

2019 **ICON-BEAT**  
TOWARD  
**FOOD, ENERGY AND WATER  
SOVEREIGNTY**



# BOOK OF EXTENDED ABSTRACTS

International Conference  
on Bioenergy and Environmentally  
Sustainable Agriculture Technology

7<sup>th</sup>-8<sup>th</sup>  
November  
Malang, Indonesia



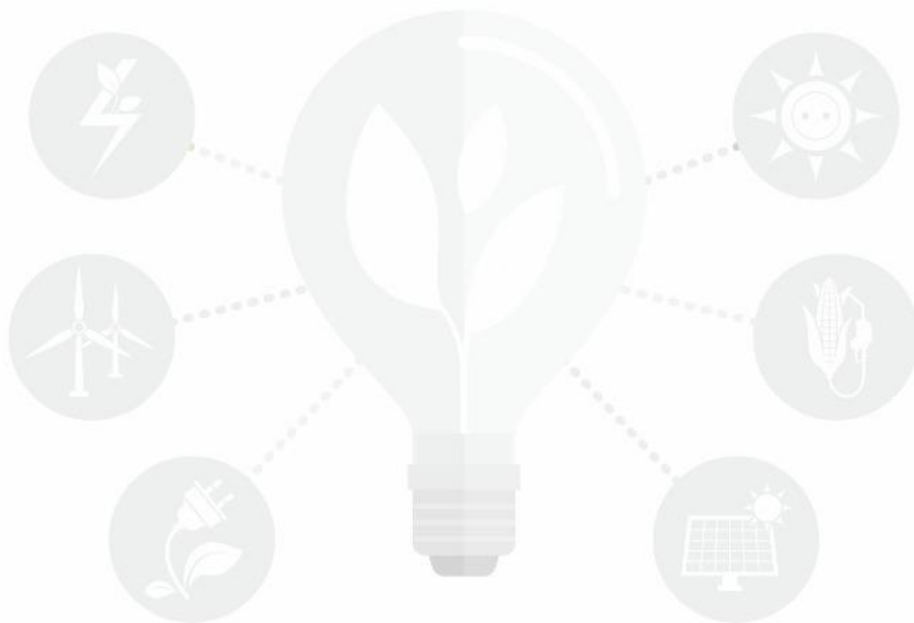
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UNIVERSITAS MUHAMMADIYAH MALANG

SJR  
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## Preface

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International Conference on Bio-Energy and Environmentally Sustainable Agriculture Technology (ICoN-BEAT) 2019.

ICoN-BEAT 2019 is organized by The Faculty of Agriculture and Animal Science, University of Muhammadiyah Malang held in “white campus”, UMM Malang. Malang is famous known by its cultural heritage and having a lot of tourism places, such as Singosari temple, Jago temple, Kidal temple, Ngliyep beach, Balekambang beach, and Sendang Biru beach. Coban Rondo waterfall, Wonosari tea plantation, Wendit pool, mount Kawi, mount Bromo panorama, Coban Pelangi waterfall, Karanglates recreation park are also interesting place.

ICoN-BEAT is annual event to celebrate the faculty anniversary and fully supported by other university and research institution partners. The cross cutting issue such as agriculture technology and sustainability, and bioenergy are putting pressure on future food security and environmental sustainability have motivated us to initiate this conference. ICoN-BEAT extending abstract consist 6 topics, which are well balance in content, manageable in term of contribution, and create of adequate discussion space for trendy topics. On this occasion 160 distinguish plenary session and 5 invited speakers had delivered their outstanding research works in various field in Bio-Energy and Environmentally Sustainable Agriculture Technologies. There were 132 oral presentation and 16 posters presentation by participant will brought opportunity to share their recent research activity/knowledge among each other graciously.

Fortunately in this year, the ICoN BEAT 2019 also conjunction with the Congress of the Indonesian Agriculture Sciences Private University Association. This event attended by more than 90 private institutions. We hope the congress running will run well and successful to the best results for high quality of agricultural education in Indonesia.

We would like to thank the organization staff, the members of the program committees and reviewers. They have worked very hard in reviewing papers and making valuable suggestions for the authors to improve their work. We also would like to express our gratitude to the external reviewers, for providing extra help in the review process, and the authors for contributing their research result to the conference.

We wish all attendees of ICoN-BEAT 2019 an enjoyable scientific gathering in UMM, Malang, Indonesia. We look forward to seeing all of you next year at the conference.

Hope you have a good day and thank you very much for your attendance.

Malang, Indonesia, 7 – 8 November 2019  
The Committee of ICoN BEAT 2019

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## Welcome to ICON-BEAT 2019

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Dear distinguished delegates and guests,

On behalf of the organizing committee of 1<sup>st</sup> International Conference on Bioenergy and Environmentally Sustainable Agriculture Technology (ICON-BEAT), it is an honor and delight to welcome you all this conference which be held at the University of Muhammadiyah Malang (UMM) Indonesia on November 7<sup>th</sup> – 8<sup>th</sup>, 2019. The conference theme is "Bioenergy and Environmentally Sustainable Agriculture Technologies: Toward Food, Energy and Water Sovereignty". This conference has been organized by Faculty of Agriculture and Animal Husbandry, University of Muhammadiyah Malang.

The Subtopics of Bio Energy will cover all boards related, Biomass , Biogas, and Biofuels, Energy Plant, Life Cycle Assessment (LCA), Rural Development, Advanced Energy Technologies (Energy Efficiency; Energy Markets; Energy Policy, Economics, Planning and Regulation), Other renewable energy related subtopics,

While The Subtopic of Environmentally Sustainable Agriculture will cover to Animal Science (Biotechnology, Breeding, Feed and Nutrition, Veterinary), Plant Science (Biotechnology, Breeding, Agro Technology, Pest and Disease, Soil Sciences), Fisheries (Aquaculture, Marine and Coastal Management), Forestry (Conservation, Climate Change, Adaptation and Mitigation, Silviculture), Food Science and Technology (Food Chemistry, Food Engineering and Nanotechnology, Food Microbiology and Safety, Nutrition, Integrated Food Science), Agribusiness and Socio-economics, Eco-design and Eco-efficiency, Ecology and Biodiversity Conservation, Efficient Use of Resources, Environmental Impact Assessment

Distinguished guests, ladies and gentlemen

In addition, we would like to inform you that the number of participant who already send the paper about 116 presenters. The participants are very enthusiasm because after a rigorous selection process, the Scientific & Editorial Board have decided to publish the selected paper at Malyasian Applied Journal (MAB) <http://icon-beat.umm.ac.id/id/> or Environment, Energy, and Earth Science Proceedings (E3S) <https://www.e3s-conferences.org/> managed by EDP Sciences, Paris, indexed in Scopus, Scimago, Conference Proceedings Citation Index-Science (CPCI-S) of Clarivate Analytics's Web of Science, DOAJ (Directory of Open Access Journals), Thomson Reuters, Google Scholar etc. The published manuscripts have passed all necessary improvement requirements (according to the Web of Conferences standard), reviewer's comments, SI (*Système International d'Unités*), plagiarism tests by Turnitin program (with the highest threshold of 20 %), 90 % of references must be sourced from the last 15 years.

We are perceived confidently that this conference will provide positive influence and contribute to develop the academic field. I look forward for the interesting deliberations that will take place here and wish you all a very successful conference.

Last but not least, I personally would like to thank you the official committees, scientific committees, and organizing partners. Special thanks as well to our co-host partners: 1). APTSIPI (Asosiasi Perguruan Tinggi Swasta Ilmu Pertanian Indonesia), 2). ILUNET (Ikatan Alumni Energi Terbarukan) University of Darma Persada, 3) Konsorsium Bioteknologi Indonesia, 4) University of Merdeka Madiun, 5) University of Veteran Bangun Nusantara Sukoharjo, 6) BIORE (Center of Biomass and Renewable Energy), 7) ITENAS (Institute of Teknologi Nasional), 8) ILCAN (Indonesian Life Cycle Assessment Network) for supporting this conference

Finally I would like to express my gratitude feeling for your participations, and please prepare yourself to gain the treasure of knowledge from the passionate experts. Then share the valuable enlightenment for a better future. It is my pleasure to see many of you here.

**With warmest regards**

**Dr. Ir. Listiari Hendrningsih, M.P.**  
**Conference Chair**

## Dean Message for ICoN-BEAT 2019

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On behalf of all the academic staff and students of the Faculty of Agriculture and Animal science, University of Muhammadiyah Malang (UMM), Indonesia, I would like to extend our warmest welcome to all the participants of The International Conference on Bioenergy and Environmentally Sustainable Agriculture Technology (ICoN-BEAT) 2019 to UMM.

University of Muhammadiyah Malang in the current time has declared toward be the green campus. This has proven that for many time UMM was awarded as a pioneer campus for new renewable energy from the ASEAN Energy Award.

The International Conference on Bioenergy and Environmentally Sustainable Agriculture Technology (ICoN-BEAT) 2019 is an international conference organized by the Faculty of Agriculture and Animal Science (FAAS) University of Muhammadiyah Malang (UMM) which collaborate with universities and others institution. The theme of this conference is *"Bioenergy and Environmentally Sustainable Agriculture Technologies : Toward Food, Energy and Water Sovereignty"*. The meaning of this theme is a system conforming technologies, environmental, economics, and social aspects to create a sustainable energy and agriculture practices. The broad scope of this system is for synergizing all fields related such as agriculture, animal science, coastal management, food, and forestry in order to make it sustainable and energy resources. I am confident that ICoN-BEAT 2019 will play an important role in encouraging activities in research and development of Bioenergy, Renewable Energy and Environmentally Sustainable Agriculture in Indonesia, and give an excellent opportunity to forge collaborations between research institutions both within the country and with international partners. I hope that over the next two days, some fruitful collaborations can be established.

This year, ICoN BEAT 2019 also conjunction with the Congress of the Indonesian Agriculture Sciences Private University Association. Thus, we hope the congress running well and successful to the best results for high quality of agricultural education in Indonesia.

The Faculty of Agriculture and Animal Science would like to thank to Rector of UMM for the support this conference. I would like to express my sincere gratitude to the distinguished invited speakers for their presence and contributions to the conference. also very high appreciate for the academic partners and media partners for the supports. I also thank all the program committee members for their efforts in ensuring a rigorous review process to select high quality papers. Hopefully this event

can run very well and success to produce the best scientific works in the field of Bioenergy and Environmentally Sustainable Agriculture Technologies.

Faculty of Agriculture and Animal Science,  
University of Muhammadiyah Malang, Indonesia,  
Dean,

**Assoc. Prof. Dr. Ir. David Hermawan, MP, IPM.**



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Zane Vincevica- Gaile	Department of Environmental Sciences – University of Latvia, Riga (LVA)

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Aris Winaya, *Indonesia*

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### Organizer

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### Academic Partners

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INDONESIAN  
LIFE CYCLE ASSESSMENT  
NETWORK

## Event and Media Partners

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### Event Partners



### Media Partners



## Schedule

Venue : Main Hall GKB 4, University of Muhammadiyah Malang, Indonesia

Date	Time	Event	Location
Thursday, 7 <sup>th</sup> November 2019	07.00-08.00	<b>Registration</b> (Registration for conference and workshop-coaching clinic)	Main Hall GKB 4 (9 <sup>th</sup> Floor)
	08.00-08.05	<b>Opening Ceremony</b> Opening by Master of Ceremony	Main Hall GKB 4 (9 <sup>th</sup> Floor)
	08.05-08.10	National Anthem & Sang Surya	
	08.10-08.20	Welcome Dance	
	08.20-08.35	<b>Speech</b> Dean of Agriculture and Animal Science Faculty UMM (Assoc. Prof. Dr. Ir. David Hermawan, MP., IPM.)	
	08.35-08.50	<b>Speech</b> Rector of UMM (Dr. Fauzan, M.Pd.)	
	08.50-09.00	Coffee Break	Main Hall GKB 4 (9 <sup>th</sup> Floor)
	09.00-09.30	<b>Keynote:</b> Dr. Arfi Thahar	Main Hall GKB 4 (9 <sup>th</sup> Floor)
	09.30-10.00	<b>Keynote:</b> Assoc. Prof. Dr. Maizirwan Mel	
	10.00-10.30	<b>Keynote:</b> Paulus Tjakrawan	
	10.30-11.00	<b>Keynote:</b> Asst. Prof. Dr. Khwunta Khwamee	
	11.00-11.30	<b>Keynote:</b> Dr. Ir. Tatang Hernas Soerawidjaja	
	11.30-11.35	Invocation	Main Hall GKB 4 (9 <sup>th</sup> Floor)
	11.35-12.30	<b>Lunch Break &amp; Poster Presentation</b>	Main Hall GKB 4 (9 <sup>th</sup> Floor)
	12.25-14.45	<b>1<sup>st</sup> Parallel Session : Oral Presentation</b>	GKB 4 Room 1, 2, 3, 4, 5, 6
	14.45-15.15	Break Time	Main Hall GKB 4 (9 <sup>th</sup> Floor)
	15.15-16.55	<b>2<sup>nd</sup> Parallel Session : Oral Presentation</b>	GKB 4 Room 1, 2, 3, 4, 5, 6
	16.55-18.30	Break Time	-
	18.30-21.00	<b>Closing Ceremony;</b> <i>Gala Dinner and Best Presenter Announcement</i>	Sengkaling

**Venue : GKB 1 Room 535 (Agriculture and Animal Science Faculty), University of Muhammadiyah Malang, Indonesia**

<b>Friday, 8<sup>th</sup> November 2019</b>	07.30-08.00	Registration	GKB 1 Room 535
	08.00-10.30	<b>Workshop and Coaching Clinic</b> "The Proper Strategy to Submit and Publish Research Article to Malaysian Applied Biology" (By Assoc. Prof. Dr. Maizirwan Mel) (Tentative)	Meeting Room of Agriculture and Animal Science Faculty (GKB 1, 5 <sup>th</sup> Floor)

**Note:** Workshop and Coaching Clinic will be held if there are at least 20 participants, and maximum of 40 participants.

## Keynote Speaker

Dr. Arfi Thahar	Research and Development Division of The Palm Oil Plantation Fund Management Agency	Indonesia
Assoc. Prof. Dr. Maizirwan Mel	Department of Biotechnology Engineering, International Islamic University Malaysia	Malaysia
Paulus Tjakrawan	Executive Chairman of the Indonesian Biofuel Entrepreneurs Association	Indonesia
Asst. Prof. Dr. Khwunta Khwamee	Department of Earth Science Faculty of Natural Resources Price of Songkla University	Thailand
Dr. Ir. Tatang Hernas Soerawidjaja	Chairman of the Indonesian Bioenergy Association Indonesian Research Council Comision Bandung Institute of Technology	Indonesia



# Plant Science and Forestry

**2019** **IC**  **N-BEAT**  
**TOWARD**  
**FOOD, ENERGY AND WATER**  
**SOVEREIGNTY**

## Cultivation of *Chlorella* sp. In Vinasse to Produce Poly-Hydroxy Butyrate

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### INTRODUCTION

Cultivation process of microalgae (*Chlorella* sp.) is costly process when developed in specific medium. Alternatively, cultivation process can be done in wastewater. Vinasse is an alcohol wastewater. The contents of vinasse is total carbon (COD), total nitrogen and  $PO_4^{3-}$  (Candido, 2017; Reis, 2017). The utilization of vinasse as cultivation medium of *chlorella* sp. does not only decrease production cost but also promises to remove the COD contents. Besides, it is potentially to produce algae based plastics in specific condition. The characteristic of algae based plastics is degradable in nature due to containing Poly-Hydroxy Butyrate (PHB). PHB is produced in microalgae cell as stress response of limited nutrient (Carpine, 2018; Das, 2018). The aim of this research is to analyze the influence of limited nutrient difference into kinetic parameters on *chlorella* sp. cultivation process in vinasse.

In this research, Vinasse was used for cultivation medium, it was collected from one of ethanol industry in Sukoharjo, Indonesia. Vinasse was sterilized to eliminate bacterial content than diluted in tap water until 5 ppm (COD = 1435 mg/L). *Chlorella* sp. was provided by CV. Algae Park, Sukoharjo, Indonesia. To support photosynthesis process, four variations were tested at limited nutrient of (R1) no nutrient (limited N and P); (R2) 40 mg/L urea and 10 mg/L TSP; (R3) 10 mg/L TSP (limited N); dan (R4) 40 mg/L urea (limited P).

This research was used 1L glass flask disk as reactor artificial with fluid capacity is 800 mL. The reactors were equipped by 54 watt neon lighting and conventional aerator was installed to make a turbulence effect. The process was conducted in 10 days on batch mode. A sample was taken every day to be assayed for its dry mass (DM), COD and PHB contents. The DM and COD analysis followed by APHA Method while the PHB contents analysis followed by Senior (1972). With respect to DM, COD and PHB measurement, the biomass growth, substrate degradation and product formation are expressed in equation (1), (2) and (3):

$$A(t) = A_{\infty} \exp\left\{-\exp\left[\frac{2.718282\mu}{A_{\infty}}(\lambda - t) + 1\right]\right\} \quad \dots (1)$$

$$-\frac{dCOD}{dt} = k_L COD^n \quad \dots (2)$$



$$-\frac{dCOD}{dt} = \frac{1}{Y_{PHB/COD}} \frac{dPHB}{dt} \quad \dots (3)$$

Equation (1), (2) and (3) was used to quantitative analysis the outcome of supplement nutrient difference and would be depicted by the value of  $k_L$ ,  $\mu$ ,  $\lambda$  and  $Y_{PHB/COD}$ .

## RESULTS AND DISCUSSION

**Table 1.** The value of  $k_L$ ,  $\mu$ ,  $\lambda$  and  $Y_{PHB/COD}$  in each reactor

Parameter	R1	R2	R3	R4
COD degradation constant (mg COD/L.d)	0.493E-4	1.847E-4	0.865E-4	1.491E-4
Biomass productivity constant (mg/L.d)	0.643	0.158	0.343	0.096
Lag phase constant (d)	13.8430	0.1058	9.6557	0.6910
Yield constant PHB to COD (g PHB/g COD)	0.0222	0.2047	0.0303	0.2655

\* The suitable parameter  $n$  (Equation 2) that gave the best-fitting of the data was  $n = 2$  for all reactors

The addition of nutrient is very important to obtain the highest of COD degradation. However, limited nutrient is influenced in biomass productivity where the biomass productivity is linear with PHB formation (Koutra, 2018). Different with the literature, in this research the high biomass productivity in limited nutrient condition is obtain the low of yield of PHB, It is mean that the formed biomass is just as a cell stress responses due to vinasse presence, where the vinasse is contains phenol which is the inhibitor for chlorella sp.

**Keywords:** chlorella sp., nutrient, vinasse, PHB

### Acknowledgment (Optional)

*This research was funded by the national competitive research grant PKPT from the Higher Education Directorate, Ministry of Research, Technology, and Higher Education, Indonesia (Number of Contract 002/LPPM-USB/Pekerti/V/2019).*

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# CERTIFICATE

No:E.2.g/1280/FPP-UMM/XI/2019



We hereby confirm that

## Gregorius Prima Indra Budianto

Gave the following oral presentation

**Cultivation of *Chlorella Sp.* in Vinasse to Produce Poly-Hydroxy Butyrate**

at the  
**International Conference on Bioenergy & Environmentally  
Sustainable Agriculture Technology**

November 7<sup>th</sup>-8<sup>th</sup>, 2019

University of Muhammadiyah Malang, Indonesia



**Dr. David Hermawan**  
Dean of The Faculty of Agriculture  
and Animal Science



**Dr. Listiari Hendraningsih**  
Conference Chairman

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