

CONFERENCE PROGRAMME PAPERS ABSTRACTS



**6th International Conference on
Sustainable Agriculture, Food
and Energy.
October 19 - 21, 2018 in MANILA,
Philippines.**

Inclusive Agri-food Energy Production for Community Empowerment in a Changing Climate

**6th International Conference
Sustainable Agriculture, Food, and Energy
SAFE2018**

**October 19-21, 2018
I'M Hotel, Makati. MANILA, PHILIPPINES**

**“Inclusive Agri-food Energy Production for
Community Empowerment in a Changing
Climate”**

CONTENTS

Welcome Message from SAFE-Network Coordinator **Dr. Novizar Nazir**

Welcome Remark from the Rector of Andalas University-INDONESIA, **Prof. Dr. Tafdil Husni.**

Welcome Remark from Local Conference Chairman/Country Coordinator SAFE-Network (Philippines) **Dr. Norman de Jesus**

Welcome Remark from Officer in Charge, Office of President, Central Bicol State University of Agriculture (CBSUA), **Prof. Rolando G. De Asis, BAE**

Welcome Remark from the President of Pampanga State University of Agriculture (PSAU), Philippines, **Dr. Honorio Soriano**

Welcome Remark from the Director of Philippines Centre for Postharvest and Mechanization (PhilMEch), **Baldwin G Jallorina, PhD.**

The composition of SAFE2018 Organizing Committee

Networking Discussion

SAFE2018 Program

List of Abstract based on Code of Sub-theme

Abstracts

SUB-THEME 1 Sustainable Energy (Energy)

SUB-THEME 2 Food Science and Technology (Food)

SUB-THEME 3 Policy and Management (PM)

SUB-THEME 4 Product Development and Innovation (Product)

SUB-THEME 5 Sustainable Energy and Environment (SA/E)

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Table of contents

Volume 347

2019

◀ Previous issue Next issue ▶

6th International Conference on Sustainable Agriculture, Food and Energy 18–21 October 2018, Manila, The Philippines

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Open all abstracts

Preface

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6th International Conference Sustainable Agriculture, Food, and Energy (SAFE2018). October 19-21, 2018 I'M Hotel, Makati. MANILA, PHILIPPINES

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Peer review statement

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Papers

Innovation on Sustainability related to Agriculture, Food, and Energy

OPEN ACCESS 012001
The Growth of Native Yeasts on Mozzarella Cheese Whey with the Resistance towards High Glucose and Ethanol Contents

R. L. Balia, L. Suryaningsih, A. Pratama and G. L. Utama

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Identification of Endophytic and Rhizosphere Bacteria in Maize (*Zea mays* L.) in Limapuluh Kota Region, West Sumatra, Indonesia

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Selection and Evaluation of Several BC2F2 Rice Accession Tolerance to Submergence Stress and Backcrossing to Local Parent

Mery Hasmeda, Entis S. Halimi, Harman Hamidson and Rizky Yudhan Guswari

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012004

Yield test of 13 accession groups of Yam (*Dioscorea alata* L.) on three various agroecology

Wuryantoro, R Mustika Wardhani and I Rekyani Puspitawati

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Vegetation analysis of highland tropical rainforest in the conservation area

Djoko Setyo Martono, Sri Rahayu and Endry Wijayanti

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Phosphorus Uptakes and Yields of Sweet Corn Grown under Organic Production System

Fahrurrozi Fahrurrozi, Zainal Mukhtar, Sigit Sudjatmiko, Mohammad Chozin and Nanik Setyowati

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012007

Variability in growth and yield among sweet corn genotypes grown under organic crop management

M Chozin, S Sudjatmiko, Z Mukhtar, N Setyowati and F Fahrurrozi

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Viability Spermatozoa Epididymis of Buffalo (*Bubalus Bubalis*) In Fertilized Media to Additional Serum at Temperature 5°C

Harissatria, D. Surtina, T. Astuti, Jaswandi and Hendri

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Biology of *Eocanthecona furcellata* (Wolff) (Hemiptera: Pentatomidae) Predator Nettle Caterpillar *Setora nitens* Walker Origin from Riau

Rusli Rustam, Herman and Muhammad Abdul Gani

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The Effect of Using Some Kind of Manure on the Content of Dry Matter, Organic Matter and Crude Protein of Elephant Grass Cv. Taiwan (*Pennisetum purpureum*) on the First Harvest

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Milk Production and Quality of Dairy Cow Fed Diet Containing Concentrate with *Durio zibethinus* Murr Seed Flour

Endang Sulistyowati, Edi Soetrisno, Sigit Mujiharjo, Dwi E. Lorence, Emilia Gustia and Siska Meisella

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012012

The Effect of Sorghum Flour (*Sorghum bicolor* L. Moench) Addition to Characteristic Quality of Goat Milk Sinbiotic Yoghurt Candidate

Een Sukarminah, Indira Lanti, Endah Wulandari, Elazmanawati Lembong and Ratih Utami

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The Analysis of Strategic Partnership to Supply Mandailing Arabica Coffee for Export Quality Markets

Erin Siregar, Novizar Nazir and Alfi Asben

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Testosterone level and mating capability of male rabbit fed commercial feed substituted with *moringa oleifera* leaf meal

N M R Suarni, I G L Oka, I G Mahardika and I P Suyadnya

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The Use of *Melastoma malabatricum* and *Manihot esculenta* extract as natural anthelmintic on the Performance of Kacang goat

Tatik Suteky and Dwatmadji

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012016

The Effect of Protected Soybean Oil and Soybean Groats Base on in Vitro Dry Matter Digestibility, in Vitro Organic Matter Digestibility in the Rumen and Post Rumen

A Pramono, R. F. Hadi, J. Sutrisno and M. Cahyadi

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012017

Optimization of hydroponic technology for production of mycorrhiza biofertilizer

A Nurbaity, N Istifadah, B A Haryantini, M F Ilhami, M I Habibullah and M Arifin

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Ni Luh Suriani, Made Ni Susun Parwanayoni, Ni Wayan Sudatri and Ni Made Suartini

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Moringa Seeds (*Moringa olifera* L.) Application as Natural Coagulant in Coffee Wastewater Treatment

Elida Novita, Sri Wahyuningsih, Hendra Andiananta Pradana, Wendy Dreifyana Marsut and Akhmad Farisul F

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012020

Effect of Shelf Life on the Quality of Fried Sambal (Condiments of Instant Uduk Rice)

Asrul Bahar and Dwi Kristiastuti Suwardiah

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012021

Storability of Seaweed Jelly Candy based on Chemical, Physical and Microbiology Characteristics

Rita Ismawati, Ita Fatkhur Romadhoni, Q.T Nurul and S.T Ratna

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Exploration of indigenous rhizobacteria: in search for their potential as plant growth promoting bacteria at two potato producing areas in West Sumatra

I Chaniago, Warnita and Z Resti

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Rats testosterone level and reproductive organ weight treated by kapok (*Ceiba pentandra* Gaertn.) seed extract

N I Wiratmini, I Setyawati and I Narayani

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012024

Involvement of Jasmonic Acid in the Induced Systemic Resistance of Tomato against *Ralstonia syzigii* sub sp. indonesiensis by Indigenous Endophyte Bacteria

Yulmira Yanti, Warnita and Reflin

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012025

Estrogen Level in Female Local Rabbit Fed Commercial Cod Liver Oil Supplementation

N G A M Ermayanti, I B M Suaskara, I Setyawati, N M R Suarni and I G A M Widhyastini

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012026

Effect of Indigenos Endophytic Bacteria on Growth of Palm Oil Seedlings (*Elaeis guineensis* Jacq) In The Nursery

Reni Mayerni, Warnita, Yuliatrri, Sari Rukmana and Okta Sagita Chan

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012027

Optimizing Quality of White Oyster Mushroom Seeds Through Plant Propagation

S Rahayu and D S Martono

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012028

Value Added Analysis of Yard-Based Agroindustry for Food Security

R M Wardhani, Wuryantoro and P G Adinurani

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012029

The Effect of Squalene Addition In-Vitro to Increase Asiaticoside Hairy Root Culture of *Centella Asiatica* (L.) Urban

Zahanis

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012030

Challenges in Molecular Identification of Endomycorrhizal Fungi from Rhizosphere of Cashew Plant

Made Pharmawati and Meitini Wahyuni Proborini

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012031

Isolation and Identification of Lactic Acid Bacteria Producing Biopreservative Bacteriosin from Smoked Fish

Tita Rialita, Een Sukarminah, Try Yuliana, Debby Moody Sumanti, Intan Kurnianingriem, Fanny Nur Octaviani, Marcellia Bella Santoso and Heditia Febby Susanto

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012032

Identification of GH Gene Polymorphisms and Their Association with Body Weight in Bayang Duck, Local Duck from West Sumatra, Indonesia

Yurnalis, Arnim, Dino Eka Putra, Zulkarnaini Kamsa and Tinda Afriani

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Properties of Ethanolysis Product from Ketapang Seed Oil (*Terminalia Catappa* Linn) Incorporated in Mucoadhesive Patch Film

Miksusanti, Herlina, A.N Fithri and Ferlinahayati

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012035

The effect of organic mineral supplementation in the ration with total mixed fiber ammoniation as basal feed to rumen environment

A Imsya, Yuanita Windusari and Riswandi

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012036

Influence of Liquid Smoke Cinnamon Against Attacks Leaf Rot Disease (*Phytophthora Infestans*) on Potato (*Solanum Tuberosum* L.)

I Ketut Budaraga, Tukiran and Syamsuwirman

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012037

The Principle of good items as a legal protection instrument of food and beverage brand holders in Indonesia

Ni Luh Made Mahendrawati, I Wayan Wesna Astara and IB Gede Agustya Mahaputra

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012038

Spermatozoa Quality of Young Male White Rat after Treated with *Moringa oleifera* Leaf Extract

I B M Suaskara, M Joni and I Setyawati

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012039

Analysis of Management, Technology and Quality of Coffee Bean in West Sumatera

Gunarif Taib and Purnama Dini Hari

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012040

Changes in Soil Chemical and Physical Properties of Andisols under Oil Palm Small holder in the West Pasaman District of West Sumatra

Bujang Rusman, Agustian and Aprisal

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012041

Toward Achieving Self-Sufficiency Livestock

Ni Made Ayu Gemuh Astiti Rasa

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012042

West Sumatera brown rice genotypes resistance to Aluminium in early growth phase

Indra Dwipa, Ardi and Nike Vorinda

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012043

Productivity and Intestinal Profile of Boilers fed with Fermented Dragon Fruit Ration

Gusti A.M.Kristina Dewi, I M. Wirapartha, I W. Wijana, I K. Anom Wiyana, D. A. Warmadewi and Budi Rahayu T

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012044

Using bio-starter to increase growth and production of hortensia flower (*Hydangea* sp)

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012045

Analysis of prospects of crude palm oil (CPO) in west Sumatra province

Lisa Nesti, Firwantan, P Shoffiyati and I Ekawati

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012046

The Analysis of Strategic Partnership to Supply Mandailing Arabica Coffee for Export Quality Markets

Erin Siregar, Novizar Nazir and Alfi Asben

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012047

The Increase in Production Efficiency of Hydroponic Salad (A Case Study Of Green Oakleaf Lettuce)

Athiwat Wangmai, Sermkiat Jomjunyong, Suwattarwong Phanphet, Naphetphan Phanphet and Saowaluk Reungsri

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012048

Decontamination of pesticide residues on tangerine fruit using non-thermal plasma technology

C Sawangrat, K Leksakul, D Bonyawan, T Anantana and S Jomjunyong

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Characteristics of Black Glutinous Rice Vinegar as Traditionally Fermented Product of Yeast Tapai and *Acetobacter aceti*

Novelina, Novizar Nazir, Risa Meutia Fiana and Dian Permana Putra

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012050

The effect of probiotic originated from Kumpai Grass Silage to Final Weight, Carcass Percentage and Commercial Carcass Cut of Pegagan duck

L.S Meisji, Darmawan, Y. Fitra, S. Sofia, G. Nuni and R Nasir

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012051

Antifungal Activities Of Cinnamon Leaf Extracts Against Sigatoka Fungus (*Pseudocercospora Fijiensis*)

Anak Agung Ketut Darmadi, Sang Ketut Sudirga, Ni Luh Suriani and I Gusti Ayu Sugi Wahyuni

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012052

Antibiotic potency of *Straptomyces drozdowiczii* on white *Rattus norvegicus* which is infected with *Acinobacter baumannii*

R Kawuri, I B G Darmayasa and C Gading

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Antimicrobial activity of lactic acid bacteria isolated from fermented durian flesh (tempoyak) against pathogenic and spoilage bacteria during storage

A Nizori, A Sukendra and Surhaini Mursyid

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012054

Bioactive compound of *Streptomyces capoamus* as biocontrol of Bacterial Wilt Disease on Banana Plant

R Kawuri and I B G Darmayasa

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012055

Application of coconut biochar and organic materials to improve soil environmental

Susila Herlambang, AZ.Purwono Budi S, Heru Tri Sutiono and Susanti Rina N

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Effects of *Bacillus thuringiensis*-based bio-insecticides on the presence of *Aphis gossypii* and Coccinellid predators on intercropping cultivation

Yulia Pujiastuti, Irmawati, Arsi Arsi and Dwi Probawati Sulistiyani

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012057

The application of biochar in improving the nutrition quality and production of sorghum plant

Ni Made Yudiastari, Ni Ketut Ety Suwitari, Luh Suariani and Yohanes Parlindungan Situmeang

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012058

Antifungal activity of leaf extract of *Mansoa alliacea* against *Colletotrichum acutatum* the cause of anthracnose disease on chili pepper

Sang Ketut Sudirga, I Ketut Ginantra and Ida Bagus Gede Darmayasa

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012059

Analysis of Fibre Fraction of Palm Oil Frond Fermented with Different Microbes and Soluble Carbohydrates Addition as Ruminant Feeding

T. Astuti, M. Nasir Rofiq, Nurhaita and U. Santoso

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012060

Application of Pectin Extracted from Cocoa Pod in the Production of Edible Film

Desniorita, Novizar Nazir, Novelina, Kesuma Sayuti and Jasril

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012061

Smart Sensor for Monitoring Integrated Wastewater

Rusdianasari, Jaksen, Ahmad Taqwa and Yudi Wijarnako

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012062

Application Alkali Treatment Rice Husk – CaCl₂ as Moisture Absorber of Coconut Palm Sugar Granule

DP Agriawati, E Warsiki, A Iskandar and E Noor

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012063

Application Nano Zeolite-Molybdate For Avocado Ripeness Indicator

VJ Putri, E Warsiki, K Syamsu and A Iskandar

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Characteristics of High Protein Snack Bar Made of Modified Sweet Potato Flour

Marleen Sunyoto, Robi Andoyo and Euis Masitoh

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Utilization of local West Sumatra bamboo for laminated bamboo board with different adhesives

Sahadi Didi Ismanto and Neswati

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Gambir Quality from West Sumatra Indonesia Processed With Traditional Extraction

Tuty Anggraini, Neswati and Alfi Asben

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Joko Sutrisno, Winny Swastike, Akmal Prayudi and Ahmad Pramono

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Isolation and identification of indigenous lactic acid bacteria on corn flour BISI-16 during spontaneous fermentation process

Andi Sukainah, Eva Johannes, Ratnawaty Fadilah, Amirah Mustarin and ReskiPraja Putra

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R Mega Sari and Syahro Ali Akbar

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PG Putri, E Warsiki and Sugiarto

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Metabolite profiling of Indonesian cacao using Gas Chromatography-Mass Spectrometry

Lukita Devy, Agung Wahyu Susilo, Ade Wachjar and Sobir

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The effect of chitosan and bran fermentation on the weight of abdominal fat, blood cholesterol and local duck eggs

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Susi Desminarti, Ermiami and Rahzarni

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012074

Side effect of long term injection of high dose whitening vitamin C to plasma glucose and cholesterol level

NW Sudatri, Dwi Ariani Yulihastiti, Ni Made Suartini, Inna Narayani and Ni Nyoman Wirasiti

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The Creation of Perception and Collaboration in Decreasing The Effects of Climate Change through Stem Education

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Livestock Occupational Extension of Farmers for Problems Solving Burning in Agricultural Zone: The Case Study of Mae Na Chon Sub-District, Mae Chaem District, Chiang Mai Province

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Efficiency of 9KWp Sun Tracking Photovoltaic in Palembang, Indonesia

Nova Pasaribu, Rusdianasari and Aida Syarif

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The effectiveness of Solar Tracker Use on Solar Panels to The Output of The Generated Electricity Power

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Performance Comparison of 3 Kwp Solar Panels Between Fixed and Sun Tracking in Palembang - Indonesia

BRD Muhammad Hamdi, Tresna Dewi and Rusdianasari

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Fermentation Process of Glycerol to Arabitol from Byproducts of *Reutalis trisperma* Biodiesel Using Yeast of *Debaryomyces Hansenii*

Efri Mardawati, Robi Andoyo, Mimin Muhaemin, Sarifah Nurjanah, Darajat Natawigena, Totok Herwanto, Handarto, Gemilang Lara Utama, Rosalinda, Poppy *et al*

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Efficiency of 9KWp Sun Tracking Photovoltaic in Palembang, Indonesia

Nova Pasaribu¹, Rusdianasari^{2*}, Aida Syarif²

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Abstract. Solar energy is one of the renewable energy potentials as an alternative energy substitute for fossil fuels in Indonesia. Indonesia that is located on the equator is very profitable because it always gets sunlight throughout the year. Indonesia has an average of the solar energy potential of 4.8 KWh / m² equivalent to 112,000 GWp. Light or sunlight can be converted into electricity using solar cell technology (Photovoltaic). Electrical energy generated from the solar panels will be maximized if the solar cell is always perpendicular to the direction of the focus of the sun. Sun tracker is a system that can automatically control the solar cell to remain focused on the direction of the sun. This paper is a case study to determine the efficiency of solar panels that use the sun tracking system with monocrystalline silicon type with 9 KWp capacity. The solar panel system is located in Plaju Palembang (South Sumatra, Indonesia) where the average daily radiation levels are 4.96 kWh /m². To determine the efficiency of the solar panel, then Data collection was performed for two months, namely in December 2017 and January 2018.

1. Introduction

Utilization of solar energy as an alternative energy source to overcome the energy crisis, especially petroleum, which occurred since the 1970s has received considerable attention from many countries in the world. In addition to its unlimited amount, the utilization does not cause pollution that can harm the environment. Light or sunlight can be converted into electricity using solar or photovoltaic cell technology. Business opportunities in the field of solar energy power plants are so great. Indonesia has the potential of solar energy amounted to 4.8 KWh / m² equivalent of 112,000 GWp ten times the potency of Germany and Europe [1-3].

The main components of solar power plant systems (PLTS) using photovoltaic technology is a solar cell. Currently, there are many solar cell manufacturing technology. The latest commercially used conventional solar cells use crystalline silicon wafer technology which the production process is quite complex and expensive. In general, the conventional solar cell manufacturing process begins with the purification of the silica to produce solar grade silica (ingot), followed by the cutting of silica into silica wafer [4-6]. Furthermore, silica wafers are processed into solar cells, and solar cells arranged to form a solar module. The final stage is to integrate solar modules with BOS (Balance of System) into solar systems. BOS is supporting components used in solar systems such as inverters, batteries, control systems, and others [7-10].

Solar energy is the potential energy for alternative energy in Indonesia. However, the efficiency of the produced by solar panels is relatively low. Electrical energy generated from the solar panels will be greatest if the solar cell is always perpendicular to the focus direction of the sun. Therefore, we need



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a system that can automatically control the solar cell in order to remain focused on the direction of the sun, namely solar tracker. Solar tracker is a system to maximize power production of Solar Power Plant (SPP) by directing the SPP to the direction of the sun. The use of solar tracker improves production efficiency solar power electricity between 20-50 percent depending on the location and type of tracker used [11,12].

Solar power plants are power plants that convert solar energy into electrical energy. Solar cell panels capturing sunlight and convert it into electrical current which is then stored in batteries so that it can meet daily energy needs. The electricity generation can be done in two ways, namely:

1. Directly using photovoltaics. Photovoltaic transform light energy directly into electricity using the photoelectric effect.
2. Indirectly through the convergence of solar energy. PLTS with this centralized system means that power plants are carried out centrally and supply power to consumers through distribution networks. The system is suitable and economical in areas with high population density.

Currently, the development of SPP in Indonesia has a strong enough base from the policy aspect. However, at the implementation stage, the existing potential has not been used optimally. Technologically, Technologically the photovoltaic (PV) industry in Indonesia is only able to do at the downstream stage, which is producing solar modules and integrate them into SPP, while solar cells are still imported. Though solar cells are the main component, but the most expensive in SPP systems. Prices that are still high are an important issue in the development of the solar cell industry. Various solar cell manufacturing technology continuously researched and developed in the framework of efforts to reduce the price of solar cell production in order to compete with other energy sources. Considering that the electrification ratio in Indonesia has only reached 55-60% and almost all areas that have not been electrified are rural areas that are far from the power plant, so PLTS that can be built in almost all locations are very suitable alternatives to develop. From 2005 to 2025, the government has planned to provide 1 million Solar Home System with a capacity of 50 Wp for low-income and hybrid 346.5 MWp solar power to remote areas. Until 2025 the government plans there will be approximately 0.87 GW of solar power capacity installed [13].

1.1. Type of Solar Power Plant (SPP) System Connection

Electrical Generating Solar Power Plant (SPP) is installed with 3 kinds of installation, namely:

1. Off Grid Systems (Stand Alone System), this power plant systems rely on solar energy as the only source of primary energy to produce electrical energy.
2. On Grid System, a series of power plant systems will keep related to the electricity network originating from PLN by optimizing the use of energy from solar panels to produce electricity as much as possible.
3. Hybrid systems, power plant systems utilizing solar energy as the main source to be combined with a generator or other renewable energy sources as a backup energy source.

The main characteristic that generally made the difference between the three systems is the use of batteries as electric energy storage media. In the Off Grid system, the battery becomes an imperative (mandatory) part of solar power as the major energy source. While in the On Grid system, the battery is not mandatory because solar power is not the main source of electrical energy. Likewise, with the Hybrid system, batteries must be adjusted to the conditions of use and the choice of primary energy [14].

2. Materials and Methods

Materials or equipment that are used in this study is the SPP with a design capacity of 9 KWp equipped with a sun tracker installed in PT Pertamina (Persero) RU III Plaju. The equipment used, namely:

Sky Energy Monocrystalline Solar Module 250 Wp

With the following technical data:

Rated Maximum Power-Pmax	: 250 W
Maximum Power Voltage-Vmp	: 30.9 V
Maximum Power Current-Imp	: 8.12 A
Open-Circuit Voltage Voc	: 37.8 V
Short-Circuit Current Isc	: 8.74 A

Efficiency	: 16.07%
Module	: 60 Cells
Rated Maximum Power-Pmax	: 4,167 W
Maximum Power Voltage-Vmp	: 0.515 V
Maximum Power Current-Imp	: 8.119 A
Inverter Conext RL 3000E	
With the following technical data	
MPPT voltage range, full power	: 160 - 500 V
Operating voltage range	: 90 - 550 V
Starting voltage	: 100 V
Max. input voltage, open circuit	: 550 V
Number of MPPT	: 2
Max. input current per MPPT	: 10 A
Custom – GTI Solar Module Single Axis Tracking System	
Monitoring System – Schneider Ethernet Box	

2.1. Structural design of on-grid solar power plants

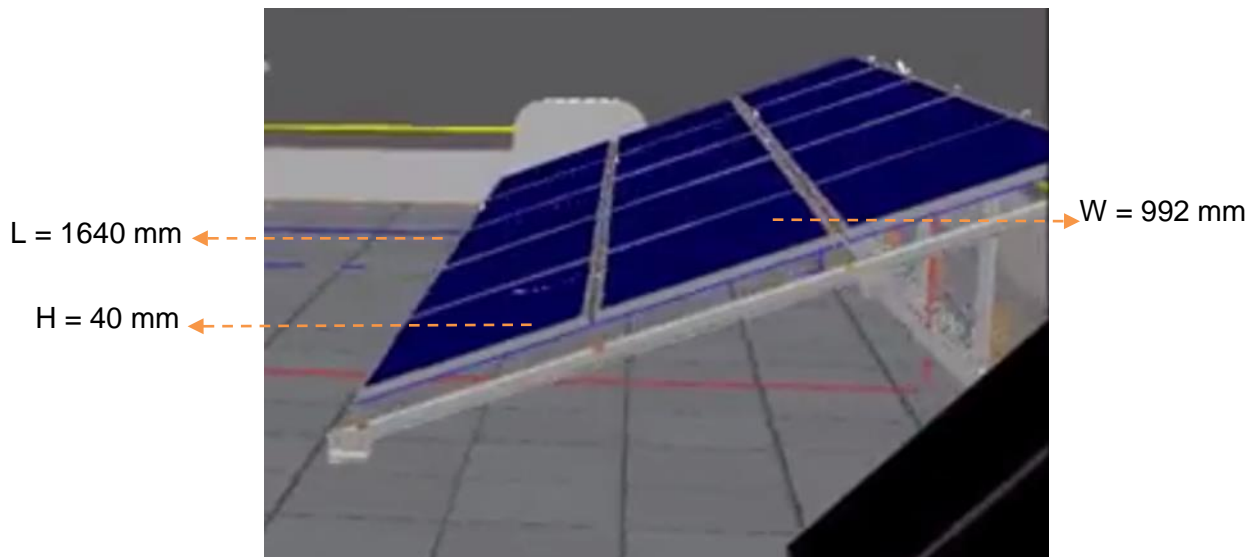


Figure 1. Design of on-grid solar power plants

2.2. Functional design of on-grid solar power plants

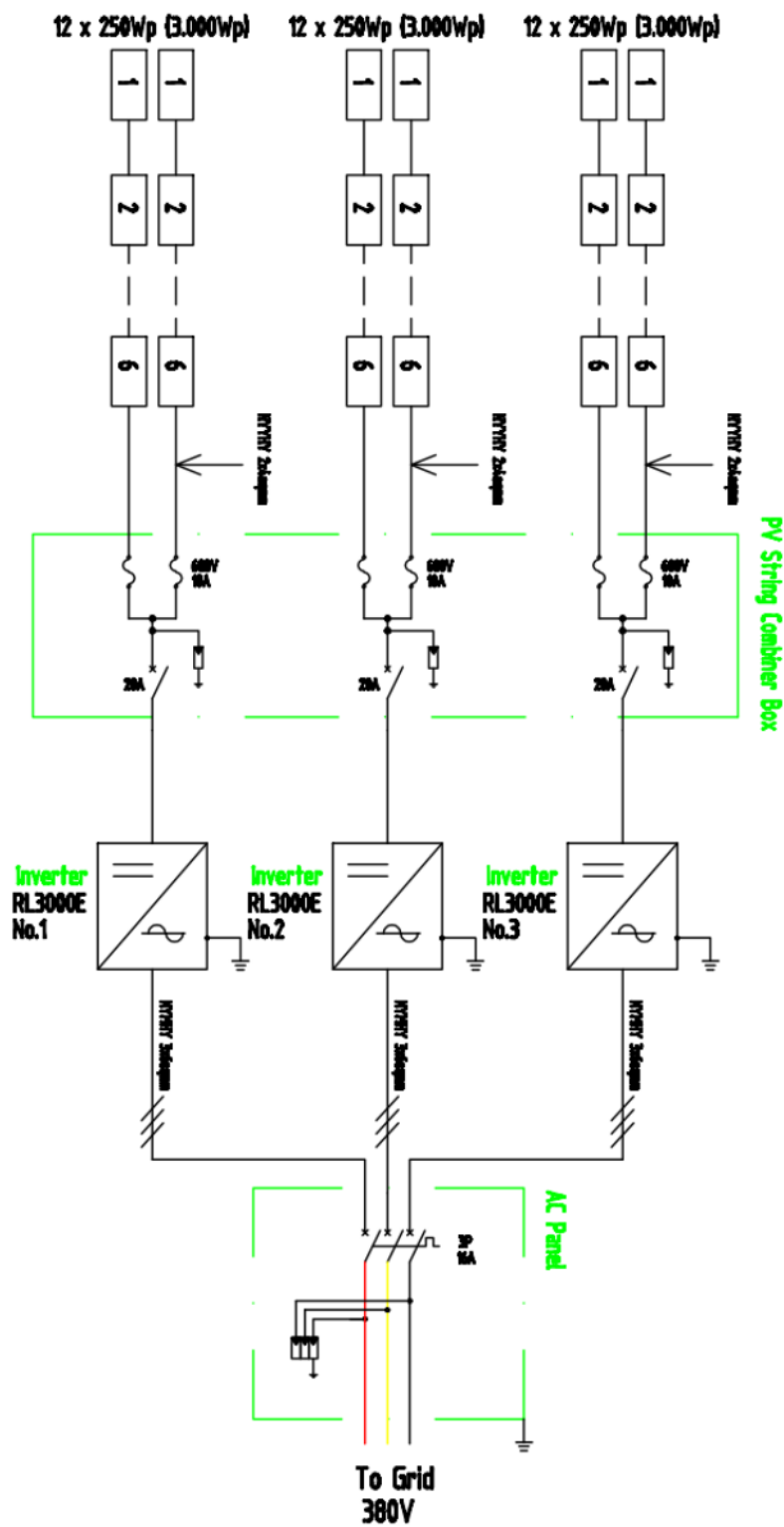


Figure 2. Single Line Diagram of On Grid Power Plants

3. Result and Discussion

The discussion of performance comparison is carried out with two data, including the difference in solar panel production at every hour and the difference in the efficiency of solar panels every day. Production observations of electric power generated by solar panels were done in October, November, December 2017 and January 2018. The data is taken from the electrical power produced each day.

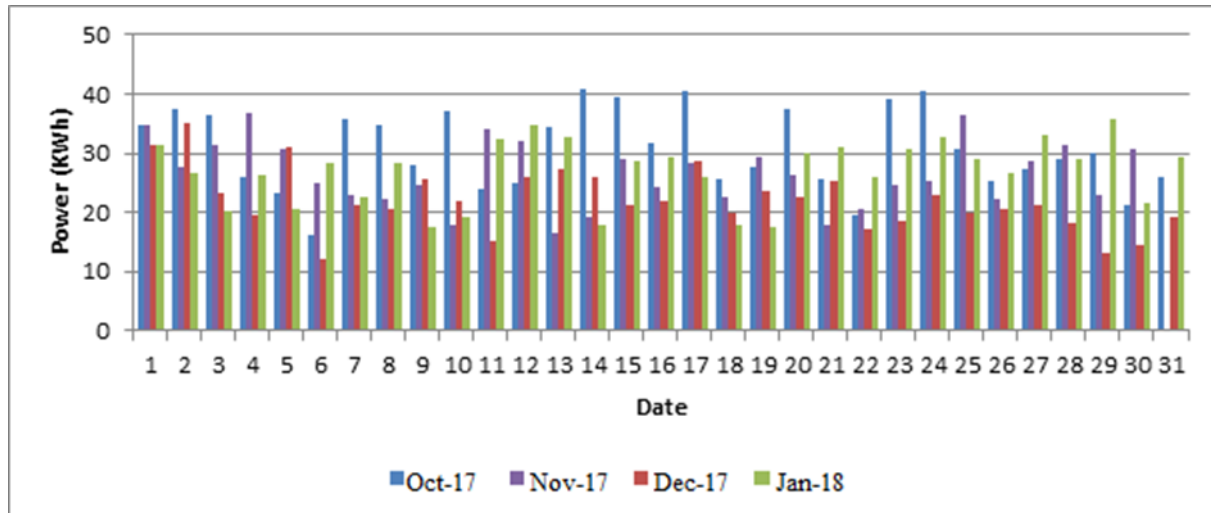


Figure 3. Daily power data graph of solar power plants 9 kWp

From the graph of daily production and high efficiency solar panel shows that the highest average power production occurred in October 2017 and the lowest average power production occurred in December 2017. The low average production during December 2017 due to frequent rains and cloudy in the intensity of solar radiation received by solar panels is less than in October 2017, November 2017 and January 2018.

Daily power production of solar panels are always varied each day, this condition is influenced by weather conditions and ambient temperature.

The average production of solar panel power is 9 KWP each month are as follows:

- Month October 2017 : 30.6 KWp
- Month November 2017 : 26.5 KWp
- Month December 2017 : 22.1 KWp
- Month January 2018 : 26.8 KWp

The efficiency (η) with a maximum in the solar panel with Monocrystalline Silicon solar cell type installed in PT.Pertamina (Persero), Refinery Unit III with an average solar radiation in Palembang of 4.96 kWh / m², is happened on:

- October 14, 2017, the efficiency (η) = 14.1%, with a power output: 40.9 KWh.

The average efficiency of solar power panels 9 KWP each month are as follows: 10.5% in October 2017; 9.1% in November 2017; 7.6% in December 2017; and 9.2% in January 2018

4. Conclusions

Based on the data analysis and graphs made in this evaluation, it was concluded that:

1. SPP maximum power of 40.9 KWh is still not good ie + 50% of design capacity (design capacity of 9 KWp) with the operational assumptions SPP is 9 hours daily.

2. The efficiency (η) with a maximum in the solar panel Monocrystalline Silicon solar cell type installed in PT. Pertamina (Persero) Refinery Unit III with average solar radiation in Palembang of 4.96 kWh / m² is on October 14, 2017, the efficiency (η) = 14.1%, the average efficiency of solar power panels 9 KWP each month are as follows:

- Month October 2017 : 10.5%

- Month November 2017 : 9.1%
- Month December 2017 : 7.6%
- Month January 2018 : 9.2%

The efficiency of solar panels with the sun tracker is still below the design efficiency is 16.07%.

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Jointly certify that,

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