, Just Sleep Hotel@NTU, Hsiu-Chi House and GIS Convention Center are less than 1 kilometer from Gongguan MRT Station (see the map below)



Taxi is the most convenient way to travel within Taipei City. If you take taxi around Taipei downtown, it will cost less than 250 NTD, starting with 70 NTD for 1.25 km. An additional 5 NTD (approx. 0.15 USD) will be charged for each additional 200 m or 80 seconds thereafter.

The Conference Venue address (in Chinese)

集思台大會議中心 GIS National Taiwan University Convention Center 地址:台北市羅斯福路四段 85 號 B1 Add: B1, No. 85, Sec. 4, Roosevelt Rd., Da'an Dist., Taipei City

MRT

Gongguan Station, Exit 2 Songshan-Xindian Line (Green Line (3)) : At the station exit 2, take the left turn to Roosevelt Rd. Here you will find the GIS NTU Convention Center on your left-hand side. (2 minutes walking)

Metro Taipei Route Map



Currency

The Country's currency is the New Taiwan Dollar (NTD). The current exchange rate is approximately NTD 31.1 /1 USD (Feb, 1, 2019, subject to change). Foreign currencies can be exchanged at hotels, airports* and a number of government-designated banks. Major credit cards are widely accepted, and traveler's checks may be accepted by a number of tourist-oriented business and at most international tourist hotels and banks. *There is no currency exchange after 21:30 in the bank of Taoyuan International Airport.

Tipping and Taxes

Tipping is not customary in most places in Taiwan. The one exception is tipping the bellboy when you check into a hotel. A 10% service charge and a 5% value-added tax are added to room rates and meals.

Electricity

110 Volts A.C. Taiwan uses electric current at 110 volts AC/60 Hz with two- (in most cases) or three-prong USA-type sockets. Appliances from Europe, Australia or South-East Asia will need an adaptor or transformer. Many hotels also have sockets for 220-volt appliances.



Time Zone Taiwan is 8 hours ahead of Greenwich Mean Time (GMT).

Useful Words

English	Mandarin Chinese
Hello	Ni Hau
Sorry, Excuse me	Duei Bu Chi
Thanks	Shie Shie
Please	Ching
Welcome	Huan Yin
Bottoms up	Gan Bei

Organizing Committees

Chairman

Professor, Zeng-Yei Hseu (National Taiwan University)

Vice-chairman

Distinguished Professor, Dar-Yuan Lee (National Taiwan University)

Secretary General

Professor, Shih-Hao Jien (National Pingtung University of Science and Technology)

International Advisory Committee

Takashi Kosaki (President, International Union of Soil Science / Professor, Aichi University)
Jae E Yang (Former President, International Union of Soil Science / Professor, Kangwon National University)
Nanthi Bolan (Professor, University of Newcastle)
Huu-Sheng Lur (Dean, College of Bioresources and Agriculture, National Taiwan University)
Zueng-Sang Chen (Professor Emeritus, National Taiwan University)

International Scientific Committee

S. M. Imamul Huq (President, Soil Science Society of Bangladesh)
Renfang Shen (President, Soil Science Society of China)
Budi Mulyanto (President, Indonesian Soil Science Society)
Ryusuke Hatano (President, Japanese Society of Soil Science and Plant Nutrition)
Yong Seon Zhang (President, Korean Society of Soil Science and Fertilizer)
Rosazlin Abdullah (President, Malaysian Society of Soil Science)
Keshav R Adhikari (President, Nepalese Society of Soil Science)
Edna D. Samar (President, Philippine Society of Soil Science and Technology)
M.G.T.S. Amarasekara (President, Soil Science Society of Sri Lanka)
Pitayakon Limtong (President, Soil and Fertilizer Society of Soil Science)
Zeng-Yei Hseu (President, Chinese Society of Soil and Fertilizer Sciences (Taiwan))
Budiman Minasny (Professor, The University of Sydney)

Local Organizing Committee

Hung-Yu Lai (National Chung Hsing University, Taiwan) Chen-Chi Tsai (National Ilan University, Taiwan) Yuan Shen (National Chung Hsing University, Taiwan) Jen-Hshuan Chen (National Chung Hsing University, Taiwan) Shan-Li Wang (National Taiwan University, Taiwan) Chong-Ho Wang (National Pingtung University of Science and Technology, Taiwan) Wei-min Hsiang (Agricultural Research Institute, Taiwan) Fo-Ting Shen (National Chung Hsing University, Taiwan) Ying-Ming Li (Agriculture and Food Agency, Taiwan) Yong-Hong Lin (National Pingtung University of Science and Technology, Taiwan) Chin-Hua Ma (World Vegetable Center, Taiwan) Li-Feng Ni (Hualien District Agricultural Research and Extension Station, Taiwan) Kai-Wei Juang (National Chiayi University, Taiwan) Hong-Yu Guo (Agricultural Research Institute, Taiwan) Chi-Ling Chen (Agricultural Research Institute, Taiwan) Yuh-Ming Huang (National Chung Hsing University, Taiwan) Yu-Min Tzou (National Chung Hsing University, Taiwan) Chiu-Chung Young (National Chung Hsing University, Taiwan) Shan-Nei Huang (Harmony Organic Agriculture Foundation, Taiwan) **Sheng-Bin Ho** (National Taiwan University, Taiwan) Ching-Ho Lin (Kaohsiung District Agricultural Research and Extension Station, Taiwan) Wen-Lung Lai (Taichung District Agricultural Research and Extension Station, Taiwan) Chao-Ming Lai (National Taiwan University, Taiwan) **Ren-Shih Chung** (National Taiwan University, Taiwan) Zhen-Qing Zhao (National Chung Hsing University, Taiwan)

Conference Program at a Glance

Venue: GIS NTU Convention Center, National Taiwan University

Sunday Nov. 03, 2019

15:00-19:00	Registration for foreign participants	
17:30-19:00	Reception for foreign participants	

Monday Nov. 04, 2019

08:00-09:00	Registration			Forum Hall
09:00-09:20	Opening Ceremony	/ (Zeng-Yei HSEU, Ch	Forum Hall	
09:20-10:00	Keynote Speech 1 (Nanthi BOLAN)		Forum Hall	
10:00-10:30	Morning Tea and Coffee			
10:30-11:10	Keynote Speech 2 (Keynote Speech 2 (Huu-Sheng LUR) Forum Hall		
11:10-11:50	Keynote Speech 3 (Chiu-Chung YOUNG)			Forum Hall
11:50-13:00	Lunch			12:00-14:00
13:00-14:00	Poster SessionPlato Hall (Odd poster number only)			(11th Floor, Just Sleep Hotel)
Room	Socrates Hall Locke Hall Alexander Hall			Archimedes Hall
14:00-15:20	S1 S2 S3			Society Report
15:20-15:50	Afternoon Tea and Coffee			
15:50-17:10	S4	Society Report		
18:00-21:00	Puppetry show and welcome banquet at La Marée Restaurant (Foreign participants & invited guests only)			

Tuesday Nov. 5, 2019

08:00-09:00	Registration Forum Hall			
Room	Socrates Hall	Locke Hall	Alexander Hall	Archimedes Hall
008:30-9:50	S7	S8	S9	S10
09:50-10:30	Morning Tea and Coff	fee		
10:30-11:50	S11	S12	S13	S14
11:50-13:00	Lunch			
13:00-14:00	Poster SessionPlat	o Hall (Even poster nu	mber only)	
14:00-15:20	S15 S16 S17 S18			
15:20-15:40	Afternoon Tea and Co	offee		
15:40-16:00	Closing ceremony (Zeng-Yei HSEU, Chairman) Socrates Hall			



Conference Floor Plan

14th ESAFS 2019 TAIWAN

Keynote Speakers

Keynote Speech 1:



Monday, Nov. 4, 09:20-10:00 Professor Nanthi BOLAN University of Newcastle, Australia Biochar application modulates soil health and fertility: a metaanalysis



Keynote Speech 2: Monday, Nov. 4, 10:30-11:10 Professor Huu-Sheng LUR National Taiwan University, Taiwan Development and prospect of a smart farming–based rice production system for sustainable agriculture in Taiwan



Keynote Speech 3: Monday, Nov. 4, 11:10-11:50 Professor Chiu-Chung YOUNG National Chung Hsing University, Taiwan Soil microbial ecology and organic matter application for sustainable agriculture

14th ESAFS 2019 TAIWAN

Oral sessions

Session 1 (S1-Nov. 4; Socrates Hall)
 Soil education for pre- and elementary-school children: current issues towards setting an international standard
 Moderators: Hideaki HIRAI, Heng TSAI

Session 2 (S2-Nov. 4; Locke Hall) Emerging contaminant elements in soil-plant systems (I) Moderators: Dar-Yuan LEE, Tomoyuki MAKINO

Session 3 (S3-Nov. 4; Alexander Hall) Soil information and digital soil mapping Moderators: Budiman MINASNY, Kai-Wei JUANG

Session 4 (S4-Nov. 4; Socrates Hall)
Soil Fertility and plant nutrition (I)
Moderators: Tetsuhiro WATANABE, Pi-Hui CHANG

Session 5 (S5-Nov. 4; Locke Hall) Soil Ecology Moderators: Ryusuke HATANO, Hung-Yu LAI

Session 6 (S6-Nov. 4; Alexander Hall)

Recent advances in paddy soil science: toward establishments of sustainable rice production, environmentally-friendly managements and food safety (I) Moderators: Mizuhiko NISHIDA, Yu-Min TZOU

Session 7 (S7-Nov. 5; Socrates Hall) Soil Fertility and plant nutrition (II) Moderators: Edna D. SAMAR, Ya-Hui CHUANG

Session 8 (S8-Nov. 5; Locke Hall)

Recent advances in paddy soil science: toward establishments of sustainable rice production, environmentally-friendly managements and food safety (II) Moderators: Mizuhiko NISHIDA, Shan-Li WANG

Session 9 (S9-Nov. 5; Alexander Hall) Soil management and climate change (I) Moderators: Shinya FUNAKAWA, Chi-Ling CHEN Session 10 (S10-Nov. 5; Archimedes Hall) Soil and water management Moderators: Ki-In KIM, Yu-Ting LIU Session 11 (S11-Nov. 5; Socrates Hall) Soil management and climate change (II) Moderators: Kye-Hoon KIM, Chia-Hsin LEE Session 12 (S12-Nov. 5; Locke Hall) Emerging contaminant elements in soil-plant systems (II) Moderators: Hsi-Mei LAI, Jin Hee PARK Session 13 (S13-Nov. 5; Alexander Hall) Soil Fertility and plant nutrition (III) Moderators: Suphachai AMKHA, Ian Auza NAVARRETE Session 14 (S14-Nov. 5; Archimedes Hall) Control, remediation and reclamation of soil degradation and soil contamination (I) Moderators: Junta YANAI, Stefan NORRA Session 15 (S15-Nov. 5; Socrates Hall) Soil management and climate change (III) Moderators: Dang Van MINH, Hsing-Cheng HSI Session 16 (S16-Nov. 5; Locke Hall) Control, remediation and reclamation of soil degradation and soil contamination (11) Moderators: Junta YANAI, Stefan NORRA Session 17 (S17-Nov. 5; Alexander Hall) Soil Fertility and plant nutrition (IV) Moderators: Minh Tien TRAN, Chien-Hui SYU Session 18 (S18-Nov. 5; Archimedes Hall) **Forest soils** Moderators: Chih-Hsin CHENG, Rosazlin ABDULLAH

Venue: GIS NTU Convention Center, National Taiwan University

Conference Program

Sunday Nov. 03, 2019

		Archimedes Hall	Session 10: Soil and water management	Ki-In KIM Yu-Ting LIU	Policy framework for soil and water conservation integrating soil erosion and ecosystem services Jae E. YANG	Ammonium and nitrate contamination of shallow groundwater under vegetable fields in the downstream areas of the Huong River, Central Vietnam Morihiro MAEDA
ר Hall	ration	Alexander Hall	Session 9: Soil management and climate change (I)	Shinya FUNAKAWA Chi-Ling CHEN	Evaluation of practices for soil organic carbon sequestration to mitigate climate change in Taiwan Chi-Ling CHEN	The ultimative loss of soil: coastal and river bank erosion – the example of Camau Peninsula, Vietnam Stefan NORRA
Forun	Regist	Locke Hall	Session 8: Recent advances in paddy soil science: toward establishments of sustainable rice production, environmentally- friendly managements and food safety (II)	Mizuhiko NISHIDA Shan-Li WANG	Fertility re-evaluation of paddy soils after 50 years of the Green Revolution (FREPS 50) ~ A case study in the Philippines ~ Fukiko MASAI	Effects of the Green Revolution on long-term changes of fertility status of paddy soils in tropical Asia Junta YANAI
		Socrates Hall	Session 7: Soil Fertility and plant nutrition (II)	Edna D. SAMAR Ya-hui CHUANG	Mobility characteristics of inorganic nutrients from soil fertilized with sewage sludge compost Riko SAMATA	The effects of biochar, poultry manure and their mixture on soil properties, growth and yield of cocoyam grown on a severely degraded sandy soil of Southwestern Nigeria Michael-Taiwo AGBEDE
Room	08:00-08:30	Room		Moderators	08:30-08:40	08:40-08:50

Room	Socrates Hall	Locke Hall	Alexander Hall	Archimedes Hall
	Session 7: Soil Fertility and plant nutrition (II)	Session 8: Recent advances in paddy soil science: toward establishments of sustainable rice production, environmentally- friendly managements and food safety (II)	Session 9: Soil management and climate change (I)	Session 10: Soil and water management
Moderators	Edna D. SAMAR Ya-hui CHUANG	Mizuhiko NISHIDA Shan-Li WANG	Shinya FUNAKAWA Chi-Ling CHEN	Ki-In KIM Yu-Ting LIU
08:50-09:00	Microbial immobilization of ¹⁵ N labeled ammonium and nitrate following addition of polysaccharide Qian MA	The effects of N application methods on N recovery and grain yield of dry direct-seeded rice in north-east Japan Mari NAMIKAWA	Effect of continuous application of livestock manure compost on soil carbon accumulation and GHG emissions from a rice paddy field in a cool-temperate region, Japan Fumiaki TAKAKAI	Assessment of the nitrate-N leaching in the upland soils using the undisturbed monolith gravimatric lysimeter YeJin LEE
09:10-09:10	Effects of combined organic- inorganic fertilization to rice productivity and nitrogen use efficiency Edna D. SAMAR	Digital assessment of soil physical quality in the central region of Taiwan Chien-Hui SYU	Soil spectral library for cocoasoil of Papua New Guinea Kanika SINGH	Sorption and exchange of potassium on montmorillonitic soil clay mineral Zuldadan NASPENDRA
09:10-09:20	Role of plant growth promoting bacteria Brevibacterium linens RS16 in rice (<i>Oryza sativa L.</i>) cultivars to ameliorate salt stress by accumulation of proline and glycine betaine Jeongyun CHOI	Alleviating soil compaction under rice-upland crop rotations with deep tillage leads to increased nutrient availability and rice yield in a long-term experiment Tran Ba LINH	Gross nitrogen transformation rates during shifting cultivation cycle in Northern Thailand Makoto SHIBATA	Modelling organic carbon stocks in croplands of China: the past and the future Yongqiang YU



KEMENTERIAN RISET, TEKNOLOGI DAN PENDIDIKAN TINGGI UNIVERSITAS ANDALAS

Alamat : Gedung Rektorat, Limau Manis Padang - 25163 Telepon: (0751) 71181,71175,71086,71087,71699 Faksimile : (0751) 71085-71301 Laman : http://www.unand.ac.id e-mail : rektorat@unand.ac.id

<u>SURAT TUGAS</u> Nomor: 8003/UN.16.WR1/PT.01.06/2019

Sehubungan dengan surat Dekan Fakultas Pertanian Universitas Andalas nomor B/836/UN16.1.D/RT.01.00/2019 tanggal 19 September 2019 tentang surat tugas Rektor Universitas Andalas menugaskan Pegawai Negeri Sipil yang tersebut dibawah ini:

Nama	: Zuldadan Naspendra, SP, M.Si
NIP	: 198907192019031007
Pangkat/Gol	: Pembina Utama Madya / IV.c
Jabatan	: Staf pengajar Fakultas Pertanian Universitas Andalas

Untuk mengikuti Seminar "14th International Conference of The East and Southeast Asia Federation of Soil Science Societies (ESAFS)" pada Tanggal 2 – 9 November 2019 di Taipei, Taiwan. Setelah melaksanakan tugas agar Saudara menyampaikan laporan secara tertulis.

Biaya yang timbul akibat dikeluarkannya surat tugas ini dibebankan pada DIPA Universitas Andalas Tahun 2019

Demikian surat tugas ini dibuat untuk dapat dipergunakan dan dilaksanakan sebagaimana mestinya.

Padang, 24 September 2019 ad. Rektor WakiT Reku Prof.Dr. Dachriyanus, Apt NIP-196901211994031001

Tembusan : 1.Rektor sebagai laporan 2. Dekan Fakultas Pertanian Universitas Andalas 3. Arsip



14th International Conference of the East and Southeast Asia Federation of Soil Science Societies (ESAFS) November 3-8, 2019, Taipei, Taiwan



Organizing Committee: Prof. Zeng-Yei Hseu (Chairman), Tel: +886-2-33664807, zyhseu@ntu.edu.tw Prof. Dar-Yuan Lee (Vice-chairman), Tel: +886-2-33664811, dylee@ntu.edu.tw Prof. Shih-Hao Jien (Secretary General), Tel: +886-8-7740358, shjien@mail.npust.edu.tw

ESAFS 2019

International Conference

Present this certificate to

Zuldadan NASPENDRA

In recognition of successful completion of the international conference on

The East and Southeast Asia Federation of Soil Science Societies

"Smart Soil Management for Sustainable Agriculture"

Zeng-Yes Heen

Dr. Zeng-Yei Hseu

Chairman of Conference, Professor **Dr. Dar-Yuan Lee** Vice-chairman of Conference, Associate Dean and Distinguished Professor **Dr. Shih-Hao Jien** Secretary General of Conference, Professor

LAPORAN PERJALANAN DINAS

NAMA	ZULDADAN NASPENDRA, SP., M.SI
NIP	19890719 201903 1 007
JABATAN	ASISTEN AHLI
UNIT KERJA	JURUSAN TANAH
DAERAH TUJUAN	TAIWAN
DASAR	Surat Tugas No 8003/UN.16.WR1/PT.01.06/2019 tanggal 24 September
PERJALANAN	2019
DINAS	ORAL PRESENTATION ON 14 th INTERNATONAL CONGRESS
	OF ESAFS (East and Southeast Asia Federation of Soil Science
	Societies)
	My entitled paper held on session 10-4:
	Sorption and exchange of potasssium on montmorillonitic soil clay
	mineral
LAMA/WAKTU	6 Days/ 3-8 NOVEMBER 2019
PERJALANAN	
DINAS	
TEMPAT	GIS Convention Center, National Taiwan University, Taipei, Taiwan
PELAKSANAAN	
ACARA/KEGIATAN	
NAMA	14 th International Conference of the East and Southeast Asia Federation
ACARA/KEGIATAN	of Soil Science Societies (ESAFS)
	Theme: "Smart Soil Management for Sustainable Agriculture"
NARASUMBER /	1. Prof. Nanthi BOLAN (University of Newcastle, Australia)
KEYNOTE	2. Prof. Huu-Sheng LUR (National Taiwan University, Taiwan)
SPEAKERS	3. Prof. Chiu-Chung YOUNG (National Chung Hsing University,
	Taiwan)
MATERI	1. Biochar application modulates soil health and fertility: a meta-
KEGIATAN/ HAL	analysis
PENTING	2. Development and prospect of a smart farming–based rice production
	system for sustainable agriculture in Taiwan
	3. Soil Microbial Ecology and Organic Matter Application for
	Sustainable Agriculture
HASIL	1. Prot. Nanthi BOLAN (University of Newcastle, Australia)
PELAKSANAAN	Biochar application modulates soil health and fertility: a meta-
TUGAS	analysis
	With increasing human population and decreasing available land for
	cultivation, food security is becoming a critical issue in many countries.
	Climate change and the decline in freshwater supply for irrigation also
	contribute to the lack of food security, resulting in malnutrition and

human death. Food security can be achieved by increasing the yield potential of crops, and by improving the soil health and productivity. Soil health and fertility continue to decline in many parts of the world mainly because of nutrient and carbon mining, poor water management and soil erosion. Soil health, as measured by the physical, chemical, and biological characteristics of soil, determines the yield potential of many crops and other ecosystem services. Soil can act both as a source and sink for greenhouse gas emission. As a source, the microbial decomposition of soil organic matter can lead to the release of carbon-di-oxide (CO2). As a sink, soil can be used to store carbon in the form of soil organic matter and also by improving soil health and biomass production.

Biochar, which is resistant to decomposition, is used to store carbon in soil. Biochar application also improves soil health, thereby increasing biomass production and carbon sequestration. This paper reviews the literature for the influence of biochar application on soil physical, chemical, and biological fertility, and present the results of a metaanalysis of these data from publications. Statistical meta-analytical methods have been developed for quantitative analysis of research results from multiple independent experiments. They have been used successfully with ecological and environmental data, and provide advantages over narrative or qualitative reviews that lack robust statistical methods

A treatment effect size estimator commonly employed in meta-analysis is the magnitude of an experimental treatment (i.e., with biochar application) mean, relative to the control treatment (i.e., without biochar application) mean. A typical effect size metric is the response ratio or the relative impact on a measured parameter (e.g., soil bulk density) following biochar application compared to that in control treatment without biochar application. Preliminary meta-analysis indicated that biochar application modulate many physical, chemical, and biological properties of soils, and the extent of biochar-induced changes depend on the nature and level of biochar application, and soil type. This paper will also cover a number of variables (i.e., biochar and soil properties, and climatic factors) on soil properties, thereby developing a generalised model for the utilization of biochar to enhance soil fertility and sustainability.

2. Prof. Huu-Sheng LUR (National Taiwan University, Taiwan) Development and prospect of a smart farming–based rice production system for sustainable agriculture in Taiwan

Cadmium has been found in rice in Taiwan since the 1980s. This cadmium accumulation in rice was caused by illegally discharged chemical factory wastewater that was further transported through irrigation canal networks into paddy fields. Hence, the cadmium-rice events led us to highly concern with soil quality and agricultural sustainability in Taiwan. The paddy soil contamination and water limitation because of climate change engendered food safety problems in agricultural production, which had a critical influence on human health. Consequently, systematic soil surveys were conducted in Taiwan to identify potentially polluted paddy fields. In addition to these surveys, a conceptual model containing irrigation water groups and pollution prevention strategies was developed for preventing rice contamination in Taiwan. Through smart farming tools, such as remote sensing for identifying soil information, and other autointelligence facilities, such as time-lapse resin capsules combined with portable X-ray fluorescence devices, a continuous monitoring and real-time bulletin systems for monitoring soil and irrigation water quality have been established in this decade. Different crop simulation models to determine soil environment quality and food safety should be studied continuously for improving smart soil management to achieve sustainable agriculture

3. Prof. Chiu-Chung YOUNG (National Chung Hsing University, Taiwan)

Soil Microbial Ecology and Organic Matter Application for Sustainable Agriculture

Taiwan is located in the subtropical- tropical zone that range from rainy to dry weather and hot to cool temperatures, depending on altitude and latitude. The intensive farming cause many diseases and insect pests. Taiwan's average annual rainfall is 2,515 mm. The soil is congenitally degraded due to the high temperature to accelerate the decomposition of soil organic matter. The lack of organic matter in the agricultural land in higher mineralization cause the low ability to retain water and fertilizer, and soil erosion. In order to ensure the crop production, farmers use a large number of chemical fertilizers and pesticides. The problem soils such as the accumulation of chemical salts, the death of a large number of roots, and the poor crop growth the soil needs to be emphasized to strengthen long-term conservation. The development direction of sustainable agriculture needs to be promoted from the agricultural point of view to the social point of view, and strengthen the application of microorganisms and organic fertilizers to achieve the health of increasing soil microbial ecological environment.

The farm management of sustainable agriculture is to establish an agricultural production system that does not rely on a large number of

chemical fertilizers and chemical pesticides. The production should save energy and reduce carbon and reduce costs, and can reduce the density of field pests and diseases, stabilize production, increase income and reduce the impact of environmental ecology. The method of agricultural production that does not rely on a large number of chemical fertilizers and pesticides is to replace some chemical fertilizers and pesticides with microbial fertilizers and microbial pesticides. It is the development opportunity of microbial fertilizers and pesticides, and it is an agricultural "biotechnology" worthy of attention. Healthy soil microbes are the gateway to sustainable agriculture. Healthy soils have healthy crops, healthy crops have healthy foods, and healthy foods have healthy humans.
Microbial Fertilizers Act have established management regulations in the Fertilizer Act of the Council of Agriculture in Taiwan. They refer to microbial products whose active ingredients are used in crop production to provide plant nutrients or promote nutrient utilization. In recent years, the development of soil microbes has the effect of promoting crop growth, competing and inducing reduction of pests and diseases, and further discovering that soil microbes can promote plant drought resistance, heat resistance, salt resistance and iron and sulfur absorption, under extreme climate change. We have established new microbial-enzymes technology to accelerate the production of organic fertilizers within 3 hours instead of 3 months composting method.
4. This conference aims to emphasize the multidisciplinary collaboration for the development of smart soil management for sustainable agriculture, which is focus on soil education and public awareness, emerging contaminant elements in soil-plant systems, pedogenesis and soil information, soil fertility and plant nutrition, soil ecology, paddy soil remediation and food safety, soil management and climate change, soil and water management, and forest soils.
 Internasional Conference of 15th ESAFS will be held in 2021 in Kuala Lumpur, Malaysia. All participants were given certificate as voluntee.

Padang, 12 November 2019 Yang Melakukan Perjalanan Dinas, Zuldadan Naspendra, SP., M.Si NIP. 19890719 201903 1 007