

# ICASI 2019

Proceedings of The 2nd International Conference On  
Advance And Scientific Innovation

Banda Aceh, Indonesia

18 Juny 2019

## EDITORS

Rahmat Hidayat

Mesran

Tengku Mohd Diansyah

Supriyanto

Dodi Siregar



## ICASI

Proceedings of The 2nd International Conference On Advance And Scientific Innovation, ICASI 2019, 18 July, Banda Aceh, Indonesia

As an annual event, THE 2ND INTERNATIONAL CONFERENCE ON ADVANCE & SCIENTIFIC INNOVATION 2019 continued the agenda to bring together researcher, academics, experts and professionals in examining about Scientific Innovation in technology, education, management, accounting and many aspect area. In 2019, this event held in 18 July 2019 at Politeknik Kutaraja, Banda Aceh, Indonesia. This ICASI Proceeding 2019 are published along with article from ICASI 2018 and each contributed paper was refereed before being accepted for publication. The double-blind peer reviewed was used in the paper selection.

•less

**Editor(s):** Rahmat Hidayat (STIM Sukma, Indonesia), Mesran Mesran (STMIK Budi Darma, Indonesia), Tengku Mohd Diansyah (Universitas Harapan Medan, Indonesia), Supriyanto Supriyanto (Politeknik LRS, Indonesia) and Dod Siregar (Universitas Harapan Medan, Indonesia)

Publisher EAI ISBN 978-1-63190-208-6 ISSN 2593-7600

Conference dates: 18th Jul 2019 Location: Banda Aceh, Indonesia

Appeared in EUDL: 26th Nov 2019

Copyright © 2019-2019 EAI

- ICASI 2019
- Other years
- ICASI 2018
- ICASI 2019

Ethics and Malpractice Statement

Back to CCER

Ethics and Malpractice Statement

Back to CCER

search terms here...

Ordered by title or year ▼

search terms here...

Ordered by title or year ▼

Showing 1-50 of 97 results

Page size: 10 25 50

1 2 Next Last

**The Exclusive Breastfeeding Policies Implementation and Health Workers Roles in Medan-Indonesia**  
Research Article in Proceedings of The 2nd International Conference On Advance And Scientific Innovation, ICASI 2019, 18 July, Banda Aceh, Indonesia  
Fitriani Pramita Guming, Muchi Yuda Pratama, Eliska Eliska, Muhamad Rabdi, Purnawingsih Purnawingsih

**Study of Agrindustry Development of Sugar Cane As Efforts to Achieve Self-Sufficiency of Sugar**  
Research Article in Proceedings of The 2nd International Conference On Advance And Scientific Innovation, ICASI 2019, 18 July, Banda Aceh, Indonesia  
Dwi Yuntasari, Nanik Islijani, Endah Kamia L.

**Application of Magnetic Coconut Shell-derived Biocarbon for Methylene Blue Removal**  
Research Article in Proceedings of The 2nd International Conference On Advance And Scientific Innovation, ICASI 2019, 18 July, Banda Aceh, Indonesia  
Nor Astafze Abdullah, Palsan Sannasi Abdullah, Mohamed Faiz Mohd Amin, Nor Azah Zaini

**Removal Of Methylene Blue From Aqueous Solution By Bio-Adsorbent Pouch**  
Research Article in Proceedings of The 2nd International Conference On Advance And Scientific Innovation, ICASI 2019, 18 July, Banda Aceh, Indonesia  
Muhammad Zharif Jasri, Nor Hakimin Abdullah, Mohd Sukhairi Mat Rasat, Khairul Nizar Syazwan Wan Salihin Wong, Mohamed Faiz Mohd Amin

**Effect of Zeolite on the Water Quality and Growth Performance of Red Hybrid Tilapia (*Oreochromis niloticus*)**  
Research Article in Proceedings of The 2nd International Conference On Advance And Scientific Innovation, ICASI 2019, 18 July, Banda Aceh, Indonesia  
Rabiatul Adawiyah Meor Mohamed Zain, Nur Farrah Izzaty Sheari, Mohamed Faiz Mohd Amin, Musthofa Jani

[Strategy for Improving Effectiveness of Green Open Space Management Through Tree Identity Application](#)  
Research Article in Proceedings of The 2nd International Conference On Advance And Scientific Innovation, ICASI 2019, 18 July, Banda Aceh, Indonesia  
Dewi Gartika

[Students' Perception Towards Retail Management Skills Through Managing Business Simulation At Centre Of Retail Excellence \(CORE\)](#)  
Research Article in Proceedings of The 2nd International Conference On Advance And Scientific Innovation, ICASI 2019, 18 July, Banda Aceh, Indonesia  
Noraini bte Hashim, Salehan bin Marsim

[Impact Signal Propagation Parameters to UMTS-LTE Handover](#)  
Research Article in Proceedings of The 2nd International Conference On Advance And Scientific Innovation, ICASI 2019, 18 July, Banda Aceh, Indonesia  
Maksum Pinem, Chairunnisa FR. Tanjung, Emerson P. Sinulingga, Suherman Suherman

[Consumer Protection Laws For Bank Customers](#)  
Research Article in Proceedings of The 2nd International Conference On Advance And Scientific Innovation, ICASI 2019, 18 July, Banda Aceh, Indonesia  
Mohammad Roesli, Sulistyani Eka Lestari, Koko Dwi Prasetyo, Yeni Ika Pratiwi, Mahrus Ali

[Determining Trinomial Coefficient With Ladder Multiplication and Its Construction in Circle and Cone](#)  
Research Article in Proceedings of The 2nd International Conference On Advance And Scientific Innovation, ICASI 2019, 18 July, Banda Aceh, Indonesia  
Jufri Jufri, M.D.H. Gamal, Hera Deswita, Budi Yanto, Fauzi Erwis

[Voice Identification Using Neural Network And Mel Frequency Cepstrum Coefficients](#)  
Research Article in Proceedings of The 2nd International Conference On Advance And Scientific Innovation, ICASI 2019, 18 July, Banda Aceh, Indonesia  
Corianti GMS, Fahmi Fahmi, Maksum Pinem, Sihar P. Panjaitan, Suherman Suherman

[Comparison Study Of Term Weighting Optimally With SVM In Sentiment Analysis](#)  
Research Article in Proceedings of The 2nd International Conference On Advance And Scientific Innovation, ICASI 2019, 18 July, Banda Aceh, Indonesia  
Amril Mutoi Siregar, Sutan Faisal, Tukino Tukino, Adam Puspabhuana, Manase Sahat H Simarangkir

[Job Satisfaction: Determinant And Effect Of Interact With Spirituality To Lecturers'performance](#)  
Research Article in Proceedings of The 2nd International Conference On Advance And Scientific Innovation, ICASI 2019, 18 July, Banda Aceh, Indonesia  
Sardiyo Sardiyo, Toto Sugiharto, Maulana Maulana

[The Influence of Portfolio Assessment on Early Childhood Student's Environmental Concern Character](#)  
Research Article in Proceedings of The 2nd International Conference On Advance And Scientific Innovation, ICASI 2019, 18 July, Banda Aceh, Indonesia  
R. Sihadi Darmoduhardjo, Sofia Hartati, Martini Meilani, Agus Sujarwanta

[Factors Influencing Research Productivity of Private Higher Education Institutions Lecturers in Kopertis Region XII](#)  
Research Article in Proceedings of The 2nd International Conference On Advance And Scientific Innovation, ICASI 2019, 18 July, Banda Aceh, Indonesia  
Jusuf N. Anamofa, Ricardo F. Nanuru, Suhardi Suhardi, Vanessa Lekahena, Tekat Dwi Cahyono, Sharlota Y. Purimahua, Khaeril Khaeril, Dellen N. Matulesy, Peinina I. Nindatu, Astuti Tuharea, Maryani Yusuf, Pipit A. Susanti, Marlen Sahureka, Ebedly Lewerissa, Iriyani Abd. Kadir, Salomi J. Hehanussa, Johana Tandisala, Broery D.P. Tjaja, Henky H. Hetharia, Johanis Wairata, Amiruddin Hi. Muhammad, Maya Laisila, Amelia Tahitu, Jolyne M. Parera, Windy Wonmally, Aveanty Miagina, Radios Simanjuntak, Sefnat A. Hontong, Nusye Lewaherilla, Idris Sudin, Richard Djiko, Marcus Latupapua

[Long Term Evolution \(LTE\) Handover Parameter Optomation](#)  
Research Article in Proceedings of The 2nd International Conference On Advance And Scientific Innovation, ICASI 2019, 18 July, Banda Aceh, Indonesia  
Maksum Pinem, Dhara Monica Aqsa, Emerson P. Sinulingga, Suherman Suherman

[Development of Intelligent Clothesline Sytem](#)  
Research Article in Proceedings of The 2nd International Conference On Advance And Scientific Innovation, ICASI 2019, 18 July, Banda Aceh, Indonesia  
Lim Jia Chun, Noor Anida Abu Talib, Haryati Jaafar, Nordiana Shariffudin, Nur Hidayah Ramli



[Comparisons of Fuzzy Logic and Propotional Integral Differential Controllers in Controlling Buck-boost DC-DC Converter](#)  
Research Article in Proceedings of The 2nd International Conference On Advance And Scientific Innovation, ICASI 2019, 18 July, Banda Aceh, Indonesia  
Maksum Pinem, Bayu Iqbal Siregar, Syafruddin HS, Suherman Suherman

[An Analysis & Measurement of Website Quality Using The WebQual 4.0 And Importance Performance Analysis \(IPA\) Method \(A Case Study Of Jagalempentivillage Brebes\)](#)  
Research Article in Proceedings of The 2nd International Conference On Advance And Scientific Innovation, ICASI 2019, 18 July, Banda Aceh, Indonesia  
Warjlyono Warjlyono, Corie Mei Hellyana

[Characterization of Liquid Smoke From Coconut Shell Based Pyrolysis Process](#)  
Research Article in Proceedings of The 2nd International Conference On Advance And Scientific Innovation, ICASI 2019, 18 July, Banda Aceh, Indonesia  
Rahmi Eka Putri, Anwar Kasim, Emriadi Emriadi, Alfi Asben

[Identification of Groundwater Quality of Alluvium Zone Using Geoelectric Method of Schlumberger Configuration in Merauke City Area](#)  
Research Article in Proceedings of The 2nd International Conference On Advance And Scientific Innovation, ICASI 2019, 18 July, Banda Aceh, Indonesia  
Virman Virman

[Development of Low Cost Recycled HDPE Filament Extruder for 3D Printing Filament](#)  
Research Article in Proceedings of The 2nd International Conference On Advance And Scientific Innovation, ICASI 2019, 18 July, Banda Aceh, Indonesia  
Anis Arendra, Sabarudin Akhmad, Mu'alim Mu'alim, Khoirul Hidayat, M Adhi Prasnowo

[Characteristics Of Disabled Porosity Development Engine Hot Press For Recycle Plastic HDPE](#)  
Research Article in Proceedings of The 2nd International Conference On Advance And Scientific Innovation, ICASI 2019, 18 July, Banda Aceh, Indonesia  
Sabarudin Akhmad, Anis Arendra, Khoirul Hidayat, Puthut Prasetyo, Mu'alim Mu'alim, M Adhi Prasnowo

[Feasibility Study of Solar and Wind Energy in Remote Islands \(Gili Labak Madura\)](#)  
Research Article in Proceedings of The 2nd International Conference On Advance And Scientific Innovation, ICASI 2019, 18 July, Banda Aceh, Indonesia  
Mu'alim Mu'alim, Sabarudin Akhmad, Anis Arendra, Khoirul Hidayat, M Adhi Prasnowo

[Study on AC Contactor Performance Under Voltage Sags](#)  
Research Article in Proceedings of The 2nd International Conference On Advance And Scientific Innovation, ICASI 2019, 18 July, Banda Aceh, Indonesia  
Surya Hardi, Rohana Rohana

[Smart City Indicators Model: A Literature Review](#)  
Research Article in Proceedings of The 2nd International Conference On Advance And Scientific Innovation, ICASI 2019, 18 July, Banda Aceh, Indonesia  
Darmawan Napitupulu, Mohammad Syafrullah, Dahlan Abdullah, R Rosmawati, Dewi Murtiningsih

[Grounded Theory in Accounting Research](#)  
Research Article in Proceedings of The 2nd International Conference On Advance And Scientific Innovation, ICASI 2019, 18 July, Banda Aceh, Indonesia  
Zul Azmi, Abdillah Arif Nasution, Wardayani Wardayani, Iskandar Muda, Supriyanto Supriyanto, Syamsul Rizal, Rahmat Hidayat

[Tunnel Stability Analysis Based on Temporary Support Modeling in The Construction of Hasang Hepp in Toba Samosir District North Sumatra Province](#)  
Research Article in Proceedings of The 2nd International Conference On Advance And Scientific Innovation, ICASI 2019, 18 July, Banda Aceh, Indonesia  
Tengku Tibri, M. Eka Onwardana, Ediyasa Ardiansyah, Heri Adhahari, Lismawaty Lismawaty, Bintang Wijaya

[Does Profitability moderate the relationship of Interest Rate, Ratio Tangible Assets, Firm Size on Capital Structure](#)  
Research Article in Proceedings of The 2nd International Conference On Advance And Scientific Innovation, ICASI 2019, 18 July, Banda Aceh, Indonesia  
Irawan Irawan, Muhammad Dharma Tuah Putra Nasution, Yossie Rossanty

## [Investigating Factors Affecting Halal Foodpreneur Orientation](#)

Research Article in Proceedings of The 2nd International Conference On Advance And Scientific Innovation, ICASI 2019, 18 July, Banda Aceh, Indonesia

Muhammad Dharma Tuah Putra Nasution, Yossie Rossanty, Surya Nita, Vita Cita Emia Tarigan

## [Impact of Experiential Marketing on Customers Repurchase Intention in Gempita Cafe](#)

Research Article in Proceedings of The 2nd International Conference On Advance And Scientific Innovation, ICASI 2019, 18 July, Banda Aceh, Indonesia

Yossie Rossanty, Rahima br Purba, Firman Ario, Muhammad Dharma Tuah Putra Nasution, Ilhamsyah Siregar

## [Reducing Crosspoints on Multistage Switching by Using Batcher Banyan Switches](#)

Research Article in Proceedings of The 2nd International Conference On Advance And Scientific Innovation, ICASI 2019, 18 July, Banda Aceh, Indonesia

M. Zulfin, Maksum Pinem, Rahmad Fauzi, M. Razali

## [Design of Rectangular Microstrip Patch Antenna for 1.8 GHz Applications](#)

Research Article in Proceedings of The 2nd International Conference On Advance And Scientific Innovation, ICASI 2019, 18 July, Banda Aceh, Indonesia

Ali Hanafiah Rambe, Suherman Suherman, Erwin Erwin

## [Communication Patterns of Management in Improving Staff Productivity](#)

Research Article in Proceedings of The 2nd International Conference On Advance And Scientific Innovation, ICASI 2019, 18 July, Banda Aceh, Indonesia

M. Nasor

## [Effect of Individual Taxpayer Behavior and Entrepreneurs Motivation On Tax Compliance](#)

Research Article in Proceedings of The 2nd International Conference On Advance And Scientific Innovation, ICASI 2019, 18 July, Banda Aceh, Indonesia

Tulus Suryanto, Waluyo Waluyo

## [Analysis of Influence Factors on Stock Rate Through Distress Financial Level in Manufacture Company in 2010-2014](#)

Research Article in Proceedings of The 2nd International Conference On Advance And Scientific Innovation, ICASI 2019, 18 July, Banda Aceh, Indonesia

Mayang Murni, Supriyanto Supriyanto, Masniati Murni Ritonga, Wardayani Wardayani, Zul Azmi, Hamdani Hamdani, Ismail Ismail, Dahlia Dahlia, Sisca Mediyanti, Saiful Bahgia

## [Mathematical Model of Location Signal Reflections from The Substrate Surface of The Sea Observed By On-Board Radar](#)

Research Article in Proceedings of The 2nd International Conference On Advance And Scientific Innovation, ICASI 2019, 18 July, Banda Aceh, Indonesia

Gysberth Wattimena, Vadim Nenashev, Dmitry Shepeta

## [Markov Chain Model in Measuring Brand Switching of Cooking Oil](#)

Research Article in Proceedings of The 2nd International Conference On Advance And Scientific Innovation, ICASI 2019, 18 July, Banda Aceh, Indonesia

Muhammad Dharma Tuah Putra Nasution, Nashrudin Setiawan, Yossie Rossanty, Irawan Irawan, Solly Aryza Lubis

## [Compensation and Organizational Commitment: The Mediating Role of Job Satisfaction](#)

Research Article in Proceedings of The 2nd International Conference On Advance And Scientific Innovation, ICASI 2019, 18 July, Banda Aceh, Indonesia

Muhammad Irfan Nasution, Muhammad Andi Prayogi, Jufrizen Jufrizen, Delyana Rahmawany Pulungan, Azuar Juliandi

## [Implementation of Square Methods in Analyzing the Security of an Application System](#)

Research Article in Proceedings of The 2nd International Conference On Advance And Scientific Innovation, ICASI 2019, 18 July, Banda Aceh, Indonesia

Suhaemi Suhaemi, H Permana, A Sunarto, D Murtiningsih, D Napitupulu, R Rahim

## [The Valuation of Non-Performing Loans](#)

Research Article in Proceedings of The 2nd International Conference On Advance And Scientific Innovation, ICASI 2019, 18 July, Banda Aceh, Indonesia

Muslih Muslih, Hazmanan Khair, Januri Januri, Ade Gunawan, M. Firza Alpi

[Brand Trust as the Mediation Effect Customer Relationship Management on Customer Loyalty](#)

Research Article in Proceedings of The 2nd International Conference On Advance And Scientific Innovation, ICASI 2019, 18 July, Banda Aceh, Indonesia  
Dewi Murtiningsih, Wendi Usino, Darmawan Napitupulu, A Adrianto

[Analysis Diversity of Mangrove Plants and Brachyura \(Uca Crab\) at Yagasu Belawan Forest](#)

Research Article in Proceedings of The 2nd International Conference On Advance And Scientific Innovation, ICASI 2019, 18 July, Banda Aceh, Indonesia  
Budianto Budianto, Edi Azwar, Pandu Prabowo, Abdurrozzaq Hasibuan

[Analysis of Aerodynamics Urban Electric Car Using Computational Fluid Dynamics](#)

Research Article in Proceedings of The 2nd International Conference On Advance And Scientific Innovation, ICASI 2019, 18 July, Banda Aceh, Indonesia  
Didi Kusaeri, MSK. Tony Suryo Utomo

[Implementation Of Neural Network And Canny Edge Detection To Recognize the Crime Through Surveillance Cameras](#)

Research Article in Proceedings of The 2nd International Conference On Advance And Scientific Innovation, ICASI 2019, 18 July, Banda Aceh, Indonesia  
Erwien Tjipta Wijaya, Aditya Galih Sulaksono

[Design Of Tsunami Detector Based Sort Message Service Using Arduino and SIM900A to GSM/GPRS Module](#)

Research Article in Proceedings of The 2nd International Conference On Advance And Scientific Innovation, ICASI 2019, 18 July, Banda Aceh, Indonesia  
Puput Dani Prasetyo Adi, Dwi Arman Prasetya, Aries Boedi Setiawan, Nachrowie Nachrowie, Rahman Arifuddin

[Particle Swarm Optimization Based C4.5 for Teacher Performance Classification](#)

Research Article in Proceedings of The 2nd International Conference On Advance And Scientific Innovation, ICASI 2019, 18 July, Banda Aceh, Indonesia  
Abdul Rahman Kadafi, Windu Gata

[Particle Swarm Optimization Based C4.5 for Teacher Performance Classification](#)

Research Article in Proceedings of The 2nd International Conference On Advance And Scientific Innovation, ICASI 2019, 18 July, Banda Aceh, Indonesia  
Abdul Rahman Kadafi, Windu Gata

[The Effect of ICT-Based Learning Media and Innovation Attitude to Learning Result Teaching With Hots](#)

Research Article in Proceedings of The 2nd International Conference On Advance And Scientific Innovation, ICASI 2019, 18 July, Banda Aceh, Indonesia  
R Mursid, S Sriadhi, Hanun Sitampul

[Finance Performance Acceleration of Company: The Impact of Change and Growth of Islamic Banks Performance in Indonesia](#)

Research Article in Proceedings of The 2nd International Conference On Advance And Scientific Innovation, ICASI 2019, 18 July, Banda Aceh, Indonesia  
S Supriyanto, W Wardayani, Hamdani Hamdani, Thasrif Muhandi, R Rahmania

[Accountability For Zakat, Infak/Sedekah Management](#)

Research Article in Proceedings of The 2nd International Conference On Advance And Scientific Innovation, ICASI 2019, 18 July, Banda Aceh, Indonesia  
Nurinda Nurinda, Muhammad Zuhriyan

1 2 Next Last

## Study of Agroindustry Development of Sugar Cane As Efforts to Achieve Self-Sufficiency of Sugar

Duwi Yunitasari<sup>1</sup>, Nanik Istiyani<sup>2</sup>, Endah Kurnia L<sup>3</sup>

{duwiyunita.feb@unej.ac.id<sup>1</sup>, istiyani.fe@gmail.com<sup>2</sup>, endahkurnia78@ymail.com<sup>3</sup>}

<sup>1,2,3</sup>Faculty of Economics and Business University of Jember, Jl. Kalimantan 37 Jember, 68121, Indonesia

**Abstract:** Indonesia is one of the producers as well as importers of sugar. Based on this fact, Indonesia should pay attention on the development of sugar cane agro-industry to ensure the fulfillment of sugar demand in the country. As a matter of fact, sugar is a strategic commodity to increase farmers' prosperity and also in favour of consumers' sensitivity to sugar price volatility. Therefore, a thorough review of various stakeholders in sugar industry to develop policies for real contribution to the national economy needs to be taken. The research deployed survey method, data collection (primary and secondary data) through field survey (observation), questionnaires, interview and literature study. Development strategy analysis method uses a tiered decision technique known as Analytical Hierarchy Process (AHP). The results of strategy analysis to achieve self-sufficiency of sugar with the development of sugar agro-industry showed that off-farm and institutional factors follow on farm factors on top priority to achieve self-sufficiency of sugar. Furthermore, on farm criteria have several alternatives with the priority of land ownership, sugar cane productivity and price stability.

**Keyword:** Sugar cane Agro-industry, Analytical Hierarchy Process, Self-sufficiency of Sugar

### 1. Introduction

In 1930s, Indonesia was once the second largest exporter of sugar (with export volume approximately 3 million tons of white crystal sugar) after Cuba worldwide (Mardianto, S., et al., 2005; Marpaung, Yanto., et al, 2010). However, from 1967 to date Indonesia has transformed to be one of great sugar importers. Yet, as a matter of fact, sugar as one of strategic commodities is highly regulated. The current profile of the sugar industry in Indonesia maintains inefficiency; within-integrated government policies. Sugar industry is managed by five ministries, with the president uses the authority of industrial management but the implementation in favour of off farm is managed by the Ministry of Industry. Whereas, in favour of on farm side the Ministry of Agriculture takes the control. Sugar Manufacturer which belongs to the Ministry of State-owned Enterprises (BUMN) takes sugar cane. The Ministry of Forestry provides land for sugar cane and the Ministry of Trade works as the traffic regulator of sugar imports including the determination of raw sugar for refineries and sugar for consumption.

The increasingly deplorable situation of the domestic sugar industry is indicated by the decline of sugar price due to a wider range of factors such as low price of refined sugar crystals (GKR) compared to that of white crystal sugar (GKP), fluctuating productions, the decrease of acreage, the decrease of sugar cane productivity per hectare and the low rate of rendement. Moreover, the situation of current sugar industry as well as the condition of sugar factories are increasingly inefficient.

The growing limitation of sugarcane area, the decrease of sugar cane productivity at farm level (sugarcane plantation) due to ratoon cultivating system, inefficiency of off farm level



due to low quality of sugarcane raw material and poor maintenance of sugar mill and poor management of slash-and-slope processing and that of both factory level and sugar cane growing area have hindered national sugar production which eventually contributes significantly to low productivity of sugar in Indonesia (Yunitasari, 2015). Moreover, the need of sugar imports raises concerns about the future of Indonesia's sugar self-sufficiency.

Hence, sugar price stability becomes the focus of annual agenda to overcome. Furthermore, the target of sugar self-sufficiency is far from reality as it is obviously reflected by continually revised sugar self-sufficiency target (Arifin, B., 2008). Ironically, the government insists on self-sufficiency achievement through the production of refined sugar raised by raw sugar import not even from domestic sugarcane. Raw sugar is currently not the subject of import duties (0%). Thus, production targets were not achieved, inflation rate was slow but farmers will be displaced.

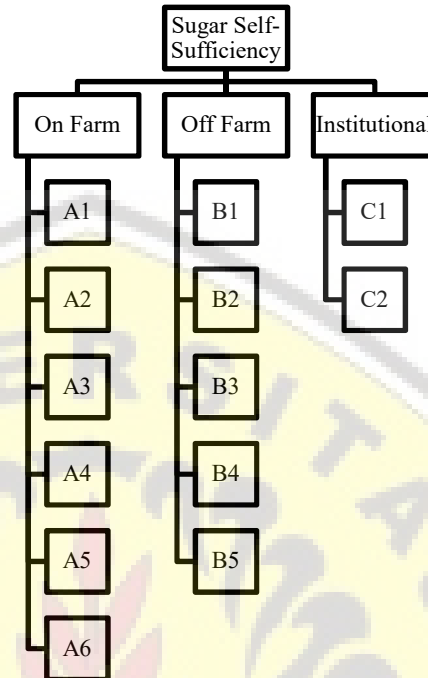
In the efforts of achieving sugar self-sufficiency, constraints from both on-farm and off-farm are often encountered. Therefore, a decision support system is needed to determine which strategy to be effective in realizing Indonesia's sugar self-sufficiency based on stipulated criteria. It deployed a decision support system application with Analytical Hierarchy Process (AHP) method for data processing to determine the people in charge in the sugar agro-industry. Analytical Hierarchy Process (AHP) is a multiple attribute comparison which provides means for decision-making techniques developed by Thomas L. Saaty in the 1970s for more complex decisions (Chauhan, et al., 2008; Koc and Burhan, 2015). The study aims at exploring the strategy of sugarcane agro-industry development in realizing food self-sufficiency through sugar self-sufficiency.

## 2. Method

This is a quantitative descriptive research conducted in 2017 with the use of 5 respondents such as Government (Ministry of Agriculture), PT. Perkebunan Nusantara, Sugar Factory, Sugarcane Farmers, Academicians and Community Leader (Association of Smallholder Sugarcane Farmers, Sugarcane Plantation Research Center). Panel data in the form of primary as well as secondary data were used. Primary data is a data source obtained directly from original ones which can be subject opinion (person) individually or in groups, object observation (physical), event or activity, and test results. Secondary data is that of obtained from books, journals and related publications.

The research used analysis tools of Analytical Hierarchy Process. The comprehensive decision-making method was firstly introduced by Thomas L. Saaty concerning qualitative and quantitative steps as follows: identifying system, identifying problems, finding the solution, and creating the hierarchy structure (Aguilar, et al., 2012).





**Fig.1.** The AHP Hierarchy to Analyse The Development Strategy of Sugar Agro-industry in Realizing Sugar Self-sufficiency in Indonesia.

**Table 1.** Criteria and Sub-Criteria Strategy of Sugar Agro-industry Development in Achieving Sugar Self-Sufficiency in Indonesia.

On Farm	A1: Land Ownership A2: Cane Productivity A3: Price Certainty A4: Capital A5: Partnership A6: Government Intervention
Off Farm	B1: Sugar Factory Management B2: Sugar Factory Productivity B3: Sugar Cane Rendimen B4: Cane Stock B5: Optimization of Milled Capacity (Milling-Hour Stop)
Institutional	C1: Sugar Industry Policy C2: Cooperative

**Table 2.** Value Scale of Interest and the remarks for AHP Analysis.

Value	Remarks
Value 1	Both factor of the same importance
Value 3	One factor is less important than the other
Value 5	One factor is more important than the other
Value 7	One factor is obviously more important than the other

Value 9	One factor is absolutely more important than the other
Value 2,4,6,8	Amongst Values, between 2 considerably close values

(Saaty, 1980)

### 3. Finding And Argument

The AHP analysis uses three criteria such as on farm, off farm and institutional. Analytical Hierarchy Process (AHP) is such a technique to support decision-making process aiming to determine the best option of a wider range of alternatives (Fong and Choi, 2000; Buyukyazici and Sucu, 2003; Messer and Allen, 2010; Kaya and Kahraman, 2011; Balubaid and Alamoudi, 2015; Russo and Camanho, 2015; Harbi, 2017). To reach food self-sufficiency through sugar self-sufficiency requires the development of sugarcane agro-industry.

#### 3.1 The Results of Criteria Analysis

Criteria play a pivotal role in sugar self-sufficiency which is meant to be the ability of domestic sugar production to meet the needs of direct consumption (final demand) and for the food and beverage industry (intermediate demand). There are some points to ponder dealing with the importance of sugar self-sufficiency in Indonesia, among others: (1) sugar becomes the basic needs of people in Indonesia and there for it should be always available in sufficient quantities with reasonable price range. This is part of food security aspects as it is very important due to Indonesia's huge demand for sugar; (2) sugar production can be significantly increased as sugar cane farmers are able to cultivate sugar cane even with government's support in the form of policies and adequate investment capital; (3) domestic sugar industry shows sufficient potential land is even able to meet national needs indicated through expansion of potential areas which eventually support the expansion of the national sugar industry.

Sugar self-sufficiency applies three primary criteria namely on farm, off farm and institutional. Based on AHP result through expert choice, out of the three criteria, on farm has the biggest role with value (0.659), off farm, then on farm at the second place with value (0.168), and lastly institutional with (0.153). Ratio inconsistency obtained is 0.06. (Padmowati, 2009) suggested that when the value of consistency ratio is less than 0.1, the result is then consistent, as indicated in the following figure:



Fig.2. The Results of Criteria Analysis

Based on Figure 2. On farm has a very important role and becomes the top priority in sugar self-sufficiency. This is due to cultivation of on farm and sugar cane plant as raw material in sugar cane production, so good facilities should be well provided to improve the quality of sugar cane. Inefficiency in the sugar cane scale of the farmers stems from repeated pressure problems even up to a dozen times, because of the unavailability of rate on dismantling funds. Besides, sugar cane farming business is getting shifted by other commodities which generate higher income, such as rice, maize, crops and horticulture. It is therefore not surprising that the area of sugar cane is limited especially in the area of rice fields. The incentives of sugar cane farmers in increasing the productivity of sugar cane also needs to be considered. Off farm becomes second priority because as a supporter in increasing sugar self-sufficiency, and become support to increase sugar cane production through sugar mill performance through its productivity and the amount of its milling capacity not yet optimal so it needs to get priority in

realizing sugar self-sufficiency. Institution becomes the last priority because institutional as a container has regulation to support increase sugar self-sufficiency, where the need of partnership between sugarcane farmers and sugar factory even in sugar industry management and policies in sugar industry in Indonesia.

### 3.2 The Result of Alternative Analysis in On Farm Criteria

On farm is a top priority in sugar self-sufficiency and has several alternatives to achieve the goal. The development of sugar cane agro-industry is inseparable from the contribution of sugarcane farmers where the people's sugar cane depends on the stock of sugar cane produced by farmers. The declining planting area from year to year, the decision of planting time, variety, fertilization and maintenance is entirely in the hands of many sugarcane farmers, with diverse skills and capital capabilities, so that this greatly affects the productivity of the people's sugar cane as a producer of white crystal sugar because the loss of sugar occurs a lot from cutting to grinding (post harvest losses can reach 30% both errors in time of cutting planted varieties, transportation or harvest scarcity). The presence of inefficiency in post-harvest affects the decrease of sugar yield, as farmers are often constrained by additional costs so that it takes a long time. The study shows some alternatives of goals. The alternatives are land ownership, sugarcane productivity, price certainty, partnership capital and interference in the cultivation and sugar cane post harvest. Of the several alternatives, the main priority is land ownership with value (0.264), then sugarcane productivity with value (0.259), then price certainty with value (0.190), capital becomes the next priority with value (0.132), the fifth priority is partnership with value (0.093), and the last is the interference in the cultivation and sugar cane post harvest with value (0.062). the ratio inconsistency obtained is 0.07 as indicated in the following figure:

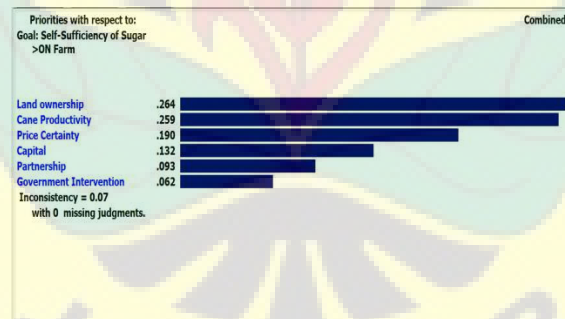


Fig.3. The Result of Alternative Analysis in On Farm Criteria.

### 3.3 The Result of Alternative Analysis in Off Farm Criteria

Off farm becomes the second priority in sugar self-sufficiency and has several alternatives to achieve the goal. In this case off farms include sugar mills, especially the state-owned sugar mills that often experience milled jams known as the inactive sugar factory. This is due to many sugar factories which still operate 4-5 months during harvest. The state-owned sugar industry faces no small constraints i.e. too large number of human resources involved, resulting in very high overhead costs. In addition, the extent of own sugar cane (TS) owned by state-owned enterprises is only one fifth of the sugar cane field (TR), consequently sugar production is highly dependent on the willingness of farmers to plant sugar cane. Furthermore, in some state-owned sugar cane productions cost itself is higher than the cost of people's sugar

cane. This causes the sugar factory dependence on farmers become seven greater. Reduced supply of sugar cane to the mill will increase the milling hours which means increased fuel costs and will eventually increase production costs. In contrast to private sugar factories which own large areas of land, both from cultivation right and leasing, it can integrate farm management with processing. Cropping, hauling and milling schedule can be arranged perfectly and yield can be estimated more precisely. The alternatives are sugar mill management, sugar mill productivity, sugar cane yield, sugarcane stock, milling capacity optimization. Of the several alternatives, the main priority is the management of sugar mills with value (0.333), the second is the productivity of the sugar factory with the value (0.301), the third is sugar cane rendement with value (0.179), sugarcane stock becomes the fourth priority with value (0.101), then the optimization of rolling capacity (milling hours) with value (0.086). The ratio of inconsistency is 0.08.

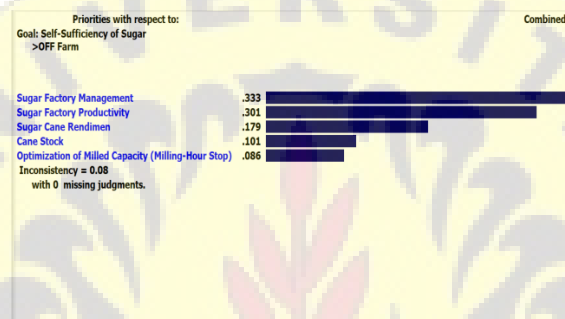


Fig.4. The Result of Alternative Analysis in Off Farm Criteria.

### 3.4 The Result of Alternative Analysis in Institutional Criteria

Institutional becomes the last priority in sugar self-sufficiency and has two alternatives to achieve the goal. The cheap price of sugar does not reflect the efficiency of production, but due to a distorted policy on the international market. The low sugar price is the result of many factors, among which are refined sugar entry to be imported only for the food and beverage industry. In fact, seeping into white sugar consumers (refined sugar prices are much cheaper than white crystal sugar), production fluctuations, the decrease of area, the decrease of sugar cane productivity and low rendement level. This clarifies that the current profile of the sugar industry remains inefficient which is indicated by un-integrated government policy as managed by five ministries. Thus, rearrangement of national sugar policy needs to be reconsidered to ensure one-door policies, including the recommendation of importing various types of sugar. Due to the absence of sanctions for abusive companies, refined sugar mills produce refined sugar with quantities and qualities in accordance with the needs of food, beverage and pharmaceutical industries, in order that refined sugar production does not absorb the market of White Crystal Sugar.

In addition, the tariff increases several times from the current level as long as it does not violate the WTO agreement, due to low tariff in Indonesia. The condition of farmers is less secure in the production of sugar cane as the stock of sugar production, due to unfavorable regulation. Likewise with the less well-off Cooperative, the majority of sugar cane cooperatives in East Java are in diseconomies of scale, indicating that the cooperatives operate inefficiently. The following factors are: (1) the cooperative runs its business with small scale farmers, causing high administrative and monitoring costs; (2) weak risk management and low



profit levels; (3) inefficient management; and (4) bureaucracy, high wages, and inefficient operations. The alternative is the policy of imported sugar and cooperative. Of the two alternatives, the main priority is the policy of imported sugar with value (0.535) and Cooperative with value (0.465). Ratio inconsistency obtained is 0.00.

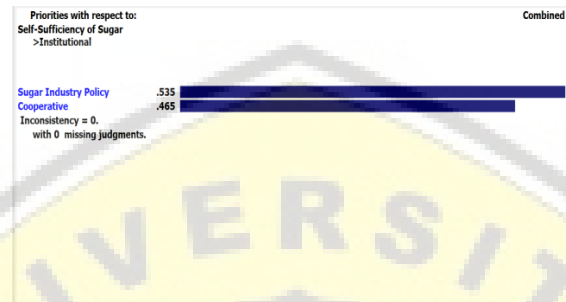


Fig.5. The Result of Alternative Analysis in Institutional Criteria.

#### 4. Conclusion

Based on the analysis, we come to the conclusion in dicatedas follows: The determination of achievement strategy of sugar self-sufficiency through development of sugar cane agro-industry in Indonesia becomes the main priority which can be seen from on farm with the value of (0.659) and with some alternatives to reach the goal. What bcomes the main priority is land ownership with thevalue of (0.264), productivity of sugar cane is located on the second priority with the value of (0.259), price certainty is then the next place with thevalue of (0.190). Capitalisplaced on the fourth priority with thevalue of (0.132), fifth priority is landed by partnership with the value of (0.093), last placeis forinterference in cultivation and post harvest of sugarcane with the value of (0.062).

#### References

- [1] Aguilar et al, 2012 'A Methodological Approach to Sugar Mill Diversification and Conversion', *Ingenieria E Investigacion*, 32(2), pp. 23–27.
- [2] Arifin, B, 2008 'Ekonomi Swasembada Gula Indonesia', *Economic Review*, (211), pp. 1–12.
- [3] Balubaid and Alamoudi 2015 'Application of the Analytical Hierarchy Process ( AHP ) to Multi-Criteria Analysis for Contractor Selection', (September), pp. 581–589.
- [4] Buyukyazici and Sucu, 2003 'The Analytic Hierarchy and Analytic Network Processes', *Hacettepe Journal of Mathematics and Statistics*, 32, pp. 65–73.
- [5] Chauhan., et al. 2008 'The Analytic Hierarchy Process as a Decision-Support System in the Housing Sector : A Case Study', *World Applied Sciences Journal*, 3(4), pp. 609–613.
- [6] Fong and Choi, 2000 'Final Contractor Selection using The Analytical Hierarchy Process', *Construction Management and Economics*, 18(5), pp. 547–557. doi: 10.1080/014461900407356.
- [7] Harbi, 2017 'Application of the AHP in Choosing Project Manager', *Ijels.Com*19, , pp. 19–27.
- [8] Kaya, T. and Kahraman, C, 2011 'An integrated fuzzy AHP-ELECTRE methodology for environmental impact assessment', *Expert Systems with Applications*, 38(7), pp.

- 8553–8562. doi: 10.1016/j.eswa.2011.01.057.
- [9] Koc and Burhan, 2015 ‘An Application of Analytic Hierarchy Process (AHP) in a Real World Problem of Store Location Selection’, *Advances in Management & Applied Economics*, 5(1), pp. 41–50.
- [10] Mardianto, S., et al, 2005 ‘Peta Jalan (Road Map) dan Kebijakan Pengembangan Industri Gula Nasional.’, *Forum Penelitian Agro Ekonomi*, 23 No. 1, pp. 19–37.
- [11] Marpaung, Yanto., et al, 2010 ‘Indonesian Journal of Agricultural Economics ( IJAE )’, *Indonesian Journal of Agricultural (IJAE)*, 2, pp. 97–119.
- [12] Messer and Allen (2010) ‘Applying Optimization and The Analytic Hierarchy Process to Enhance Agricultural Preservation Strategies in The State of Delaware’, *Agricultural and Resource Economics Review*, 39(3), pp. 442–456. doi: 10.1017/S1068280500007437.
- [13] Padmowati (2009) ‘Pengukuran Index Konsistensi Dalam Proses Pengambilan Keputusan’, *Seminar Nasional Informatika*, 2009(semnasIF), pp. 80–84.
- [14] Russo and Camanho, 2015 ‘Criteria in AHP: A Systematic Review of Literature’, *Procedia Computer Science*. Elsevier Masson SAS, 55(Itqm), pp. 1123–1132. doi: 10.1016/j.procs.2015.07.081.
- [15] Saaty, 1980 ‘The Analytic Hierarchy Process: What It Is and How It Is Used’, 9(3–5), pp. 161–176. Available at: <http://www.sciencedirect.com/science/article/pii/0270025587904738>.
- [16] Yunitasari, 2015 ‘Model Pengembangan Agroindustri Gula Tebu Sebagai Upaya Peningkatan Perekonomian Wilayah di JawaTimur’.

