

ORGANIZING INSTITUTION



MEMBERS



7th International Conference

Sustainable Agriculture, Food, and Energy

Phuket
THAILAND, 2019



SAFE 2019 THAILAND

SAFE 2019
International Conference
Sustainable Agriculture,
Food and Energy.
October 18-21, 2019
Phuket. THAILAND.

**Conference
Programme
Papers Abstracts**

GREEN AGRI-FOOD ENERGY PRODUCTION FOR A BETTER WORLD IN A CHANGING CLIMATE

7th International Conference
Sustainable Agriculture,
Food and Energy



**BECOMING
BIGGER
TOGETHER**

HOME FOR CONNECTING PEOPLE

SAFE NETWORK

Asia Pacific Network for Sustainable Agriculture, Food and Energy

www.safe-network.org

**7thInternational Conference
Sustainable Agriculture, Food, and Energy
SAFE2019**

**October 19-21, 2019
Phuket Rajabhat University, Thailand**

**“Green Agri-food Energy Production for a
Better World in a Changing Climate”**

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WELCOME MESSAGE FROM SAFE-NETWORK

Welcome to the International Conference on Sustainable Agriculture, Food, and Energy (SAFE 2019)

We are proud to welcome you to the **International Conference on Sustainable Agriculture, Food, and Energy (SAFE2019): Green Agri-food Energy Production for a Better World in a Changing Climate** which will be held from October 19-21, 2019 in Phuket, Thailand. The host institutions are Phuket Rajabhat University, Chiang Mai University and Chiang Mai Rajabhat University. This conference is the 7th annual conference after the 1st International Conference on Sustainable Agriculture, Food, and Energy (**SAFE2013**) in Padang, Indonesia (12-14 May 2014), the 2nd conference **SAFE2014** in Bali, Indonesia (17-19 September 2014). The 3rd conference **SAFE2015** in Ho Chi Minh City, VIETNAM (17-19 November 2015), 4th conference **SAFE2016**, Colombo, Sri Lanka (October 20-22, 2016), the 5th conference **SAFE2017**, Malaysia, August 22-24, 2017 and the 6th SAFE2018 Conference is Makati, Manila. PHILIPPINES

Aside from the conferences, workshops and short course programs, SAFE-Network has expanded to producing **SAFE Rice Project** as an output of organic rice research conducted by Malaysian and Indonesian faculty-researchers. As the Network grows, the Network plans to embark on innovative platforms where “sustainability” can be served best especially to some group of learners who do not have sufficient background in agriculture science. The Network chooses Philippines, particularly CBSUA, to initially host the **Virtual Farm Academy** in collaboration with SAFE Network and eventually with universities from Malaysia, Indonesia, India, Pakistan, Iran, Thailand, Japan, Taiwan, Sri Lanka, Australia and Bangladesh who are also active members of the Network. CBSUA will take the lead in facilitating the modules to online participants and take the necessary actions in expediting the modular classes. The Network Head Coordinator, together with CBSUA President shall issue certificates of program completion to registered participants. We express our deep gratitude for the support given by Dr. ALBERTO N. NAPERI the President of CBSUA. The virtual farm academy will be launched in the opening ceremony of SAFE2019 and we invite all of us to discuss the operational plan of this Virtual Academy on October 19, 2019 in Phuket.

On behalf of SAFE-Network, we would like to say thanks and convey our appreciation to the Phuket Rajabhat University, Chiang Mai University and Chiang Mai Rajabhat University for co-hosting this conference.

We would like especially to thank Prof. Dr. Tafdil Husni, *Rector of Andalas University* for his strong support to this event, Assoc.Prof. Sermkiat Jomjunyong, Ph.D, *Local Conference Coordinator*, Dr. Worajit Setthapun, *Conference Secretary* and the members of the local organizing committee who helped with all the preparations required to make the conference a success, as well as the session organizers who worked to ensure a high level of science presented at the meeting. Moreover, of course, we thank all honorable speakers and participants who have agreed to attend and discuss your work! Finally, please understand that while every effort was made to publish this book as the “final” program, we know that unavoidable withdrawals and other changes will occur.

Welcome to SAFE-2019, Phuket! Please enjoy the friendship!
One planet! One happiness! Friendship creates wonders!

Prof. Dr. Novizar Nazir
SAFE-Network Coordinator



MESSAGE FROM THE RECTOR OF ANDALAS UNIVERSITY-INDONESIA

Sawasdi khap,

I would like to congratulate and convey my gratitude to the **SAFE Network** for undertaking the initiative to organize **SAFE2019** (7th International Conference on Sustainable Agriculture, Food, and Energy). Andalas University is delighted to be the organizer of this conference since the 1st International Conference on Sustainable Agriculture, Food, and Energy (**SAFE2013**) in Padang, Indonesia (12-14 May 2014), the 2nd conference of **SAFE2014 in Bali**, Indonesia (17-19 September 2014), the 3rd conference of **SAFE2015** in Ho Chi Minh City, VIETNAM (17-19 November 2015), 4th conference ([SAFE2016](#)) in Colombo, Sri Lanka, October 20-22, 2016, the 5th conference **SAFE2017**, Malaysia, August 22-24, 2017 and 6th **SAFE2018** Conference is Makati, Manila (Philippines).

The theme of this year's conference is "Green Agri-food Energy Production for a Better World in a Changing Climate". Climate change is one of the most complex problems we face today. This issue involves many dimensions - science, economics, society, politics and morals and ethical questions- and are global problems, felt on a local scale, which will exist for decades and centuries to come. Activities in the agricultural, food and energy sectors are sectors that have an impact on climate change, but on the other hand, that are heavily affected by climate change itself. Therefore, the participation of the scientific community from universities and research institutions to address the problems related to climate change is highly expected.

Through the conference, we hope to generate substantial contributions to create a better solution and new value on sustainability and sustainable development of agriculture, food, and energy. We are confident that valuable innovation that can change or create more efficient processes, products and ideas are forged after attending this conference. Sustainability is a difficult issue and complex. It is not a goal but a process. I would like to thank the organizing committee and the co-organizer institutions for the hard work and full commitment in preparation of this conference.

Finally, we congratulate Phuket Rajabhat University, Chiang Mai University and Chiang Mai Rajabhat University for hosting this conference. My personal respect and thanks go to all participants. Please enjoy the friendship, enjoy the culture of Thailand! I wish you an enjoyable and memorable conference in Phuket.

Khawp khun khap!

Prof. Dr. Tafdil Husni

Rector of Andalas University



OPENING AND WELCOME MESSAGE BY CONFERENCE COORDINATOR

Assoc.Prof. Sermkiat Jomjunyong, Ph.D.,
Country Coordinator of SAFE-Network (THAILAND)
Faculty of Engineering.. Chiang Mai University.

Prof. Dr. Tafdil Husni, Asst.Prof.Dr. Hiran Prasarnkarn, Dr. Alberto N. Naperi and Prof. Dr. Novizar Nazir,
Distinguished participants, Ladies and Gentlemen:

It gives me a great pleasure to welcome all of you and chair the Opening Ceremony this morning to the “International Conference on Sustainable Agriculture, Food, and Energy (SAFE 2019)” Green Agri-food Energy Production for a Better World in a Changing Climate” which will be held from October 18th - 21st, 2019, Phuket, Thailand. The host institution is jointly organized by SAFE Network, Chiang Mai University, Chiang Mai Rajabht University, Phuket Rajabhat University, THAILAND and ANDALAS University, INDONESIA.

SAFE Network is an Asia Pacific network of university and college educators, researchers, and activists, who collaborate in analysis, synthesis, connecting and educating the people for a better economy, ecology, and equity in agriculture, food and energy system.

This conference is the seventh conference since the year 2013 to 2018. The SAFE 2019 conference will provide us not only essential knowledge but also a great opportunity to share experiences both technical and regulatory issues.

I would like to take this opportunity to express my sincere thanks to the organizers and in particular our honorable speakers. All of them have been working with us since the beginning of the planning stage and they are still here today for all of us, even though they are both very busy with their responsibilities at their agencies. We truly appreciate your dedication. Again, this conference program could not have been made possible without SAFE Network and Phuket Rajabhat University, THAILAND.

Finally, this is an opportune time for me to declare the official opening of the “SAFE 2019” and I wish all 4 fruitful days of interesting and beneficial program and also that you have a pleasant stay in Phuket.

I warmly welcome you again.

Assoc.Prof. Sermkiat Jomjunyong, Ph.D



WELCOME SPEECH BY PRESIDENT OF PHUKET RAJABHAT UNIVERSITY

Welcome All delegates,

I am pleased to welcome you to this landmark conference on the International Conference on Sustainable Agriculture, Food, and Energy (SAFE2019): Green Agrifood Energy Production for a Better World in a Changing Climate” which held from October 19-21, 2019 in Phuket, Thailand. Through this conference, we would like to engage with all of you in an open and constructive dialogue about resources and opportunities to interact with prominent leaders in the field of sustainability and greatly expand your global network of scholars and professionals This event aims to bring together people from different areas and interests to share ideas, explore various discussions, maintain existing connections, establish new connections and partnerships, and share the achievements of the work.

I am honored and delighted to greet you all at the 7th International on Conference Sustainable Agriculture, Food, and Energy or SAFE 2019. For this The conference which brings together experts and academics from around the world, especially ASEAN Country. There are many sessions regarding keynote speech, oral presentation, and poster presentation etc. You can network and learn with the professionals in this conference.

I would like to thank you to our partners with the good relationship for long time. I am happy to see all of delegates in this international conference. I am sure that everyone will find the conference and your stay in Phuket both valuable and enjoyable.

Asst. Prof. Hiran Prasankarn, Ph.D.
President of Phuket Rajabhat University.

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HP:+66 53 885 871. E-mail: worajit@gmail.com

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Virtual Farm Academy

COLLABORATIVE INTEGRATED LEARNING ACADEMY



SAFE
NETWORK
Asia Pacific Network for
Sustainable Agriculture
Food and Energy

**BECOMING
BIGGER
TOGETHER**

The SAFE Network

The Asia Pacific Sustainable Agriculture, Food, and Energy (SAFE) Network is a network of university and college educators, researchers and advocates who collaborate in analysis, synthesis, connecting and educating the people for a better economy, ecology and equity. Initially, it organizes scientific international conferences. The 1st International Conference on Sustainable Agriculture, Food, and Energy (SAFE2013) was held in Padang, Indonesia (12-14 May 2014); the 2nd conference SAFE 2014 in Bali, Indonesia; the 3rd conference SAFE 2015 in Ho Chi Minh City, Vietnam, the 4th conference SAFE 2016, Colombo, Sri Lanka, the 5th conference SAFE 2017 in Malaysia; and the 6th conference SAFE 2018 in Manila, Philippines. Also, one of its banner activities is the conduct of an annual short course program for students to address major sustainability challenges in agriculture, food and energy system. In 2016 and 2017, it was held at Warmadewa University in Bali, Indonesia and in 2018 at Central Bicol State University of Agriculture in Camarines Sur, Philippines. This year, the short course program was held in University of Padjadjaran, Bandung Indonesia.



**BECOMING
BIGGER
TOGETHER**

Aside from the conferences and short course programs, the Network has expanded to producing SAFE Rice as an output of organic rice research conducted by Malaysian and Indonesian faculty-researchers. (<http://safe2019.safe-network.org>) As the Network grows, it plans to embark on innovative platforms where “sustainability” can be served best especially to some group of learners who do not have sufficient background in agriculture science.

SAFE Virtual Farm Academy

As the academe embraces industry 4.0, the next generation of learners is expected to exploit a virtual learning environment in the future. With the fast pace of technology, future learners are no longer interested in a traditional classroom setting. Technology has taught them to become independent learners with a short span of attention, hence, the creation of a virtual school. Minerva project is one classic example (<https://www.youtube.com/watch?v=Gk5iiXqh7Tg>)

A virtual academy is a learning space, usually online, where courses are taught to participants in the form of a web-based technology classroom. Often referred to as cyber-classroom, virtual schools deliver online learning platform either on a supervised class or an unsupervised education mode. The SAFE Network, through its partner-universities, will develop a similar model with emphasis on topics

that relate to sustainability and happiness. We may be concerned on productivity and regeneration of resources but at the end of the day what counts most is our happiness. We can begin with the most critical issues in food and environment. Experts on certain topics can volunteer to share to a group of 10-15 participants around the Asia Pacific region to start the ball rolling. Then, as a Network, we can expand this to a bigger and more structured discussions including a mini virtual SAFE course.

The Network chooses Philippines, particularly CBSUA, to initially host the virtual academy in collaboration with SAFE Network and eventually with universities from Malaysia, Indonesia, Thailand, Taiwan, Sri Lanka, Australia and Bangladesh who are also active members of the Network. CBSUA will take the lead in facilitating the modules to online participants and take the

necessary actions in expediting the modular classes. The Network Head Coordinator, together with CBSUA President shall issue certificates of program completion to registered participants. The virtual academy will be launched in the next international conference which will be held on October 20, 2019 in Thailand.

With the vast network it has, SAFE Network will provide resources and opportunities to interact with prominent leaders in the field of sustainability and greatly expand the global network of scholars and professionals. It shall serve as a collaborative arm of universities such as CBSUA to bring together people from different areas and interests to share ideas, explore various discussions, maintain existing connections, establish new connections and partnerships, and share the achievements of their work.

Module Preparation

The Network is already seven years in active existence and it was founded through volunteerism from senior lecturers and professors who wish to share their knowledge to others. Hence, the preparation and delivery of module will also be a voluntary act of professors, researchers and practitioners according to their field of expertise. The first module will center on “Small-holder family food security”. The module, like any other programs, shall consist of learning outcomes, discussion points and games/activities. It will be an activity-based program so it would be a stress-free class eliciting the participants happiness and creativity during the course of their learning.

The outline for this topic is as follows:

- Module A. Concept of Food Security (one week)
 - Module B. Models of Small-holder farms (three weeks)
 - Module C. Assessment of small-holder farms in various communities (five weeks)
 - Module D. Development of a pilot-project (eleven weeks)
- Implementation

Initially, this module will be delivered online by Prof. Dr. Helmi and Dr. Ravindra Joshi who are specialists in sustainability and food security in small-holder farms. The succeeding topics are farm tourism and stingless beekeeping which shall be delivered by CBSUA’s lecturers and professors.

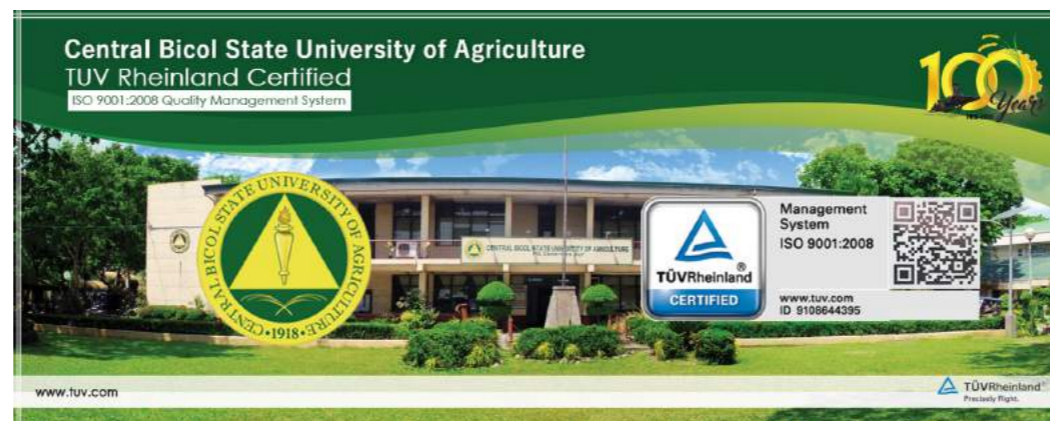


VIRTUAL FARM ACADEMY

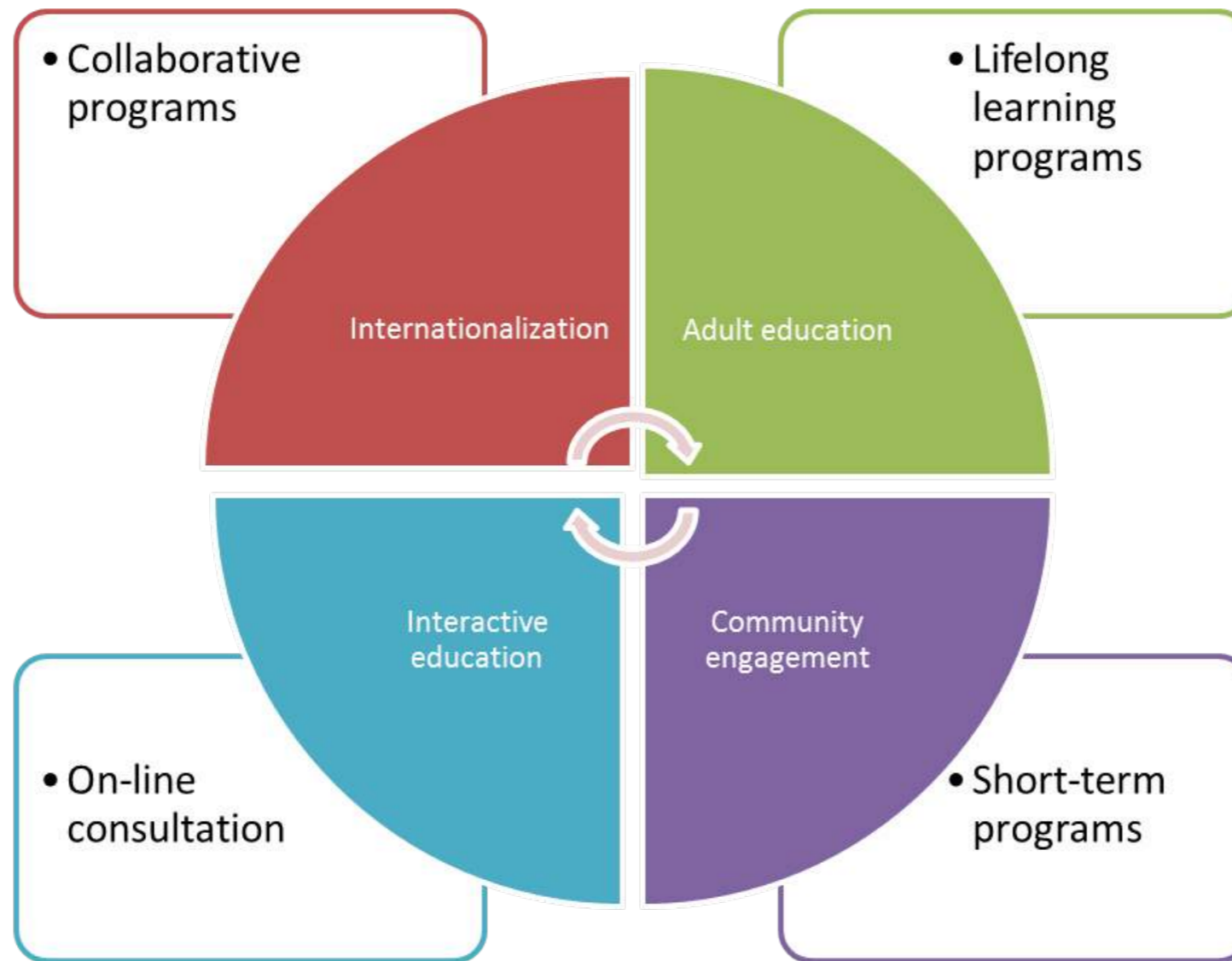
Implementation

The mode of delivery will be made through an online portal. The participants will be assessed to match their profile with the modules being offered. The participants can register any time to start and complete the module. The participants are required to develop an output as a means of measuring whether the learning outcomes have been achieved or not. The module instructor shall determine whether the participant is worthy of a certificate of completion after an evaluation of the output. The target audience of this virtual academy shall be the lifelong learners who are either potential farmers with no experience in farming and practitioners with insufficient educational background in agriculture. The other feature of the VFA is the on-line consultation program where a faculty-specialist is assigned on a specific day to answer the queries of the farmers.

The SAFE Network and its partner universities, including CBSUA, shall help in promoting the virtual academy program to its target participants. The virtual academy shall be under the Office of the External and International Linkages of CBSUA. It shall coordinate with the university's Lifelong Learning Center, College of Information and Technology (Sipocot campus), Information and Communication Center and Extension Division since its purpose traverse through the programs of the said offices. In order to reach the small farmers in the countryside, CBSUA, particular, will team up with the Local Government Units to facilitate the setting up of a virtual program in their municipalities.



VFA Framework





Project Team within CBSUA

Since the project is a partnership with Asia-Pacific SAFE Network, the **Office of the External and International Linkages** will supervise the implementation of the program. While the nature of the project cuts across our mandate on community engagement, the **Extension Office** will take the lead in facilitating and monitoring the implementation of the farm sustainability modules. As the University embarks on developing adult education programs, this project will be integrated in the **Lifelong Learning Center** of the University. The Center will assist in the development of modules and craft strategies on how they can be delivered effectively to the target market. On the technical side, the **College of Information and Technology** will develop the web platform that will enable the VFA to function as an online learning system. In order to maintain the connectivity, the **Information and Communication Office** will develop, implement and support Information Systems and Applications that support the academic and administrative processes of the VFA.

SAFE2019 PROGRAM

DAY 0: Thursday, October 17 2019

ARRIVAL OF PARTICIPANTS AND SECRETARIAT MEMBER & CHECK IN HOTEL: METROPOLE PHUKET HOTEL

DAY 1: Friday October 18 2019

PHI PHI ISLAND TOUR

SAFE Secretariat arrange Phi Phi Island Tour/participants should pay)

DAY 2: Saturday, October 19, 2019

10.00-12.00 AM | NETWORKING DISCUSSION

Agenda: Virtual Farm Academy, Conference, Workshop, Summer Course, Collaboration

Venue: METROPOLE PHUKET Hotel, THAILAND

01.00-09.00 PM | PRE-CONFERENCE TOUR (FREE FOR PARTICIPANTS)

Starting Point: METROPOLE PHUKET Hotel, THAILAND

DESTINATION: Phuket Old Town, Karon View Point, Big Buddha, Wat Chalong Temple, Promtep Sunset, Chilva Market

07.30-09.45 PM | WELCOME DINNER:

SAFE Network will provide food and drink

Registration: OC will provide conference kits

Venue: METROPOLE PHUKET Hotel, THAILAND

08.15-08.30 PM | INVITED SPEAKER

AGRICULTURE, FOOD, ENERGY, AND SUSTAINABILITY IN NEPAL

Prof. Dr. Megh Raj Pokhrel

Central Department of Chemistry, Tribhuvan University, Kirtipur, Kathmandu. Nepal

Venue: METROPOLE PHUKET Hotel, THAILAND

VENUE: PHUKET RAJABHAT UNIVERSITY, PHUKET-THAILAND

		Opening Ceremony Venue: PKRU CONVENTION HALL Person in Charge/MC: Dr. Worajit Setthapun, AdicET, Chiang Mai Rajabhat University, THAILAND	
	7.30-8.00 AM	Registration	
8.15-8.25	Thailand National Anthem Indonesia National Anthem		
8.25-8.30	Conference Program Introduction by Local Conference Coordinator, Dr. Serkiyat Jomjunyong , SAFE-Network National Co-ordinator (THAILAND). CHIANG MAI UNIVERSITY (CMU). THAILAND		
8.30-8.35	Welcome Remark from Rector of Andalas University, Prof. Dr. Tafdil Husni		
8.35-8.40	Opening Remark from President of Phuket Rajabhat University, THAILAND. Asst.Prof.Dr. Hiran Prasarnkarn		
8.40-9.00	Book Launching on <i>The Miracle Tree of Moringa I</i> , Co-writers: Dr. Ravindra Joshi and Dr. MC. Palada Presentation of Certificate of Appreciation and Special Gift from Prof. Dr. Novizar Nazir (SAFE-Network) to the host of SAFE2019: Andalas University, Chiang Mai University (CMU), Phuket Rajabhat University (PRU). Special Gift for Local Conference Coordinator Assoc. Prof. Dr. Sermkiyat Jomjunyong , and Local Conference Secretary, Dr. Worajit Setthapun , Official Photo Session.		
KEY NOTE ADDRESS: Session Chair: Dr. Norman de Jesus, (Country Coordinator, Philippines). Pampanga State Agricultural University, Philippines			
9.00-9.30	The Concept of Virtual Farm Academy Prof. Dr. Helmi, Andalas University-Indonesia Dr. Hanilyn Hidalgo, Central Bicol State Agricultural University (CBSUA). Philippines		
9.30-9.40	Discussion		
9.40-9.45	Signing Ceremony of Letter of Intent on the Establishment of Virtual Farm Academy between SAFE-Network and CBSUA, Philippines		
9.45-10.00	COFFEE BREAK		
Plenary Session I Venue: Main Conference Room Emerging Technology in Agriculture and Food		Plenary Session II Venue: Asian Workshop on Sustainable Energy	

	<p>Session Chair: Prof. Dr. Manggala de Chatura, (Country Coordinator, Sri Lanka). University of Ruhuna, Sri Lanka</p>	<p>Session Chair: Dr. Worajit Setthapun, AdiCET. Chiang Mai University, Thailand Note: The time allocated for each speaker is 20 minutes, consisting of 15 minutes for presentation and 5 minutes for question and answer</p>
10.10-10.30	<p>INVITED SPEAKER 1:</p> <p>EMERGING PLASMA TECHNOLOGY FOR NEXT GENERATION AGRICULTURE AND FOOD PROCESSES</p> <p>Prof. Jeon Geon Han Thai-Korea Collaboration Research Center,Chiang mai University, Thailand Center for Advanced Plasma Surface Technology, Sungkyunkwan University, Republic of Korea</p>	<p>INVITED SPEAKER 5:</p> <p>TOWARD SUSTAINABLE TRANSPORT VIA ASEAN FUEL ECONOMY ROADMAP Dr. Nuwong Chollacoop Lab Head, Renewable Energy Laboratory National Metal and Materials Technology Center (MTEC),National Science and Technology Development Agency, Thailand</p>
10.30-10.50	<p>INVITED SPEAKER 2:</p> <p>SUSTAINABLE DRYING SYSTEMS FOR AGRICULTURAL CROPS IN RURAL COMMUNITIES</p> <p>Romualdo C. Martinez, Ph.D. Chief Science Research Specialist Philippine Center for Postharvest Development and Mechanization (PHilMech) Munoz, Nueva Ecija, Philippines</p>	<p>INVITED SPEAKER 6:</p> <p>CONVERSION OF AGRI-WASTE INTO BIOMASS ENERGY INTEGRATED WITH MICROGRIDS Assoc.Prof. Keng-Tung Wu, PhD Director, Industry Promotion Office for Southeastern Asia (IPOSA) Head, Planning & Marketing Division, International College of Innovation and Industry Liaison (ICIIL). National Chung Hsing University, Taichung, Taiwan (ROC)</p>
10.50-11.10	<p>INVITED SPEAKER 3:</p> <p>ENABLING ENVIRONMENT FOR ENTREPRENEURSHIP & DISRUPTIVE TECHNOLOGY Dr. Wibool Piyawattanametha Director, Advanced Imaging Research Center Department of Biomedical Engineering, Faculty of Engineering King Mongkut's Institute of Technology Ladkrabang (KMITL), Thailand</p>	<p>10.50-11.00 Presenter 1: AN OVERVIEW OF COMMUNITY EMPOWERMENT BY SOLAR ENERGY Dr Vivek Mandot V. K. B. Government Girls' College, Dungarpur, Rajassthan 314001, India</p> <p>11.00-11.20 Presenter 2: COMPOSITIONAL ANALYSES OF SELECTED LIGNOCELLULOSIC BIOMASS FROM MALAYSIA AGRO-WASTE USING VAN SOEST METHOD Dr. Masita Mohammad Solar Energy Research Institute, SERI, UKM, Malaysia</p> <p>11.20-11.30 Presenter 3: PRODUCTION OF BIOGAS FROM PALM OIL MILL EFFLUENT WITH INDIGENOUS BACTERIA Prof. Dr. Muhammad Said Chemical Engineering Department, Faculty of Engineering, Universitas Sriwijaya</p>
11.10-11.30	<p>INVITED SPEAKER 4:</p>	

	TRANSFORMATION OF GADONG TUBER STARCH INTO SOPHISTICATED MATERIAL Assoc. Prof.Dr. Azwani Mat Lazim Universiti Kebangsaan Malaysia. Malaysia	
11.30-12.00	DISCUSSION	11.30-13.00 Venue: Room1 Presentation: Energy-005 Energy 06 Energy 07 Energy 08 Energy 09 Energy-011 Energy 013 Energy 014 Energy 015 Energy 010 Energy 017 Energy 019 Energy 020 Energy 021 Energy 023 Energy 024 Energy 025 GPI-97
12.10-13.30	BREAKOUT SESSION 1 Venue: Room 1-8	
13.00-14.00	LUNCH BREAK	

DAY 3: Sunday, October 20, 2018

VENUE: PHUKET RAJABHAT UNIVERSITY, PHUKET-THAILAND

12.05-13.00 Breakout Session 1 (Previous Speaker will invite the next speaker to present, etc)
CHAIR: Dr. Ravindra Joshi, Country Coordinator (Fiji and Pacific Island))
Secretary: Dr. Rahmanta Setiahari (Merdeka University of Madiun, Indonesia)

Parallele Session	Room 1	Room 2	Room 3	Room 4	Room 5	Room 6	Room 7	Room 8
12.05-12.15	Energy	THE REGIONAL LAND USE CONTROL FOR SUSTAINABLE AGRICULTURE. Melinda Noer , Andalas University. Indonesia	BIOFERTILIZERS INCREASES THE GROWTH AND YIELD OF EDAMAME SOYBEANS ON THE COASTAL SOIL OF BENGKULU, INDONESIA Abimanyu Dipo Nusantara . Univ. Bengkulu. Indonesia	CATECHIN, EPICATECHIN AND EPIGALLOCATECHIN GALLATE OF GAMBIR TEA WITH TELANG PIGMENT. Tuty Anggraini . Andalas University. Indonesia	THE HOLISTIC COMPONENTS OF CATTLE PRODUCTION FOR SOLVING THE HAZE IN CHIANG MAI Sermkiat Jomjunyong . CMU-Thailand	ISOLATION AND CHARACTERIZATION OF POTENTIAL PROBIOTIC YEAST FROM FISH FERMENTED Yetti Marlida , Andalas University. Indonesia	VOLUME AND AVAILABILITY OF BANANA AND WATER LILY AND THEIR UTILIZATION AS FEED INGREDIENTS FOR GOATS IN LUZON-PHILIPPINES. Norman de Jesus , PSAU. Philippines	EFFECTS OF <i>BACILLUS THURINGIENSIS</i> -BASED BIO-INSECTICIDES ON THE PRESENCE OF INSECTS AND THEIR LEVEL OF ATTACK ON MELON FRUIT CULTIVATION IN POLYBAGS Yulia Pujiastuti . Unsri. Indonesia
12.15-12.20	Energy	GPI-01	AST-01	PD-02	Environment-15	FST-02	GPI-11	AST-11
12.20-12.25	Energy	GPI-02	AST-02	PD-03	Environment-16	FST-05	GPI-12	AST-12
12.25-12.30	Energy	GPI-03	AST-03	PD-06	Environment-17	FST-06	GPI-12	AST-13
12.30-12.35	Energy	GPI-04	AST-04	PD-08	Environment-18	FST-07	GPI-14	AST-14
12.35-12.40	Energy	GPI-06	AST-06	PD-10	Environment-19	FST-08	GPI-17	AST-15
12.40-12.45	Energy	GPI-07	AST-09	PD-12	Environment-20	FST-09	GPI-18	AST-16
12.45-12.50	Energy	GPI-08	AST-10	PD-14	Environment-21	FST-10	GPI-20	AST-17
12.50-13.00	Q&A	Q&A	Q&A	Q&A	Q&A	Q&A	Q&A	Q&A

14.00-15.35 Breakout Session 2 (Previous Speaker will invite the next speaker to present, etc)
Chair: Assoc,Prof.Dr. Nurul Huda, Country Coordinator (Malaysia)
Secretary: Dr. Leily Nurul Komariah (Sriwijaya University, Indonesia)

Parallel Session	Room 1	Room 2	Room 3	Room 4	Room 5	Room 6	Room 7	Room 8
14.00-14.10	MODELING VISCOELASTIC PROPERTIES OF GLUTEN-FREE RED KIDNEY BEAN NOODLE Pavalee Chompoorat Postharvest program in Faculty of Engineering and Agro-Industry. Maejo University. Thailand	THE MORPHOLOGY OF CILEMBU SWEET POTATO AFTER COOKED BY BOILING IN WATER, BAKED AND MICROWAVE IRRADIATION. Bohari M. Yamin. UKM. Malaysia	WATER RAINFALL HARVESTING QUALITY AS A FERTIGATION RESOURCES USING AUTOPOT TOMATO CHERRY (SOLANUM L. VAR CERASIFORME) QUALITY. Nurpilihan, Unpad. Indonesia	THE EFFECT OF PROBIOTIC SUPPLEMENTATION ON LIVER BIOCHEMISTRY AND COLON MORPHOMETRIC IN BROILER CARCASS AT POST TRANSPORTATION Roostita L. Balia, Universitas Padjadjaran. Indonesia	O MOTHER EARTH-IS THE SOIL IN YOU IS SAFE FOR AGRICULTURE-? : AN EASY METHOD TO FIND IT SAFE! G.R. Rajakumar, AICRP for Dryland Agriculture. India	FRACTIONATION, ISOLATION AND CHARACTERISATION OF OIL PALM FRONDS XYLOOLIGOSACCHARIDES : A POTENTIAL SOURCE OF PREBIOTICS. Sabiha Hanim Saleh, UiTM. Malaysia	THE HALAL FOOD PROFILE IN THAI CONSUMER ATTITUDE BY USING FLASH PROFILE METHOD. Kallayanee Tengpongsathon . King Mongkut's Institute of Technology Ladkrabang, Thailand	IMPROVEMENT of MANGO PRODUCTION through SCIENCE and TECHNOLOGY INNOVATIONS and SUPPORT MECHANISMS for CAPACITY DEVELOPMENT in BATAAN and ZAMBALES Hermogenes M.Paguia, Bataan Peninsula State University. Philippines
14.10-14.15	GPI-21	GPI-40	AST-18	PD-15	Environment-02	FST-11	GPI-59	AST-36
14.15-14.20	GPI-22	GPI-41	AST-19	PD-16	Environment-03	FST-12	GPI-60	AST-37
14.20-14.25	GPI-23	GPI-43	AST-20	PD-17	Environment-04	FST-13	GPI-61	AST-38
14.25-14.30	GPI-24	GPI-44	AST-21	PD-18	Environment-05	FST-14	GPI-62	AST-39
14.30-14.35	GPI-25	GPI-45	AST-23	PD-19	Environment-06	FST-15	GPI-63	AST-40
14.35-14.40	GPI-26	GPI-46	AST-24	PD-20	Environment-07a	FST-16	GPI-64	AST-41
14.40-14.45	GPI-28	GPI-47	AST-25	PD-21	Environment-08	FST-17	GPI-65	AST-42
14.45-14.50	GPI-29	GPI-48	AST-26	PD-22	Environment-11	FST-18	GPI-67	AST-43
14.50-14.55	GPI-30	GPI-49	AST-27	PD-23	Environment-12	FST-19	GPI-68	AST-45
14.55-15.00	GPI-31	GPI-50	AST-28	PD-25	Environment-13	FST-20	GPI-69	AST-46
15.00-15.05	GPI-32	GPI-51	AST-29	PD-26	Environment-22	FST-21	GPI-70	AST-47
15.05-15.10	GPI-33	GPI-52	AST-30	PD-27	AST-53	FST-22	GPI-71	AST-48
15.10-15.15	GPI-34	GPI-53	AST-31	PD-28	AST-54	FST-25	GPI-73	AST-49
15.15-15.20	GPI-35	GPI-56	AST-33	PD-29	AST-55	FST-26	GPI-73	AST-50
15.20-15.25	GPI-38	GPI-57	AST-34	PD-30	AST-56	FST-27	GPI-74	AST-51
15.25-15.30	GPI-39	GPI-58	AST-35	PD-31	AST-57	FST-28	GPI-75	AST-52
15.20-16.00	Q&A	Q&A	Q&A	Q&A	Q&A	Q&A	Q&A	Q&A

16.00-17.20 Breakout Session 3 (Previous Speaker will invite the next speaker to present, etc)
Chair: Dr. Norashikin Ab. Azis (Universiti Putra Malaysia, Malaysia)
Secretary: Dr. Addion Nizori (University of Jambi, Indonesia)

Parallel Session	Room 1	Room 2	Room 3	Room 4	Room 5	Room 6	Room 7	Room 8
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16.10-16.15	AST-58	AST-83	AST-105	PD-32	PD-55	PD-75	GPI-76	GPI-93
16.15-16.20	AST-60	AST-84	AST-106	PD-33	PD-56	PD-76	GPI-77	GPI-94
16.20-16.25	AST-61	AST-85	AST-107	PD-34	PD-57	PD-77	GPI-78	GPI-95
16.25-16.30	AST-62	AST-87	AST-108	PD-35	PD-59	PD-79	GPI-79	GPI-96
16.30-16.35	AST-63a	AST-88	AST-109	PD-36	PD-59	PD-80	GPI-80	GPI-98
16.35-16.40	AST-64	AST-89	AST-110	PD-37	PD-60	PD-81	GPI-82	GPI-100
16.40-16.45	AST-65	AST-90	AST-111	PD-38	PD-61	AST-125	GPI-83	GPI-101
16.45-16.50	AST-66	AST-91	AST-112	PD-39	PD-62	AST-126	GPI-84	GPI-103
16.50-16.55	AST-69	AST-94	AST-113	PD-41	PD-63	AST-127	GPI-85	GPI-104
16.55-17.00	AST-70	AST-95	AST-114	PD-42	PD-64	AST-128	GPI-86	GPI-105
17.00-17.05	AST-71	AST-96	AST-116	PD-43	PD-65	AST-129	GPI-87	GPI-106
17.05-17.10	AST-72	AST-97	AST-117	PD-45	PD-66	AST-130	GPI-88	GPI-107
17.10-17.15	AST-73	AST-98	AST-118	PD-47	PD-67	AST-131	GPI-89	GPI-108
17.15-17.20	AST-74	AST-99	AST-119	PD-48	PD-68	AST-132	GPI-92	GPI-109
17.20-17.35	AST-75	AST-100	AST-120	PD-49	PD-69	AST-133	GPI-116	GPI-111
17.35-17.40	AST-76	AST-101	AST-121	PD-50	PD-70	AST-134	GPI-121	GPI-112
17.40-17.45	AST-79	AST-102	AST-122	PD-51	PD-71	AST-135	GPI-122	GPI-113

17.45-17.50	AST-80	AST-103	AST-123	PD-52	PD-72		GPI-123	GPI-114
17.50-17.55	AST-81	AST-104		PD-53	PD-74		GPI-124	GPI-115
17.55-18.10	Q&A	Q&A	Q&A	Q&A	Q&A	Q&A	Q&A	Q&A

18.10 –18.20 CLOSING CEREMONY								
KEY POINTS/HIGHLIGHT FROM THE SESSIONS								
Dr. Worajit Setthapun (CMRU, Thailand), Local Conference Secretary								
Dr. Helen Martinez, SAFE2019 Networking Meeting Secretary, PhilMech, Philippines								
Dr. Irawati Chaniago, SAFE-Network Secretary, Andalas University-INDONESIA								
Closing Message: Dr. Sermkiat Jonjumnyong, Local Conference Coordinator. CMU, Thailand								

AST-Agricultural Science and Technology|

FST-Food Science and Technology|

PD-Product Development|

GPI-Green Production and Innovation|

Energy-Energy|

Environment-Environment|

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Made Deviani Duaja	Faculty of Agriculture, University of Jambi	ORGANIC FERTILIZERS FOR SUSTAINABLE AGRICULTURE AND SOYBEAN (GLYCINE MAX .L) GROWTH AND YIELD	AST-02
Wilyus	Faculty of Agriculture, Universitas Jambi	MODEL of AGROECOSYSTEM MANAGEMENT as RESERVOIR (BANK) NATURAL ENEMY in RICE AGROECOSYSTEM	AST-03
Edison	Universitas Jambi	SUPPLY RESPONSIVENESS MODEL OF CORN IN TANJAB TIMUR DISTRICT: APLICATION WITH META RESPONSE FUNCTION	AST-04
Aryunis	Faculty of Agriculture, Universitas Jambi	IDENTIFICATION OF GENETIC CHARACTERISTICS OF LOCAL RICE FIELDS OF ORIGIN JAMBI	AST-05
Ardhiyan Saputra	Faculty of Agriculture, Universitas Jambi	Influencing Factors of potatoes Production in Merangin Regency	AST-06
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Abimanyu Dipo Nusantara	Faculty of Agriculture, Universitas Bengkulu	BIOFERTILIZERS INCREASES THE GROWTH AND YIELD OF EDAMAME SOYBEANS ON THE COASTAL SOIL OF BENGKULU, INDONESIA	AST-08
Yudhy Harini Bertham	Faculty of Agriculture, Universitas Bengkulu	USING BIOFERTILIZER TO INCREASE PEANUT GROWTH AND YIELD ON COASTAL SOIL OF BENGKULU, INDONESIA	AST-09
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Study of the Supply Water Discharge at the Micro Hydro Power Installation

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Abstract. Micro hydro-power plant (MHP) with 10 KW power in Sarwan Sub-village, Merbau Village Ogan Komering Ulu Regency, was installed by the funding of corporate social responsibility (CSR) of PT. Pertamina (Persero). It was built to utilize the water potential energy switched into electricity to meet the needs of the people of the Sarwan sub-village. It was also aimed to make Merbau village sustainable-energy independent. One of the supporting factors is the Sarwan river's flow capacity so that the methodology used in this research tried to reanalyze the existing discharge of the river in Sarwan village. This study analyzed the discharge in July with the dry season intensity of 46.6 mm, and the discharge obtained was 0.496 m³/sec so that the Pin was 12.18 Kw, and Pout was 8.47 kW with the energy demand by the people of Sarwan village amounting to 4.81 kW. This means that MHP in Sarwan village could back up all of the needs of the residents of Sarwan village for electricity for 24 hours, and the optimization of the utilization of MHP in Sarwan village remains potentially developed.

1. Introduction

As the population grows, the need for electricity in rural areas increases, but, on the other hand, the financial support by the government to expand the electricity network is limited. Micro-hydro is often considered as a plausible alternative in meeting the electricity needs of rural communities. Merbau Village is located in Banding Agung subdistrict, Ogan Komering Ulu Selatan district, Sumatra Selatan province. Merbau village consists of 6 sub-villages, one of which is the Sarwan sub-village, which is located in sub-village 5. The number of its population is 128 people in 32 families. The livelihoods of the people are farmers of coffee and other commodities such as pepper, sugar palm, and cacao. Sarwan is one of the sub-villages that was unreachable by the State Electricity Company (PLN) for electricity supply. This is caused by the area profile, demography, and topography of the Sarwan area which has hilly contours with a valley. One of the obstacles for PT. PLN (PERSERO) to distribute electric power was the economic factor that corresponded to those previously-mentioned reasons. Furthermore, the potential consumers would be charged extra to build low voltage electric poles. It caused higher costs incurred by the community.

By using the CSR fund program of PT. Pertamina (PERSERO), after studying the potential local energy source, that is waterfall with a height of 9 meters situated 2.5 km away from the settlement, it was possible to utilize it as an alternative energy source. The water potential energy was possible to be converted to kinetic energy and was switched to mechanical energy. The mechanical energy was eventually converted into electrical energy through a generator. In 2017 the micro hydropower plant



(MHP) was constructed using a crossflow turbine with a capacity of 10 KW to make Sarwan become a pilot project of Energy Independent Village in 2021 with sustainable development. The selection of a crossflow turbine was adjusted to the water discharge and height (head). In its application, a cross-flow turbine is very well used for small hydropower centers with a power of approximately 750 kW. The height of falling water that could be used was above 1 m to 200 m with a capacity of between 0.02 m³/s to 7 m³/s [1-3].

Considering the above reasons including the sustainable program to create "independent energy village", and one supporting factor that is the Sarwan's river flow capacity, the authors conducted a study on the supply of water discharge at the MHP installation in Sarwan sub-village, Merbau Village, South OKU, South Sumatra [4-6].

2. Materials and Method

The research was carried out in the Sarwan sub-village of Merbau village, Merbau village was one of 12 villages in the sub-district of Agung Ogan Komering Ulu district or often called South OKU which has an area of 10 km². Data is collected during the dry season by observing the intensity of rainfall. Retrieval of flow velocity data using flowwatch type FW 450 is divided into three sections, then measuring the depth and width of the river flow.

Stages of analysis are done by calculating the existing river flow, calculating the flowrate in this study using the calculation of the average appearance method. After getting the existing river flow discharge, the optimum flow capacity is obtained by connecting the flow capacity to the output of the Crossflow turbine, both input power, and output cross flow turbine, then analyzing the community usage load on the power generated with the existing river flow discharge.

The direct discharge measurement method that can be used in this case is the salt method, current meter, floating, and rectangular weir. Complete references for discharge measurements are as follows: [7-9]: 1] River Flow and Open Channel Measurement Method (SKSNI 03-2414-1991); 2] River Flow Measurement Method (SKSNI 03-2159-1992); 3] River Flow Measurement Method and Open Channels with Propeller Type Measuring Instrument {Figure 1}(SKSNI 03-2819-1992); 4] Procedures for River Flow Measurement and Open Channels with Flow Measurement and Buoys (SNI 03-2411).

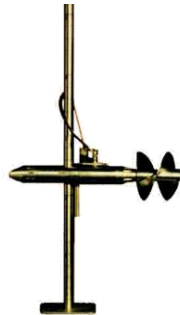


Fig 1. Propeller speed measuring instrument

It is used for measuring in the depth of the vertical line whose speed will be measured, then the depth of measurement 0.2; 0.6; and 0.8 from the water surface is determined as shown in Figure 2 [10].

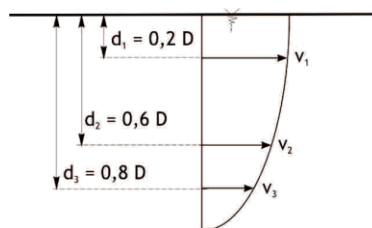


Fig 2. Depth measurement

3. Result and Discussion

3.1. Flow Velocity

To measure flow velocity, this study used flow watch type FW450. This research was conducted in July 2018 because of the weather intensity during the dry season. The intensity measurement was taken from the nearest station with a value of 46.6 mm. 10 measurements were done to take v average. The catchment area is divided into 3 cross-sections with flow velocity v_1 , v_2 , and v_3 , as shown in Figure 3. V_1 velocity was taken in 0.6d depth, v_2 velocity was taken in 0.2d and 0.8d depth, and v_3 velocity was taken in 0.6d depth. As a result, the flow velocity can be seen in the following Table 1.

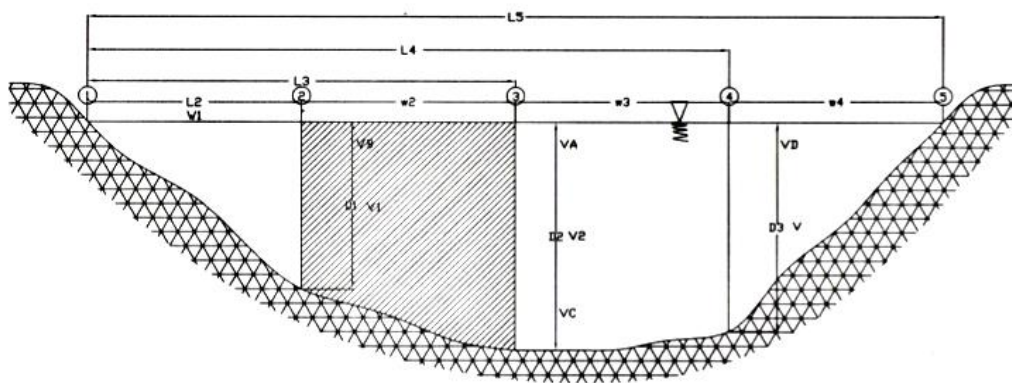


Fig 3. Catchment area

Table 1. Flow Velocity

No	Distance	Dm	Velocity			
			Month			
July						
	L (m)	(m)	0.2d	0.6d	0.8d	V (m/s)
1	0	0		0	0	0
2	0.55	0.55		0.41667	0	0.42
3	1.1	0.7	0.47	0	0.36111	0.42
4	1.65	0.52		0.38889	0	0.39
5	2.2	0		0	0	0

3.2. Flow Width and the Depth of Catchment Area

To measure the width and depth of the flow catchment area, the researcher used meter tape. The catchment area was divided into 3 cross-sections as in Figure 4. The edge distance 1 was equal to 0 with the depth (dm) of 0, a measurement depth of 0. Meanwhile, the edge distance 2 equals 55 cm with the depth (dm) of 55 cm and a measurement depth of 33 cm. The edge distance 3 equals 110 cm with the depth (dm) of 70 and the measurement depth of 14 cm and 56 cm. The edge distance 4 equals 165 cm with the depth (dm) of 52 cm and the measurement depth of 31.2. Lastly, the edge distance 5 equals to 220 cm with depth (dm) and the depth of measurement of 0. All can be seen in Table 2.

Table 2. Flow Width and the Depth of Catchment Area

No	Edge distance	Depth dm (cm)	The depth of Measurement		
	L (cm)		0.2d	0.6d	0.8d
1	0	0		0	
2	55	55		33	
3	110	70	14		56
4	165	52		31.2	
5	220	0		0	

To find the flow rate, we must know the cross-sectional area of the river and the flow velocity. The width of the river crossing can be obtained from the width times the depth of the river. To calculate the flow velocity, this study uses the average of the polygon-area calculation method, with the formula:

The width of the area of polygon 2-3: [11-13]

$$A_{2-3} = \frac{d_2+d_4}{2} w_2 \quad (1)$$

Discharge calculation

$$Q_{2-3} = \left(\frac{\sqrt{2}+\sqrt{3}}{2} \right) \left(\frac{d_2+d_3}{2} \right) w_2 \quad (2)$$

Generally, discharge through an area of polygon x and x+1 equals to:

$$Q_{x-x+1} = \left(\frac{\sqrt{x}+\sqrt{x+1}}{2} \right) \left(\frac{d_x+d_{x+1}}{2} \right) w_x \quad (3)$$

Tabel 3. Flow Discharge

No	Edge distance	dm	Velocity				
			Month				
			July				
	L (m)	(m)	0.2d	0.6d	0.8d	V (m/s)	Q (m/s)
1	0	0		0		0	0
2	0.55	0.55		0.42		0.42	0.143
3	1.1	0.7	0.47		0.36	0.42	0.270
4	1.65	0.52		0.39		0.39	0.08342
5	2.2	0		0		0	0
Total of Discharge							0.49691
Discharge Average							0.09938

3.3. Turbine Power

The calculation of turbine power is described by the following diagram:

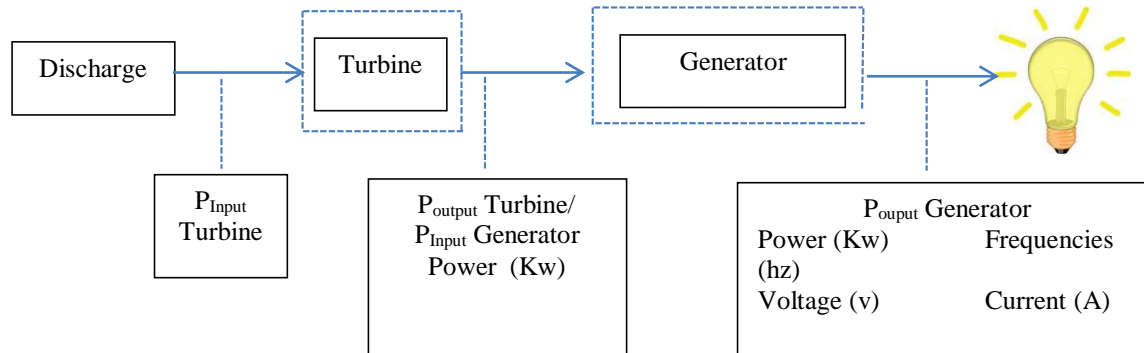


Fig 4. Block diagram of MHP power

Turbine Input Power is calculated based on the equation of: [14-15]

$$P_{in} = \rho \cdot g \cdot Q \cdot H_{net}$$

$$P_{in} = 1000 \times 9.81 \times 0.0994 \times 12.5$$

$$= 121868 \text{ watt}$$

$$= 12.18 \text{ Kw}$$

Turbine Output Power is calculated based on the equation of:

$$P_{in} = \rho \cdot g \cdot Q \cdot H_{net} \cdot eff_t \cdot eff_G$$

$$P_{in} = 1000 \times 9.81 \times 0.0994 \times 12.5 \times 0.74 \times 0.94$$

$$= 8478 \text{ watt}$$

$$= 8.47 \text{ Kw}$$

Where :

$$\rho = 1000 \quad g = 9.81 \text{ m/s}^2$$

$$H_{net} = 12.5 \text{ meter} \quad Q = 0.994 \text{ m/s}$$

$$Eff_{turbine} = 0.74 \quad Eff_{Generator} = 0.94$$

The Sarwan Subvillage population consisted of 128 people (32 families) with 30 houses, so that the demand for electricity consumption is as follows:

Table 4. The Demand for Electricity of Sarwan community

Electronic	Power	Total Power
30 TV	65 watt	1950 watt
90 LED House Lamp	13 watt	1170 watt
111 LED Street Lamp	13 watt	1443 watt
2 Water Pump	125 watt	250 watt
	Total	4813 watt

Note :

- There are 30 houses
- Each house has 1 CRT (Cathode Ray Tube) TV, 3 LED lamps
- There are 111 street lamps

The operating time of the MHP Sarwan sub-village in a day is 15 hours because the community of Sarwan sub-village does their activities in the garden and workplaces from 7:00 a.m. to 3:00 p.m. The detailed usage of the electricity by the community per day can be seen as follows:

Table 5. Details of electricity usage per day

		power amount used			
07.00-15.00		No electricity usage			
16.00-17.00	30 TV	65 watt	1950 watt		
	2 Water pump	125 watt	250 watt		
		Total	2200 watt		
18.00-21.00	30 TV	65 watt	1950 watt		
	90 House lamp	13 watt	1170 watt		
	111 Street lamp	13 watt	1443 watt		
		Total	4563 watt		
22.00-06.00	30 House lamp	13 watt	390 watt		
	111 Street lamp	13	1443 watt		
		Total	1833 watt		

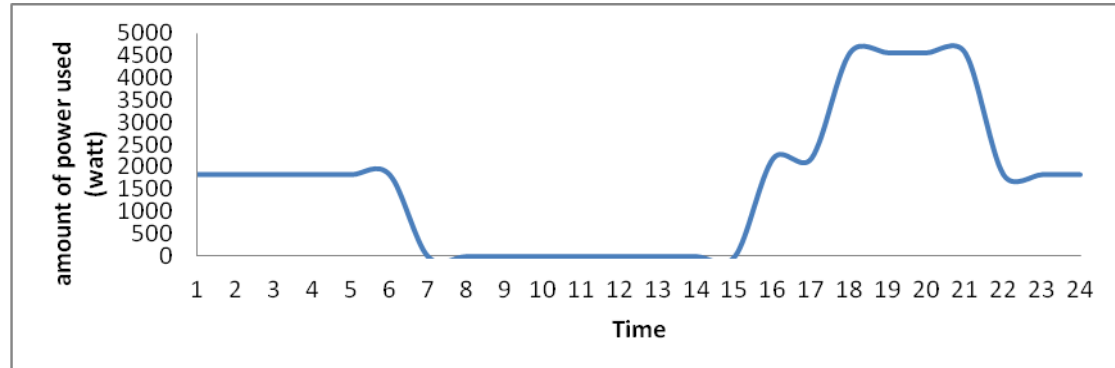


Figure 5. Graph of electricity usage load per day

The peak use of electricity Sarwan sub-village community was at 6:00 p.m. to 9:00 p.m. with the power of 4.56 KW. From 7:00 a.m. until 3:00 p.m, the electricity usage load of the community of Sarwan was 0 because the community of Sarwan sub-village did their activities outside their houses. The usage burden of the Sarwan sub-village community was 4.56 kW when using the PLN network. Therefore, the community of Sarwan paid for $4.56 \text{ kW} \times (\text{Rp. } 1467.28 \times 10\% \times 10\%) = \text{Rp. } 60.000$.

4. Conclusions

Discharge supply in July had an intensity of rainfall in the dry season of 46.6 mm from BMKG (Meteorology, Climatology, and Geophysical Agency) data of South Sumatra Province with the discharge produced at the existing flow of 0.496 m/sec, so that the turbine pin can be obtained at 12.18 kW and Pout Turbine at 8.47 kW. The usage load of the Sarwan sub-village community is 4.81 kW, where the Sarwan sub-village MHP has a minimum power of 8.47 kW which means that Sarwan MHP

can back up all of the electricity needs of the residents of Sarwan sub-village for 24 hours and this still is potential to develop the utilization of MHP in the Sarwan sub-village.

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